GMT NEXTGEN TRANSIT PLAN

SERVICE GUIDELINES

JUNE 2017

DRAFT

Green Mountain Transit

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1. INTRODUCTION

Green Mountain Transit (GMT) strives to provide quality transit service in a cost-effective manner that is consistent and equitable. To do so, GMT must make a number of competing decisions on where demand is greatest, on which types of service would work best and be most appropriate, and where limited resources can and should be used. This set of service guidelines defines how GMT will:

- Determine where service should be provided
- Design service
- Determine appropriate service levels
- Ensure that service is productive

The service guidelines will be applied to the entire family of services provided by GMT and are intended to bring clarity and consistency to the process of continually adjusting and improving transit services to meet varied and changing customer needs. In most cases, the service guidelines define minimum thresholds that must be met, and most services would exceed the minimum thresholds. However, the guidelines are also designed to—within limits—provide flexibility to respond to varied customer needs and community expectation in an accountable, equitable, and efficient manner.

Finally, it should be noted that adherence to these service guidelines is dependent upon resource availability, and in particular, funding availability. In the event of constrained resources, GMT will meet these guidelines as closely as possible and will work to achieve consistency as resources permit.

2. GMT SERVICES

RIPTA provides a family of services that are designed to meet a wide array of travel needs. These services consist of the following types of routes:[1]

- Major Urban Local
- Urban Local
- Rural Local
- Commuter
- Shuttle
- Flex
- Seasonal Local
- Seasonal Flex

MAJOR URBAN LOCAL

Major Urban Local routes are GMTs highest ridership and/or most productive routes and form the "backbone" of the GMT's urban system in the Burlington metro area. These routes operate along major arterials and offer simple, straight, and direct service. Major Urban Local routes provide frequent service from early morning until late night.

All Major Urban Local routes provide fixed-route service, which means that they operate along a designated route and serve designated stops.

URBAN LOCAL

Urban routes are local routes that provide service urbanized areas where there is significant demand for transit, although less than in corridors served by Major Urban Local routes. Most of these routes operate to and from downtown Burlington.

All Urban Local routes provide fixed-route service.

RURAL LOCAL

Rural Local routes are those that operate outside of the Burlington metro area – in Franklin, Grand Isle, Lamoille, and Washington counties. These routes primarily serve town centers and other more densely developed areas with smaller scale services that reflect lower levels of demand than in Chittenden County.

[1] The specific routes included in each class are shown in Appendix A.

Rural local routes provide operate as either fixed-route service or deviated fixed-route service. Deviated fixed-route service operates primarily along a designated route, but, upon request, will deviate from the designated route to serve "off-route" locations.

COMMUTER

Commuter routes are designed primarily to provide commuter service to and from downtown Burlington and Montpelier. Express routes typically make only limited stops and travel on major regional roadways and highways. Most of these routes are designed to provide weekday only peak period service. However, depending upon demand, some commuter routes operate for longer hours.

Commuter routes provide fixed-route service and serve designated stops. In addition, some Commuter routes (for example, the Route 2 Commuter) also allow passengers to request a stop anywhere along the route.

SHUTTLE

Shuttle services are designed to provide service for specific needs such as shopping and accesses to services, including social services. Depending upon demand, these service may operate only one day a week (for example, some supermarket shuttles), or multiple days a week.

Shuttle routes can provide either fixed-route or deviated fixed-route service.

FLEX

Flex routes (which are also known as Demand-Response routes) serve similar markets as shuttle services but in in areas where it is difficult to provide fixed-route service because destinations are widely scattered. These routes provide service anywhere within a geographically limited zone (known as a Flex zone), and pick up and drop off passengers anywhere within the zone, including connecting points with fixed-route bus service for travel outside the zone.

SEASONAL LOCAL

GMT provides seasonal service in areas where there is sufficient demand for transit only during certain parts for the year – for example, the Legislative Shuttle in Montpelier when the Legislature is in session, and ski season service in Stowe and the Mad River Valley.

Seasonal Local routes provide fixed-route service in the same manner as Rural Local routes, but as described, only operate during certain periods of the year.

SEASONAL FLEX

Seasonal Flex routes operate in the same manner as regular Flex routes, but only during certain periods of the year.

3. SERVICE DESIGN PRINCIPLES

GMT works to serve as many residents, workers, and visitors as it can within its available resources. This involves many trade-offs as some service attributes that attract one type of rider will deter other riders – for example, meandering services designed to minimize walk distances are attractive to those who are not time-sensitive, but unattractive to those who are. GMT's family of services attempts to balance these competing demands to develop a network that meets the greatest public good. At the same time, however, there are also certain service design principles that will improve service for nearly all riders.

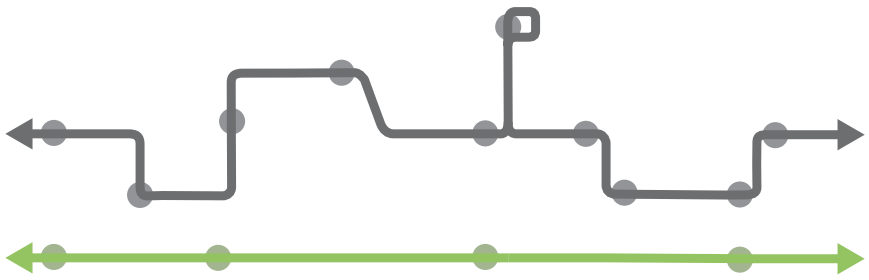
➲ SERVICE SHOULD BE SIMPLE

To encourage people to use transit, transit service should be easy to understand. The way service is designed influences how easy it is for people to understand the transportation options available to take them where and when they want to go. Most of the guidelines in this section are aimed at making service intuitive, logical, and easy to understand.

➲ ROUTES SHOULD OPERATE ALONG A DIRECT PATH

Passengers and potential passengers alike prefer faster, more direct transit services. In order to remain competitive with the automobile, special attention should be placed on designing routes to operate as directly as possible to maximize average speed for the bus and minimize travel time for passengers while maintaining access to service. Routes should not deviate from the most direct alignment unless there is a compelling reason to do so.

Most riders prefer straighter more direct service than circuitous service

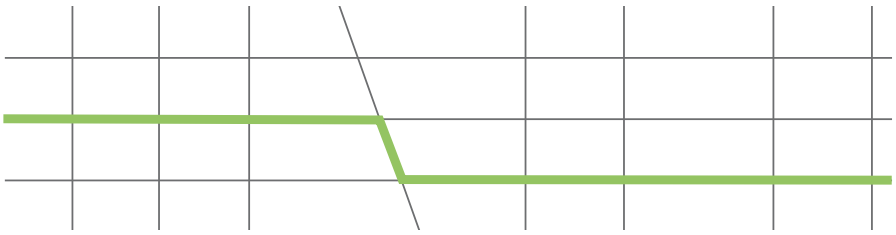


➲ ROUTE DEVIATIONS SHOULD BE MINIMIZED

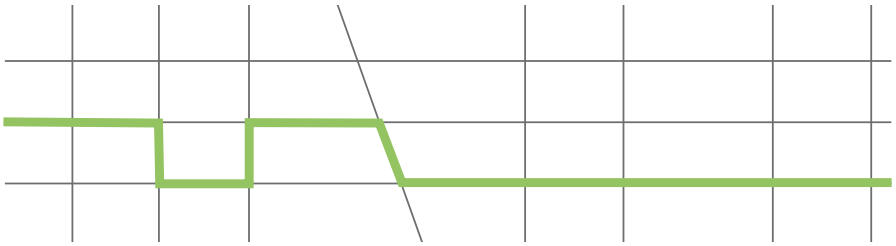
As described above, service should be as direct as possible. Consistent with this idea, the use of route deviations—traveling off the most direct route—should be minimized.

Serving different locations on different trips makes service complicated and inconveniences most riders

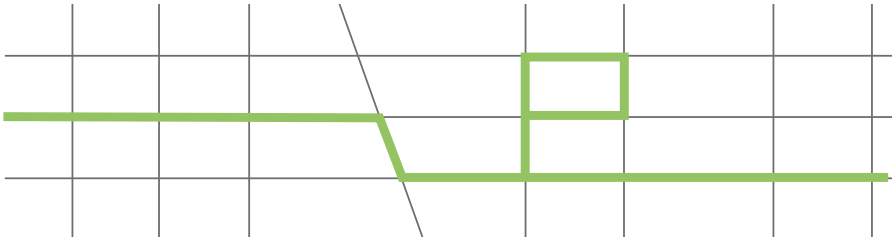
Main Route



8:43 AM Trip



2:23 PM Trip



There are, however, instances when the deviation of service off of the most direct route is appropriate, for example to avoid a bottleneck or to provide service to major shopping centers, employment sites, schools, etc. In these cases, the benefits of operating the route off of the main route must be weighed against the inconvenience caused to passengers already on board. Route deviations should be implemented only if:

- The deviation will result in an increase in overall route productivity.
- The number of new passengers that would be served is equal to or greater than 25% of the number of passengers who would be inconvenienced by the additional travel time on any particular deviated trip.
- The deviation would not interfere with the provision of regular service frequencies and/or the provision of coordinated service with other routes operating in the same corridor.

In most cases, where route deviations are provided, they should be provided on an all-day basis. Exceptions are during times when the sites that the route deviations serve have no activity—for example route deviations to shopping centers do not need to serve those locations early in the morning before employees start commuting to work.

➲ MAJOR ROUTES SHOULD OPERATE ALONG ARTERIALS

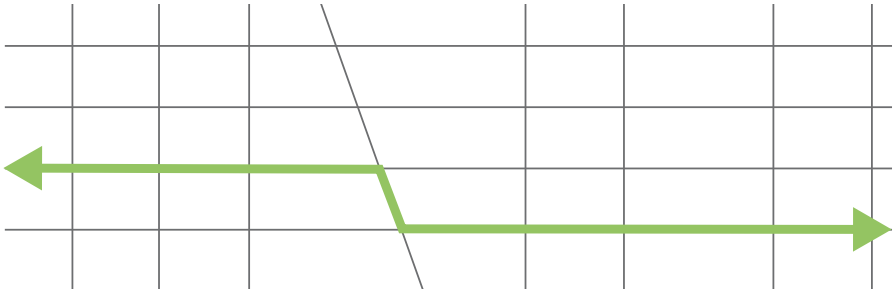
Major Urban Local, Urban Local, and higher ridership Rural Local routes should operate on major roadways and should avoid deviations to provide local circulation. Riders and potential transit users typically have a general knowledge of an area's arterial road system and use that knowledge for geographic points of reference. The operation of bus service along arterials makes transit service faster and easier for riders to understand and use.

➲ ROUTES SHOULD BE SYMMETRICAL

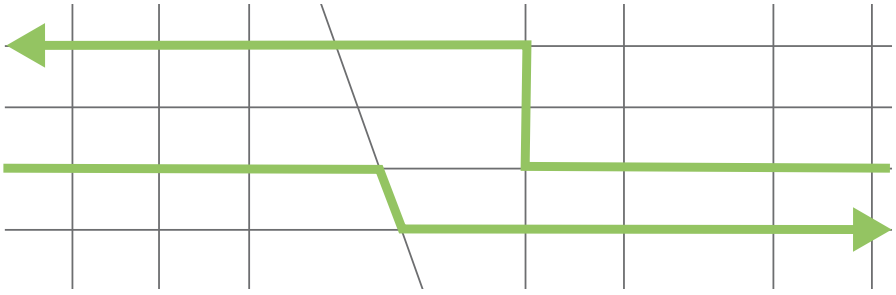
Routes should operate along the same alignment in both directions to make it easy for riders to know how to return to their trip origin location. For example, if a route follows 4th Street into downtown, it should use 4th Street on its outbound trip. Exceptions can be made in cases where such operation is not possible due to one-way streets or turn restrictions. In those cases, routes should be designed so that the opposite directions parallel each other as closely as possible.

Operating service along the same alignment in both directions makes it easier for riders to understand service and find their return trip

Symmetrical



Non-Symmetrical



➲ SERVICES SHOULD BE WELL-COORDINATED

Where routes connect, schedules should be coordinated to the greatest extent possible to minimize connection times for the predominant transfer flows.

➲ SERVICE SHOULD OPERATE WITH CONSISTENT SCHEDULES

Routes should be scheduled to operate at regular intervals (headways). People can easily remember repeating patterns but have difficulty remembering irregular ones. For example, routes that provide four trips an hour should depart from their terminals every 15 minutes. Limited

exceptions can be made in cases where demand spikes during a short period in order to eliminate or reduce crowding on individual trips.

People can remember repeating patterns much more easily than non-repeating ones

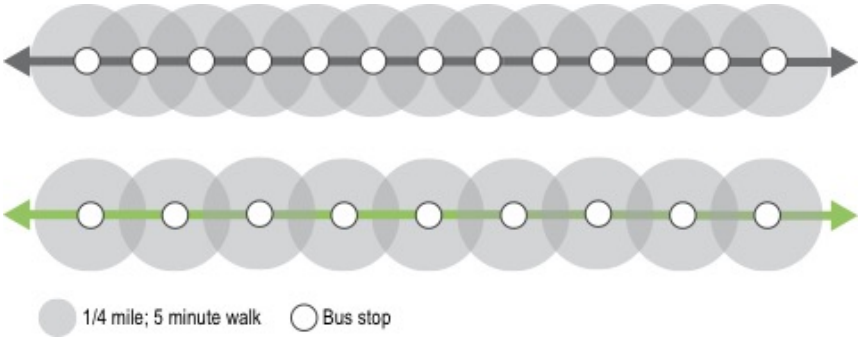
Departures with Clockface Headways: 8:00, 8:15, 8:30, 8:45, 9:00, 9:15, 9:30, etc…

Departures with Inconsistent Frequencies: 8:00, 8:17, 8:32, 8:44, 9:01, 9:13, 9:30, etc

➲ STOPS SHOULD BE SPACED APPROPRIATELY

The distance between stops significantly impacts travel times. More closely spaced stops provide customers with more convenient access as they are likely to experience a shorter walk to the nearest bus stop. However, they also increase travel times and are the major reason that transit is slower than automobile travel (since each additional stop requires the bus to decelerate, come a complete stop, load and unload riders), and then accelerate and re-merge into traffic. Most riders want service that balances convenience and speed, and the number and location of stops is a key component of determining that balance.

Too many stops can make service unacceptably slow for many potential riders



The different types of transit services are tailored toward serving different types of trips and needs. In general, services designed to serve a broad cross-section of the population (for example, most local and commuter routes) should have fewer stops, while services that emphasize accessibility (for example, Shuttles) should have more frequent stops. Commuter routes are a special case in many of these routes travel for significant distances through undeveloped areas. In these cases, stops should be located based on specific demands rather than an average spacing.

Guidelines for minimum stop spacing (or maximum stops per mile) are shown in Table 1. Exceptions to these guidelines can and should be made in locations where walking conditions are poor (which is the case along many rural routes) or there are other significant considerations.

Table 1 | Bus Stop Spacing Guidelines

	Local Routes (Major Urban, Urban, Rural, and Seasonal)	Commuter	Shuttles	Flex (including Seasonal)
Minimum Stop Spacing (feet)	1,100	NA	660	NA
Maximum Stops per Mile	5	NA		NA

➲ SERVICE DESIGN SHOULD MAXIMIZE SERVICE

The distance and travel time of a route determine how efficiently a bus can operate. Service should be designed to maximize the time a vehicle is in service, and minimize the amount of time it is out-of-service. In other words, the length of the route and the time it takes to make each trip impacts how long of a layover is required at each end and how many buses are needed to provide the service. Often, it may be more efficient to extend a route to pick up a few more passengers and limit the amount of layover time.

➲ VEHICLE TYPES SHOULD BE APPROPRIATE FOR SERVICE

Depending upon the type of service provided, ridership ranges from very high to low, and travel times range from short to long. The types of vehicles used on different routes should reflect those differences. At the present time, GMT uses standard transit buses on urban routes, a mix of commuter coaches, standard transit buses, and small "cutaway" vehicles on commuter routes, and cutaway vehicles on rural routes. Vehicle types are currently determined based largely on passenger volumes.

The three vehicle types provide differing degrees of comfort. The large commuter coaches used for some LINK services provide the highest level of comfort, while the standard transit buses used for urban service provide a moderate level of comfort that is standard throughout the transit industry. The cutaways provide a lowest level of comfort that is noticeably below that of urban services. As GMT replaces these vehicles, it will work to improve comfort levels.

Commuter Coach **Standard Transit Bus** **Cutaway**

4. SERVICE LEVEL GUIDELINES

Service level guidelines define when service should be provided and how often it should be provided. Four guidelines are used:

1. Service Coverage
2. Span of Service
3. Service Frequencies
4. Passenger Loadings

The guidelines listed in this document are used to determine minimum or maximum acceptable levels for each GMT route, by route type. On an ongoing basis, service should be added when ridership increases to levels that exceed maximum loading guidelines. Conversely, service should be evaluated and potentially reduced when ridership falls below the minimum productivity guidelines. Likewise, service spans may be expanded to extend the span of service earlier in the morning and later at night, if minimum productivity guidelines can be met.

➲ SERVICE COVERAGE

Public transit is designed to be mass transportation rather than personalized transportation. As such, it is most effective in areas where sufficient numbers of people live and work in close proximity. The best indicators of whether there will be underlying demand for productive transit service are population and employment density, with at least three households per acre, 4 jobs per acre, or a combination thereof, necessary to support local fixed-route services (see Figure 1). GMT will endeavor to provide local service in all areas where population and employment densities exceed these thresholds.

Figure 1 | Transit Supportive Population and Employment Densities

Source: Composite data compiled by Nelson\Nygaard from various sources.

Other factors may also be considered. For example, socio-economic characteristics such as income levels, the number of households without automobiles or fewer automobiles than works, can increase or decrease underlying demand. GMT will also consider these factors when examining potential demand for service.

➲ MINIMUM SPANS OF SERVICE

The number of hours per day when transit service is provided along a route, a segment of route, or between two locations plays a role in determining the attractiveness of transit service to potential users. Transit service must be available near the time a trip needs to be made in order for transit to be a travel option.

Passenger needs and GMT's financial capacity are key considerations in setting weekday service spans, and in deciding which routes are operated on Saturdays and Sundays. Weekday routes should permit workers and students to make their morning start times, and should end late enough to provide return trips home for second shift workers. Service oriented to non-work travel can start later and end sooner. Sunday service may not be necessary on many routes.

The minimum span of service guidelines define the minimum period of time that different types of service should operate. Minimum span of service guidelines are presented in Table 1. Note that service can start earlier and end later if demand warrants, but the extra service would be subject to the minimum performance guidelines presented in Section 5. Also, the guidelines may not apply to some services on certain days, indicated by a "--". Service may still be provided on these days (to meet other guidelines, for example), though it would not be subject to minimum span of service guidelines.

Table 1 | Minimum Span of Service Guidelines

	Major Urban Local	Urban Local	Rural Local	Commuter	Shuttles	Flex	Seasonal Local	Seasonal Flex
Weekdays								
Begin	6:00 AM	6:00 AM	7:00 AM	Peak only	--	9:00 AM	7:00 AM	--
End	11:00 PM	8:00 PM	6:00 PM	Peak only	--	3:00 PM	5:00 PM	--
Saturdays								
Begin	6:00 AM	6:00 AM	*Saturday service as warranted, but not required*					
End	8:00 PM	7:00 PM						
Sundays								
Begin	7:00 AM	6:30 AM	*Sunday service as warranted, but not required*					
End	8:00 PM	8:00 PM						

Note: The beginning span of service refers to the departure of the first inbound trip, and the ending span of service refers to the departure time of the last peak direction trip.

➲ MINIMUM SERVICE FREQUENCIES

Service frequency is the time interval between two vehicles traveling in the same direction on the same route. This has a significant impact on transit ridership. High frequency service is considered a key characteristic of attractive service. At the same time, frequency has a significant impact on operating costs, and vehicle and hour requirements increase with improvements in service frequency.

Because of the expense of high frequency service, transit service frequency is normally based upon existing or potential demand. This often translates into variations in service frequency throughout the day, with higher frequency in peak periods, and less frequent service outside of the peak.

In general, frequencies are established to provide enough vehicles past the maximum load point(s) on a route to accommodate the passenger volume and stay within recommended loading guidelines. Minimum service frequency guidelines are presented in Table 2. When a corridor is served by multiple routes, effective service frequencies in the corridor would be more frequent than those of individual routes.

Table 2| Minimum Service Frequency Guidelines (Frequency in Minutes)

	Major Urban Local	Urban Local	Rural Local	Commuter	Shuttles	Flex	Seasonal Local	Seasonal Flex
Weekdays								
Early AM	30	60	–	–	–	–	–	
AM Peak	15	30	60	2 trips	60	60	60	60
Midday	30	30	60	–	60	60	60	60
PM Peak	15	30	60	2 trips	60	60	60	60
Night	30	60	–	–	–	–	60	
Saturdays								
All Day	30	60	*Saturday service as warranted, but not required*					
Sundays								
All Day	30	60	*Sunday service as warranted, but not required*					

Note: "--" indicates that the guideline does not apply. Also, the guidelines apply to services that are provided, and do not imply that all services will be provided at all times.

Clockface service intervals (e.g. every 10, 12, 15, 20, 30 or 60 minutes) are easier for passengers to remember and can help facilitate better transfer connections between routes. Whenever possible, frequencies should be set at regular clockface intervals.

➲ PASSENGER LOADING

GMT will design its services to keep the number of passengers on its vehicles at a comfortable level. During peak periods, this means that some passengers may be expected to stand for part of the trip. During off-peak periods and for service that operates for long distances, service will be designed to try to provide a seat to all customers.

Two different techniques are used to keep passenger loads within acceptable levels. The first is to match vehicle types with ridership levels, and to use larger vehicles on higher ridership routes. The second method is to provide more frequent service, with service frequencies set to keep passenger loads within the limits presented in Table 3.

The vehicle load standard is calculated on the basis of an average for the both the peak and off-peak periods, at the busiest point on the route. For instance, if a route operates every 15-minutes, then 4 buses would pass the busiest point in an hour. The average number of passengers for these 4 buses must fall within the service standards, even though any one bus may be more crowded than the average. If the standard is exceeded for the average calculation, GMT will consider more frequent service or larger vehicles to improve the situation.

Table 3| Average Vehicle Loading Maximums

	Major Urban Local	Urban Local	Rural Local	Commuter	Shuttles	Flex	Seasonal Local	Seasonal Flex
Average Maximum Passenger Loading (as a percentage of seating capacity)								
Peak	120%	120%	100%	100%	100%	100%	120%	100%
Off-Peak	100%	100%	100%	–	100%	100%	100%	100%

Note: Maximums are averages over one-hour periods; individual trips may exceed averages.

5. PERFORMANCE AND PRODUCTIVITY GUIDELINES

GMT must use its resources effectively and all routes should achieve a minimum level of productivity and performance. The two primary guidelines to assess productivity and cost-effectiveness are:

1. Passengers per Revenue Vehicle Hour for all routes except Commuter routes. This is a measure of how many passengers buses on a route carry for each hour they are in service.
2. Passengers per Trip for Commuter routes. This measure is used for Commuter routes because they typically carry passengers for long distances with little passenger turnover. As a result, Passenger per Revenue Service Hour figures are low, but by design.

➲ PASSENGERS PER REVENUE VEHICLE HOUR/TRIP

With limited exceptions, all service should attract a minimum level of ridership. For routes that experience a significant amount of ridership turnover along the route (all services except Commuter routes), this minimum level of ridership is expressed in terms of Passengers per Revenue Service Hour, or in simpler terms, the average number of passengers that a bus should serve for each hour it is in service. For Regional and Express/Commuter routes, which often travel for long distances with little ridership turnover, the minimum level of ridership is expressed in terms of Passengers per Bus Trip. These minimum productivity levels are presented in Table 4.

Table 4| Minimum Productivity Levels (Passengers per Revenue Vehicle Hour or Trip)

	Major Urban Local	Urban Local	Rural Local	Commuter	Shuttle	Flex	Seasonal Local	Seasonal Flex
Measure:	**Per Hour**	**Per Hour**	**Per Hour**	**Per Trip**	**Per Hour**	**Per Hour**	**Per Hour**	**Per Hour**
Weekdays	20	15	6	10	6	4	15	4
Saturdays	15	10	6	10	6	4	15	4
Sundays	15	10	6	10	6	4	15	4

6. APPLICATION OF PERFORMANCE GUIDELINES

In cases where routes do not meet minimum performance guidelines, changes should be made to improve route performance. These changes can include a variety of measures, including reconfiguring the route alignment to attract more passengers, targeted marketing, eliminating particularly unproductive segments, and reducing service levels. If no changes can be identified that improve performance, steps may be taken to discontinue the route unless it serves a demonstrable critical need that is not served by other routes or services (including paratransit service).

In cases where service expansion is considered, ridership and productivity estimates should be developed that indicate that there is a reasonable certainty that the new service will meet the performance guidelines within 12 months of implementation.