King County Metro Service Guidelines

Introduction

Metro has developed service guidelines that it will use to design and change transit services in an ever-changing environment. The guidelines will help Metro make sure that its decision-making is objective, transparent, and aligned with the region's goals for its public transportation system. These guidelines are consistent with the *King County Metro Transit Strategic Plan for Public Transportation*, Strategy 6.1.1, which calls for Metro to "Manage the transit system through service guidelines and performance measures."

Metro will use the guidelines to make decisions about expanding or reducing service, to evaluate service productivity, and to determine if service revisions are needed because of changes in rider demand or route performance.

The guidelines are designed to address productivity, social equity and geographic value. They are also intended to help Metro respond to changing financial conditions and to integrate its services with the regional transportation system.

The guidelines are grouped into the following categories:

- All-Day and Peak Network
  The All-Day and Peak Network is the centerpiece of the transit system that Metro is building to meet the region's current and future public transportation needs. The All-Day and Peak Network guidelines are intended to ensure that transit supports household and employment density, connects centers, and provides service levels appropriate to the population and ridership throughout King County. The guidelines establish the service levels needed to support growth, ensure social equity, and provide geographic value.

- Performance measurement
  These guidelines establish standards for productivity, passenger loads, and schedule reliability. Metro will use these guidelines to evaluate individual routes and recommend changes needed to maintain service quality and deliver effective and efficient service.

- Service restructures
  These guidelines define the circumstances that will prompt Metro to restructure multiple routes along a corridor or within an area.

- Route design
  These are qualitative and quantitative guidelines for designing specific transit routes and the overall transit network.

- Use and implementation
  This section describes how Metro will use all guidelines, how they will be prioritized to make recommendations about adding or reducing service, and how the performance of individual bus routes and the Metro system as a whole will be reported.

All-day and peak network

Metro strives to provide high-quality transit service to a wide variety of travel markets and a diverse group of riders. Metro designs its services to meet a number of objectives:

- Support regional growth plans
- Respond to existing ridership demand
- Provide productive and efficient service
- Ensure social equity
- Provide geographic value through a network of connections and services throughout King County communities.

Metro is building a network of services to accomplish these objectives. The foundation of the All-Day and Peak Network is a set of two-way routes that operate all day and connect designated regional growth centers, manufacturing and industrial centers, and other areas of concentrated activity. All-day service is designed to meet a variety of travel needs and trip purposes throughout the day. Whether riders are traveling to work, appointments, shopping, or recreational activities, the availability of service throughout the day gives them the ability to travel when they need to. The All-Day and Peak Network also includes peak service that provides faster travel times, accommodates very high demand for travel to and from major employment centers, and serves park-and-ride lots in areas of lower population density.

A key step in developing the All-Day and Peak Network is to determine the service levels that meet the needs of King County's diverse communities. Metro determines these service levels through a three-step process:

First, service levels are set by scoring all corridors using six measures addressing land use, social equity, and geographic value. Corridors with higher scores are assigned higher levels of service. Second, service levels are adjusted based on existing ridership. Where the service level suggested in Step 1 would not be adequate to accommodate existing riders, would be inconsistent with service levels set for RapidRide services, or would leave primary connections without night service, corridor service levels are increased. Third, peak service that enhances the all-day network is determined using travel time and ridership information.

These steps provide broad guidance for establishing a balance of all-day service levels and peak services. The target service levels may be revised as areas of King County grow and change.

Metro does not have sufficient resources to fully achieve the All-Day and Peak Network today. The service-level guidelines, used in combination with the guidelines established for managing the system, will help Metro make progress toward the All-Day and Peak Network.

Service levels are defined by corridor rather than by route to reflect the fact that there may be multiple ways to design routes to serve a given corridor, including serving a single corridor with more than one route. The desired service levels can be achieved through service by a single route or by multiple routes.

Metro evaluated 113 corridors where it provides all-day service today and 94 peak services that it provides today. The services in these corridors include those linking regional growth centers, manufacturing/industrial centers, and activity centers; services to park-and-rides and major transit facilities; and services growth centers that are geographically distributed throughout King County. The same evaluation process could be used to set service levels for corridors that Metro does not currently serve.

All-day and peak network assessment process

STEP 1: SET SERVICE LEVELS	
FACTOR	PURPOSE
Land Use	Support areas of higher employment and household density
Social Equity and Geographic Value	Serve historically disadvantaged communities
	Provide appropriate service levels throughout King County

STEP 2: ADJUST SERVICE LEVELS	
FACTOR	PURPOSE
Loads	Provide sufficient capacity for existing transit demand
Use	Improve effectiveness and financial stability of transit service
Service Span	Provide adequate levels of service throughout the day

STEP 3: IDENTIFY PEAK OVERLAY	
FACTOR	PURPOSE
Travel Time	Ensure that peak service provides a travel time advantage compared to other service alternatives
Ridership	Ensure that peak service is highly used

OUTCOME: ALL-DAY AND PEAK NETWORK

Step 1: Set service levels

Service levels are determined by the number of households and jobs in areas with access to a corridor, by the proportion of historically disadvantaged populations near the corridor, and by the geographic distribution of regional growth centers, manufacturing and industrial centers, and activity centers in King County. These factors give Metro a way to take into account the elements that make transit successful as well as the populations and areas that must be served to support social equity and deliver geographic value. Each corridor is scored on six factors, and the total score is used to set service levels in a corridor. Each corridor is intended to have the identified frequency during some or all of the time period listed.

Land use factors

The success of a transit service is directly related to how many people have access to the service and choose to use it. Areas where many people live and work close to bus stops have higher potential transit use than areas where few people live and work close by. Areas that have interconnected streets have a higher potential for transit use than areas that have fewer streets or have barriers to movement, such as hills or lakes. The land use factors Metro uses to determine service levels are the number of households and jobs located within a quarter-mile walking access of stops. The quarter-mile calculation considers street connectivity; only those areas that have an actual path to a bus stop are considered to have access to transit. This is an important distinction in areas that have a limited street grid or barriers to direct access, such as lakes or freeways. The use of land-use factors is consistent with Metro's *Strategic Plan for Public Transportation* because it addresses the need for transit to serve a growing population (Strategy 3.2.1) and encourages land uses that transit can serve efficiently and effectively (Strategy 3.3.1)

Social equity and geographic value factors

As it strives to develop an effective transit network that ensures social equity and provides geographic value, Metro considers how the network will serve historically disadvantaged populations, activity centers, regional growth centers, and manufacturing and industrial centers. As a way to achieve social equity, Metro identifies areas where low-income and minority populations are concentrated as warranting higher levels of service. Metro also identifies

primary connections between centers as warranting a higher level of service, to achieve both social equity and geographic value. Centers are located in all areas of the county and include major destinations for all people, such as large employment sites, healthcare institutions, human service agencies, libraries, and community centers. Metro considers centers regardless of their size.

Primary connections are defined as the predominant transit connection between centers based on a combination of ridership and travel time. Regional growth centers and manufacturing centers are identified in the region's *Vision 2040* plan. Metro identified additional activity centers based on the adopted Countywide Planning Policies, which envision activity areas as "moderate concentrations of commercial development and housing that function as a focal point for the local community." Metro expanded on this definition to include major medical centers, higher-education institutions, and transit hubs because these are areas of high importance to the transit system and people who use transit. The Countywide Planning Policies are being updated as this is being written, and the update could result in a change to the definition of activity areas. Metro will ensure that the name and description of activity areas reflect any revisions of the Countywide Planning Policies.

The use of factors related to social equity and geographic value is consistent with the *Strategic Plan for Public Transportation*. The use of social equity factors guides transit service to provide travel opportunities for historically disadvantaged populations (Strategy 2.1.2). Factors concerning activity centers and geographic value guide service to areas of concentrated activity (Strategy 3.4.1) and ensure that services provide value in all areas of King County. Regional growth centers, manufacturing and industrial centers, and activity centers are listed in Appendix 1.

Thresholds and points used to set service levels

FACTOR	MEASURE	THRESHOLDS	POINTS
Land Use	Households within ¼ mile of stops per corridor mile	3,110[1]	10
		2,080	7
		1,040	4
		<1,040	0
	Jobs within ¼ mile of stops per corridor mile	17,390[2]	10
		11,480	7
		5,810	4
		<5,810	0
Social Equity and Geographic Value	Percent of boardings in low-income census tracts[3]	Above system average (>70.4%)	5
		Below system average (>70.4%)	0
	Percent of boardings in minority census tracts[4]	Above system average (>60.5%)	5
		Below system average (>60.5%)	0
	Primary connection between regional growth, manufacturing and industrial centers	Yes	5
		No	0
	Primary connection between activity centers	Yes	5
		No	0

1 Thresholds for land use factors were set based on where a corridor scored relative to the highest score of all corridors. Thresholds for households per mile were set based on 75%, 50% and 25% of the highest score.

2 Thresholds for jobs per corridor mile were set based on 50%, 33% and 16% of the highest score.

3 Low-income tracts are those where more than 8.3% of the population has low incomes, based on 2000 Census data.

4 Minority tracts are defined as tracts with greater than 26.6% of the population as minority (all groups except White, non-Hispanic), based on 2000 Census data.

Frequency based on total score

Scoring range	Peak service frequency (minutes)	Off-peak service frequency (minutes)	Night service frequency (minutes)
25-40	15	15	30
19-24	15	30	30
10-18	30	30	--
0-9	60 or worse (≥60)	60 or worse	--

Step 2: Adjust service levels

After setting service levels on the basis of the six factors in Step 1, Metro adjusts the levels to ensure that the All-Day and Peak Network accommodates current ridership levels. Corridor service levels are increased if providing service at the levels established under Step 1 would not accommodate existing riders, would be inconsistent with policy-based service levels set for RapidRide services or would result in an incomplete network of night service.

Thresholds used to adjust service levels

Factor	Measure	Threshold	Adjustment to warranted frequency		
			Service level adjustment	Step 1 frequency (Minutes)	Adjusted frequency (Minutes)
Cost recovery	Estimated cost recovery by time of day—*if existing riders were served by step 1 service levels*	>100% In any time period	Adjust two levels	15 or 30	<15
				≥60	15
		Peak >50% Off-peak >50% Night >33%	Adjust one level	15	<15
				30	15
				≥60	30
		Night >16%	Add night service	--	30
		Night >8%		--	≥60
Load	Estimated load factor[5] by time of day—*if existing riders were served by step 1 service levels*	>1.5	Adjust two levels	15 or 30	<15
				≥60	15
		>0.8	Adjust one level	15	<15
				30	15
				≥60	30
Service span	Connection at night	Primary connection between regional growth centers	Add night service	--	≥60
		Frequent peak service	Add night service	--	30

[5] Load factor is calculated by dividing the maximum load along a route by the total number of seats on a bus, to get a ratio of riders to seats.

Metro also adjusts service levels on existing and planned RapidRide corridors to ensure that identified service frequencies are consistent with policy-based service frequencies for the RapidRide program: better than 15 minutes during peak periods, 15 minutes during off-peak periods, and 15 minutes at night. Where policy-based service frequencies are better than service frequencies established in Step 2, frequencies are improved to the minimum specified by policy.

The combined outcome of Steps 1 and 2 is a set of corridors with all-day service levels that reflect factors concerning land use, social equity, geographic value, and ridership. These corridors can be divided into families based on the frequency of service. Corridors with the highest frequency would have the longest span of service.

Step 3: Identify peak overlay

Peak service adds value to the network of all-day service by providing faster travel times and accommodating very high demand for travel to and from major employment centers. Peak service thresholds ensure that peak service is well-used and provides benefits above the network of all-day service. Service levels on peak routes are established separately from the all-day network because they have a specialized function within the transit network.

Thresholds for peak services

Factor	Measure	Threshold
Travel time	Travel time relative to alternative service	Travel time should be at least 20% faster than the alternative service
Ridership	Rides per trip	Rides per trip should be 90% or greater compared to alternative service

Metro considers travel time and ridership to determine where peak service is appropriate. Peak service in a corridor that also has all-day service should have higher ridership and faster travel times than the other service to justify its higher cost. If peak service does not meet the load and travel-time thresholds but serves an area that has no other service, Metro would consider preserving service or providing service in a new or different way, such as connecting an area to a different destination or providing alternatives to fixed-route transit service.

Peak service generally has a minimum of eight trips per day on weekdays only. Peak service is provided for a limited span compared to all-day service. The exact span and number of trips are determined by demand on an individual route basis.

Evaluating new service

Metro has defined the All-Day and Peak Network on the basis of appropriate levels of service for all-day and peak services within King County today. However, the service assessment processes are also applicable when Metro is considering and evaluating potential or proposed new services. They can also be applied over time to determine appropriate levels of service as areas of King County change.

Service families

All-Day and Peak Network services are broken down by level of service into five families. Service families are primarily defined by the frequency and span of service they provide. The table below shows the typical characteristics of each family. Some services may fall outside the typical frequencies depending on specific conditions.

Summary of typical service levels by family

Service family	Frequency[6] (minutes)			Days of service	Hours of service[7]
	Peak[8]	Off-peak	Night		
Very frequent	15 or better	15 or better	30 or better	7 Days	16-20 Hours
Frequent	15 or better	30	30	7 Days	16-20 Hours
Local	30	30 - 60	--*	5-7 Days	12-16 Hours
Hourly	60 or worse	60 or worse	--	5 Days	8-12 Hours
Peak	8 Trips/day minimum	--	--	5 Days	Peak

*Night service on local corridors is determined by ridership and connections.

- **Very frequent** services provide the highest levels of all-day service. Very frequent corridors serve very large employment and activity centers and high-density residential areas.
- **Frequent** services provide high levels of all-day service. Frequent corridors generally serve major employment and activity centers and higher-density residential areas.
- **Local** services provide a moderate level of all-day service. Local corridors generally serve regional growth centers and low- to medium-density residential areas.
- **Hourly** services provide all-day service no more frequently than every hour. Basic corridors generally connect low-density residential areas to regional growth centers.
- **Peak** services provide specialized service in the periods of highest demand for travel. Peak services generally provide service to a major employment center in the morning and away from a major employment center in the afternoon.

While the service families are based on frequency, Metro also classifies individual routes by their major destinations when comparing productivity. These classifications are based on the primary market served. Regional growth centers in the core of Seattle and the University District are significantly different from markets served in other areas of King County. Services are evaluated based on these two primary market types to ensure that comparisons reflect the service potential of each type of market.

- **Seattle core** routes are those that serve downtown Seattle, First Hill, Capitol Hill, South Lake Union, the University District, or Uptown. These routes serve regional growth centers with very high employment and residential density.
- **Non-Seattle core** routes are those that operate only in other areas of Seattle and King County. These routes provide all-day connections between urban or activity centers outside of Seattle or provide service in lower-density areas.

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[6] Frequency is the minutes between consecutive trips in the same direction. A trip with four evenly spaced trips per hour would have an average headway of 15 minutes and a frequency of four trips per hour.

[7] Hours of service, or span, is defined as the time between the first trip and the last trip leaving the terminal in the predominant direction of travel.

[8] Time period definitions: Peak, 5–9 a.m. and 3–7 p.m. weekdays; Off-peak, 9 a.m.–3 p.m. weekdays, 5 a.m.–7 p.m. weekends; Night, 7 p.m.–5 a.m. all days.

Performance management

Metro uses performance management to improve the efficiency and effectiveness of the transit system. Performance management guidelines are applied to individual routes to identify high and low performance, areas where investment is needed, and areas where resources are not being used efficiently and effectively.

Productivity

Productivity measures identify routes where performance is strong or weak as candidates for addition, reduction, or restructuring. High and low performance thresholds differ for routes that serve the Seattle core areas[9] and those that do not. Routes serving the Seattle core are expected to perform at a higher level because the potential market is much greater than for routes serving other areas of King County.

The measures for evaluating routes are rides per platform hour[10] and passenger miles per platform mile[11]. Two measures are used to reflect the fact that services provide different values to the system. Routes with high ridership relative to the amount of investment perform well on the rides-per-platform-hour-measure. Routes with full and even loading along the route perform well on the passenger-miles-per-platform-mile measure; an example is a route that fills up at a park-and-ride and is full until reaching its destination.

Low performance is defined as having productivity in the bottom 25 percent of routes within a category and time period. High performance is defined as having productivity levels in the top 25 percent of routes within a category and time period. Routes that perform poorly on both measures are identified as the first candidates for reduction.

Rides/platform hour thresholds			
Time period	**Route destination**	**Low (25%)**	**High (75%)**
Peak	Seattle core	<18.9	>42.5
	Not Seattle core	<11.5	>26.1
Off-peak	Seattle core	<28.8	>50.2
	Not Seattle core	<11.1	>28.2
Night	Seattle core	<14.8	>28.5
	Not Seattle core	<5.4	>16.5

Passenger miles/platform mile thresholds			
Time period	**Route destination**	**Low (25%)**	**High (75%)**
Peak	Seattle core	<8.9	>14.3
	Non-Seattle core	<2.6	>7.7
Off-peak	Seattle core	<11.0	>17.2
	Non-Seattle core	<2.8	>9.4
Night	Seattle core	<5.5	>9.7
	Non-seattle core	<1.5	>5.7

9 Seattle core areas include the regional growth centers in downtown Seattle, First Hill/Capitol Hill, South Lake Union, Uptown, and the University District.

10 Rides per platform hour is a measure of the number of people who board a transit vehicle relative to the total number of hours that a vehicle operates (from leaving the base until it returns).

11 Passenger miles per platform mile is a measure of the total miles riders travel on a route relative to the total miles that a vehicle operates (from leaving the base until it returns).

Productivity thresholds are based on fall 2009 route performance. Thresholds will be updated every two years to reflect trends in performance and to ensure that performance measures reflect current conditions.

Passenger loads

Passenger loads are measured to identify crowded services as candidates for increased investment. Overcrowding is a problem because buses may pass up riders waiting at stops, riders may choose not to ride if other transportation options are available, and overcrowded buses often run late because it takes longer for riders to board and get off at stops.

Passenger loads are averaged using observations from a complete period between service changes. Trips must have average loads higher than thresholds for an entire service change period to be identified as candidates for investment. Load factor is calculated by dividing the maximum load along a route by the total number of seats on a bus, to get a ratio of riders to seats.

- When a route operates every 10 minutes or better, an individual trip should not exceed a load factor of 1.5.
- When a route operates less than every 10 minutes, an individual trip should not exceed a load factor of 1.25.
- No trip on a route should have a standing load for 30 minutes or longer.

Other considerations: Vehicle availability

Action alternatives:

- Assign a larger vehicle
- Add or adjust the spacing of trips within a 30-minute period

Schedule reliability

Metro measures schedule reliability to identify routes that are candidates for remedial action due to poor service quality.

Schedule adherence is measured for all Metro services. Service should adhere to published schedules, within a reasonable variance based on time of day and travel conditions. When measuring schedule adherence, Metro focuses on routes that are regularly running late. On-time is defined as a departure that is five minutes late or worse at a scheduled time point.

Time period	**Lateness threshold** (Excludes early trips)
Weekday average	> 20%
Weekday pm peak average	> 35%
Weekend average	> 20%

Headway adherence is defined as headways within two minutes of published headways when service is every 1-7 minutes, or within three minutes of published headways when scheduled headways are 8-15 minutes.

Investment can include route design, schedule, or traffic operations improvements. Routes that operate with a headway less frequent than every 10 minutes that do not meet performance thresholds will be prioritized for schedule adjustment or investment. Routes that operate with a headway of every 10 minutes or more frequent that do not meet performance thresholds will be prioritized for traffic operations (speed and reliability) investments. It may not be possible to improve through-routed routes that do not meet performance thresholds because of the high cost and complication of separating routes.

Other considerations: External factors affecting reliability

Action alternatives:

- Adjust schedules
- Adjust routing
- Invest in speed and reliability improvements

Service restructures

Service restructures are changes to multiple routes along a corridor or within an area. Restructures may be prompted for a variety of reasons but in general are made to improve the efficiency and effectiveness of transit service.

Key reasons that will trigger consideration of restructures are:

Sound Transit or Metro service investments

- Extension or service enhancements to Link light rail, Sounder commuter rail, and Regional Express bus services.
- Expansion of Metro's RapidRide network, investment of partner or grant resources, or other significant introductions of new Metro service.

Corridors above or below All-Day and Peak Network frequency

- Locations where the transit network does not reflect current travel patterns and transit demand due to changes in travel patterns, demographics, or other factors.

Services compete for the same riders

- Locations where multiple transit services overlap or provide similar connections.

Mismatch between service and ridership

- Situations where a route serves multiple areas with varying demand characteristics or situations where ridership has increased or decreased significantly even though the underlying service has not changed.
- Opportunities to consolidate or otherwise reorganize service so that higher ridership demand can be served with improved service frequency and fewer route patterns.

Major transportation network changes

- Major projects such as SR-520 construction and tolling and the Alaskan Way Viaduct replacement; the opening of new transit centers, park-and-rides, or transit priority pathways; or the closure of facilities like the South Park Bridge.

Major development or land use changes

- Construction of a large-scale development or new institutions such as colleges or medical centers, or significant changes in the overall development of an area.

Service design

Metro uses service design guidelines to develop transit routes and the overall transit network. Guidelines reflect industry best practices for designing service. The use of service design guidelines can enhance transit operations and improve the rider experience. Some guidelines are qualitative considerations that Metro should take into account. Other guidelines have quantitative standards for comparing and measuring specific factors.

1. Network connections

Routes should be designed in the context of the entire transportation system, which includes local and regional bus routes, light-rail lines, commuter rail lines and other modes. Metro strives to make transfers easy as it develops a network of services. Network design should consider locations where transfer opportunities could be provided, and where provision of convenient transfers could improve the efficiency of the transit network. Where many transfers are expected to occur between services of different frequencies, timed transfers should be maintained to reduce customer wait times.

2. Multiple purposes and destinations

Routes are more efficient when designed to serve multiple purposes and destinations rather than specialized travel demands. Routes that serve many rider groups rather than a single group appeal to more potential riders and are more likely to be successful. Specialized service should be considered when there is sizeable and demonstrated demand that cannot be adequately met by more generalized service.

3. Easy to understand, appropriate service

A simple transit network is easier for riders to understand and use than a complex network. Routes should have predictable and direct routings and should provide frequency and span appropriate to the market served. Routes should serve connection points where riders can connect to frequent services, opening up the widest possible range of travel options.

4. Route spacing and duplication

Routes should be designed to avoid competing for the same riders. Studies indicate that people are willing to walk one-quarter mile on average to access transit, so in general routes should be no closer than one-half mile. Services may overlap where urban and physical geography makes it necessary, where services in a common segment serve different destinations, or where routes converge to serve regional growth centers. Where services do overlap, they should be scheduled together, if possible, to provide effective service along the common routing.

Routes are defined as duplicative in the following circumstances:

- Two or more parallel routes operate less than one-half mile apart for at least one mile, excluding operations within a regional growth center or approaching a transit center where pathways are limited.
- A rider can choose between multiple modes or routes connecting the same origin and destination at the same time of day.
- Routes heading to a common destination are not spaced evenly (except for operations within regional growth centers.

5. Route directness

A route that operates directly between two locations is faster and more attractive to riders than one that takes a long, circuitous path. Circulators or looping routes do not have competitive travel times compared to walking or other modes of travel, so they tend to have low ridership and poor performance. Some small loops may be necessary to turn the bus around at the end of routes and to provide supplemental coverage, but such

extensions should not diminish the overall cost-effectiveness of the route. Directness should be considered in relation to the market for the service.

Route deviations are places where a route travels away from its major path to serve a specific destination. For individual route deviations, the delay to riders on board the bus should be considered in relation to the ridership gained on a deviation. New deviations may be considered when the delay is less than 10 passenger-minutes per person boarding or exiting the bus along the deviation.

$$\frac{\text{Riders traveling through x Minutes of deviation}}{\text{Boardings and exitings along deviation}} \leq 10 \text{ minutes}$$

6. Bus stop spacing

Bus stops should be spaced to balance the benefit of increased access to a route against the delay that an additional stop would create for all other riders. While close stop-spacing reduces walk time, it may increase total travel time and reduce reliability, since buses must slow down and stop more frequently.

Service	Average stop spacing
RapidRide	½ mile
All other services	¼ mile

Portions of routes that operate in areas where riders cannot access service, such as along freeways or limited-access roads, are excluded when calculating average stop spacing. Additional considerations for bus stop spacing include the pedestrian facilities, the geography of the area around a bus stop, passenger amenities, and major destinations.

7. Route length and neighborhood route segments

A bus route should be long enough to provide useful connections for riders and to be more attractive than other travel modes. A route that is too short will not attract many riders, since the travel time combined with the wait for the bus is not competitive compared to the time it would take to walk. Longer routes offer the opportunity to make more trips without a transfer, resulting in increased ridership and efficiency. However, longer routes may also have poor reliability because travel time can vary significantly from day to day over a long distance. Where many routes converge, such as in regional growth centers, they may be through-routed[12] to increase efficiency, reduce the number of buses providing overlapping service, and reduce the need for layover space in congested areas.

In some places, routes extend beyond major activity centers to serve residential neighborhoods. Where routes operate beyond major activity centers, ridership should be weighed against the time spent serving neighborhood segments, to ensure that the service level is appropriate to the level of demand. The percent of time spent serving a neighborhood segment should be considered in relation to the percent of riders boarding and exiting on that segment.

$$\frac{\text{Percent of time spent serving neighborhood segment}}{\text{Percent of riders boarding/exiting on neighborhood segment}} \leq 1.2$$

[12] "Through-routing" means continuous routing of vehicles from one route to another such that a rider would not have to transfer from one route to reach a destination on the other.

8. Operating paths and appropriate vehicles

Buses are large, heavy vehicles and cannot operate safely on all streets. Buses should be routed primarily on arterial streets and freeways, except where routing on local or collector streets is necessary to reach layover areas. Bus routes should also be designed to avoid places where traffic congestion and delays regularly occur, if it is possible to avoid such areas while continuing to meet riders' needs. Bus routes should be routed, where possible, to avoid congested intersections or interchanges unless the alternative would be more time-consuming or would miss an important transfer point or destination. Services should operate with vehicles that are an appropriate size to enable safe operation while accommodating demand.

9. Route terminals

The location where a bus route ends and the buses wait before starting the next trip must be carefully selected. Priority should be given to maintaining existing layover spaces at route terminals to support continued and future service. People who live or work next to a route end may regard parked buses as undesirable, so new route terminals should be placed where parked buses have the least impact on adjoining properties, if possible. Routes that terminate at a destination can accommodate demand for travel in two directions, resulting in increased ridership and efficiency. Terminals should be located in areas where restroom facilities are available for operators, taking into account the times of day when the service operates and facilities would be needed. Off-street transit centers should be designed to incorporate layover space.

10. Fixed and variable routing

Bus routes should operate fixed routes in order to provide a predictable and reliable service for a wide range of potential riders. However, in lower-density areas where demand is dispersed, demand-responsive service may be used to provide more effective service over a larger area than could be provided with fixed-route service. Demand-responsive service may be considered where fixed-route service is unlikely to be successful or where unique conditions exist that can be met more effectively through flexible service.

11. Bus shelters

Bus shelters should be installed based on ridership, in order to benefit the largest number of riders. Special consideration may be given to areas where high numbers of transfers are expected, where waiting times for riders may be longer, or where stops are close to facilities such as schools, medical centers, or senior centers. Other considerations include the physical constraints of bus stop sites, preferences of adjacent property owners, and construction costs.

RapidRide routes

Level of amenity	Boardings
Station	150+
Enhanced stop	50-149
Standard stop	Less than 50

Other routes

Location	Boardings
City of Seattle	50
Outside Seattle	25

Use and implementation

Metro uses the following guidelines when adding or reducing service as well as in the ongoing development and management of transit service.

Guidelines for adding or reducing service

Guideline	Measures
Productivity	Rides per platform hour
	Passenger miles per platform mile
Passenger loads	Load factor
Schedule reliability	On-time performance
	Headway adherence
	Lateness
All-Day and Peak Network	Current service relative to All-Day and Peak Network

Adding service

Metro invests in service by using guidelines in the following order:

1. Passenger Loads
2. Schedule Reliability
3. All-Day and Peak Network
4. Productivity

Passenger Loads and Schedule Reliability
Metro first uses the passenger load and schedule reliability guidelines to assess service quality. Routes that do not meet the standards are considered to have low-quality service, which has a negative impact on riders and could discourage them from using transit. These routes are the highest priority candidates for investment. Routes that are through-routed but suffer from poor reliability may be candidates for investment, but because of the size and complexity of changes to through-routes, they would not be automatically given top priority.

All-Day and Peak Network
Metro next uses the All-Day and Peak Network guideline to determine if corridors are under-served. The land use, social equity, geographic value, and ridership factors are applied to find out if a corridor should have a higher level of service than it currently has. Investments in under-served corridors are prioritized primarily using the geographic value score. Investments are ordered for implementation on the basis of the geographic value score, followed by the land use score, then the social equity score. Other constraints or considerations such as fleet availability or restructuring processes could be used to suggest order of implementation.

Metro is open to forming partnerships with cities and private companies that would fully or partially fund transit service, and will make exceptions to the established priorities to make use of partner funding. Metro's partners are expected to contribute at least one-third of the cost of operating service. Partnerships will be considered according to the following priorities:

1. Service funded fully by Metro's partners would be given top priority over other service investments.
2. On corridors identified as under-served in the All-Day and Peak Network, service that is between one-third and fully funded by Metro's partners would be given top priority among the set of investments identified

in under-served corridors. However, this service would not be automatically prioritized above investments to address service quality problems.

Productivity
The final guideline Metro uses to determine if additional service is needed is productivity. Routes with high productivity perform well in relation to other routes; investment in these services would improve service where it is most efficient.

Reducing service

Metro identifies service to be reduced by using the guidelines for productivity and the All-Day and Peak Network. Metro also considers restructures when making large reductions, to identify areas where restructuring could lead to more efficient service. Reduction of service can range from reduction of a single trip to elimination of an entire route. While no route or area is exempt from change during large-scale system reductions, Metro will seek to maintain service at All-Day and Peak Network levels, and to avoid reducing service on corridors already identified as under-served.

Service restructuring allows Metro to improve efficiency while consolidating and focusing service in corridors such as those in the All-Day and Peak Network. Restructuring allows Metro to make reductions while minimizing impacts on areas identified as under-served in the All-Day and Peak Network. Metro strives to eliminate duplication of service and match service to ridership during large-scale reductions.

Priorities for reduction are listed below. All areas identified as over- or under-served are defined in relation to the All-Day and Peak Network. Reduction priorities are:

1. Reduce low-productivity services in the following order:
   - All-day routes that do not provide service on all-day corridors of the All-Day and Peak Network.
   - Peak routes that meet none or only one of the criteria for peak service of the All-Day and Peak Network.
   - All-day routes that operate on over-served corridors.
   - All-day routes that operate on appropriately-served corridors. This worsens the deficiency between existing service and the All-Day and Peak Network service levels.
2. Restructure service to improve efficiency of service.
3. Reduce higher-productivity services:
   - All-day or peak routes that do not provide service on all-day corridors of the All-Day and Peak Network.
   - All-day or peak routes that provide service on all-day corridors of the All-Day and Peak Network. This worsens the deficiency between existing service and the All-Day and Peak Network service levels.
4. Reduce low-productivity services in areas identified as under-served. This worsens the deficiency between existing service and the All-Day and Peak Network service levels.

Metro serves some urbanized areas of east and south King County that are adjacent to or surrounded by rural land. Elimination of all service in these areas would result in significant reduction in the coverage that Metro provides. To ensure that Metro continues to address the mobility needs of people throughout King County, connections to these areas would be preserved when making service reductions, regardless of productivity.

In urbanized areas adjacent to or surrounded by rural land, Metro may provide service in different ways in the future, including alternatives to fixed-route transit service. These services could include fixed-route with deviations, Dial-a-Ride Transit, or other alternative services that offer mobility similar to the fixed-route service provided. Services such as Community Access Transportation also provide alternatives to fixed-route service by allowing Metro to partner with local agencies or jurisdictions to provide service in a way that meets the needs of the community and is more efficient and cost-effective than fixed-route transit. This approach is consistent with the *Strategic Plan for Public Transportation* because it considers a variety of products and services appropriate to the market (Strategy 2.1.1).

Implementation

Metro regularly revises service three times each year—in spring, summer, and fall. The summer service change coordinates with the summer schedule for the University of Washington, because service is adjusted each summer on routes serving the UW. In cases of emergency or time-critical construction projects, Metro may make changes at times other than the three regularly scheduled service changes. However, these situations are rare and are kept to a minimum because of the high level of disruption and difficulty they create. Metro will identify and discuss service changes that address performance-related issues in its annual route performance report.

Any proposed changes to routes are subject to approval by the Metropolitan King County Council except as follows (per King County code 28.94.020):

- Any single change or cumulative changes in a service schedule which affect the established weekly service hours for a route by 25 percent or less.
- Any change in route location which does not move the location of any route stop by more than one-half mile.
- Any changes in route numbers.

Public outreach

Metro conducts outreach to gather input from the public when considering major changes. Outreach ranges from relatively limited activities, such as posting rider alerts at bus stops, to more extensive outreach including mailed informational pieces and questionnaires, websites, media notices and public open houses.

For service changes that affect multiple routes or large areas, Metro may convene a community-based sounding board. Sounding board members attend public meetings, offer advice about public outreach, and provide feedback about what changes to bus service would be best for the local communities. Metro considers sounding board recommendations as it develops recommendations.

Proposed changes may require County Council approval, as described above. The Council holds a public hearing before making a final decision on changes.

Future guidelines

As the transit system changes over time, Metro may need to change some guidelines as well. Updates to the guidelines will be considered along with updates to Metro's Strategic Plan for Public Transportation.

Centers in King County

Regional Growth Centers

Auburn
Bellevue
Burien
Federal Way
First Hill/Capitol Hill
Kent
Northgate
Overlake
Redmond
Renton
SeaTac
Seattle CBD
South Lake Union
Totem Lake
Tukwila
University District
Uptown

Manufacturing/Industrial Centers

Ballard/Interbay
Duwamish
Kent
North Tukwila

Activity Centers

Alaska Junction
Aurora Village Transit Center
Ballard (Ballard Ave NW/NW Market St)
Beacon Hill Station
Black Diamond
Bothell (UW Bothell/Cascadia Community College)
Carnation
Central District (23rd Ave E/E Jefferson St)
Children's Hospital
Columbia City Station
Covington (172nd Ave SE/SE 272nd St)
Crossroads (156th Ave NE/NE 8th St)
Crown Hill (15th Ave NW/NW 85th St)
Des Moines (Marine View Dr/S 223rd St)
Duvall
Eastgate Park and Ride
Enumclaw
Factoria (Factoria Blvd SE/SE Eastgate Wy)
Fairwood (140th Ave SE/SE Petrovitsky Rd)
Maple Valley (Four Corners, SR-169/Kent-Kangley Rd)
Fremont (Fremont Ave N/N 34th St)
Georgetown (13th Ave S/S Bailey St)
Green River Community College
Greenwood (Greenwood Ave N/N 85th St)
Harborview Medical Center and specialty center
Highline Community College
Issaquah Highlands
Issaquah (Issaquah Transit Center)
Juanita (98th Ave NE/NE 116th St)
Kenmore (Kenmore Park and Ride)
Kent East Hill (104th Ave SE/SE 240th St)
Kirkland (Kirkland Transit Center)
Kirkland (South Kirkland Park and Ride)
Lake City
Lake Forest Park
Lake Washington Technical College
Madison Park (42nd Ave E/E Madison St)
Magnolia (34th Ave W/W McGraw St)
Mercer Island
Mount Baker Station
Newcastle
North Bend
North City (15th Ave NE/NE 175th St)
Oaktree (Aurora Ave N/N 105th St)
Othello Station
Rainier Beach Station
Renton Highlands (NE Sunset Blvd/NE 12th St)
Renton Technical College
Roosevelt (12th Ave NE/NE 65th St)
Sammamish (228th Ave NE/NE 8th St)
Sand Point (Sand Point Way/NE 70th St)
Shoreline (Shoreline Community College)
Snoqualmie
SODO (SODO Busway/Lander St)
South Mercer Island
South Park (14th Ave S/S Cloverdale St)
South Seattle Community College
Tukwila International Blvd Station
Twin Lakes (21st Ave SW/SW 336th St)
Valley Medical Center
Vashon
Wallingford (Wallingford Ave N/N 45th St)
Westwood Village
Woodinville (Woodinville Park and Ride)

APPENDIX: Corridors Evaluated for All-Day and Peak Network

CONNECTIONS		
BETWEEN	AND	VIA
Admiral District	Southcenter	California Ave SW, Military Rd, TIBS
Alki	Seattle CBD	Admiral Way
Auburn	Pacific	Algona
Auburn	Burien	Kent, SeaTac
Auburn/GRCC	Federal Way	15th St SW, Lea Hill Rd
Aurora Village	Seattle CBD	Aurora Ave N
Aurora Village	Northgate	Meridian Av N
Avondale	Kirkland	NE 85th St, NE Redmond Wy, Avondale Wy NE
Ballard	Seattle CBD	15th Ave W
Ballard	University District	Green Lake, Greenwood
Ballard	Lake City	Holman Road, Northgate
Ballard	Seattle CBD	W Nickerson, Westlake Av N, 9th Ave
Ballard	University District	Wallingford (N 45th St)
Beacon Hill	Seattle CBD	Beacon Ave
Bellevue	Eastgate	Lake Hills Connector
Bellevue	Redmond	NE 8th St, 156th Ave NE
Bellevue	Renton	Newcastle, Factoria
Burien	Seattle CBD	1st Ave S, South Park, Airport Wy
Burien	Seattle CBD	Delridge, Ambaum
Burien	Seattle CBD	Des Moines Mem Dr, South Park
Capitol Hill	Seattle CBD	15th Ave E
Capitol Hill	Seattle CBD	Madison St
Capitol Hill	White Center	South Park, Georgetown, Beacon Hill, First Hill
Central District	Seattle CBD	E Jefferson St
Colman Park	Seattle CBD	Leschi, Yesler
Cowen Park	Seattle CBD	University Way, I-5
Discovery Park	Seattle CBD	Gilman Ave W, 22nd Ave W, Thorndyke Av W
Eastgate	Bellevue	Newport Wy , S. Bellevue, Beaux Arts
Eastgate	Overlake	Phantom Lake
Eastgate	Bellevue	Somerset, Factoria, Woodridge
Enumclaw	Auburn	Auburn Wy S, SR 164
Fairwood	Renton	S Puget Dr, Royal Hills
Federal Way	Kent	Military Road
Federal Way	SeaTac	SR-99
Fremont	Broadview	8th Av NW, 3rd Av NW
Fremont	Seattle CBD	Dexter Ave N
Fremont	University District	N 40th St
Green River CC	Kent	132nd Ave SE

CONNECTIONS		
BETWEEN	AND	VIA
Greenwood	Seattle CBD	Greenwood Ave N
High Point	Seattle CBD	35th Ave SW
Issaquah	North Bend	Fall City, Snoqualmie
Issaquah	Eastgate	Newport Way
Issaquah	Overlake	Sammamish, Bear Creek
Kenmore	Totem Lake	Finn Hill, Juanita
Kenmore	Kirkland	Juanita
Kenmore	Shoreline	Lake Forest Park, Aurora Village TC
Kenmore	University District	Lake Forest Park, Lake City
Kennydale	Renton	Edmonds Av NE
Kent	Renton	84th Av S, Lind Av SW
Kent	Renton	Kent East Hill
Kent	Burien	Kent-DM Rd, S. 240th St, 1st Av S
Kent	Maple Valley	Kent-Kangley Road
Kent	Seattle CBD	Tukwila
Kirkland	Factoria	Overlake, Crossroads, Eastgate
Kirkland	Bellevue	South Kirkland
Lake City	University District	35th Ave NE
Lake City	University District	Lake City, Sand Point
Lake City	Seattle CBD	NE 125th St, Northgate, I-5
Laurelhurst	University District	NE 45th St
Madison Park	Seattle CBD	Madison St
Madrona	Seattle CBD	Union St
Magnolia	Seattle CBD	34th Ave W, 28th Ave W
Mercer Island	S Mercer Island	Island Crest Way
Mirror Lake	Federal Way	S 312th St
Mount Baker	Seattle CBD	31st Av S, S Jackson St
Mountlake Terrace	Northgate	15th Ave NE, 5th Ave NE
Mt Baker	University District	23rd Ave E
Northeast Tacoma	Federal Way	SW 356th St, 9th Ave S
Northgate	Seattle CBD	Green Lake, Wallingford
Northgate	University District	Roosevelt
Northgate	University District	Roosevelt Way NE, NE 75th St
Othello Station	Columbia City	Seward Park
Overlake	Bellevue	Bell-Red Road
Overlake	Bellevue	Sammamish Viewpoint, Northup Way
Queen Anne	Seattle CBD	Queen Anne Ave N
Queen Anne	Seattle CBD	Taylor Ave N
Rainier Beach	Seattle Center	Martin Luther King Jr Wy, E John St, Denny Way
Rainier Beach	Seattle CBD	Rainier Ave

CONNECTIONS		
BETWEEN	AND	VIA
Rainier Beach	Capitol Hill	Rainier Ave
Redmond	Eastgate	148th Ave, Crossroads, Bellevue College
Redmond	Fall City	Duvall, Carnation
Redmond	Totem Lake	Willows Road
Renton	Enumclaw	Maple Valley, Black Diamond
Renton	Seattle CBD	Martin Luther King Jr Wy, I-5
Renton	Renton Highlands	NE 4th St, Union Ave NE
Renton	Burien	S 154th St
Renton	Seattle CBD	Skyway, S. Beacon Hill
Renton	Rainier Beach	West Hill, Rainier View
Renton Highlands	Renton	NE 7th St, Edmonds Av NE
Richmond Beach	Northgate	Richmond Bch Rd, 15th Ave NE
Sand Point	University District	NE 55th St
Shoreline	University District	Jackson Park, 15th Av NE
Shoreline CC	Greenwood	Greenwood Av N
Shoreline CC	Northgate	N 130th St, Meridian Av N
Shoreline CC	Lake City	N 155th St, Jackson Park
Totem Lake	Seattle CBD	Kirkland, SR-520
Tukwila	Des Moines	McMicken Heights, Sea-Tac
Tukwila	Seattle CBD	Pacific Hwy S, 4th Ave S
Tukwila	Fairwood	S 180th St, Carr Road
Twin Lakes	Federal Way	S 320th St
Twin Lakes	Federal Way	SW Campus Dr, 1st Ave S
University District	Seattle CBD	Broadway
University District	Seattle CBD	Eastlake, Fairview
University District	Seattle CBD	Lakeview
University District	Bellevue	SR-520
UW Bothell	Redmond	Woodinville, Cottage Lake
UW Bothell/CCC	Kirkland	132nd Ave NE, Lake Washington Tech
Vashon	Tahlequah	Valley Center
Wedgwood	Cowen Park	View Ridge, NE 65th St
West Seattle	Seattle CBD	Fauntleroy, Alaska Junction
White Center	Seattle CBD	16th Ave SW, SSCC
White Center	Seattle CBD	Highland Park, 4th Ave S
Woodinville	Kirkland	Kingsgate