



Image from Oran Viriyincy

4 SERVICE

Ensuring delivery of high-quality transit service is of paramount interest to the City of Seattle. Transit service in Seattle is largely funded and operated by King County Metro Transit and Sound Transit, but the City has established a role in funding transit service, mostly in the form of subsidizing additional runs on overcrowded bus routes. Given Metro's large service area and financial challenges, the City should prepare to play an increasingly active role in funding service over the next 20 years.

The City's primary transit service objective is to ensure mobility in Seattle. In times of economic recession, the City may need to focus on maintaining current service levels on high ridership routes. In better times, resources should be dedicated to expanding the Frequent Transit Network.

Achievement of TMP goals will require continued work between SDOT and its transit agency partners, exemplified by recent partnerships that have shaped the RapidRide program, operation of Seattle Streetcar, stop consolidation on Metro routes operating in Seattle, and simplification of downtown transit pathways.

SEATTLE TRANSIT SERVICE PRIORITIES

Transit service in Seattle is largely funded and operated by King County Metro Transit and Sound Transit. The Seattle Department of Transportation (SDOT) manages local streets and transportation facilities and is best positioned to improve transit service by making capital investments that speed buses, improve reliability, and improve access to transit stops and stations. However, ensuring delivery of high-quality service is a priority for the City of Seattle, and the City has established a role in funding transit service by subsidizing additional service on high ridership or overcrowded bus routes. Given Metro's large service area and financial challenges, the City should prepare to play an increasingly active role in funding service over the next 20 years.

- The City's primary transit service objective is to ensure mobility in Seattle. During periods when transit revenues are in decline, the City may need to focus on maintaining service on high ridership routes. In better economic times, resources should be dedicated to expanding the Frequent Transit Network (FTN).
- The second City objective is to develop and expand the FTN to provide high-quality, high-frequency service between urban villages and urban centers for at least 18 hours per day and to reinforce walking, biking, and riding transit as the preferred modes of travel for in-city trips.
- A third City service objective is to develop the local transit network to effectively feed and support the FTN and to take advantage of high capacity rail and bus services. Local service should not run in parallel to FTN routes for long distances, unless those services are part of route combinations that provide FTN service and/or there are topographical or other barriers that impact access.

Effective partnerships with Metro and Sound Transit must be in place at the staff and executive level to ensure these objectives are achieved. These partnerships will support successful inter-agency collaboration, exemplified by recent efforts that have shaped the RapidRide program, operation of Seattle Streetcar, stop consolidation on Metro routes operating in Seattle, and simplification of downtown transit pathways.

THE FREQUENT TRANSIT NETWORK

What is the Frequent Transit Network?

The Frequent Transit Network (FTN) guides service priorities in Seattle and gives direction for where capital investment would provide the greatest community benefit. The FTN should offer frequent, reliable service on designated corridors connecting urban villages and urban centers throughout the day, every day. Figure 4-1 illustrates the FTN that is in place today, with additional elements envisioned by 2030. The FTN will be developed with

both bus and rail technologies. Whether an FTN corridor is to be served by bus or rail, the network should be developed to provide a consistently high standard of capacity, reliability, frequency, and customer service amenities. Seattle must continue to work with King County Metro to deliver the FTN vision and realize its value by fostering supportive land use development and high-quality pedestrian access.

The FTN represents the service element of the Complete Transit System and provides a guide for the City in:

- **Mobility Corridor Development:** Guides where the City should make coordinated transit, access, and land use investments (as described in the Mobility Corridors section of Chapter 5 on page 5-22). These corridors are the primary connections—and carry the most travelers—between key destinations and neighborhoods in Seattle.
- **Intersection and Signal Management:** Guides how signals and rights-of-way are managed in FTN corridors. Since these corridors carry the highest volume of transit riders and have the greatest potential to capture more non-auto users, signal management at intersections should favor transit vehicles; on-street parking uses should be reduced in the interest of moving full, high-capacity buses through congested commercial districts; and integrated solutions should be sought to allow transit and bicycles to safely coexist.
- **Service Investment:** Guides where the City should invest limited operating funds. FTN corridors were developed through an extensive evaluation of travel patterns, for all trip types, within and to and from the City of Seattle. This work is summarized in [the Transit Master Plan Briefing Book, Chapter 2](#). Arguably, the urban village connections made by the FTN are the most important travel connections for all modes.

Service Design Principles for the Frequent Transit Network

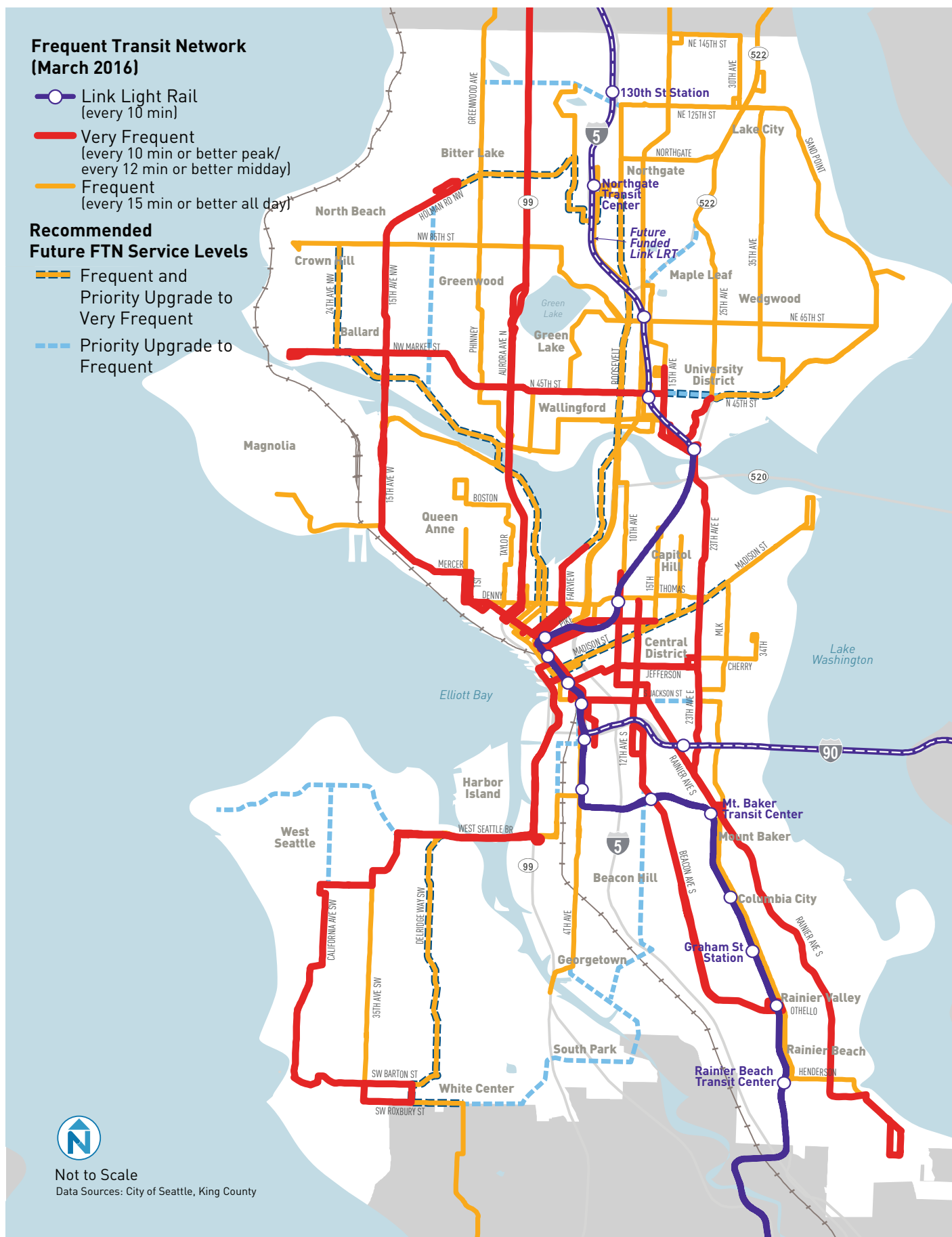
The following service principles were used to guide transit investment priorities for the Transit Master Plan (TMP):

- **Demand Driven:** Invest in transit where overall travel market demand is high
- **Direct:** Provide direct connections between urban villages and centers
- **Connected:** Develop a frequent service grid and create high-quality places for people where lines intersect
- **Simple:** Design for transparency and ease of use

In conjunction with the corridor evaluation process (see discussion in Chapter 3), these principles were used to design the network of corridors recommended for capital investment, service investment, and restructuring.

Appendix C provides background on development of the FTN map and the classification of the FTN corridors.

FIGURE 4-1 FREQUENT TRANSIT NETWORK



The diagrams in Figure 4-2 illustrate three basic concepts in transit network design: a point-to-point, a grid, and a radial (aka “hub-and-spoke”) model.

While a point-to-point model may provide the most direct connections between the most destinations, in a radial or grid model, fewer lines are required. Fewer vehicles and operators are needed, allowing providers to deliver more frequent service on some or all routes and overall trips that are shorter, even factoring in transfers.

While in practice, most transit systems combine different models, the radial pattern predominates in Seattle. Radial bus and rail routes are overlaid with a number of point-to-point type services. Long radial routes have the best frequency and highest ridership but not always because people want to travel to the Center City. Crosstown routes, such as Metro’s Route 48 (see sidebar), also have very strong ridership. The TMP proposes service restructuring that moves Seattle transit toward a more grid-oriented design. This is best illustrated by the proposed FTN investments that link services between the Rainier Valley and the University District and between Beacon Hill, Capitol Hill, and the University District. Rather than traveling to downtown, routes would be modified to cross multiple FTN lines that offer convenient transfers to downtown (Link light rail, Madison BRT, and east-west priority bus routes). While some downtown-bound passengers would need to connect (transfer) to Link, others would have direct connections that did not previously exist (e.g., Rainier Valley to Central District and Beacon Hill to First Hill/Capitol Hill).

Certain sectors of the City are better suited to a FTN grid than others. In the north, a grid is achievable and many important elements are planned or in place. In the south, challenges are much greater due to topography; physical barriers such as I-5, Boeing Field, and the railroads; and disconnected land use patterns. An important decision for developing a better grid pattern in south Seattle involves the routing of West Seattle RapidRide and Delridge bus services through SODO. The TMP

recommends that strong consideration be given to routing these services to not use an SR 99 approach, but rather to use a pathway on 4th Avenue (some segments of 1st may need to be used as well to allow bi-directional access to Spokane). Although speed and reliability challenges need to be resolved, a focus of Chapter 3 (Corridors), this routing decision allows for the development of a high-quality connection between 4th Avenue, the E-3 Busway, and SODO stations. It recognizes the diverse demand patterns of residents; most trips (of all types, not just transit trips) made by southeast and southwest residents do not go downtown, but rather are oriented to other south Seattle neighborhoods and to Burien, Tukwila, Renton, and other southern neighboring cities (see Figure 4-3).

Performance Characteristics of the Frequent Transit Network

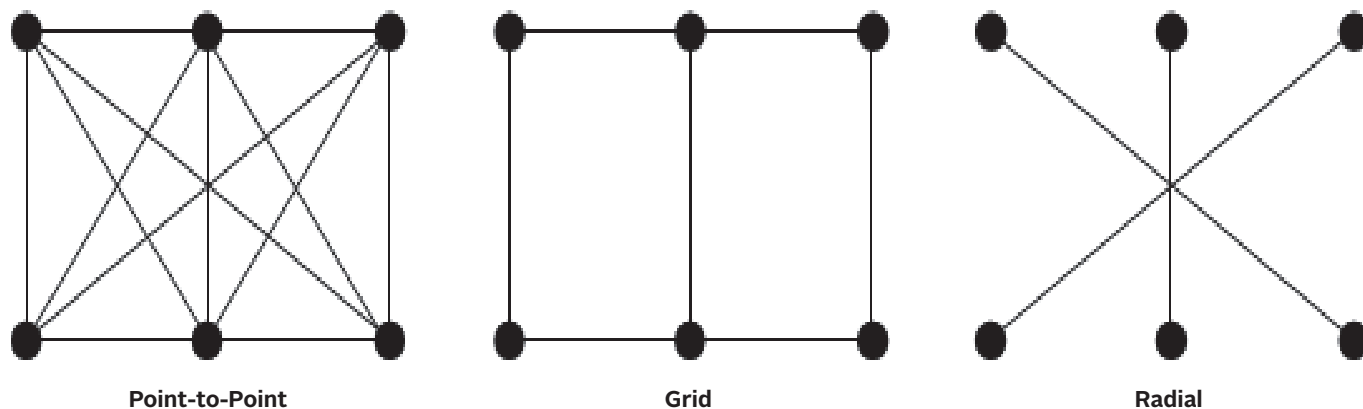
To meet City goals to increase transit mode share, the Frequent Transit Network must be:

- **Fast and Reliable:** Operate transit on arterial streets/ transit priority streets where it will be most rapid and reliable; make improvements that speed transit and make transit travel more competitive with automobile travel.
- **Frequent:** Connect urban centers and urban villages with 15 minute or better, all day service.

In addition to implementing the capital projects specified for FTN corridors (see Chapter 3), a top priority for the City of Seattle is to work with Metro and other regional transit providers to deliver the following level of service on all FTN corridors:

- **Frequent All Day:** 15 minute or better service frequency all day
- **Long Hours:** 18- to 24-hour service span (6 a.m. to midnight, or later)
- **Every Day:** 7 day per week service

FIGURE 4-2 TRANSIT NETWORK DESIGN CONCEPTS



Source: Nelson\Nygaard

KING COUNTY METRO ROUTE 48

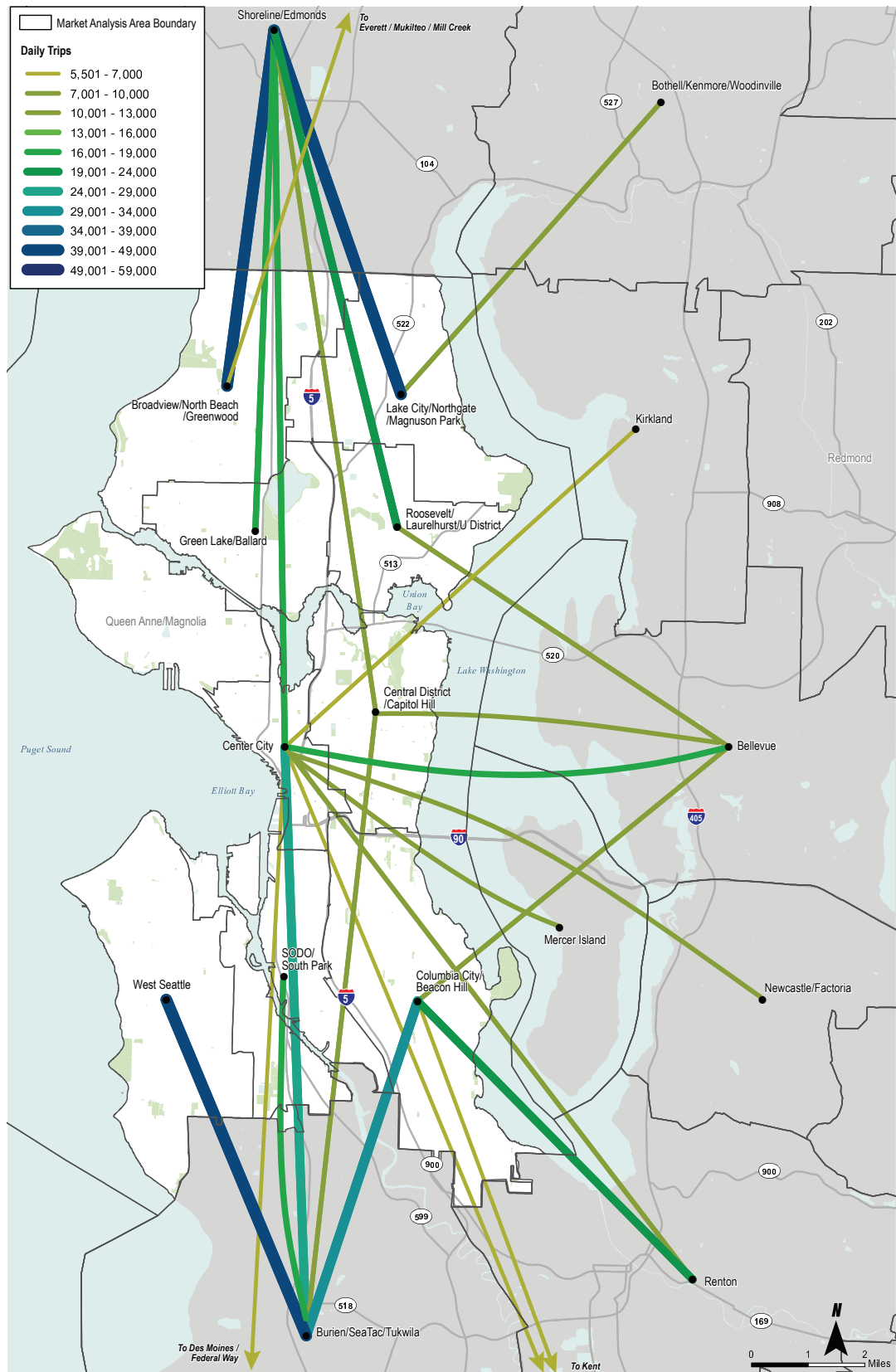
King County Metro's Route 48 is an example of a successful crosstown bus route. Route 48 effectively operates as two crosstown routes (48N and 48S) that seamlessly interline in the U-District, running from Mount Baker to Loyal Heights via the U-District. In March 2016 the 48N will become a new KCM Route 45. The route will still run between Loyal Heights and the U-District with a terminus at Husky Stadium Station.

As the highest ridership route in the county, Route 48 illustrates that demand for non-CBD services can be strong when service is direct and operates at high frequency. The fact that Route 48 allows riders to travel through the U-District without transferring is likely a limited part of its success. The route could operate as successfully and more reliably as two separate lines or as longer east-west and north-south crosstown services.

The TMP recommends a Frequent Transit Network priority corridor that connects the southern segment of Route 48 between the U-District and Mount Baker with the southern segment of Route 7 between Mount Baker and the Rainier Valley light rail station. It recommends a second FTN priority corridor serving the northern portion of Route 48 and, further, recommends that both portions of the route be converted to electric trolley. As noted above, KCM's Link Connections restructuring (March 2016) will implement this service configuration.



FIGURE 4-3 MAJOR ORIGIN-DESTINATION TRAVEL PAIRS BETWEEN SEATTLE AND REGION
(ALL OTHER TRIPS, 2008)

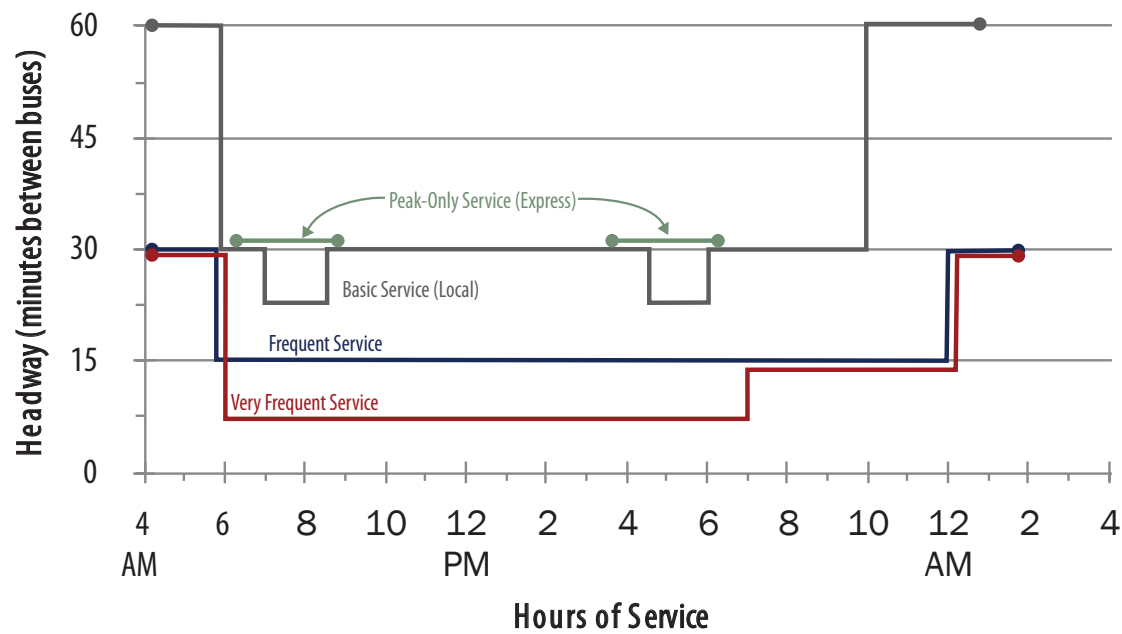


An examination of non-work travel shows that West Seattle and South Seattle residents travel frequently to and from destinations in Burien, Sea-Tac, Renton, and Tukwila.

Data Source: City of Seattle

Several FTN corridors already have headways that are better than every 15 minutes. Others will merit or require this level of service to meet projected ridership demands. Figure 4-4 illustrates target service levels over the course of the day for FTN (Frequent and Very Frequent) and Local services.

FIGURE 4-4 SERVICE TARGETS FOR THE FREQUENT TRANSIT NETWORK



Achieving Frequent or Very Frequent Service levels on the FTN is a key objective for Seattle, but will require incremental improvements and increased funding.

Source: Nelson\Nygaard

The TMP modeled future ridership demand to determine which routes are most likely to require additional service to meet increased demands. These corridors present opportunities for Seattle to fund additional service during peak hours or throughout the day. Figure 4-5 provides guidance as to where service subsidies might be in greatest need due to high passenger loads, particularly following speed and reliability improvements recommended in Chapter 3. (Note, however, that all TMP corridors are priority corridors.)

FIGURE 4-5 FREQUENT NETWORK CORRIDORS PRIORITIZED FOR CITY SERVICE SUBSIDY

Priority Based on Estimated Passenger Loading	Corridor
Highest Priority for Investment	5 Rainier Valley – U-District (Rainier/23 rd) 10 Northgate – Ballard – Downtown (15 th Ave) 7 Capitol Hill – South Lake Union – Queen Anne (Denny) Center City Priority Bus Corridors (Jackson, Pike/Pine, Queen Anne to Seattle Pacific University, and Yesler/9 th /Jefferson) 9 Aurora Village – Downtown (Aurora) 3 Othello – U-District (Beacon/Broadway) 4 Mount Baker – Downtown (Rainier/Jackson) 15 Greenwood – Downtown 13 Ballard – U-District (Market/45 th) 2 Burien TC/Delridge – Downtown 14 Crown Hill – Greenlake – U-District 1 West Seattle – Downtown (Fauntleroy) 12 Lake City – Northgate – U-District

Note: Based on planning-level analysis, actual conditions will vary. Priority is relative to RapidRide service levels.

Services that Comprise the Frequent Transit Network

The FTN is mode neutral. Key modes that deliver FTN service are:



Image from Nelson\Nygaard

Light Rail (Rapid Transit): Rapid transit is defined by services that operate completely or largely in their own rights-of-way, separated from interaction with other modes of transportation. Link light rail is the only transit service in Seattle that fits this category. However, Seattle's long range vision for transit identifies a number of corridors that are candidates for future rapid transit.



Image from Nelson\Nygaard

Priority Corridor Bus (Diesel and Electric Trolley Bus): Bus service operating on major arterial roadways is the foundation of Seattle transit service, carrying a majority of daily transit trips in Seattle.



Image from Wikimedia Commons user Ludek

Rapid Streetcar: This is a high-capacity urban rail mode that uses streetcar vehicles, which are lighter than light rail vehicles, operating in existing street rights-of-way. Priority over vehicular traffic is provided wherever possible, and traffic operations and stop spacing are designed and managed to achieve a high level of speed and reliability. There is no rapid streetcar service currently in Seattle. However, the TMP recommends two such lines: Loyal Heights – Ballard – Fremont – South Lake Union – International District and Roosevelt – U District – South Lake Union – International District. Rapid Streetcar is a promising mode for building out other proposed corridors in the Seattle long-range HCT vision, particularly where passenger demand is consistently higher than what a frequent bus can handle.



Image from Nelson\Nygaard

Local Streetcar: The South Lake Union Streetcar and First Hill Streetcar (future) target short circulation trips in the Center City and adjacent neighborhoods. Although local streetcars provide frequent service, they have very different characteristics than the other modes—they are not designed with speed in mind and therefore do not operate in transit-only lanes or with priority over traffic.



Image from Nelson\Nygaard

Bus Rapid Transit: BRT is a high-capacity rubber-tired mode designed with features similar to light rail, ranging from distinctly branded buses and stops to exclusive rights-of-way. Boston's Silver Line (shown above) is an example of "full" BRT, with more aggressive priority treatments and station-like stops. King County Metro's RapidRide could be said to fall into a "light" category, where buses primarily operate in mixed traffic and transit priority is focused on points of congestion.

BRT typically uses diesel-powered vehicles, however electric trolley buses could also be used. The TMP recommends one such line, on Madison from Capitol Hill to Colman Dock. It would be limited to 40-foot buses due to the topography of the corridor.

CRITERIA FOR EXPANSION OF THE FREQUENT TRANSIT NETWORK

As Seattle land use patterns change over time, the City should continue to work with Metro to ensure that any further investment in the FTN service meets the following criteria:

- **Demand** – ridership and land use patterns suggest demand for all day (at least 18 hours) service with headways of 15 minutes or better between 6 a.m. and 9 p.m., or later
- **Permanence** – dense and diverse land use patterns guarantee strong ridership support over time
- **Connections** – direction linkages between urban villages and urban centers
- **Linkages** – intersections with other FTN routes
- **Simplicity** – direct route design that supports network transparency

These criteria are supported by the King County Metro Transit Strategic Plan for Public Transportation and Service Guidelines. Metro's Strategic Plan calls for Metro to "Manage the transit system through service guidelines and performance measures." Metro's objectives for developing an all-day network of top-quality service align with the FTN objectives. The Strategic Plan indicates Metro will design its services to meet the following 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

Under each objective, thresholds are established to guide adjustment of service levels. For more information see <http://metro.kingcounty.gov/planning>.

Branding the Frequent Transit Network

The FTN concept is the basis for leveraging broad public-public and public-private partnerships needed to improve and better market a diverse network of high-frequency services. It provides an opportunity to create a recognizable subset of services that communicates quality, comfort and convenience. Branding the FTN is most importantly an opportunity to communicate that the City's highest quality transit route network is a permanent, integrated part of city infrastructure.

Seattle's transit network is saturated with brands, including those used by multiple transit agencies, those used for

Transit branding can apply to many elements of a transit route or system, but is most effective when applied to all:



Vehicles are effectively used to brand the Hop, Skip, and Jump family of service in Boulder, Colorado.

Image from Nelson\Nygaard

specific modes (e.g., Link, Seattle Streetcar), and those used for service families (e.g., RapidRide). Link, Seattle Streetcar, and RapidRide brands are all suggestive of a minimum level of service (frequency), but what about the rest of the Metro bus system that provides comparable service levels? Seattle residents, workers, and visitors would benefit most from a unifying service quality brand that crosses multiple providers and service families.



Branding elements in this prototype stop and shelter installed by STM in Montreal clearly identify the transit agency, differentiate service types through use of color, and incorporate transit maps on the stop pole.

Image from STM



Public information signs in Portland include wayfinding to major transit services.

Image from Flickr user NedRichards



Transit signage on the Portland (OR) Transit Mall is prominent and distinct from other types of signage and clearly identifies the agency and service types and routes at the stop.

Image from Nelson\Nygaard

Transit branding can also be applied very pointedly or broadly to elements of a city's transit system:



SINGLE ROUTE: Cleveland's Health Line BRT is an example of single service with a unique set of features, route design, branding, and public information.

Image from Nelson\Nygaard



SERVICE FAMILY: RapidRide, King County Metro's enhanced corridor bus service, is an example of a brand that will be applied to a subset of bus service.

Image from Nelson\Nygaard



NETWORK: Portland's Frequent Network is a brand that is applied to all services, rail or bus, to connote a minimum level of service quality.

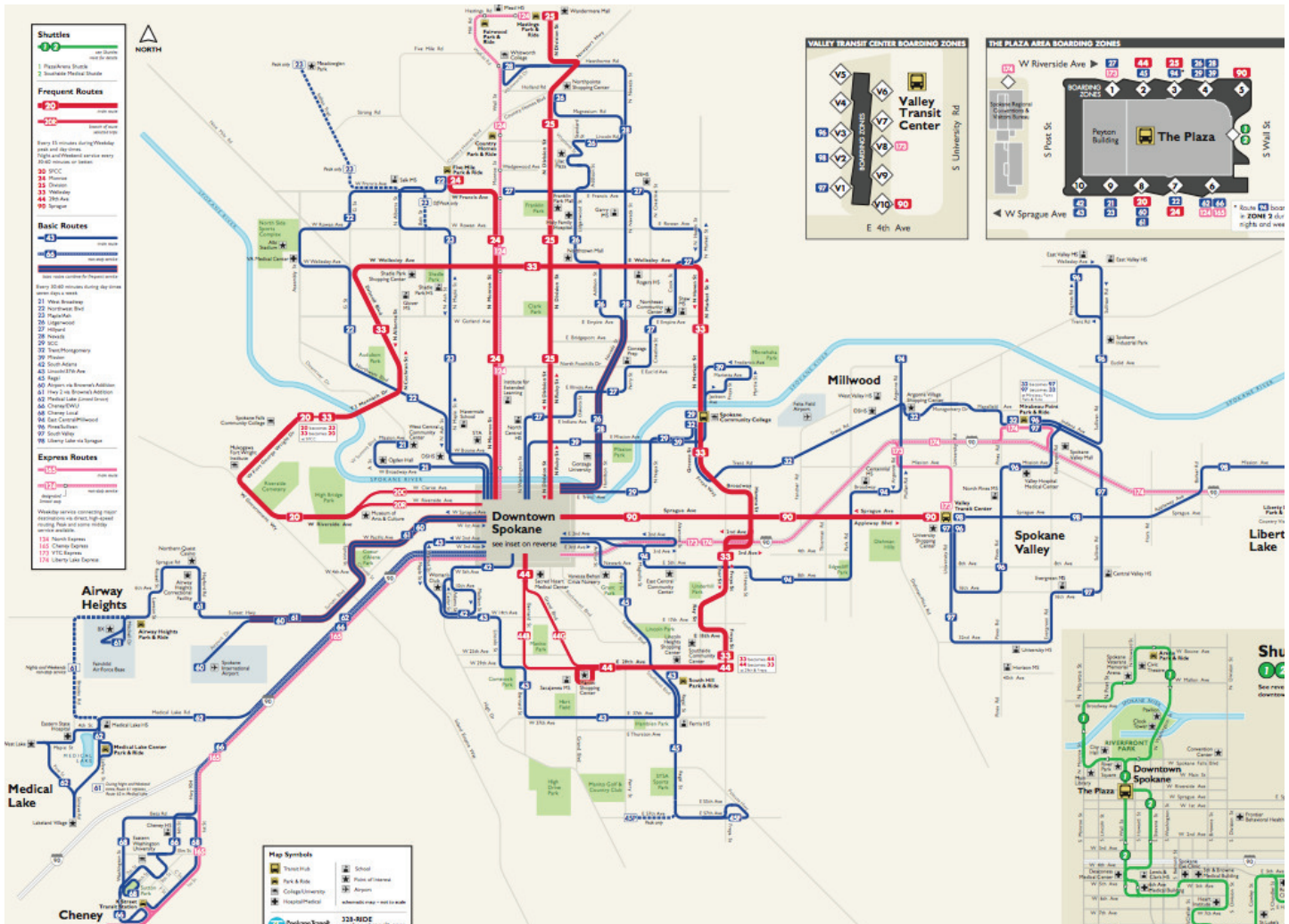
Image from Nelson\Nygaard

Consider an on-line transit trip planner. When a customer enters an origin and destination in the system, they almost always choose to sort their results (if the trip planner doesn't already do so for them) by shortest travel time. System branding can help communicate which services are most likely to be fast, frequent, and reliable. Key principles and steps for using branding to improve ridership on the Seattle transit system include:

- Emphasizing clear information and branding of connections over vehicle or service types, including:
 - An easy to use map of the FTN emphasizing connections between major nodes (Figure 4-6 provides an example from Spokane). TriMet in Portland also effectively maps its Frequent Network (see Figure 4-8.)
 - Providing route level maps that simply communicate direct connections between key destinations and major transfer points. King County Metro's map of the RapidRide A-Line in Figure 4-7 employs this technique.
- Marketing a network of services and creating a brand that is used in all public information, including:
 - Vehicles (can be a very subtle brand that overlays existing provider or service brands)
 - Facilities (e.g., stations, stops, and other amenities)
 - Signage
 - Schedules and on-line transit information
 - Advertising and public information

Metropolitan areas with a single agency that oversees regional transit operations, such as Minneapolis, Portland, and Montreal, have greater incentive to develop a strong network brand. Since these agencies are paying for all services, they work hard to avoid duplicative services and market the value of a strong network (see sidebar, page 4-13).

FIGURE 4-6 EFFECTIVE MAPPING SAMPLE



Source: Spokane Transit

FIGURE 4-7 SAMPLE ROUTE-LEVEL MAP

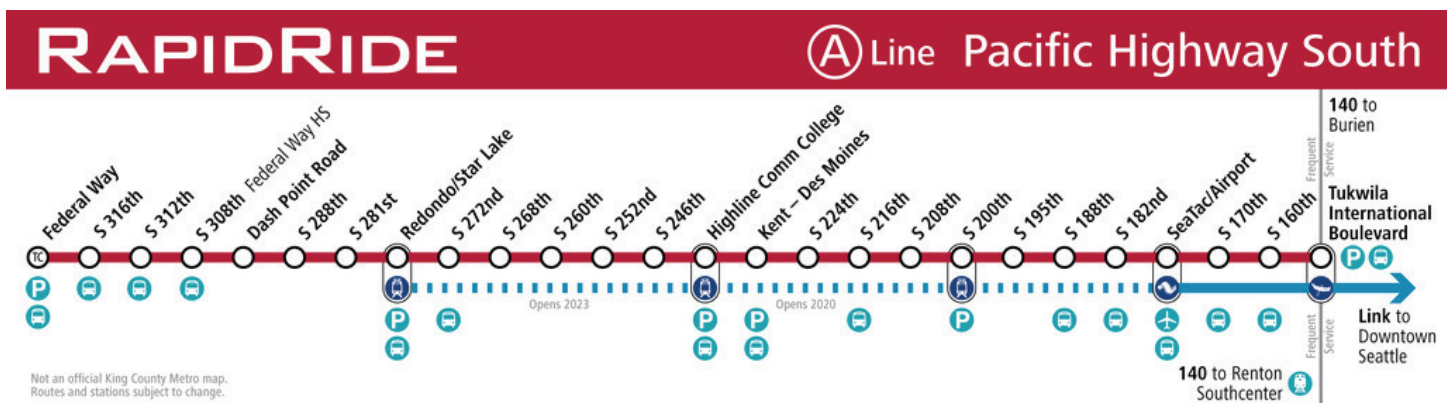


Image from Oran Viriyny

SERVICE BRANDING

Transit branding can be employed to help communicate aspects of service quality (e.g., speed, reliability, frequency, and span of service) on an individual route or a network of routes. In some cases, a brand communicates all of these aspects. For high-capacity transit services that are commonly known to operate at high frequency all day, branding is often tied to speed or some other aspect of service. For example, the Link brand connotes the broader function of the light rail system—to connect major urban centers around the Puget Sound region. Branding of bus services in urban areas, where many routes service multiple functions and geographies and operate with varying levels of service, is most effective when tailored to communicate the key service-quality attributes. In the case of Seattle's core network of bus routes, which include most of the electric trolley system, "frequency" is the most important aspect of

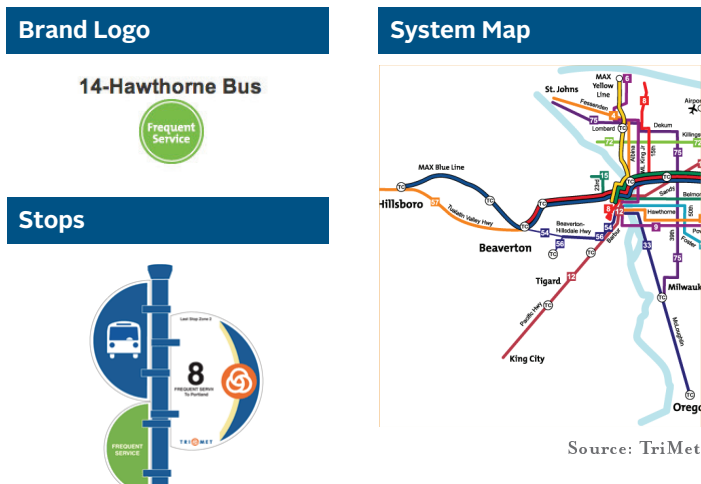
the network to communicate. Customers are more sensitive to wait time than on-board travel time. This is particularly true for short trips. Therefore, Seattle and King County Metro should focus branding efforts on "frequency."

TriMet in Portland, Metro Transit in Minneapolis, and STM in Montreal have built very strong brands around a frequent service network. Translink in Vancouver, BC uses a Frequent Transit Network as a guiding developmental component of their citywide transportation plan, although their service brands do not use frequency as a primary theme. In each of these cases, the "frequent" brand also connotes a core set of services where the greatest investment is made to improve reliability, comfort, passenger amenities, and travel time (or at least priority over congestion).

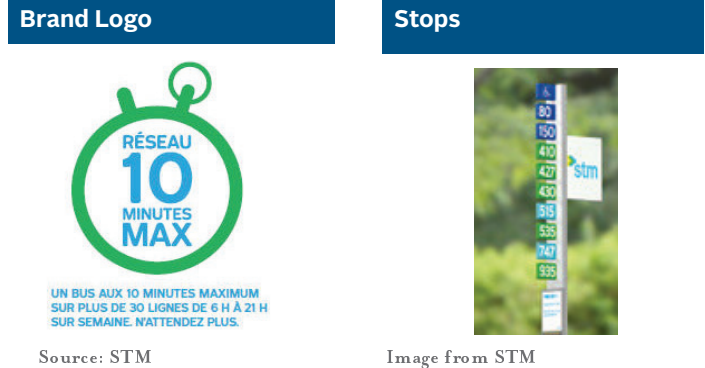
The examples offered in Figure 4-8 are integrated elements of each agency's marketing plan, but none are a dominant brand for a particular type of service.

FIGURE 4-8 EXAMPLES OF FREQUENT SERVICE NETWORK BRANDING

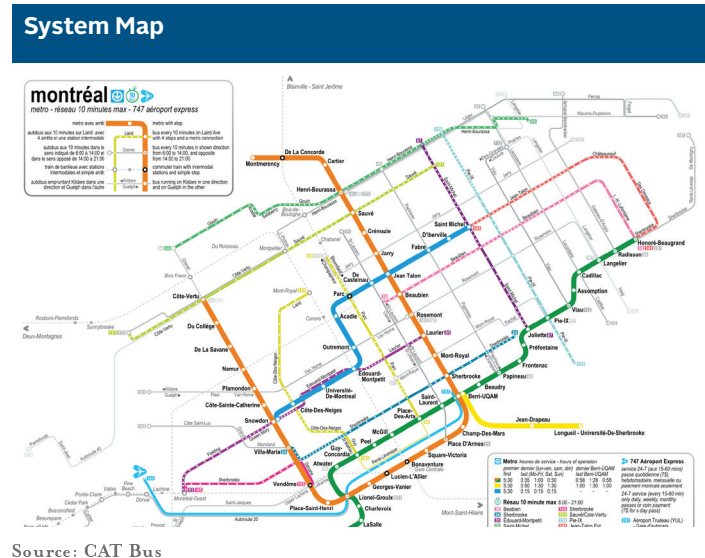
TriMet (Portland, OR) – Frequent Service



STM (Montreal) – Réseau 10 Minutes Max



Metro Transit (Minneapolis) – High Frequency Service



ELECTRIC TROLLEY BUS BRANDING ELEMENTS

Certain attributes of Seattle's electric trolley bus system could provide attractive branding elements, such as zero-emissions operations. On the other hand, Metro should avoid the use of "green" operations as a dominant brand because it does not apply to the entire system of frequent bus service within Seattle. The following examples show how other agencies have incorporated "green" branding on their bus fleets. An approach for Metro and the City of Seattle may involve a much more subtle sub-brand that stresses zero-emissions and/or low noise attributes, but does not involve full bus wraps or significantly different paint schemes.



The Pittsburgh Port Authority is branding its new diesel-electric hybrid buses as "Clean Green," with green paint and a leaf design.

Image from Flickr user Herrvebah



Branded electric bus in Minneapolis.

Image from Flickr user fihrdad fog



A compressed natural gas (CNG) electric hybrid in San Diego.

Image from Flickr user SoCalMetro (used with permission)



Hybrid-electric bus in Columbus, Ohio.

Image from Flickr user gsbrown99

STRATEGY AREA: IMPLEMENTING THE FREQUENT TRANSIT NETWORK

- **FTN 1:** Partner with Metro and other regional transit providers to deliver the following level of service on all Frequent Transit Network corridors:
 - 15 minute or better service frequency all day (between 6 a.m. and 9 p.m., or later)
 - 18- to 24-hour service span (6 a.m. to midnight, or later)
 - 7 day per week frequent service
- **FTN 2:** Develop local funding sources to support additional service subsidy (see also Chapter 6 - Funding).
- **FTN 3:** Target any City transit operating funds/subsidies to meet or surpass minimum service levels on routes that comprise the Frequent Transit Network, particularly where Frequent Transit Network corridors regularly exceed loading standards.
- **FTN 4:** Work with Metro to develop performance agreements that ensure service hours gained through City capital investments will be reinvested in routes serving the Frequent Transit Network in Seattle.
- **FTN 5:** Work with Metro to develop a transit system restructuring study, or studies, for all Seattle bus routes (and possibly key services extending beyond Seattle).
- **FTN 6:** Use a Multiple Account Evaluation (MAE) approach (see Chapter 3) to reassess priorities for expansion of the Frequent Transit Network every 5 years.
- **FTN 7:** Work with Metro to develop a late-night service program on top of performing Frequent Transit Network routes. (Secondary to establishment of minimum service levels – FTN 1).
- **FTN 8:** Manage operations of arterial transit streets to provide priority to transit vehicles carrying high passenger volumes.
- **FTN 9:** Set policies that encourage all land uses with high transit trip generation to locate within ½ mile of a Frequent Transit Network route.
- **FTN 10:** Provide input to Metro on specifications for the new Electric Trolley Bus fleet and consider funding vehicle features that support Frequent Transit Network design and service levels and enhance ride quality and passenger comfort.
- **FTN 11:** Coordinate FTN service level standards and operations with relevant land use codes.

SEATTLE ELECTRIC TROLLEY BUS SYSTEM

Overview

Public transit is an emblematic element of every great city. New York has its subway, Toronto its streetcar system, and Vancouver its SkyTrain metro system. All these systems combine function, quality, and brand appeal to deliver a compelling service that is widely used by residents and visitors alike. No one element of Seattle's transit system delivers greater mobility, access to important local destinations and transit friendly neighborhoods, or holds more potential to elevate the quality and appeal of transit than the electric trolley bus system operated by King County Metro. If there were personal ads for transit, the electric trolley bus would have an attractive line in the Seattle papers.

"Always there but quiet, hill climber, environmentally friendly, seeks hilly Seattle neighborhood for diligent service."

Seattle's electric trolley bus (ETB) system is an important tool to deliver City goals related to mobility, environmental protection, and quality of life.

To meet City and County targets for climate change, growth, and reduction of vehicle miles traveled, Seattle's transit network must be capable of absorbing far more ridership than it currently accommodates. This will require transit to carry many more people in Seattle and serve a broader range of trip types for residents and visitors. The City and King County Metro must continue to partner to ensure Seattle can gracefully support planned growth with safe, comfortable, clean, and effective mobility for all its residents. Maintenance, enhancement, and expansion of the electric trolley bus system can help to meet this goal.

An Abbreviated History

As part of a broad effort to modernize Seattle's transportation system in 1939, a special commission proposed the replacement of a number of streetcar, cable car, and bus routes with a 110 mile electric trolley bus system. With swift action to launch the system, 235 trolley buses were operating by the following year. Two to three decades later, the 110 mile system was still in place, but faced competition with modern diesel buses, which could be operated cheaply given the low cost of fuel.¹

When North Seattle was annexed in the 1950s, 40,000 new residents were promised transit service. Seattle Transit, the city's then-private transit company, was in dire financial straits and could not bear the costs required to extend trolley wire infrastructure to the new northern city limits. Instead, many of the overhead power lines were dismantled and trolleys were replaced with diesel buses. Figure 4-9 illustrates the extent of the electric trolley bus system in 1963, prior to the annexation of North Seattle.

By 1970, the system had diminished to 32 route miles.

When Metro (then the Municipality of Metropolitan Seattle) inherited the trolley bus system in 1973, it successfully retained federal grant funds to restore aging infrastructure and replace the vehicle fleet.

Figure 4-10 illustrates the extent of the King County Metro electric trolley bus system as it operates in 2011.

Today, King County operates 14 different ETB routes on 70 miles of streets. The 159 vehicle ETB fleet includes both standard forty-foot and articulated coaches. Electric bus routes carry approximately 23% of Metro riders countywide while consuming approximately 15% of service hours.

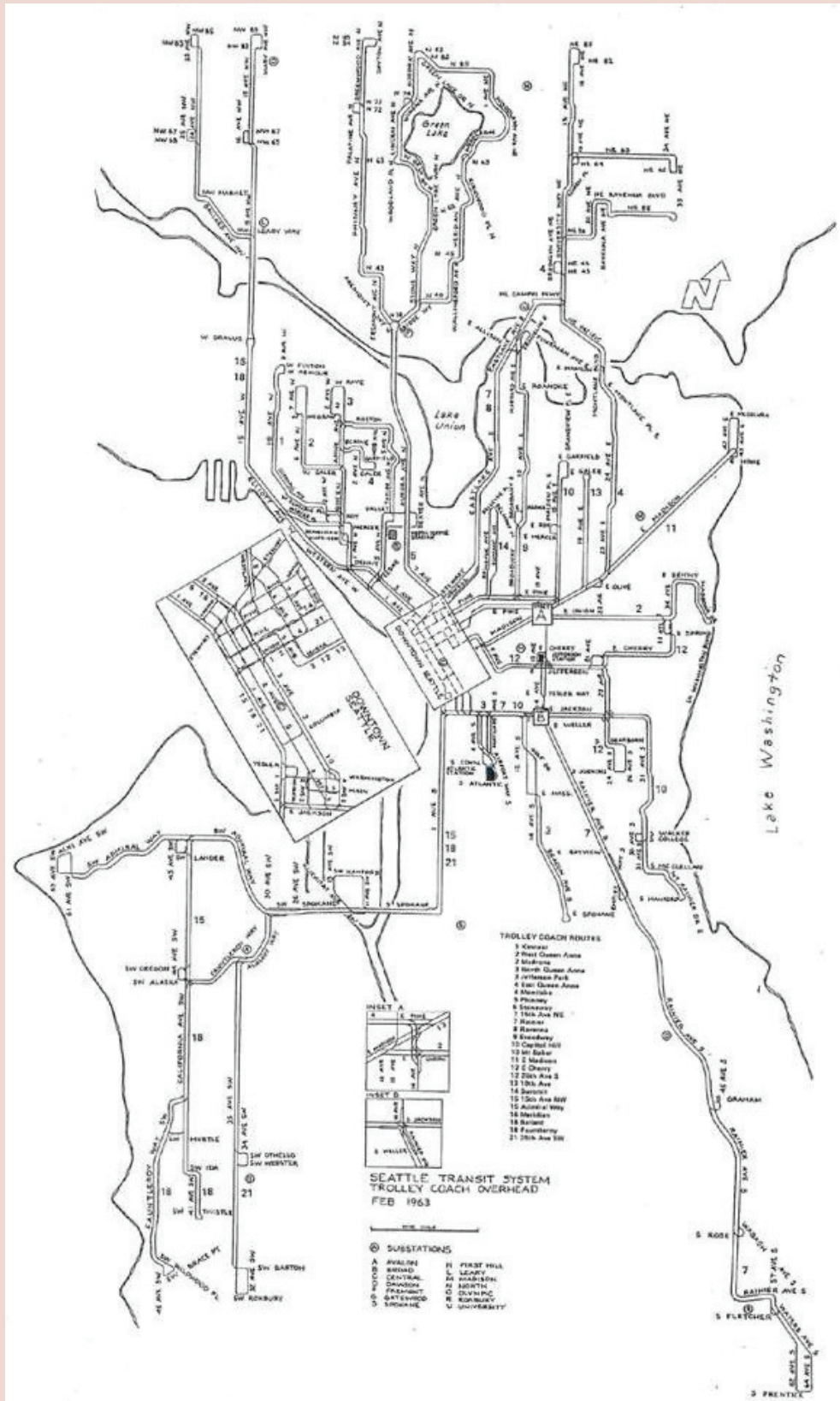
¹ King County Trolley Bus Evaluation Report. May 2011. King County Metro.



Earlier (left) and current generation (right) electric trolley buses. By 2015, Metro will have replaced its entire ETB fleet with modern vehicles. This investment in vehicles itself will improve customer experience on many Seattle bus routes.

Images from Flickr user Oran Viriyincy

FIGURE 4-9 1963 ELECTRIC TROLLEY BUS NETWORK PRIOR TO NORTH SEATTLE ANNEXATION



Proposed by a special commission in 1939 as part of an effort to modernize Seattle's transportation system, a 235 trolley bus system was launched and operating 110 miles of two-way service by the following year.

Source: King County Metro

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Produced by the Seattle
Department of Transportation
No warranties of any sort,
including accuracy, fitness or
merchantability, accompany
this product.
Not to Scale
PLOT DATE: <06/2011>
AUTHOR: <Neilson Hygaard
Consulting Associates>

Source: SDOT

This map illustrates the City of Seattle's plans for expanding its electric trolley bus system. The legend identifies four types of routes:

- Candidate Near-Term ETB Corridors:** Solid red lines.
- Electrified Segments of Candidate Corridors:** Red dashed lines.
- Candidate Wire Extension Projects:** Blue dashed lines.
- Existing Electric Trolley Bus:** Brown solid lines.
- Link Light Rail:** Blue circle icons.

The map shows various neighborhoods and transit hubs across Seattle, including Aurora TC, Northgate TC, University District, Westlake Hub, Colman Dock, King St., Mount Baker TC, Rainier Beach, and South Park. Key streets like Aurora Avenue, I-5, I-90, and local thoroughfares are labeled. Specific project callouts include:

- Electrify Route 48 North:** A red arrow points to a corridor from Greenwood through Crown Hill towards Ballard.
- Possible Extension:** A red arrow points south along Fremont Avenue from Wallingford.
- Possible Extensions:** Two red arrows point west along 15th Avenue NW from Ballard towards Magnolia.
- Extend Route 44 to Laurelhurst:** A blue arrow points east from University District towards Laurelhurst.
- Electrify Route 11:** A blue arrow points north along East Union Street from the downtown area.
- Enable new north-south crosstown on Eastside by filling wire gaps on 23rd Avenue E:** A blue arrow points north along 23rd Avenue E.
- Enable Othello - Capitol Hill - U District Crosstown by adding wire on 12th:** A blue arrow points north along 12th Avenue NE.
- New wire on Yesler between 2nd Avenue and 9th Avenue E. New wire on 9th Avenue to E. Jefferson:** A blue arrow points north along Yesler Way.
- Rainier Ave is electrified but a new route to U. District could be enabled by 23rd Ave gap closure:** A red arrow points north along Rainier Avenue from Rainier Valley towards the University District.
- Connect Route 7 to Rainier Beach Station:** A blue arrow points south along Rainier Avenue from Rainier Beach towards the center.

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Not to Scale
PLOT DATE: <06/2011>
AUTHOR: <Nelson\Nygaard Consulting Associates>

Source: SDOT

WHY IS THE ELECTRIC TROLLEY BUS IMPORTANT TO SEATTLE?

Arguably, an electric trolley bus is just another vehicle type used to deliver urban transit service. A vehicle itself does not make or break the value or quality of service provided by a transit route or system. However, a number of factors distinguish and emphasize the value of electric trolleys in Seattle.

- **Hilly terrain:** Seattle's unique topography includes a number of ridges and land forms that drop quickly to the water bodies that surround the City. The electric trolleys provide rapid acceleration and quiet operation on steep grades that cannot be matched by diesel or diesel electric hybrid vehicles.
- **Great neighborhoods:** Seattle is famous for its livable neighborhoods; quiet operations provided by electric trolleys allow high levels of transit service in dense mixed-use neighborhoods without the downside of noise and emissions created by diesel coach operations. Electric buses are the quietest mode of motorized street-level public transit.
- **Rapid urban growth:** Seattle is projected to grow rapidly over the next 20 years, with most of the population and job growth projected to occur in the Center City areas and other urban centers where current electric trolley service is most extensive.
- **Strong environmental values:** The City and County are national leaders in environmental protection and have set aggressive goals for reducing greenhouse gas emissions. Seattle's power company, City Light, provides GhG-neutral electricity, allowing electric transit in Seattle to provide clear emission reduction compared with diesel operations. Regardless of power source, electric buses are approximately 1.9-2.4 times as energy efficient as diesel buses.¹
- **Ease of navigation:** Transparency and ease of navigation has always been an argument in favor of rail transit. Fixed rail tracks running in the street right-of-way are easy to recognize and signal to passengers that there will be a train coming soon. Overhead wires used to power ETBs provide a similar benefit. Since trolleys run in neighborhoods that host many of the City's visitor attractions, this benefit, combined with high-quality information, can help to draw visitors and infrequent riders to transit.
- **Additional funding:** Despite higher operating and capital costs compared to diesel or diesel electric bus options (discussed below), the availability of FTA fixed guideway funding for the electric trolley system helps King County Metro provide more service per increment of locally generated funding. A recent analysis by King County shows that on an annual life cycle cost basis, which includes both operating and capital cost elements, using trolley buses to operate the existing network is \$3.7 million cheaper each year.²

Electric Trolley Bus Fleet Replacement

A recent decision by King County Metro to replace its entire electric trolley fleet with modern coaches by 2014 sets the stage for Seattle and King County to elevate the function and perception of the ETB system. Matching the fleet improvements with operational enhancements, access improvements, and better passenger facilities will leverage greater value from investments in new vehicles.

Specifications for these vehicles will be developed by King County Metro by early 2012. It is important that new vehicles include the following features:

- Modern BRT rail-like vehicle appearance.
- Low floors and extra doors (3-4 doors vs. 2-3 doors, depending on vehicle length) for faster boarding. This could be particularly valuable as Metro and other providers migrate toward off-board fare payment. (Many ETB routes will be top candidates for implementing full or partial off-board fare payment).
- Off-wire capability to allow rerouting around street closures.
- ORCA "smart card" readers at all doors to allow all-door boarding for pass holders.
- Passive restraint wheelchair system.

If these features are not included in the Metro-funded specifications, the City of Seattle should consider providing supplemental funding to ensure this significant investment in passenger vehicles aligns with City priorities for service quality and access. Figure 4-12 shows features of ETB used in other cities.

¹ Metro Trolley Expansion Program FEIS; also The Trolleybus in Edmonton: A Step Toward Better Public Transit and a Cleaner Environment, Kevin Brown, 2001

² King County Trolley Bus Evaluation Report. May 2011. King County Metro.

FIGURE 4-12 POSSIBLE VEHICLE ENHANCEMENTS

Three Door Boarding



EMTU low-floor trolleybus in São Paulo provides three door boarding.

Image from Wikimedia Commons user Ailton Florencio

Battery Operations



A Translink electric trolley bus in Vancouver, B.C. This is a 40' New Flyer vehicle with battery auxiliary power allowing off-wire operations.

Image from Wikimedia Commons user Bobanny

Rail Style Vehicle



Irisbus Cristalis trolleybus in Lyon, France.

Image from Wikimedia Commons user Momox de Morteau

Open Interior Layout for Greater Capacity



Photo of interior configuration of Irisbus Cristalis 60 foot articulated electric trolley bus.

Image from Wikimedia Commons user tompagenet

Advanced Pole Technology



Wellington NZ carbon fiber poles reduce “jumping” wires or dewirements. This vehicle is produced by Designline Vehicles.

Image from Wikimedia Commons user tompagenet

BUS FEATURES

These photos highlight important features for enhancing the comfort, capacity, and accessibility of buses. These features are relevant to both ETB expansion and buses generally. They include:

- Low-floor vehicles for level boarding and streamlined wheelchair access
- Automated stop announcements, both visual and audible
- Seats that fold up to accommodate wheelchairs
- Perimeter seating and a wider aisle
- Seats that fold up to accommodate standing room passengers, as well as plentiful bars and grips to hold onto
- Boarding at multiple, wide door, with fare payment readers available at all doors
- Interior maps illustrating the route, stops, and travel times

FIGURE 4-13 FEATURES FOR ENHANCING BUS COMFORT, CAPACITY, AND ACCESSIBILITY



Accessible wheelchair boarding from multiple doors on a bus in Rome.

Image from Nelson\Nygaard

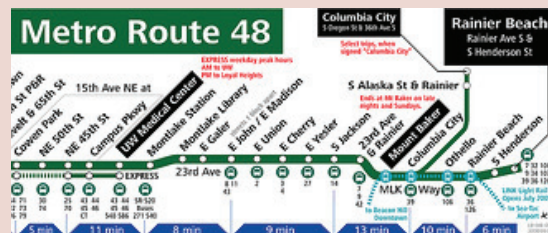


Perimeter seating on an articulated bus. Image from Flickr user Dennis Tsang



Requiring off-board ticket purchases and/or providing on-board electronic card readers speeds boarding times.

Flickr user Monica Arellano-Ongpin



Rail-like route strip maps, exemplified by this concept for Metro Route 48, would make it easier for new riders and visitors to use the bus system.

Image from Oran Viriyincy (via Flickr)

STRATEGY AREA: ENHANCING THE ELECTRIC TROLLEY BUS SYSTEM

- **ETB1:** Work with Metro to ensure that the 2014-15 vehicle procurement includes the state-of-the-art features referenced in Figures 4-12 and 4-13.
- **ETB2:** Pursue grant funding opportunities and develop partnerships with Metro and others to continue expanding the system until and unless new zero-emissions technology becomes widely available, reliable, and affordable.
- **ETB3:** Ensure that SDOT and other City processes for permitting electric transit infrastructure helps facilitate trolley system development.
- **ETB4:** Collaborate with Metro to consider an electric trolley sub-brand that stresses the zero-emissions and/or low noise attributes of ETB service.

SEATTLE

LOCAL TRANSIT NETWORK

Local Transit Network

King County Metro provides a network of fixed-route bus services to lower-density areas of Seattle that are not directly served by the FTN. Referred to as the Local Transit Network (LTN) in this plan, this includes routes that provide access to the FTN, express service from neighborhoods to downtown, and neighborhood circulation. The LTN is also supplemented by demand responsive public transportation services and private and institutionally operated shuttles that provide services targeted at specific populations.

The LTN is not a key focus of this plan, since the City's limited transit resources will be focused on the development of the FTN. However, the City should support Metro actions to:

- Maintain a basic or "lifeline" level of LTN service to within ½ mile of most Seattle residents. This level of service is defined by a minimum of 60 minute frequencies for 15 hours per day. If a route cannot support this level of service, then redeployment and/or provision of alternative service concepts should be considered.
- Restructure LTN services as new FTN services come on line (e.g., the opening of the University Link and North Link will provide an opportunity to eliminate duplicative downtown-bound services and redeploy services to better feed Sound Transit light rail stations or FTN corridor stations).
- The extent of LTN service will change over time, becoming a smaller share of the City's overall system as:
 - New rapid transit lines are implemented and replace express routes (less LTN service, more FTN service).
 - The FTN expands.
 - New local service or private shuttles are added to support new rapid transit lines.
 - Demand grows for local services feeding rail stations or transportation centers, allowing them to be upgraded to FTN service.
 - Service consolidation occurs to improve service efficiency and effectiveness.

Coverage rather than speed is the goal for the LTN. Stop spacing as close as 600 feet can be acceptable in some cases, but transit access improvements are, like the FTN, critical to maximizing its usefulness. The City should consider the elevated need for access to LTN stops in prioritizing pedestrian and bicycle investments.

Local Transit Network Priorities

The City should focus efforts to improve the LTN—through funding or policy—on areas with the highest ridership and those areas that do not have convenient walking access to the FTN. The TMP recommends that the City focus on LTN improvements in two areas: (1) partnering with Metro on

strategic restructurings that allow service hours to be redeployed within the LTN and (2) enhancing service in areas with limited FTN access.

- **Restructuring Opportunities:** The following are areas where the City should work with Metro to continue to refine or restructure the LTN in conjunction with completed or upcoming FTN service improvements:
 - **Southeast Seattle:** Many LTN routes in this area have been restructured to provide connections with Link light rail stations between Mt. Baker and Rainier Valley. However, challenging topography and wide light rail stop spacing make it challenging for many residents to access light rail.
 - **University District/North Seattle:** Sound Transit University Link (Husky Stadium) and North Link (Roosevelt, Northgate) extensions will open in 2016 and 2021, respectively. Both will provide opportunities to redeploy LTN service to feed this high-capacity link to the Center City. Opening of the Northgate station, in particular, will provide opportunity to discontinue downtown-bound, peak-only express bus service. Service redeployment in this section could be allocated to improve LTN service in neighborhoods, such as Pinehurst, that don't have convenient walk access to the current or planned FTN.
 - **NE Seattle:** The planned opening of RapidRide lines D (Northgate – Ballard – Downtown) and E (Aurora Village – Downtown) will present an opportunity to consider service restructuring in NE Seattle. In particular, this is an opportunity to consider enhancing services that intercept FTN corridors on Aurora Ave, Lake City Way, and 15th Ave NE and eliminating expensive express bus services to downtown.
- **Priority Areas for LTN Investment:** The following are areas of the city where FTN services are more than a ½ mile walk and, therefore, LTN routes should be considered for increased service levels through reallocation from lower-productivity LTN routes. LTN routes must also have the following characteristics to be considered for added service: (1) be well utilized and (2) be designed to provide access to the FTN and/or multimodal hubs.
 - West Seattle: north of Alaska Junction and along 35th Ave SW
 - Georgetown/South Park
 - Magnolia
 - NE Seattle: east of 25th Ave NE and north of NE 45th Street
 - North Seattle: east-west services in the vicinity of N 125th Street and N 145th Street

The TMP Briefing Book, pages 4-9 and 4-10, illustrates the bus network in Seattle.

STRATEGY AREA: IMPLEMENTING THE LOCAL TRANSIT NETWORK

- **LTN 1:** Encourage Metro and other regional transit providers to deliver at minimum the following level of service on well-utilized Local Transit Network corridors that connect effectively to the Frequent Transit Network:

- 60 minutes frequency or better
- 15 hour service span or longer
- 7 day per week service

Where supported by demand, increased frequency should be provided at peak hours.

- **LTN 2:** Develop local funding sources to support additional service subsidy (see also Chapter 6 - Funding) or directly pay for local neighborhood service. City funds should be directed to the most cost effective means of delivering LTN service, which could include buying Metro service or funding other delivery mechanisms for neighborhood shuttle services.
- **LTN 3:** Focus any City resources available for LTN investment on routes with the highest ridership and/or those areas that lack convenient walking access to the FTN.
- **LTN 4:** Work with Metro to restructure LTN services to more effectively connect with FTN services, allowing simultaneous service changes.
- **LTN 5:** Work with Metro and other human service transportation providers to reduce spatial or temporal gaps in the transportation system for people with special mobility needs.
- **LTN 6:** Multimodal hubs, major transit stations, and priority access nodes should be designed to provide high-quality bus intermodal connections to minimize the penalty associated with connecting from a local route to an FTN service.
- **LTN 7:** Work with major institutions and employers to facilitate use of employer-funded, high-occupancy shuttles to provide access to major transit hubs or rail stations.
- **LTN 8:** Maintain oversight of the accessible taxi program; ensure the fleet has an adequate number of accessible taxis, that procedures are in place to prioritize use by persons with disabilities, and that there is good customer service.
- **LTN 9:** Work with providers to ensure that public, institutional, and private transportation services deliver convenient connections between the FTN and residences and facilities that serve seniors and persons with disabilities.
- **LTN 10:** Collaborate closely with King County Metro to test new transportation approaches, such as neighborhood circulators or shopping shuttles that may better serve older adults and persons with disabilities in a more cost-effective manner than public paratransit or full-sized buses, allowing reallocation of unproductive, expensive services.

ADA Paratransit, Social and Human Service Transportation

King County Metro Transit offers a variety of services for people with special transportation needs. These include Metro's Access Transportation service, which responds to the federal Americans with Disabilities Act (ADA) requirements and its Community Transportation Program described in more detail in [the TMP Briefing Book, page 4-3](#), and summarized in the sidebar on page 4-27. Dozens of other non-profit and privately funded organizations provide transportation services to Seattle residents with special transportation needs. The City plays a key role in managing its street system so that cars, vans, and shuttle buses used by these providers can move efficiently and reliably through the City.

During 2009, a total of 1.15 million ADA paratransit trips were provided at an average cost of \$38 per trip (compared to a fixed route boarding cost per trip of \$3.90). About 30% of

paratransit passengers are able to use fixed-route transit for at least some of their trips; however, they are often prevented from using the bus because of barriers that keep them from accessing the nearest bus stop or station. It is in the best interest of both customers and public agencies that provide paratransit to encourage and facilitate the use of fixed-route services by all riders who are capable of boarding standard buses.

Despite the range of transportation options already available to citizens of Seattle, existing public transit and/or paratransit services cannot meet all mobility needs. What are the most significant needs or gaps that, if addressed, could improve mobility for all users, particularly older adults and persons with disabilities? Some of these are outlined below:

- **Lack of Knowledge and Information:** There is a need to improve how people access route and schedule information. Customers and social service agency staff need to understand the range of services offered, as well as their limitations or eligibility factors, if any. It is important that information be available electronically (online), in print, and by telephone. All materials should also be available in accessible formats.
- **Spatial or Geographic Gaps:** Key origins and destinations utilized by persons with disabilities or seniors are not located on the FTN or have challenging physical conditions for travelers to reach a bus stop. In addition to Metro operated Community Transportation Program services, programs such as Safe Routes to Transit can help overcome these challenges.
- **Temporal Gaps:** Transit service hours may not be adequate; there may be lengthy waits to schedule service, or a long time on the vehicle, especially if the trip requires multiple transfers.
- **Facility Siting:** Facilities that support special needs populations are not always located where there is existing public transportation. Land use policies that encourage such facilities to locate near high quality transit access are critical.
- **Lack of Safe and Accessible Pedestrian Access to Transit:** Amenities may be missing that prevent or hinder people from traveling to and from transit stops and their destinations, such as missing or damaged sidewalks, lack of curb cuts, lack of signalized intersections, or not enough time for people who move more slowly to cross streets.

The City of Seattle should consider the following strategies and partnership opportunities to enhance travel options and quality for people with special transportation needs:

- Make enhancements to fixed-route public transportation operations and planning such as additional bus operator training, incorporating travel needs of older people in route planning, stop placement and facility design, and



Access vehicle on 24th Avenue E

Image from Nelson\Nygaard



Left: In 2006, Sound Transit received a federal grant to implement Talking Signs, a wireless communication system that provides audible landmark identification and wayfinding assistance. Right: A tactile sign facilitates wayfinding within a TriMet MAX station.

Left: Image from Flickr user Sound Transit, used with permission.

Right: Image from Nelson\Nygaard



coordination with other agencies and transportation providers.

- Improve access to information by fully integrating the needs of older adults, persons with disabilities, and non-English speaking people in planning and design of transit facilities, offering fully accessible public information options, and employing state of the art technology that aids disabled residents in navigating streets and accessing transit facilities.
- Provide enhancements to public transportation vehicles such as low-floor buses, kneeling buses, wider doors, improved interior circulation, additional stanchions and grab bars, ergonomic seating designed for older riders, and accessibility features either required or encouraged by ADA, such as ramps, larger letters on head signs, and stop announcements.
- Provide programs to help older people take advantage of existing services, such as information and assistance programs to connect older people with appropriate services and outreach and training programs.
- Expand supplementary services including flexible route and community transportation services, ADA complementary paratransit, non-ADA demand-responsive services, taxi subsidy programs, and volunteer driver programs.
- Apply universal design strategies at transit facilities, bus stops, and on streets and sidewalks in the immediate vicinity of transit facilities and stops.
- Support information programs that help policy makers recognize the range of benefits to make transportation improvements such as: keeping people healthy, improving affordability of transportation, maintaining independence, improving public health, and reducing costs to public agencies responsible for implementing ADA paratransit.

These actions are critically important, but they are not the only actions needed. Other important actions include assuring supportive services to caregivers who provide transportation, encouraging further development of unsubsidized private transportation services, increasing the availability of accessible taxicabs, and coordinating with non-emergency medical transportation provided under Medicaid and Medicare.

Private Shuttles and Transportation

Seattle has many private companies and institutions that provide shuttle or bus service in the city or to and from the city to major employment sites. These providers carry a small number of daily passengers compared with public transportation, but fill important niches or special services. In many cases, comparable trips are available on the public transit system, but employers want a faster, more private, or exclusive service for their employees or students. The City's role in supporting such services should be limited to ensuring vehicles have access to customers at the curb or at major transit nodes.

- Allow shuttles to access curb space for pick up and drop off.
- Encourage facility designs at rail stations and transportation centers that include pick-up/drop-off space for private shuttles.
- Consider establishing a fee for use of curb space by private shuttle operators that charge a fee for use of their vehicles.

Operating shuttle services is a cost to hospitals and universities that may support their core missions. In the long run, development of high-quality, high-capacity public transit will provide the greatest benefit to Seattle's major companies and institutions.



Shuttles utilize passenger loading zones designated by the City to board and off-board passengers.

Image from Nelson\Nygaard

KING COUNTY COMMUNITY TRANSPORTATION PROGRAM

King County's Community Transportation Program provides services to people with special transportation needs. The program includes a range of transportation and education programs that go beyond regular bus service and complementary paratransit service required by the federal Americans with Disabilities Act (ADA). The program works to provide services that are more flexible and responsive to the needs of persons with disabilities. The Community Transportation Program services include:

- **Enhanced Access Transportation Service:** provides expanded level of service for ADA paratransit customers, including a larger service area, door-to-door service (vs. curb-to-curb), and additional reservation options.
- **Taxi Scrip Program:** low-income King County residents age 18 to 64 who have a disability or are age 65 and over can buy up to six books of taxi scrip each month from Metro at a 50 percent discount.
- **Transit Instruction Program:** provides free training services to teach persons with disabilities and seniors how to ride regular public transit.
- **The Hyde Shuttle:** provides a free van service for seniors 55 or older and people with disabilities living in Central or Southeast Seattle.
- **Community Access Transportation (CAT):** program to find innovative uses of retired Access and vanpool vehicles that includes:
 - **Advantage Vans:** Social and human service agencies agree to provide a minimum number of rides to Access users each month. In exchange, Metro provides an operating grant (with a minimum ride threshold) emergency response, vehicle maintenance and repairs, driver training, and technical assistance to participating agencies.
 - **CAT Vanworks:** Metro pays the monthly cost of a standard Vanpool agreement on behalf of local agencies that have a number of clients who are eligible for Metro's ADA Paratransit Program (Access Transportation) and are traveling to work sites.