

Sound Transit Service Standards and Performance Measures

2018 Edition



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Executive Summary

What are Service Standards and Performance Measures?

Service standards and performance measures are the policies and parameters used to design, modify, and evaluate transit service. Think of them like a toolbox for managing transit service.

Sound Transit uses these guidelines and measures to optimize efficiency and effectiveness while maintaining or improving service. Service standards are intended to serve as a decision-making tool to assist Sound Transit staff, management, and Board members when considering service changes.

In 1998, Sound Transit adopted its first set of Service Standards and Performance Measures. This original policy document was revised in 2006 to include Sounder commuter rail and Tacoma Link, and then again in 2010 to include the Link light rail system. The standards and measures were revised once more in 2014 to include updated productivity measures.

The 2018 revision simplifies and clarifies the 2014 Service Standards and Performance Measures, but does not change any of the system standards.

Service Design Guidelines

- Ensure service design consistency
- Address infrastructure, route, schedule efficiency, and passenger amenities

Service Performance Measures









- Establish performance targets
- Determine productivity and service quality throughout the system

Service Evaluation & Management

- Defines the process for making changes to service
- Maintains standard of service quality and continued improvement of the customer experience

Overview of Performance Measures

Service performance measures provide the framework for evaluating service and informing management of Sound Transit service. A quick reference table of performance targets for each of Sound Transit’s services is provided below. For a detailed explanation of each performance measure, please refer to [Section 1: Introduction to Service Standards and Performance Measures](#).

	Productivity				Service Quality			
	 Boardings per Trip	 Boardings per Revenue Hour	 Subsidy per Boarding	 Passenger Miles per Platform Mile	 Passenger Load	 On-Time Performance	 Customer Complaints	 Operated as Scheduled
ST Express FAST, FREQUENT REGIONAL BUS SERVICE (SEE PAGE 15)	<ul style="list-style-type: none"> Monitored regularly and reported annually with a comparative analysis of each route’s performance and a peer comparison analysis Annual targets are adjusted accordingly 				Standing passengers not to exceed 1.23 - 1.5 times total seats and limit standing time to 30 minutes	85% of trips arrive within five minutes of schedule, never early	Less than 15 complaints per 100,000 boardings	99.8% of scheduled trips operated
Sounder HIGH CAPACITY COMMUTER RAIL (SEE PAGE 19)	<ul style="list-style-type: none"> Monitored regularly and reported annually with a peer comparison analysis Annual targets are adjusted accordingly 				Most riders have a seat, otherwise limit standing time to 30 minutes	95% of trips arrive at route terminals within seven minutes of schedule	Less than 15 complaints per 100,000 boardings	99.5% of scheduled trips operated
Tacoma Link LIGHT RAIL WITH MULTI-MODAL CONNECTIONS (SEE PAGE 21)	<ul style="list-style-type: none"> Monitored regularly and reported annually with a comparative analysis by time of day and a peer comparison analysis Annual targets are adjusted accordingly 				Standing passengers permitted up to 1.86 times number of seats	98.5% of trips depart/arrive route terminals within three minutes of schedule	Less than 15 complaints per 100,000 boardings	98.5% of scheduled trips operated
Link FREQUENT, RELIABLE HIGH-CAPACITY LIGHT RAIL (SEE PAGE 24)	<ul style="list-style-type: none"> Monitored regularly and reported annually with a comparative analysis by time of day and a peer comparison analysis Annual targets are adjusted accordingly 				Standing passengers not to exceed two times number of seats and limit standing time to 30 minutes	90% of headways within two minutes of schedule	Less than 15 complaints per 100,000 boardings	98.5% of scheduled trips operated

How does Sound Transit develop service changes?

After a service has been designed and implemented, Sound Transit may make adjustment to the service through periodic service changes. These changes range from altering a Link light rail schedule to changing an ST Express bus alignment to introducing a new route, rail line, or service. **Sound Transit uses service changes to manage the efficiency, reliability, and quality of service.**

Service changes generally originate through one of four processes:

PERFORMANCE MONITORING

Monitoring and ranking the performance of service, guided by the standards and measures in this document.

VOTER-APPROVED PLANS

The completion of voter-approved high-capacity transit (HCT) projects can drive service changes, including: starting new service, opening new alignments and stations, and modifying existing service to maximize network connectivity.

SOUND TRANSIT BUDGET

Annual coordination with the agency's budget to identify appropriate resources for delivering services. Changes in funding and revenue streams can impact how much service can be provided.

REGIONAL COORDINATION WITH PARTNER AGENCIES

Coordination with partner transit agencies to identify opportunities for increased service integration, to better facilitate travel and connections between local and regional services.

After a need for a potential service change is identified, the service change can be developed in a few ways.

OPERATIONAL MANAGEMENT

Changes that are aimed to address near-term operation issues and typically based on staff monitoring service throughout the year or customer and stakeholder feedback

SERVICE IMPLEMENTATION PLAN (SIP)

Prepared annually in coordination with the agency budget, the SIP provides important details on service delivery for the upcoming year.

COMPREHENSIVE OPERATIONS ANALYSIS (COA)

Conducted every few years, a COA has detailed analysis of ridership patterns and system operations, including, but not limited to: passenger activity at a route and system level, running time and schedule adherence, and emerging system trends.

FIVE-YEAR SERVICE OUTLOOK & PLAN

Preliminary service plan that describes how current or upcoming ST or partner agency capital projects may impact future service delivery.

How are service changes approved?

Sound Transit manages the transit network through service changes. **Service changes are classified as either minor or major changes.** All major service changes include public participation and require approval by the Sound Transit Board of Directors. Any change classified as minor may be made without Board approval, allowing staff to be responsive in addressing minor service quality issues.

Major Service Change

There are a few types of major service changes:

- Changing a route's (bus or rail) weekly platform hours by more than 25 percent
- Moving the location of a stop by more than a half (1/2) mile
- Closing a stop without an alternative stop within a half (1/2) mile

Minor Service Change

There are many types of minor service changes, including, but not limited to:

- Changing a route's (bus or rail) weekly platform hours by less than 25 percent
- Minor schedule adjustments
- Short-term temporary closures or construction re-routes

Public Process and Board Approval

Major service changes are typically approved by the Board of Directors through the adoption of the annual SIP and budget. Minor service changes are approved at the agency staff level. Major service changes require a service equity analysis (i.e. Title VI evaluation), while minor service changes do not require a Title VI analysis.



Service Change Dates

Service changes are made in March and September of each year.

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Introduction to Service Standards and Performance Measures

Service Implementation Plan (SIP)

Prepared annually in coordination with the agency budget, the SIP provides important details on service delivery for the upcoming year. The SIP also reviews the performance of each Sound Transit mode from the previous year using the service standards and performance measures from this document. The Plan offers an evaluation and analysis of the services to provide direction for potential changes for the upcoming year. The current and previous SIPs can be found online at soundtransit.org/sip.

Sound Transit plans, builds, and operates regional transit systems and services to improve mobility for Central Puget Sound. These service standards and performance measures reflect Sound Transit's commitment to ensuring transparency and accountability throughout the service planning and evaluation process.

The annual agency budget sets specific service performance targets for each transit mode. The service standards and performance measures provide a framework for evaluating each mode and how well it meets those performance targets. Performance data is reported annually in the agency's **Service Implementation Plan (SIP)** and reported in monthly and quarterly reports to the Board of Directors, which can be found online at soundtransit.org/ridership.

The service standards and performance measures, detailed in the following pages, help define the mode's service levels, facilitate consistent service design, and identify standards for modifying service. Service standards ensure Sound Transit system performance is consistent with the budget's performance targets and industry standards. **The document is organized to address the three components of a service standards policy: service design, service performance measures, and service evaluation.**

Service Design

Service design guidelines outlined in this document reflect the operating parameters and service characteristics of Sound Transit's modes. The guidelines ensure service continuity within each mode. These guidelines are not intended to be a set of strict rules, but instead applied on a case-by-case basis with consideration of the optimum service design, customer benefits, and potential impacts. Sound Transit's service standards vary by mode, but typically relate to infrastructure, route design, scheduling efficiency, and passenger amenities. Coordination with partner agencies and local jurisdictions is critical to implementing many of these guidelines.

Service Performance Measures

Service performance measures provide the framework for evaluating service. **Sound Transit evaluates service based on three performance areas: ridership, productivity, and service quality.** Each of these areas is analyzed on a system, corridor, and/or route level each year. Ridership analysis is detailed annually in the SIP, with targets based on the annual budget process. This document details how productivity and service quality are measured each year.

For some measures, there are associated service standards, or thresholds, a route must achieve to justify service. If the standards are not met, service delivery on that route will be re-evaluated.

Productivity

Productivity is determined by four key performance indicators:



Boardings per Trip is the number of passenger boardings for each scheduled one-way trip.



Boardings per Revenue Hour is the number of passenger boardings during one hour of scheduled revenue service, including layover time.



Subsidy per Boarding is the net cost of service (operating cost minus fare revenue) divided by the number of passenger boardings, with numbers based on a full fiscal year.



Passenger Miles per Platform Mile is calculated by dividing passenger miles by the number of vehicle platform miles traveled in a full year.

Service Quality

Sound Transit evaluates service quality based on passenger load, on-time performance, customer complaints, and trips operated as scheduled.



Passenger Load compares the number of passengers on the vehicle to the vehicle's seating capacity. The passenger load standard must balance the efficient allocation of vehicles (seat utilization) with a comfortable rider experience (access to seating for most of the trip).



On-Time Performance is based on whether trips are arriving at time points early, late, or on time and determines service reliability for customers.



Customer Complaints convey customer satisfaction and help identify service strengths or weaknesses. A high volume of complaints related to a specific service attribute can inform service change decisions.



Operated as Scheduled compares a trip's actual performance to the published timetable/schedule.

Service Evaluation

Service evaluation is the process of utilizing these service standards and performance measures to inform service change decisions. Sound Transit conducts on-going service analysis and periodic comprehensive operations analysis (COA) to identify potential service changes and develop the annual SIP. The service change process is detailed in [Section 3: Making Changes to Sound Transit Service](#).

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Design Guidelines, Performance Measures, and Service Standards



ST Express

FAST, FREQUENT REGIONAL BUS SERVICE

ST Express offers fast, frequent two-way service on 28 routes connecting Snohomish, King, and Pierce Counties. Sound Transit provides this bus service via service agreements with transit partners: King County Metro, Pierce Transit, and Community Transit. ST Express provides service to over 50 transit centers and park-and-ride lots.



Sounder

HIGH CAPACITY COMMUTER RAIL

Sounder commuter rail spans three counties, serving commuters on the north line from Everett to Seattle and on the south line from Lakewood to Seattle. Sound Transit owns the railway between Lakewood and Tacoma. BNSF owns the railway between Tacoma and Everett and operates Sounder service through a contract with Sound Transit. Amtrak provides maintenance for the Sounder fleet of locomotives and passenger cars.



Tacoma Link

LIGHT RAIL WITH MULTI-MODAL CONNECTIONS

Tacoma Link is a 1.6-mile light rail passenger line that runs through the heart of downtown Tacoma. There are six unique stations complete with artwork that reflects the history and community of Tacoma. Trains run every 12 minutes during the day on weekdays and Saturdays, and every 24 minutes weekday evenings and Sundays.



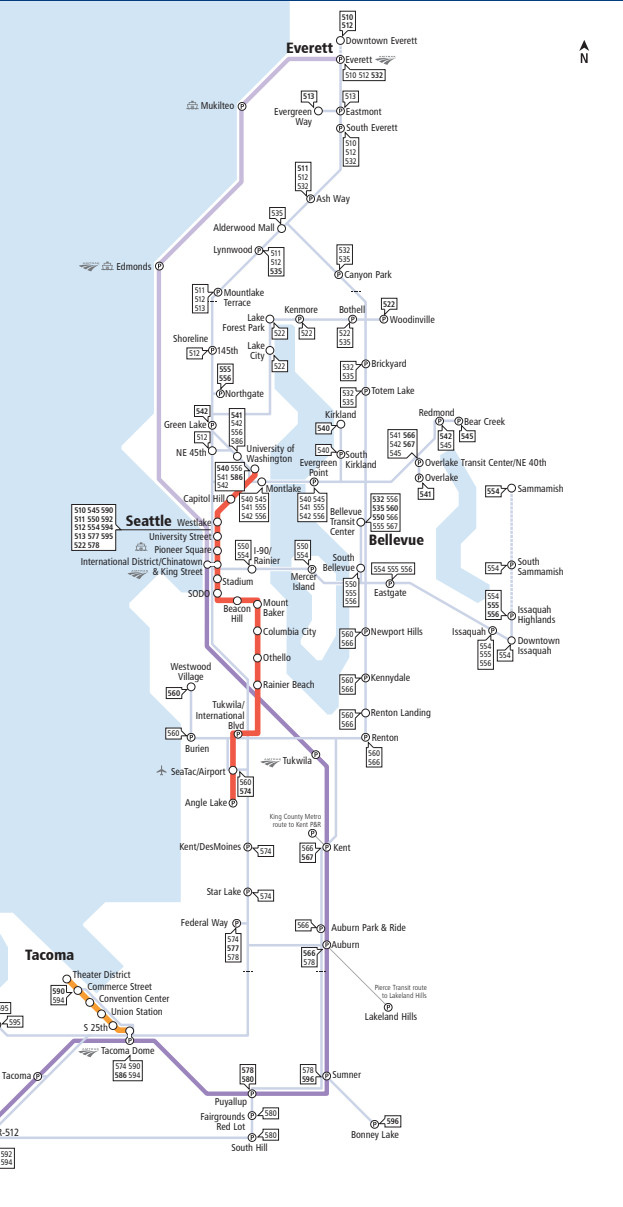
Link

FREQUENT, RELIABLE HIGH-CAPACITY LIGHT RAIL

Link light rail operates on over 20 miles of alignment between the University of Washington Station in the City of Seattle and Angle Lake Station in the City of SeaTac, serving 16 passenger stations, including four in the Downtown Seattle Transit Tunnel (DSTT). King County Metro operates and maintains the system through an intergovernmental agreement with oversight by Sound Transit staff. Paratransit service is also operated by King County Metro within the Link service area.

SOUND TRANSIT CURRENT SERVICE

- Link Light Rail**
 - University of Washington–Seattle–SeaTac/Airport–Angle Lake
 - Tacoma Dome–Theater District
 - Souder Commuter Rail**
 - Everett–Seattle Sounder
 - Tacoma–Seattle Sounder
 - ST Express Regional Bus**
 - Bold = Route terminus**
 - 510 Everett–Seattle Express
 - 511 Ash Way–Seattle Express
 - 512 Everett/Lynnwood–Seattle Express
 - 513 Everett–Seattle Express
 - 522 Woodinville–Seattle Express
 - 532 Everett–Bellevue Express
 - 535 Lynnwood–Bellevue Express
 - 540 Kirkland–University District Express
 - 541 Overlake–University District Express
 - 542 Redmond–University District Express
 - 545 Redmond–Seattle Express
 - 550 Bellevue–Seattle Express
 - 554 Issaquah–Seattle Express
 - 555 Issaquah–Northgate Express
 - 556 Issaquah–University District–Northgate Express
 - 560 Bellevue–Sea-Tac Airport/West Seattle Express
 - 566 Auburn–Renton–Overlake Express
 - 567 Kent–Overlake Express
 - 574 Lakewood–Sea-Tac Airport Express
 - 577 Federal Way–Seattle Express
 - 578 Puyallup–Federal Way–Seattle Express
 - 580 Lakewood–Puyallup Express
 - 586 Tacoma–University District Express
 - 590 Tacoma–Seattle Express
 - 592 DuPont–Lakewood–Seattle Express
 - 594 DuPont–Lakewood–Tacoma–Seattle Express
 - 595 Gig Harbor–Seattle Express
 - 596 Bonney Lake–Sumner Express
- Bus Fare Zone Boundary
 --- Limited Service
 --- Connector
 --- Service provided by other agencies
- Park & Ride
 ○ Ferry Terminal
 ○ Sea-Tac Airport
 ○ Antrak



Nov 2017

SOUND TRANSIT FUTURE SERVICE

- Link Light Rail**
 - Future service:**
 - Everett–Seattle–West Seattle
 - Redmond–Seattle–Mariner
 - Ballard–Seattle–Tacoma
 - Issaquah–Bellevue–South Kirkland
 - Tacoma Dome–Tacoma Community College
 - In service:**
 - Link of Washington–Angle Lake
 - Tacoma Dome–Theater District
 - Souder Commuter Rail**
 - Future service:**
 - DuPont–Lakewood
 - In service:**
 - North Line (Everett–Seattle)
 - South Line (Lakewood–Seattle)
 - Bus**
 - Future service:**
 - Bus Rapid Transit (BRT)
 - In service:**
 - ST Express bus (service re-evaluated annually)
- New station or bus facility
 P Added parking
 ○ Station improvements
 ○ Major transfer hub
 ○ Existing station or bus facility
 P Existing parking
 ○ Provisional light rail station



May 2018



ST Express Bus

Service Concept

- Offers higher capacity, higher speed service, generally with more frequency than local bus service
- Utilizes high-occupancy vehicle (HOV) lanes and other priority infrastructure (e.g., traffic signal priority, optimized stops/stations, etc.)
- Operates in both directions throughout the day and week
- Crosses city and county boundaries, with a significant portion of passengers traveling between jurisdictions
- Connects passengers to commuter rail, light rail, ferries, other express buses, and local service networks
- Provides service in corridors that connect designated regional population and employment centers within the Sound Transit District or in corridors with planned high-capacity rail or BRT in the future

High Capacity Corridors

ST Express bus service can help build ridership in a corridor where future high-capacity transit is planned. Once high-capacity transit (rail or BRT) is built, the ST Express service can be modified or discontinued to avoid duplication of service.

Service Design

Routing

To provide efficient service, ST Express routes should run on right-of-ways less prone to delays, including: HOV lanes, High Occupancy Toll (HOT) lanes, Business Access and Transit (BAT) lanes, and HOV direct access ramps. When operating in mixed traffic, routes should use designated limited access highways and major regional arterials. Express routes should avoid operating on secondary arterials and collector/distributor streets, except when necessary to access transit centers, HOV facilities, significant trip generators, or turnaround loops.

Key Transfer Points

ST Express should be coordinated with other Sound Transit service and/or local routes to facilitate connections at transit centers and key transfer points. To the greatest extent possible, schedules should minimize connection time while maintaining reliability at transfer points, where a high volume of passengers are transferring to and from ST Express service. Ideally, ST Express and connecting transit service should operate at frequencies that allow for spontaneous customer transfers without schedule timing.

Strategies to minimize wait time include:

- Prioritize each location based on actual or projected number of boardings and alightings
- Offset the ST Express schedules, where feasible, to distribute wait time equitably among transfer locations
- Provide more frequent service (i.e. 15-minute headways or better) at key times when transfer volumes are greatest, such as weekday peak periods

Transfer Point Pulse Scheduling

A pulse is a timed transfer between multiple routes at a transit center or other key transfer point that occurs at regular intervals. For example, a transit center with a pulse time on the :30 might have buses arriving between 9:22 and 9:25 and all buses departing at 9:30. This occurs on intervals, typically every hour: 9:30, 10:30, 11:30, etc. Modifying pulse times is an additional strategy to minimize wait time at the transfer point with pulse scheduling or minimize wait time at other points along the route.



Maximum Headways Based on Period of Service

- Peak: 30 minutes
- Base: 60 minutes
- Reduced: 60 minutes

Defining Service Frequency and Headway

Frequency refers to the number of trips per hour departing from a given point. Headway is the number of minutes between departures. If a bus departs from a stop at 6:10 AM, 6:40 AM, 7:10 AM, 7:40 AM, etc., its headway is 30 minutes (time between each departure) and its frequency is two departures per hour. Sometimes a route may be described as having a 15-minute frequency, even though the minute interval actually refers to the headway, while the frequency would be four departures per hour.



Service Span (Hours of Operation)

The service span for ST Express should be coordinated with passenger activity and demand and with local transit networks and other Sound Transit services. ST Express service span may vary between routes based on passenger demand and route performance.

	12 AM	5 AM	6 AM	9 AM	3 PM	6 PM	8 PM	12 AM
WEEKDAY	Reduced	Base	Peak	Base	Peak	Base	Reduced	
SATURDAY			Base				Reduced	
SUNDAY/HOLIDAY			Reduced					



Service Frequency & Headway

Sound Transit schedules ST Express frequency based on demand, clock-face scheduling, and the maximum headway guideline, which is 30 minutes during peak periods and 60 minutes during off-peak periods for ST Express. The guideline is designed to keep wait times reasonable for passengers who require a transfer. Once service is in place, headways may be improved to provide more frequent service if route productivity consistently exceeds the system average or if passenger loads exceed Sound Transit's service standards.



Directness of Travel

Directness of travel refers to how a traveler chooses a mode. The coefficient of directness provides a quantitative comparison between how a transit mode's travel time compares to travel time in a single-occupancy private vehicle. For ST Express, its coefficient of directness for a route should not exceed 1.33. **The scenario below meets the service standard of a coefficient of directness at or below 1.33.**

$$\begin{array}{c} \text{A} \end{array} \text{---} \text{Bus} \text{---} \begin{array}{c} \text{B} \end{array} \text{ 32 min.} \quad / \quad \begin{array}{c} \text{A} \end{array} \text{---} \text{Car} \text{---} \begin{array}{c} \text{B} \end{array} \text{ 25 min.} \quad = \quad 1.28$$

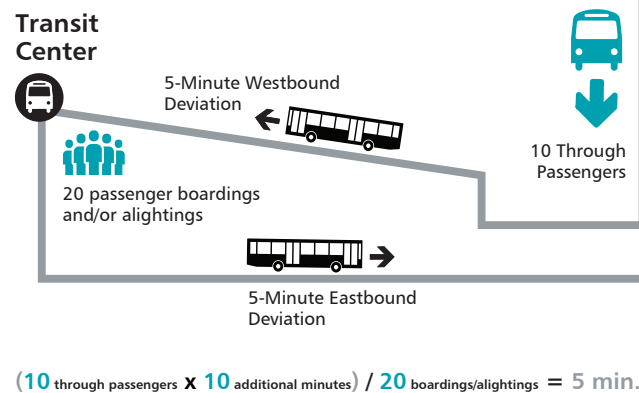




Deviations

ST Express routes should avoid deviations that backtrack or deviate from the most direct route between major trip generators. In some instances, a deviation is warranted because projected ridership gains outweigh the additional travel-time burden to through passengers. Where projected ridership on the deviation warrants direct service during part or all of the day, Sound Transit considers operation of separate service patterns along mainline and deviation. For ST Express, a deviation is only acceptable if the total additional travel time for through passengers does not exceed 10 minutes for each boarding/alighting along the deviation. **The scenario below is acceptable, as the total additional travel time is only 5 minutes.**

Ridership Gains Scenario




Short Turns

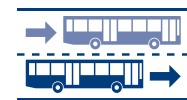
Short turns are selected trips scheduled to turn around before reaching the end of the route, providing more capacity on the segment of the route with the greatest demand. Short turns should not result in excessive layover. In order to



more efficiently and effectively allocate resources based on passenger demand, short turns should be considered for ST Express routes that experience a significant drop in demand after a certain point. Short turns can be implemented if resource allocation changes.

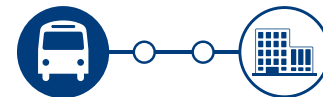


Bus turns around to head back instead of serving full route.



Coordination of Corridor Service

Outside of major activity centers, operation of more than one ST Express route on the same street (or a closely parallel corridor) should be avoided, except where there is a high demand, an HOV lane, or special transit priority treatment. Schedules of routes operating on the same corridor should be coordinated to optimize service headways for customers, where feasible. Sound Transit coordinates with partner agencies, including Pierce Transit, Community Transit, and King County Metro, to provide adequate level of service in various corridors and to minimize parallel bus service where no customer benefit is achieved.



Route Anchors

Major trip generators located at the end of a route have a positive effect on ridership and can “anchor” the route’s terminal at a logical location. Routes should be scheduled to serve peak passenger demand at these locations.



Schedule Efficiency

Schedules should be optimized to minimize dwell time at intermediate stops. Partner agency operating rules may impact ST Express schedule development, requiring close coordination.

- **Layover** is the break time between a route trip end and a next route trip start. For ST Express, layovers should be approximately 15 percent of the total cycle time, though additional layover time may be added to ensure clock-face headways or proper operator breaks. A reduction in layover time may be considered if it results in lower vehicle requirements without compromising the schedule. Locations with frequent through-passenger ridership should avoid layover time, when possible.
- **Scheduled Mid-Route Wait Times** should be minimized to the greatest extent possible so the local service can operate in a “pulse window” around the regional service. Mid-route waits should only be considered for connection and coordination of service at major transit centers where there is significant demonstrated ridership and high transfer activity between multiple routes. Where necessary, scheduled wait times should be no more than five minutes.



Layover Areas

For ST Express routes, layover areas, also called layover bays or zones, should be created for operator breaks and coordinated with available comfort stations (bathrooms). The size of a layover bay is generally determined by the frequency of the routes utilizing the space. Layover capacity should always be considered when making service changes or planning for future service. Layover areas should be coordinated with partner agencies to be within a short walking distance from an available operator comfort station, typically within 1/4 of a mile or 5-minute walk.

When implementing or modifying ST Express service, layover bay availability and/or design must be considered. In general, ST Express layover bays should be designed for 60-foot articulated buses. The following guidelines outline the required space and preferred designs for ST Express layover bays.

Route Frequency	Layover Space
More than 30 Minutes	One 60-foot articulated bus vehicle
15 – 30 Minutes	Two 60-foot articulated bus vehicles
7.5 – 15 Minutes	Three 60-foot articulated bus vehicles
Less than 7.5 Minutes	Four 60-foot articulated bus vehicles

Clock-Face Headways

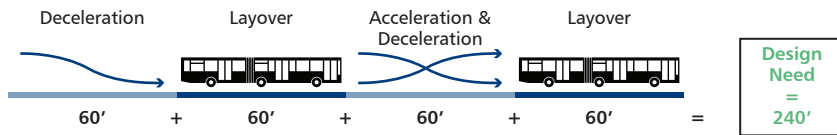
A schedule designed purely based on demand usually creates irregular headways. For example, if a bus departs a timepoint as scheduled at 5:15 PM, 5:47 PM, 6:12 PM, 6:46 PM, and 7:13 PM, the headways are 32 minutes, 25 minutes, 34 minutes, and 27 minutes, respectively.

Alternatively, clock-face schedules are designed so that bus departure times repeat based on a consistent headway. A clock-face schedule with 30-minute headways could have departure times at 5:02 PM, 5:32 PM, 6:02 PM, etc. If the frequency was adjusted to 20-minute headways, the departure times would still be clock-face at 5:02 PM, 5:22 PM, 5:42 PM, etc.

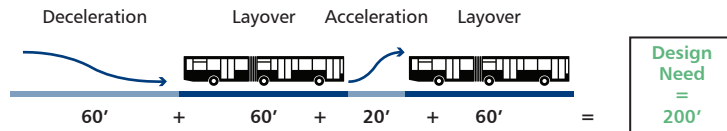
Clock-face headways improve schedule readability for customers and create more consistent layover time for operators.

Existing off-street layover areas should be identified and utilized whenever possible, as off-street layovers provide the greatest operational flexibility. If off-street layover area is not available or financially feasible, on-street layover may be considered. Three models for on-street layover for ST Express are fully independent, independent out, and dependent bays.

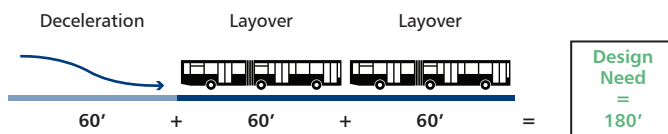
- **Fully Independent On-Street Layover Bay** is located within the right-of-way of a public street, which enables each bus to pull in and out of the layover bay independent of another bus. Preferred when accommodating for multiple routes with different layover needs because it provides the most operational flexibility.



- **Independent Out On-Street Layover Bay** enables the first bus to pull in and out of the layover bay independent of another bus, assuming bus in the rear position advances to the head of the bay once the space is vacated (dependent operation). Preferred when both layover spaces are for the same route(s).



- **Dependent On-Street Layover Bay** assumes the bus in the rear position always advances to the head of the bay once vacated. Implemented only when both layover spaces are for the same route(s).

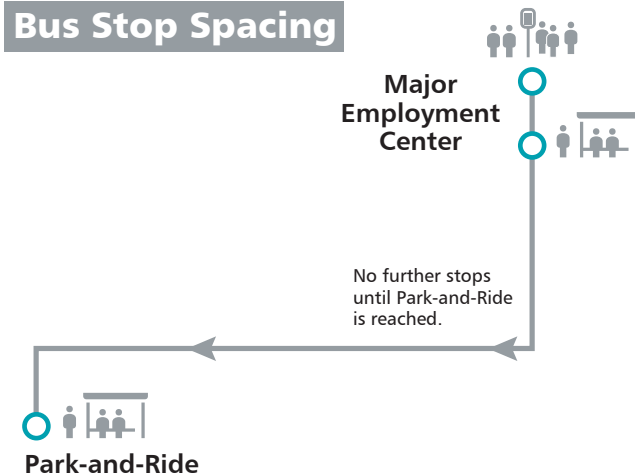


Stop Spacing

By definition, express routes should make fewer stops than local routes. Passenger stops for ST Express should be limited to transit centers, major transfer points, major origins/destinations, and park-and-ride lots. Each stop should achieve at least 25 daily boardings or alightings. Stops with limited service span (less than 12 hours of service per day) should achieve at least 15 boardings or alightings.

In dense urban areas with high demand, like downtown Seattle, stops may be more closely spaced. Stops should be planned based on the availability of connections to other routes or modes, major trip generators along the route, transfer points, and the availability of designated right-of-ways or other factors that allow for increased operating speeds. Stops should be clearly marked and identifiable.

Bus Stop Spacing





Passenger Amenities

ST Express route connectivity to local bus systems facilitates frequent transfers, creating a demand for passenger amenities. Stops with a high number of boardings per hour should have bus shelters or other weather protection amenities, when feasible, and schedule information and route labeling to enhance the passenger transfer experience.

Transit Shelter



Adding shelters where possible protects riders from weather and makes the waiting experience more comfortable. The size and location of a shelter depends on the surrounding environment.

Passenger Information

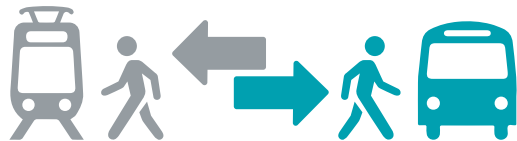


Route maps and schedules should be available at stations and stops. High-activity or transfer stops should receive priority if resources are limited.



Bus-Rail Integration

Integration among transit services is a priority for the Puget Sound region. Sound Transit is committed to strong partnerships with other local and regional providers to create connections to Sounder commuter rail, Link light rail, and ST Express bus. Effective integration between bus and rail can benefit passengers in terms of travel time, frequency of service, transfer connections, and reliability.



Key Attributes of an Integrated Regional Transit System

- Seamless transfers between different modes of public transportation
- Efficient allocation of operating resources between bus and rail
- Integrated regional fare payment system supporting convenient transfers

Service Performance Measures

Productivity

Productivity is determined based on boardings per trip, boardings per revenue hour, subsidy per boarding, and passenger miles per platform mile, as defined in **Section 1: Introduction to Service Standards and Performance Measures**. For ST Express, each route's combined performance among these four performance indicators determines its overall productivity ranking among ST Express routes. These rankings are divided into four quartiles to determine whether service changes should be considered.

- **First Quartile** (Top 25% of Routes): Top performers may be candidates for service and infrastructure enhancements, depending on resource and funding availability.
- **Second and Third Quartiles** (Middle 50% of Routes): These routes operate within normal operating parameters and likely do not warrant major service changes.
- **Fourth Quartile** (Lower 25% of Routes): Poor performers may require service changes to improve productivity and cost effectiveness.

Productivity is just one consideration when Sound Transit develops proposed service changes. Mobility and accessibility for transit-dependent populations, support of other modes, and adjustments for new development will also impact service decisions.

Service Quality

Service quality is determined by passenger load, on-time performance, customer complaints, and trips operated as scheduled, all of which are monitored monthly, quarterly, and annually by Sound Transit.



PASSENGER LOAD

During times of peak demand, ST Express passenger loads may exceed bus seating capacity on individual trips. Standing loads are a normal occurrence and not cause for immediate action but should be monitored. The passenger load standards exist to assign priority for action at the trip level when there is pattern of excessive load or standing time.

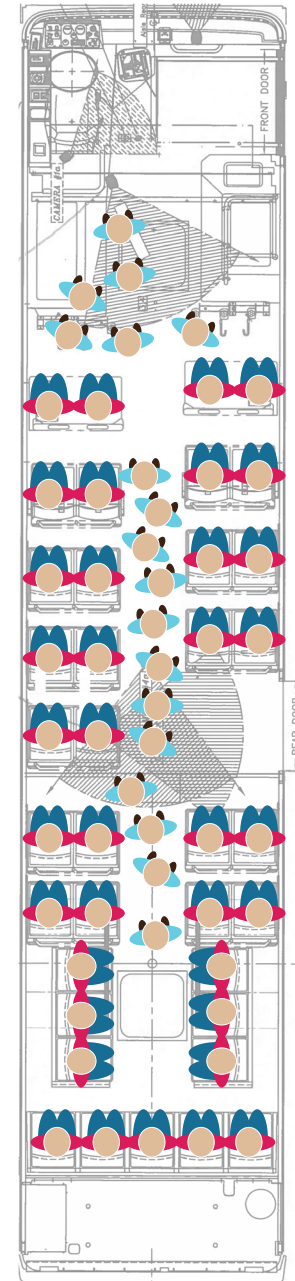
Load Factor

Automated passenger count (APC) data is used to identify the ST Express stop with the maximum passenger load. Passenger load is calculated by dividing the total number of passengers on board upon arrival at the maximum load-point by the total seating capacity of the vehicle.

If the load factor exceeds the standard listed in the following table on a regular basis, corrective action should be considered. Regular basis is defined as at least three days a week for weekday service and two times a month for Saturday or Sunday service.

Bus Type	Number of Seats	Max. Passenger Load	Load Factor
40-foot high floor	42	63	1.50
40-foot low floor	37	55	1.50
45-foot high floor	57	70	1.23
60-foot low floor	56	81	1.45
42-foot double deck	82	101	1.23

Sound Transit's performance standard for passenger load is a load factor of 1.5 for a 40-foot low floor bus. In a bus that seats 37 riders, that's a maximum passenger load of 55 riders. (See figure to the right)



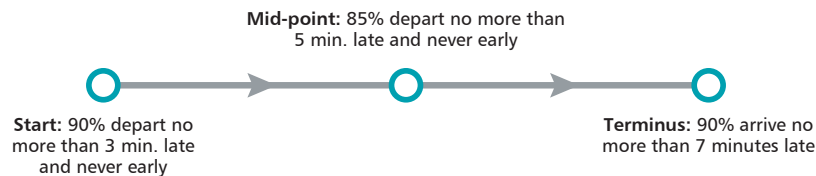
Standing Time

To ensure customers are not standing for excessive periods of time, Sound Transit uses the following standard: **If standing time is reaching 30 minutes or greater on a regular basis, corrective action should be considered.** Regular basis is defined as at least three days a week for weekday service and two times a month for Saturday or Sunday service.

Minutes of Passenger Standing Time	Action Priority
More than 45 Minutes	High priority; mitigating action should be implemented as soon as possible; meets criteria for use of budget contingency if available.
30 – 44 Minutes	Medium priority; mitigating action should be implemented at next regular service change date if budget available.
Less than 30 Minutes	No immediate mitigating action required, but may be candidate for future service improvement.

ON-TIME PERFORMANCE

For ST Express to be successful, it must provide convenient and reliable transfers and follow the published schedules. To ensure customer reliability, Sound Transit performs periodic assessment of on-time performance using automatic vehicle location (AVL) data. The standards for on-time performance for ST Express are as follows:



CUSTOMER COMPLAINTS

Sound Transit is receptive to rider feedback and tracks customer complaints. **Systemwide, complaints should not exceed 15 per 100,000 boardings.** Customer complaints can relate to on-time performance, crowding, or amenities, among other things. Customer complaints can provide important context for staff to further investigate any service issues, potentially leading to service changes.



OPERATED AS SCHEDULED

Sound Transit tracks the percentage of scheduled trips operated as listed in the published timetable, another key performance indicator related to service quality. **On average, 99.8 percent of scheduled ST Express trips should be operated as published.**

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Sounder Commuter Rail

Service Concept

- Utilizes existing railroad lines to provide high-capacity passenger rail service during peak travel times
- Provides dependable, on-time service with strong grade separation, fully protected at-grade road crossings, and, often times, a faster, more direct route between communities than parallel highway corridors
- With seats for at least 145 passengers per car, a seven-car train can carry over 1,000 passengers, significantly increasing the capacity of the regional transportation network
- Operates on BNSF-owned tracks, except for the south line segment between Tacoma and Lakewood, which is owned by Sound Transit
- Provides park-and-ride facilities at all stations, except King Street Station in Seattle, increasing access and catchment area for customers with their own cars

Service Design

After its initial development, Sounder commuter rail service design is well-established and thus a candidate only for minimal, if any, changes. Routes, stops, and even much of the scheduling is determined by rolling stock and operating agreements with BNSF.

Service Performance Measures

Productivity

Productivity is determined based on boardings per trip, boardings per revenue hour, subsidy per boarding, and passenger miles per platform mile, as defined in [Section 1: Introduction to Service Standards and Performance Measures](#). Periodically, Sound Transit compares Sounder productivity results to peer commuter rail operations using data from the National Transit Database (NTD).

Service Quality

Service quality is determined by passenger load, on-time performance, customer complaints, and trips operated as scheduled, all of which are monitored monthly, quarterly, and annually by Sound Transit.



PASSENGER LOAD

The purpose of Sounder load guidelines is to ensure that most passengers will have a seat for at least a majority of their trip. **When standing load conditions occur on three or more days a week on either Sounder line, corrective action should be considered to ensure that those standing represent a minority of passengers and to limit standing time to 30 minutes.**

Actions that could reduce standing time include minor schedule adjustments to balance loads, adding cars to trains to increase capacity, and making passengers aware of other trains that may have available seats.



ON-TIME PERFORMANCE

Across both Sounder lines, an average of 95 percent of all scheduled trips should arrive at route terminals within seven minutes of the time shown in the published timetable.



CUSTOMER COMPLAINTS

Sound Transit is receptive to rider feedback and tracks customer complaints. **Systemwide, complaints should not exceed 15 per 100,000 boardings.** Customer complaints can relate to on-time performance, crowding, or amenities, among other things. Customer complaints can provide important context for staff to further investigate any service issues, potentially leading to service changes.



OPERATED AS SCHEDULED

Sound Transit tracks the percentage of scheduled trips operated as listed in the published timetable, another key performance indicator related to service quality. **On average, 99.5 percent of scheduled Sounder trips should be operated as published.**





Tacoma Link Light Rail

Service Concept

- Provides fast, efficient service, exceptional on-time performance, and frequent headways
- Reduces dwelling time and improves accessibility with level platform boarding
- Accommodates a total capacity of 56 passengers per car
- Travels 1.6-mile route in 10 minutes due to signal priority and partial separation from traffic
- Maximizes existing infrastructure with two-way travel on the single track segment of the alignment

Service Design

After its initial development, Tacoma Link light rail service design is well-established and thus a candidate only for minimal, if any, changes. New stations require street right-of-way and are difficult and costly to add or relocate. Tacoma Link cars are single units that cannot be coupled together to form multi-car trains due to the current configuration of the alignment and station length in Downtown Tacoma. The single-track section between Tacoma Dome and Union Station/S. 19th Street is a constraining factor of the system, as it only allows for two cars, maximum, to be in operation at any one time. A 12-minute headway can be operated with two cars, while one car can provide a 24-minute headway during periods of lower demand. Thus, the two most feasible options to Tacoma Link service levels are schedule-based: adjusting headways and/or adjusting the span of service.



Service Performance Measures

Productivity

Tacoma Link service is segmented into time periods by time of day and day of the week to evaluate productivity. The productivity of each time period is compared against the system average and then rated according to specific performance criteria. Corrective action may be considered for time periods that consistently under-perform. Conversely, time periods with high average productivity and/or overcrowding may be candidates for a longer span of service and/or 12-minute headways.

Productivity by time period is determined based on four key performance indicators: boardings per trip, boardings per revenue hour, subsidy per boarding, and passenger miles per platform mile, as defined in **Section 1: Introduction to Service Standards and Performance Measures**. Each time period is evaluated on all four performance indicators, and its overall ranking is the mathematical average of the four rankings. Refer to the appendix for additional information on how productivity by time period is calculated and how each time period is rated.

Service Quality

Service quality is determined by passenger load, on-time performance, customer complaints, and trips operated as scheduled, all of which are monitored monthly, quarterly, and annually by Sound Transit.



PASSENGER LOAD

Passenger load for light rail differs from other modes, as the trips are shorter. Since a scheduled one-way trip time is only ten minutes, **standees are permitted, up to the maximum car capacity of 56 passengers (30 seated plus 26 standing passengers, or a 1.86 load factor)**. If standees regularly occur on five or more consecutive trips when 24-minute headways are scheduled, Sound Transit will review the existing schedule and available budgetary resources to determine if adjustments are necessary.

Due to the nature of light rail scheduling, even minor changes would likely require a significant recalibration of the schedule. This may be taken into consideration in the proposed service change evaluation process based on a cost-benefit analysis.



ON-TIME PERFORMANCE

For Tacoma Link, an average of 98.5 percent of all scheduled trips should arrive at route terminals on time. A trip is late if it either departs a terminal station more than three minutes after the scheduled time or arrives at a terminal station more than three minutes after the scheduled time.



CUSTOMER COMPLAINTS

Sound Transit is receptive to rider feedback and tracks customer complaints. **Systemwide, complaints should not exceed 15 per 100,000 boardings.** Customer complaints can relate to on-time performance, crowding, or amenities, among other things. Customer complaints can provide important context for staff to further investigate any service issues, potentially leading to service changes.



OPERATED AS SCHEDULED

Sound Transit tracks the percentage of scheduled trips operated as listed in the published timetable, another key performance indicator related to service quality. **On average, 98.5 percent of scheduled Tacoma Link trips should be operated as published.**





Link Light Rail

Service Concept

- Utilizes a combination of underground tunnels, elevated structures, and separated surface right-of-ways to provide efficient service
- Serves one of the region's highest transit ridership corridors with frequent seven-days-a-week service
- Accommodates 148 passengers (with a roughly 50/50 standing/seating ratio) on a 95-foot car and, when coupled, can create up to a four-car train with 600-passenger capacity
- Reduces dwell time, and improves accessibility with level platform boarding
- Reaches speeds up to 55 miles per hour

Service Design

After its initial development, Link light rail service design is well-established and thus a candidate only for minimal, if any, changes. New stations require street right-of-way and are difficult and costly to add or relocate. However, the following design guidelines are recommended for any new Link service investments.



Routing

All planned Link light rail extensions will operate in a designated right-of-way. Link signal systems are designed to keep safe spacing between trains.



Capacity

Currently, both two- and three-car trains operate during peak periods, with three-car trains operating on weekends. Capacity should be adjusted by balancing passenger load with minimum frequency targets. Sound Transit’s LRP and System Expansion Plan provide guidance on future capital projects, extensions, and service levels.



Deadhead

Deadhead time is any time when the vehicle is in transit/moving, but not open to the public for service. An example is when a vehicle is traveling to the start of a route at the beginning of a service day without carrying passengers. Deadhead time be minimized as much as possible when designing Link infrastructure and schedules.



Short Turns

In cases where the demand on the outer end of a line is lower, it may improve overall system efficiency to turn a train around before it reaches the route terminal. Because these “short-turn” trains require crossover tracks to reverse direction, the infrastructure necessary for short turns must be incorporated into the initial system design process rather than retrofitted at a later time for an additional cost. Capital costs for crossover infrastructure are recovered through operating cost savings.

Service Performance Measures

Productivity

Productivity is determined based on boardings per trip, boardings per revenue hour, subsidy per boarding, and passenger miles per platform mile, as defined in **Section 1: Introduction to Service Standards and Performance Measures**. Periodically, Sound Transit compares Link light rail productivity results to peer light rail operations using data from NTD.

Service Quality

Service quality is determined by passenger load, on-time performance, customer complaints, and trips operated as scheduled, all of which are monitored monthly, quarterly, and annually by Sound Transit.



PASSENGER LOAD

Passenger load for light rail differs from other modes, as the trips are shorter. Thus, standees are permitted, up to the maximum car capacity of 148 passengers. **The Sound Transit standard for passenger load on Link is a maximum load factor of 2.0**, which means half of the 148 are seated and half are standing. In this scenario, there should be 4.4 square feet per standing passenger, which is considered a comfortable standing load, per the Transportation Research Board’s *Transit Capacity and Quality of Service Manual*.

Sound Transit uses automated passenger count (APC) data to evaluate overload conditions during each bi-annual service change period. If the load factor exceeds 2.0 or 30 minutes of standing time on a regular basis, corrective action should be considered. Regular basis is defined as at least three days a week for weekday service and two times a month for Saturday or Sunday service.





ON-TIME PERFORMANCE

A Link train is considered late if it departs a terminal station more than one minute late or arrives at a terminal station three or more minutes late and is unable to make its scheduled departure time for the next trip.

Several factors can contribute to disruptions in service, impacting Link's on-time performance. For example, in the Downtown Seattle Transit Tunnel, Link shares a right-of-way with a large volume of buses, which multiplies the opportunities for delays. Sections of track may also periodically be shut down for planned construction, maintenance, or repairs, requiring trains use a single track for bi-directional travel. Link's on-time performance should be considered with these factors in mind when evaluating a service change or new service.

Headway Adherence

Link provides frequent scheduled headways of 10 minutes or less during most hours of the day. Headway adherence is defined as the percentage of time that the scheduled headway is maintained, +/- two minutes. Sound Transit's standard is that 90% of headways are within two minutes of schedule.

Headway adherence differs from on-time performance/schedule adherence because individual trains may be off schedule, while the service may be running at regular intervals with the intended headway (or better). For the Link system, headway adherence is typically a better representation of the customer experience than on-time performance.



CUSTOMER COMPLAINTS

Sound Transit is receptive to rider feedback and tracks customer complaints. **Systemwide, complaints should not exceed 15 per 100,000 boardings.** Customer complaints can relate to on-time performance, crowding, or amenities, among other things. Customer complaints can provide important context for staff to further investigate any service issues, potentially leading to service changes.



OPERATED AS SCHEDULED

Sound Transit tracks the percentage of scheduled trips operated as listed in the published timetable, another key performance indicator related to service quality. **On average, 98.5 percent of scheduled Link trips should be operated as published.**



Special Event and Extra Service

Major events, such as professional football or baseball games, generate large volumes of traffic and parking demand. According to Sound Move, if a Sound Transit service helps to achieve a significant transit mode share at a major event, it provides a public benefit by relieving pressure on major highways and parking facilities near the event venue.

Extra service supplements existing service with increased capacity. For example, trains may be added to regular service if an event or activity is expected to generate enough increased demand that additional trains are needed to prevent overloads. **Special service** is a one-time or infrequent service designed to transport a large number of passengers directly to/from an event, usually along a route that doesn't already exist within the system. Special service only operates during time periods when the event is generating demand (typically prior to and after the event).

Special rail service may be considered if an event meets the following criteria:

- Open to the general public
- Venue located adjacent to a station
- Expected to carry at least 400 passengers per train trip
- Authorized by the operating railroads
- Adequate operating, maintenance, and security staffing available

Special service for ST Express is infrequent, but may be operated in the course of regular transit agency business, including:

- Field trips to survey routes and schedules of existing or planned ST Express routes or to survey route safety assessments and accident investigations
- Road tests in the course of everyday vehicle maintenance activities
- Transportation of Sound Transit employees or other officials to or from facilities or projects within the service area for the purpose of conducting oversight functions or for emergency preparedness-related functions

Preference may be given to an event that:

- Defines start/finish times when the majority of attendees will arrive and depart
- Covers a significant portion of its direct cost through fares, subsidies from outside parties, in-kind services, promotional trades, or a combination of these sources
- Mitigates congestion on regional highways and reduces parking requirements in the vicinity of the venue
- Reduces passenger overloads on regular Sound Transit train and bus service
- Attracts new customers, promotes Sound Transit, generates positive media coverage and community goodwill

Special service is subject to budgetary availability; meeting the criteria does not guarantee special service will be provided.

3

Making Changes to Sound Transit Service

The purpose of service standards and performance measures is to assist Sound Transit staff, management, and Board members when considering changes to service. Service changes can range from minor schedule adjustments to adding new routes to the system. Regular evaluation of service helps Sound Transit identify if there are under-performing routes or services that may be improved or addressed through service changes.

Origins of Service Changes

There are four key processes that may prompt service changes, including:

Performance Monitoring

Consistent performance monitoring informed by the standards and measures in this document may identify areas for service improvement.

Voter-Approved Plans

The completion of major high-capacity transit (HCT) capital projects can drive new service changes, including: starting new service, opening new alignments and stations, and modifying existing service to maximize network connectivity. Sound Move, ST2, and ST3 are voter-approved plans that have facilitated or will facilitate major capital investment in the region.

Sound Transit Budget

The SIP is coordinated with the agency budget to ensure that proposed changes are included and funded appropriately. In addition, changes in funding and revenue streams detailed in annual budgets can impact how much service can be provided, leading to potential service changes.

Regional Coordination with Partner Agencies

Sound Transit staff continually works with partner transit agencies to identify opportunities for increased coordination and service integration. Potential service changes that may evolve from coordination include scheduling changes to better facilitate transfers between local and regional services or structural network changes.

Development of Service Changes

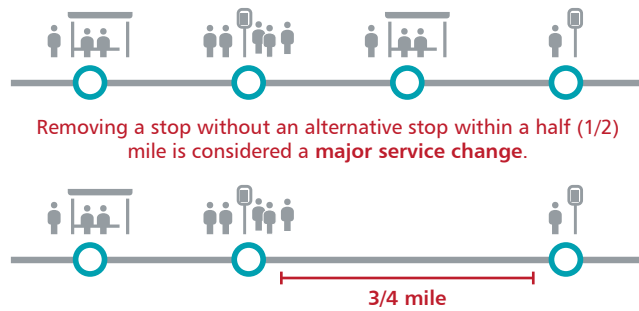
Service changes can be more responsive or more strategic based on what prompted the change and the time frame for implementation. Changes based on performance results in the annual SIP are more responsive, while changes proposed in a comprehensive operations analysis or five-year service plan are more long-term and strategic. Sound Transit must be prepared to plan for the long term while also remaining adaptive to changing demands in the short term.

Types of Service Changes

Major Service Changes

A major service change is defined as any single change in service on an individual bus or rail route that would do one of the following: (1) change a route's weekly platform hours by more than 25 percent, (2) move the location of a stop or station by more than a half (1/2) mile, or (3) close a stop without an alternative stop within a half (1/2) mile.

Major service changes may have significant customer and budget impacts, and are typically implemented through the annual SIP and require a service equity analysis (i.e. Title VI evaluation). If circumstances require more immediate implementation of a major service change, a separate motion may be presented to the Board of Directors outside of the annual SIP process.



Minor Service Changes

Typically, minor service changes are implemented to address near-term operational issues, such as passenger overloads, on-time performance, transfer connections, or traffic revisions that affect routing. Feedback from customers, operators, local jurisdictions, other transit agencies or stakeholder groups may also result in minor service changes. Minor service changes may be approved and implemented at the staff administrative level. These may include:

For ST Express:

- Any single change, or cumulative changes, in a service schedule that affects the established weekly platform service hours for a route by 25 percent or less
- Any change in route location that does not move the location of a stop by more than a half mile
- In the event of an emergency that requires change to established routes or schedules or classes of service not meeting the above criteria, the Chief Executive Officer may implement such change for the necessary period of time or until the Sound Transit Board can establish a time frame
- Other services, such as tripper service, limited, special, and other types of transit routes, may be established by the Chief Executive Officer, consistent with annual budget appropriations and special bus service criteria.

For Sounder:

- Minor schedule adjustments
- Changes to train consists (number of passenger cars per train)

For Tacoma Link:

- Any single change, or cumulative changes, in a service schedule that affects the established weekly service hours for a route by 25 percent or less
- Temporary closure of stations or line segments made necessary by construction, parades, emergencies, or other situations expected to be short-term

For Link:

- Permanent Changes that can be implemented at regular service change dates:
 - » Scheduled headway adjustments of up to three minutes during specified times of day
 - » Scheduled span of service time adjustments of up to 10 minutes
 - » Addition of up to six daily one-way trips to address overcrowding
 - » Deletion of up to six daily one-way trips to address low ridership/productivity
- Temporary changes that can be implemented at any time:
 - » Changes to train consists (number of passenger cars per train)
 - » Implementation of extra service or special service in accordance with policy
 - » Temporary headway adjustments and/or bus service substitutions required for construction, maintenance, repairs, accidents, or emergencies

Service Change Processes

Service Equity Analysis (Title VI Evaluation)

As required by Title VI of the Civil Rights Act of 1964 and subsequent FTA regulations, Sound Transit has developed its Title VI Program, which is updated every three years or as required by the FTA Regional Office. Through Resolution R2013-18, the Sound Transit Board of Directors established policy direction requiring Sound Transit to conduct a service equity analysis (i.e. Title VI evaluation) prior to making any major service change.

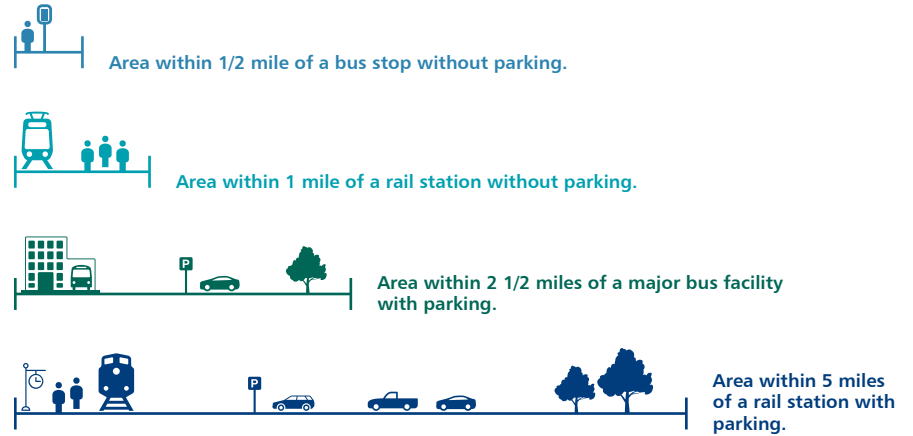
The goal of the service equity analysis is to determine if potential adverse effects of the service change create an unfair burden on typically underrepresented communities. Resolution R2013-18 sets the threshold for what qualifies as a disparate impact on minority populations and/or a disproportionate burden on low-income populations.

- **Disparate Impact** occurs when the minority percentage of the population adversely affected by a major service change is greater than the average minority percentage of the population of Sound Transit's service area.
- **Disproportionate Burden** occurs when the low-income percentage of the population adversely affected by a major service change is greater than the average low-income percentage of the population of Sound Transit's service area.

Although Limited English Proficiency (LEP) populations are not a protected class under the Civil Rights Act of 1964 and the FTA does not require analysis of LEP populations in a service equity analysis, Sound Transit takes steps to consider these populations when evaluating major service changes.

Sound Transit defines its service area based on a radial distance from each transit stop rather than a set buffer around the route alignments. The distance for each type of stop is detailed in the following graphic.

Defining Service Area



In accordance with FTA recommendations and Resolution R2013-18, Sound Transit uses the following process to perform service equity analysis:

- Obtain the most recent American Community Survey (ACS) five-year population estimates for all Census tracts where part or all of the tract falls within the Sound Transit service area.
- Calculate the population representation for each tract based on the percentage of the area that falls within the Sound Transit service area. (Example: If a Census tract is 10 acres total and 3 acres fall within the service area, a proportional share, i.e. 30 percent, of the population is included in the analysis.) This approach assumes an even distribution of population and is considered the most accurate approach within the transit industry.
- Calculate the average percentage of minority, low-income, and Limited English Proficiency (LEP) residents within the Sound Transit service area.
- Identify geographic areas with above-average percentages of minority, low-income, and LEP residents.

If a major service change would create a disparate impact or disproportionate burden, Sound Transit will consider reasonable steps to avoid, minimize, or mitigate the adverse impacts and reanalyze the modified changes to determine if the impacts have been removed or lessened.

New Route Trial Period

The trial period for a new route is 24 months to allow for full market development and ridership potential. New routes will then be evaluated using the same performance measures as established routes. After the trial period, if the new route falls in the poor performing categories for two or more performance measures, service changes may be recommended to improve performance. Ridership trends will also be considered prior to recommending changes.

Evaluation of Service Requests and Comparative Evaluation

Requests for new service and service changes will be evaluated in a systematic way to ensure compliance with the Service Standards. If it appears that a request is consistent with the Service Standards, it will move to the Comparative Evaluation phase.

In conjunction with the annual SIP, a comparative evaluation of proposed new routes, service additions or deletions, and proposed route changes will be conducted to determine the optimum use of available resources. In this phase of the service evaluation process, it is determined whether the resources used for poorly performing routes would be better utilized to improve service on routes exceeding passenger load standards, those with high ridership levels, or others that are not achieving the on-time performance standard.

Proposed new routes, requests, and other service modifications will also be considered in the comparative evaluation phase of the process. Proposals that score well in this process will be candidates for inclusion in the Draft SIP and coordinated with the budget development and approval process.

4

Glossary

A

Alighting

A single passenger exiting a transit vehicle.

B

Business Access And Transit (BAT) Lane

A roadway section designated for the preferential or exclusive use of transit vehicles. Typically not separated from traffic, BAT lanes are designated through roadway markings and signage. May permit other vehicles (including single-occupancy) to use the lane when slowing to make a turn/access a business.

Boarding

A single passenger getting onto a transit vehicle.

C

Crowding

A situation where the number of customers exceeds the available space. May refer to on-board crowding (on the vehicle) or platform crowding (in the space allocated for customers to wait for the vehicle). See also: passenger load

D

Deadhead

Time when a vehicle is in transit/moving, but with no passengers (not open to the public for service). Typically includes time when a vehicle is traveling to or from the garage/depot and a terminus point and travel from the end of service on one route to the beginning of another.

Dwell

Time spent at a scheduled stop without moving, typically to pick up and drop off passengers or wait to make connections with other routes. Time includes opening and closing of vehicle doors.

F

Fare Revenue

Revenue earned from carrying passengers in regularly scheduled service. Includes: base fare, any premiums (zone, peak, or express), and transfer charges. All fare media is counted toward fare revenue, including cash, ORCA cards, and Transit GO Tickets.

Frequency

Number of trips in the same direction of travel within an hour. For example, if a bus departs from a stop at 6:10 AM, 6:40 AM, 7:10 AM, 7:40 AM, etc., its frequency is two trips per hour. See also: headway

H

Headway

Number of minutes between consecutive trips in the same direction of travel. For example, if a bus departs from a stop at 6:10 AM, 6:40 AM, 7:10 AM, 7:40 AM, etc., it has 30-minute headways. See also: frequency

High-Capacity Transit (HCT)

Generally refers to transit service that can carry a larger volume of passengers using larger vehicles and/or more frequent service than a fixed-route bus service. Light rail transit (LRT), like Link, commuter rail, like Sounder, and bus rapid transit (BRT) are generally considered high-capacity transit modes.

High-Occupancy Vehicle (HOV) Lane

A roadway section reserved for carpools, vanpools, buses, motorcycles, or any vehicle carrying two or more people. Rules depend on the highway and time of day.

High-Occupancy Toll (HOT) Lane

A roadway section that permits travel by both high-occupancy vehicles (see: high-occupancy vehicle lanes) and non-HOV drivers who choose to pay a toll. Tolls fluctuate minute-to-minute based on real-time traffic conditions. Rules depend on the highway and time of day. Examples: I-405 express toll lanes and SR 167 HOT lanes

L**Layover Area/Layover Bay/Layover Zone**

The physical space where a vehicle “parks” during layover time, which is the time between the end of one trip and beginning of the next when a vehicle is temporarily parked to allow for delay recovery, operator breaks, and/or operator change. See also: layover time

Layover Time

A short period of recovery time built into a transit schedule between the end of one revenue service trip and beginning of the next, where the vehicle is not in transit. Usually occurs at a route terminus. Designed to allow for recovery from delays, provide operator breaks, and/or provide time for an operator change.

Limited English Proficiency (LEP)

Refers to persons for whom English is not their primary language and who have a limited ability to read, write, speak, or understand English. Determined by the U.S. Census question asking how well a person speaks English. Respondents who indicate they speak English less than very well, not well, or not at all are considered LEP persons.

Load Factor

A ratio of utilized to offered vehicle capacity. The load factor is calculated by dividing the total number of passengers onboard a vehicle upon arrival at a timepoint by the total seating capacity of the vehicle.

Long-Range Plan (LRP)

The goals, policies, and strategies for the long-term development of Sound Transit service and infrastructure are reflected in a long-term plan to establish time frames and provide guidance for complementary planning efforts. The most recent Regional Transit Long-Term Plan was adopted in December 2014.

Low-Income

Persons whose median household income is below the federal poverty level.

M**Minority**

Persons who self identify as being one or more of the following ethnic groups: American Indian and Alaska Native, Black or African American, Hispanic or Latino, Native Hawaiian and Other Pacific Islander.

O**On-Time Performance**

Expressed as a percentage of trips arriving on time in accordance with the definition of “on time” for a particular mode. For example, a Sounder train arriving at a route terminal within seven minutes of the scheduled time is considered “on time.”

Operating Cost

The total costs required to operate transit service, including: wages and benefits for operators and other personnel, fuel and power expenses, maintenance and repair costs, fare collection expenses, vehicle licensing and registration, insurance, and general administrative expenses.

P**Passenger Load**

The number of passengers on board a vehicle at a given time. Includes both seated and standing passengers.

Passenger Mile

A mile traveled by a single passenger on a transit service. “Total Passenger Miles” represents the cumulative sum of distances traveled by each passenger, calculated by multiplying the number of trips by the average trip length.

Platform Hour

Any time between when a transit vehicle pulls out of the depot and returns at the end of service, including dwell, layover, and deadhead time.

Platform Mile

Any mile a transit vehicle operates, which includes in-service miles and deadhead miles. Typically the total distance the transit vehicle travels while away from the operating base.

Productivity

The quantity of transit output per unit of consumed resources, such as:

- **Boardings per Trip:** number of boardings per each scheduled one-way trip
- **Boardings per Revenue Hour:** number of boardings during one revenue hour
- **Subsidy per Boarding:** net cost of service (operating minus fare revenue) divided by the number of boardings
- **Passenger Miles per Platform Mile:** total passenger miles divided by total vehicle platform miles

R

Revenue Hour

Time when a vehicle is operating scheduled trips along its route and available to the general public. Includes layover and dwell time but not deadhead.

Revenue Mile

One vehicle traveling one mile in revenue service (during a revenue hour).

S

Service Implementation Plan (SIP)

A document developed annually by Sound Transit in coordination with the budgeting process. The SIP includes service evaluation from the previous year and service delivery goals for the upcoming year that correspond with resource allocation in the budget.

Span of Service

Amount of time each day in which service is operating. Example: 6:00 AM to 12:00 AM

Standing Time

The number of minutes a passenger spends standing on a vehicle in service. (Typically a vehicle that has seats, but where there is space for passengers to stand if no seats are available.)

T

Time Period

A portion of one day of revenue service. Example: 9:00 AM - 3:00 PM / Mid-day

Transit Signal Priority

Operational manipulation of traffic signals to either hold a green light or shorten a red light in favor of transit vehicles to reduce dwell time at traffic signals. Transit Signal Priority is not synonymous with Signal Preemption. Transit Signal Priority adjusts everyday signal operations to better accommodate transit vehicles, while Signal Preemption interrupts the everyday traffic signal queue to accommodate an approaching emergency vehicle, train, or other singular event (as opposed to daily occurrence).

Trip

The one-way operation of a revenue vehicle between two terminus points on a route.

A

Appendix

FROM TACOMA LINK PRODUCTIVITY, PAGE 22:

Productivity for Tacoma Link is evaluated by time period based on day of the week and time of day as follows:

Time Periods for Tacoma Link Productivity Analysis:

- **Weekday Peak:** From 6:00 a.m. to 9:00 a.m. and from 3:00 p.m. to 6:00 p.m.
- **Weekday Midday:** From 9:00 a.m. to 3:00 p.m.
- **Saturday/Sunday:** From start of service to 6:00 p.m.
- **Early Morning/Evening:** Before 6 a.m. weekdays and after 6:00 p.m. any day
- **Holiday:** From 10:00 a.m. to 6:00 p.m.

Each time period is evaluated based on four key performance indicators:

- Boardings per revenue hour
- Boardings per trip
- Subsidy per boarding
- Passenger miles per train platform mile

Table A provides the criteria for three of the indicators: boardings per revenue hour, boardings per trip, and passenger miles per train platform mile. Table B provides the criteria for subsidy per boarding. Each performance rating is then assigned a numerical value, as follows:

- Above: 1**
- At+: 2**
- At-: 3**
- Below: 4**

Table A: Criteria for Productivity Ranking (Boardings per Revenue Hour, Boardings per Trip, Passenger Miles per Train Platform Mile)

Rating	Wkdy Peak (Pct. of System Avg.)	Wkdy Mid (Pct. of System Avg.)	Sat/Sun (Pct. of System Avg.)	Early AM and Evening (Pct. of System Avg.)	Holiday
ABOVE	150% and above	125 – 150%	100 – 125%	75 – 100%	75 – 100%
AT +	125 – 150%	100 – 125%	75 – 100%	50 – 75%	50 – 75%
AT -	100 – 125%	75 – 100%	50 – 75%	25 – 50%	25 – 50%
BELOW	Below 100%	Below 75%	Below 50%	Below 25%	Below 25%

Table B: Criteria for Productivity Ranking (Subsidy per Boarding)

Rating	Wkdy Peak (Pct. of System Avg.)	Wkdy Mid (Pct. of System Avg.)	Sat/Sun (Pct. of System Avg.)	Early AM and Evening (Pct. of System Avg.)	Holiday
ABOVE	50 – 75%	75 – 100%	100 – 125%	125 – 150%	125 – 150%
AT +	75 – 100%	100 – 125%	125 – 150%	150 – 175%	150 – 175%
AT -	100 – 125%	125 – 150%	150 – 175%	175 – 200%	175 – 200%
BELOW	Above 125%	Above 150%	Above 175%	Above 200%	Above 200%

For each time period, the four numbers are added together and divided by four to calculate the average, which corresponds to an overall performance rating, as shown in Table C.

Table C: Overall Performance Rating

Performance Rating	Numerical Score
ABOVE	1.0 – 1.5
AT +	1.5 – 2.5
AT -	2.5 – 3.5
BELOW	Above 3.5