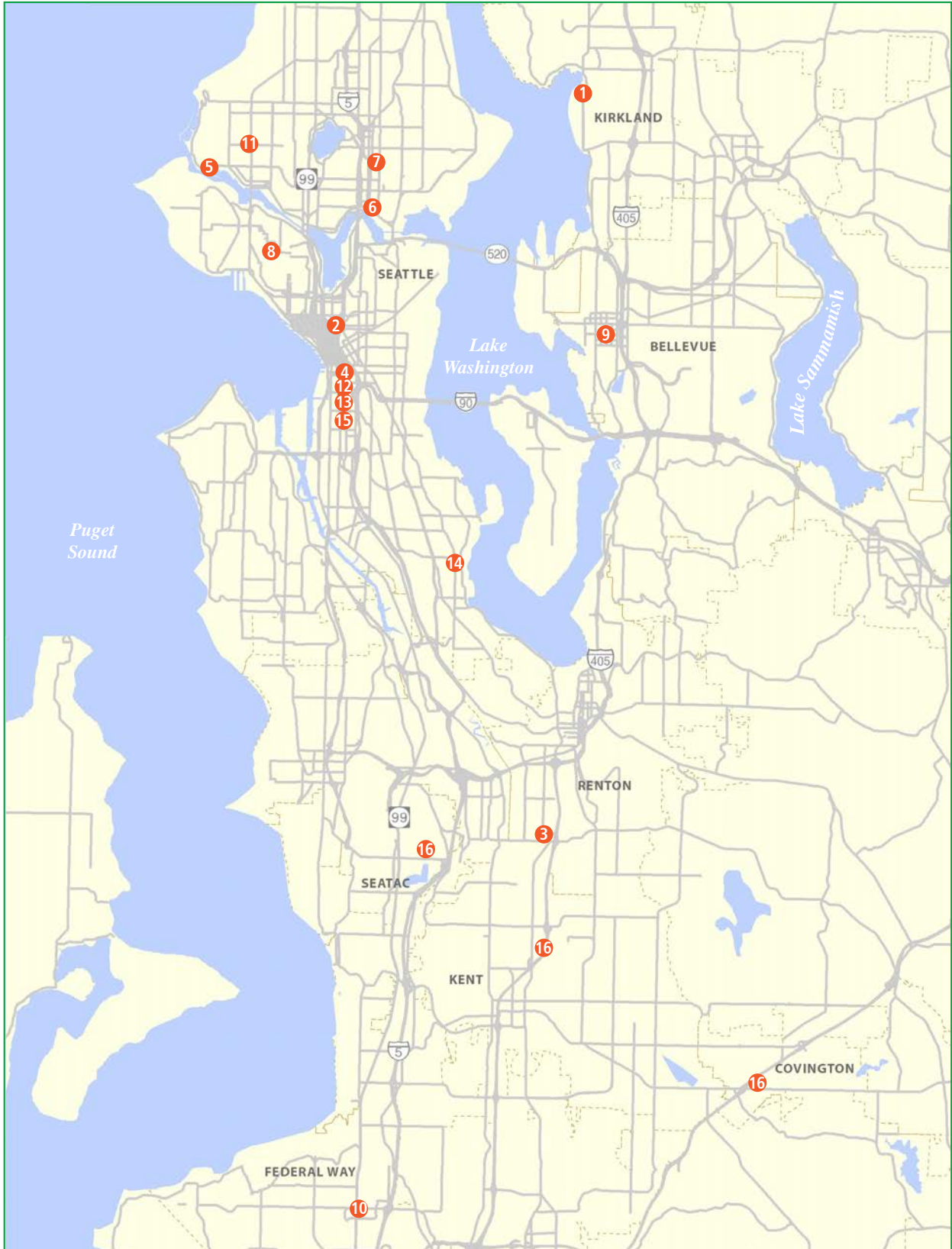


2019 Annual Hot Spot Improvements Report

King County Metro | Speed & Reliability



King County



Spot Improvements Program 2019 Annual Report

This annual report describes the spot improvements that were implemented in 2019 through partnerships with the cities of Seattle, Bellevue, Kirkland, Federal Way, the Washington State Department of Transportation (WSDOT), Sound Transit (ST), and BNSF Railroad. The 16 Spot improvement projects highlighted in this report benefited:

- 162,700 weekday riders
- 103 bus routes (includes Metro, Sound Transit, Community Transit and Pierce Transit)

Resulting in:

- \$607,000 in avoided additional operating cost
- Improved bus operational safety at 4 locations.

The Spot Improvements Program consists of low-cost capital investments aimed at improving bottleneck conditions that affect bus travel times and reliability, which results in increased attraction to public transit as a travel mode of choice. Some spot improvement projects support a planned routing or service change, such as the closure of the I-90 HOV ramps due to construction of East Link Light Rail.

The Spot Improvements Program supports the adopted *King County Metro Transit Strategic Plan for Public Transportation 2011 – 2021* (Strategy 5.1.3: Improve Transit Speed and Reliability). The spot improvement projects utilize a set of transit supportive toolboxes identified in the *Speed and Reliability Guidelines and Strategies* report.

The success of each implementation was made possible with the support of cities and their willingness to make operational changes within their roadway infrastructures and traffic signal systems to benefit transit riders.

For additional information regarding this program, please contact Owen Kehoe at 206-477-5811 or owen.kehoe@kingcounty.gov.

Irin Limargo
Supervisor, Speed and Reliability Unit
Capital Planning Section
King County Metro

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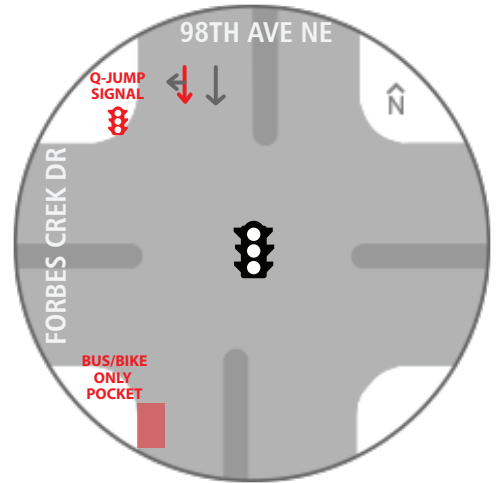
98TH AVE NE AND FORBES CREEK DRIVE

Routes: 234, 236, 255

ISSUE

Buses heading southbound on 98th Avenue NE experienced delay when trying to merge back into traffic after serving a stop north of the intersection due to the lane width, parked vehicles south of the intersection, and heavy southbound traffic. In addition, the City of Kirkland wanted to improve an existing bike lane on 98th Avenue and make sure that any changes would work well for buses as well as bikes.

Peak frequency is 8 buses/hour.



IMPROVEMENTS

Traffic Signals, Signs and Channelization – Metro worked with the City of Kirkland to design and install a bus queue jump signal, a short red bike/bus lane south of the intersection, and accompanying signage for southbound traffic. The City of Kirkland constructed the improvements and Metro provided the traffic signal equipment needed for the queue jump.

Southbound transit delay at this intersection was reduced on average by 24% in the AM peak period. The bus lane and queue jump will also provide reliability benefits during congested periods.

TRANSIT BENEFITS

BUS DELAY IMPROVEMENTS

ROUTE BENEFIT

DAILY PASSENGER BENEFIT (PER 1000)



Acknowledgements:
Aparna Khanal, Brian Dalseg (City of Kirkland)



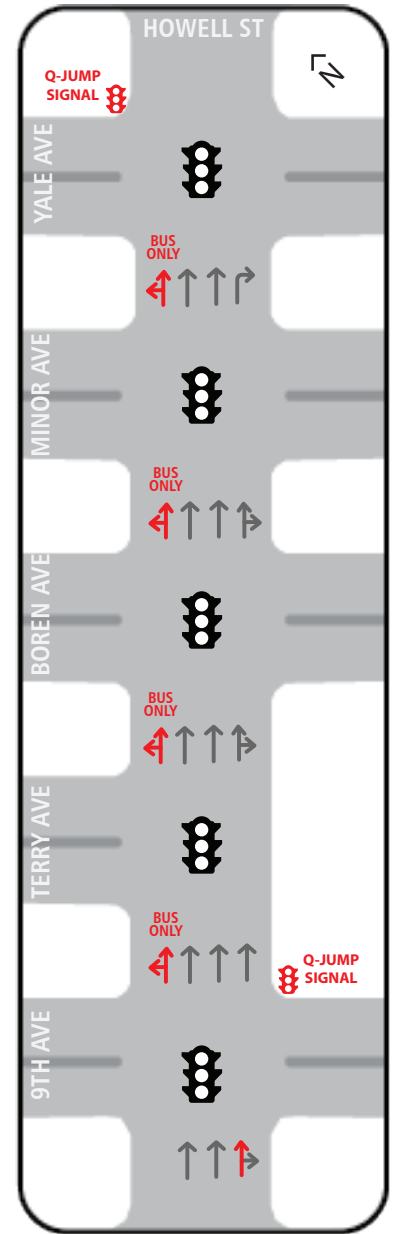
HOWELL ST BETWEEN 9TH AVE AND YALE AVE

Routes: 41, 402, 405, 410, 415, 417, 422, 510, 511, 513, 578, 590, 592, 594, 595

ISSUE

Transit service operated by Metro, Community Transit, and Pierce Transit was experiencing long delays when travelling northbound on Howell Street to access the I-5 Express ramp during the PM peak period. Buses travelled in a right-center bus-only lane that experienced friction from general purpose vehicles, however changing traffic patterns in the area and increased traffic in the South Lake Union neighborhood rendered the old bus lane ineffective. General-purpose vehicles would block the bus lane while trying to merge into the right-most lane to access either the I-5 southbound ramp at Yale Avenue or the I-5 northbound ramp on Olive Way via Minor Avenue and Boren Avenue.

Peak frequency is 36 buses/hour.



IMPROVEMENTS

Traffic Signals, Signs, and Channelization

– Metro partnered with SDOT to shift the bus-only lane to the northern most (far left) lane between 9th Avenue and Yale Avenue. At 9th Avenue, buses utilize the existing queue jump signal to transition into the bus-only lane on the northern side of the street. At Yale Avenue, the existing bus stop on Howell St far-side Yale Ave is accessed by using a new queue jump signal to transition buses back over to the south side of the street.



Tree-trimming along the corridor was needed so that the double-decker buses used by Community Transit could travel in the new bus-only lane

The new left-side bus lane helps to reduce friction from private vehicles merging across Howell Street, improving bus travel times during the PM peak by 30%.

TRANSIT BENEFITS

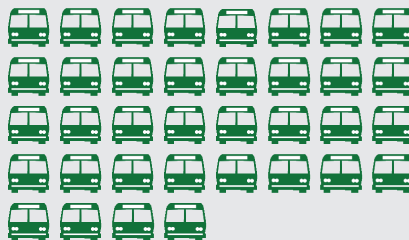
BUS DELAY IMPROVEMENTS

ROUTE BENEFIT

DAILY PASSENGER BENEFIT (PER 1000)



36 BUSES PER HOUR



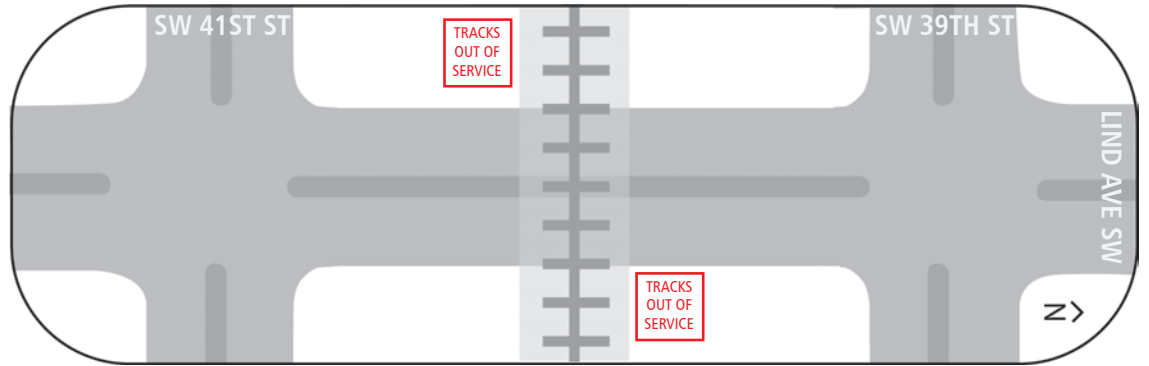
Acknowledgements:
 Laura Wojcicki (SDOT), Jonathan Dong (SDOT),
 Carter Danne (SDOT), Carol McMahan (SDOT)
 Pauh Wang (SDOT), Sara Hayden (CT)



ISSUE

Buses traveling along Lind Avenue SW were experiencing delay due to a railroad crossing. Metro buses are required to stop at all active railroad crossings unless they have been designated as out of service. However, Metro bus operators had noticed that plants were growing between the rail lines, which seemed to indicate the tracks had been unused for some time.

Peak frequency is 2 buses/hour per direction.



IMPROVEMENTS

Railroad Crossing – Metro partnered with the Washington Utilities and Transportation Commission to confirm that the railroad crossing was out of service and have the railroad install “Tracks Out of Service” signs so that buses could proceed over the crossing without stopping.

Buses no longer stop at the railroad crossing; transit delay at the railroad crossing was reduced by 10 seconds. In addition, this low-cost improvement reduces fuel consumption and wear-and-tear on coaches.

TRANSIT BENEFITS

BUS DELAY IMPROVEMENTS (IN SEC)



ROUTE BENEFIT



DAILY PASSENGER BENEFIT (PER 100)



Acknowledgements:
Lori Halstead (UTC), BNSF Railroad



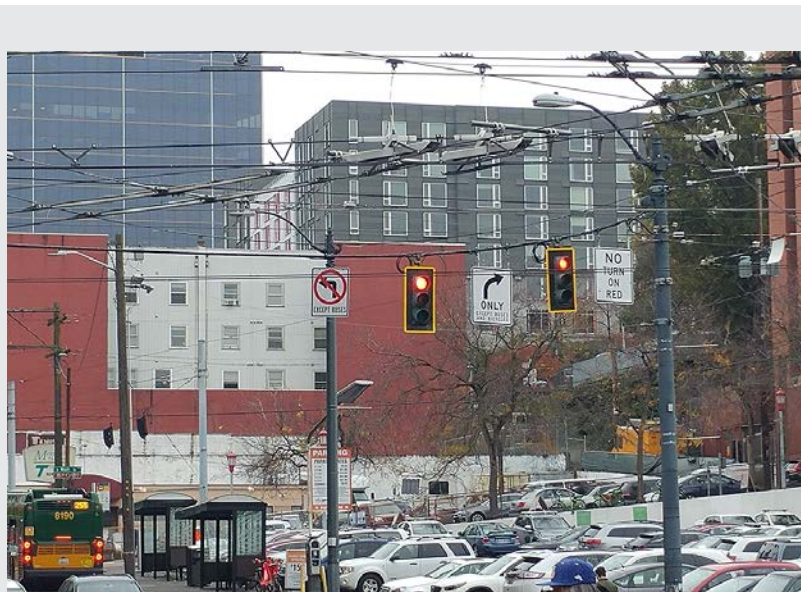
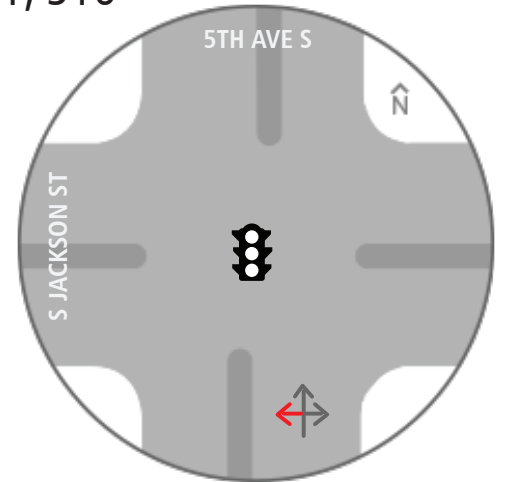
5TH AVE S AND S JACKSON ST

Routes: All Metro trolley routes, plus some non-trolley routes:
74, 76, 77, 252, 255, 257, 268, 301, 308, 311, 316

ISSUE

King County Metro operators were noticing that non-transit vehicles were making a northbound left turn at the intersection of 5th Ave S & S Jackson St, which is not permitted. This turn is reserved exclusively for buses since this is the primary access point for Metro’s trolley bus routes to and from the bus base to the south. Non-transit vehicles making this turn were delaying buses trying to get to the beginning of their next trip.

Peak frequency is 68 buses/hour.



IMPROVEMENTS

Traffic Sign – Metro partnered with SDOT to install a new “No Left Turn, Except Buses” sign to make it clear to non-transit vehicles that the northbound left turn at the intersection wasn’t permitted.

The improved signage results in fewer non-transit vehicles northbound on 5th Ave S violating the left turn restriction.

This change helped Metro trolley buses and buses using 5th Ave coming from base that turn left onto Jackson St or continue north on 5th Ave.

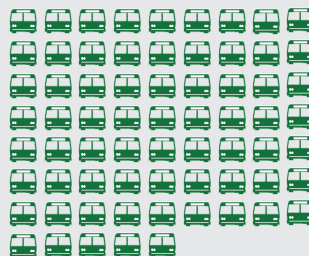
TRANSIT BENEFITS

IMPROVED RELIABILITY



68
BUSES
PER HOUR

ROUTE BENEFIT



DAILY PASSENGER BENEFIT (PER 1000)

6,100
PASSENGERS



Acknowledgements:
Jonathan Dong (SDOT), Christina Arthur (SDOT),
Enrique Garcia (SDOT)



ISSUE

Buses making the westbound left turn from Market Street to 32nd Avenue NW were experiencing difficulty making the turn due to poor visibility of vehicles along 32nd Avenue NW. The intersection had two way stop-control for Market Street, which meant that vehicles on Market Street needed to wait until a gap in traffic was available in order to make their turn.

Peak frequency is 10 buses per hour.



IMPROVEMENTS

Traffic Sign – SDOT added stop signs to the 32nd Avenue northbound and southbound approaches, which meant that all traffic arriving at the intersection would have to come to a full stop before proceeding.

Based on a recent site visit, the all-way stop has resulted in an easier, safer left turn for Route 29 and 44 buses. Bus operators no longer report concerns at this intersection.

Transit delay for the westbound left turn at this intersection was reduced by 10 seconds in the midday period.

TRANSIT BENEFITS

BUS DELAY IMPROVEMENTS (IN SEC)

ROUTE BENEFIT

DAILY PASSENGER BENEFIT (PER 1000)



Acknowledgements:
Jonathan Dong (SDOT), Carter Danne (SDOT)



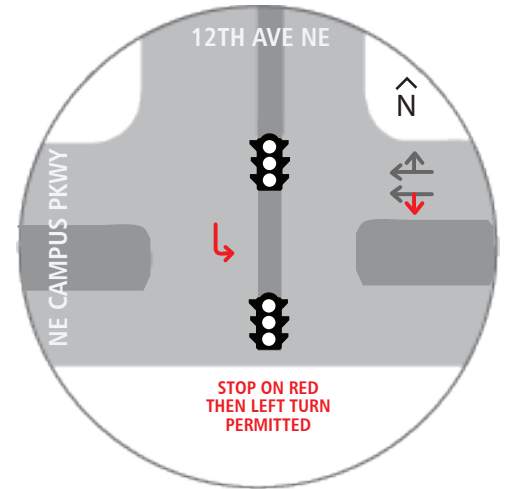
12TH AVE NE AND NE CAMPUS PKWY

Route: 372

ISSUE

Buses exiting layover on westbound Campus Parkway and making a U-turn onto eastbound Campus Parkway to begin their next trip were experiencing delay due to a new traffic signal installed at 12th Avenue. The intersection was formerly all-way stop-controlled, which allowed buses to easily make the series of left turns to complete the U-turn. The installation of the signal meant that buses needed to stop twice instead of once and wait for a green signal to proceed through the U-turn. Given the short distance between the eastbound and westbound directions of Campus Parkway, this resulted in the westbound bike lane being blocked by the rear end of a coach as it attempted to make the turn.

Peak frequency is 7 buses/hour.



IMPROVEMENTS

Traffic Sign – Metro partnered with SDOT to install a sign that indicated that left turns on red are permitted when proceeding onto a one-way street after making a full stop. This was installed for the southbound approach of 12th Avenue to eastbound Campus Parkway, which reminds operators that they may complete the U-turn once traffic is clear on eastbound Campus Parkway.

Buses are turning left turn on red onto eastbound Campus Parkway (after a full stop and when traffic is clear) in accordance with the new signage, resulting in transit delay reductions of 23 seconds per trip while traveling to the first outbound stop at University Way.

This change helped one Metro route and the 4,000 daily passengers that take this route. In addition, this change helps bicyclists by reducing instances where the westbound bike lane is blocked.



TRANSIT BENEFITS

BUS DELAY IMPROVEMENTS (IN SEC)

ROUTE BENEFIT

DAILY PASSENGER BENEFIT (PER 1000)



Acknowledgements:
Jonathan Dong (SDOT), John Marek (SDOT),
Carter Danne (SDOT)



ISSUE

Eastbound buses turning right onto University Way NE were having trouble serving the southbound bus stop at Ravenna Ave NE. Buses would have difficulty lining up with the curb in front of the bus stop and sometimes passengers would have to embark/disembark from/onto roadway level rather than the sidewalk.

Peak frequency is 8 buses per hour.



IMPROVEMENTS

Bus Operations – After evaluating several proposals to reconfigure the intersection, SDOT and Metro developed a solution to move the bus stop farther south along University Way NE, giving Route 45 buses more space to line up with the curb. Buses can more easily and quickly line up with the curb, and people can more easily board/deboard the bus from/onto the sidewalk instead of the roadway.

Moving the bus stop south along University Way improves the speed and reliability of buses turning to access the stop, as well as the safety of passengers using the bus stop.

TRANSIT BENEFITS

PASSENGER SAFETY



ROUTE BENEFIT



DAILY PASSENGER BENEFIT (PER 1000)



Acknowledgements:
Fred Perez (SDOT), Jody Trendler (KCM Transit Route Facilities)



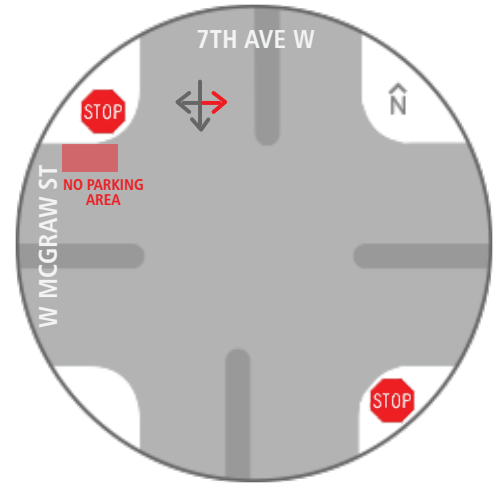
7TH AVE W & W MCGRAW ST

Route: 2

ISSUE

Southbound buses turning left onto W McGraw St were having to pull out into the intersection in order for bus drivers to see past parked cars and trees growing along the north side of the street. This was delaying buses and causing them to block a pedestrian crossing while waiting for a gap in cross traffic.

Peak frequency is 2 buses/hour.



IMPROVEMENTS

Bus Operations – Metro worked with SDOT to restrict about 2 parking spots on W McGraw St just west of 7th Ave W and trim trees in the planter strip on the north side of McGraw. Buses can now more safely begin the southbound left turn farther back on 7th Ave W due to the improved sight lines.

Clearing sight lines along McGraw improves safety for buses and passengers riding along the turn and improves the speed and reliability of buses making the turn.

TRANSIT BENEFITS

IMPROVED RELIABILITY

ROUTE BENEFIT

DAILY PASSENGER BENEFIT (PER 1000)



2
BUSES
PER HOUR



2,700
PASSENGERS



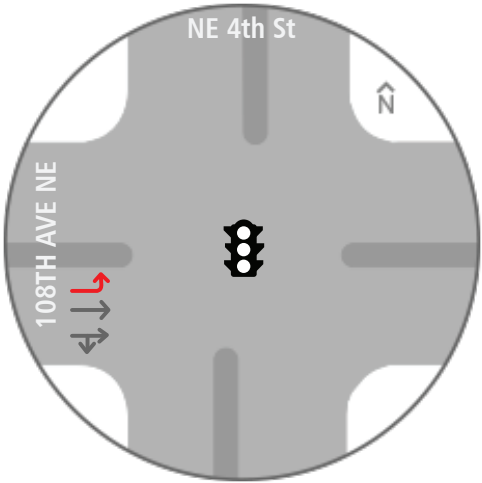
Acknowledgements:
Fred Perez (SDOT), Doug Hicks (KCM Transit Route Facilities)



ISSUE

Eastbound buses turning left onto northbound 108th Ave NE were delayed due to heavy traffic and a short eastbound left turn signal phase. Eastbound queues would sometimes block buses from merging into the left turn lane.

Peak frequency is 12 buses per hour.



IMPROVEMENTS

Traffic Signals – Worked with the City of Bellevue to change signal phase order for the eastbound left turn phase. By allowing the eastbound left turn phase to come up after the eastbound through phase, buses are less often stuck in eastbound through traffic while trying to access the left turn lane, and the eastbound left turn phase can come up earlier/longer if westbound traffic is light.

Transit delay for the eastbound left turn at this intersection was reduced by 26 seconds in the AM peak period.

TRANSIT BENEFITS

BUS DELAY IMPROVEMENTS (IN SEC)

ROUTE BENEFIT

DAILY PASSENGER BENEFIT (PER 1000)



Acknowledgements:
Darcy Akers (City of Bellevue)



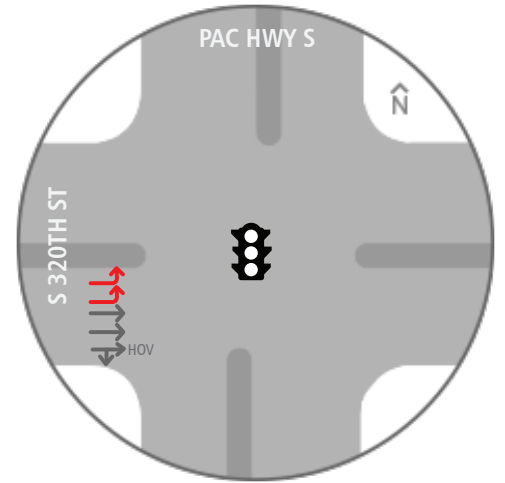
S 320TH ST AND PACIFIC HWY S (SR 99)

Routes: 179, 197

ISSUE

Eastbound buses turning left onto northbound Pacific Highway S were delayed due to heavy traffic and a short eastbound left turn signal phase. Eastbound queues would sometimes block buses from merging into the left turn lane.

Peak frequency is 8 buses/hour.



IMPROVEMENTS

Traffic Signals – Worked with the City of Federal Way to change the order of the eastbound left turn phase and lengthen it by 4 seconds. By providing more time for the turn, buses can more easily make it through the intersection and are less often stuck in left turn queues. The change in signal phase order also helps keep buses from getting stuck in eastbound through traffic before merging into the left turn lanes.

Transit delay for the eastbound left turn at this intersection was reduced by 17 seconds in the AM peak period.

TRANSIT BENEFITS

BUS DELAY IMPROVEMENTS (IN SEC)

ROUTE BENEFIT

DAILY PASSENGER BENEFIT (PER 100)



Acknowledgements:
Soma Chattopadhyay and Rick Perez (City of Federal Way)



ISSUE

Several safety concerns were raised regarding the southbound RapidRide station, which is situated in a traffic island separating southbound through traffic on 15th Ave with traffic turning right onto NW 65th St. The traffic island had non-standard signing and the roadway paint was wearing off; no protection was provided for customers waiting at the station in case a vehicle crashed into the traffic island. In addition, pedestrians were observed accessing the RapidRide station at location without a crosswalk or signal.

Peak frequency is 17 buses per hour.



IMPROVEMENTS

Signage, channelization, and pedestrian improvement – The City of Seattle installed updated signage and refreshed the roadway paint on the north side of the traffic island. A new pedestrian railing was installed to provide some protection for waiting customers from errant vehicles, and to discourage pedestrians from crossing at the unprotected north side of the island.

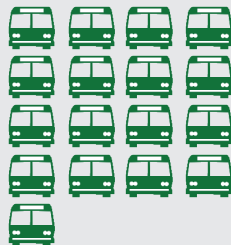
Safety was improved for the 585 daily users of the southbound 15th Ave NW & NW 65th St RapidRide station.

TRANSIT BENEFITS

PEDESTRIAN SAFETY



17
BUSES
PER HOUR



ROUTE BENEFIT

DAILY PASSENGER BENEFIT (PER 100)

585
PASSENGERS



Acknowledgements:
Jonathan Dong (SDOT), Carol McMahan ((SDOT)



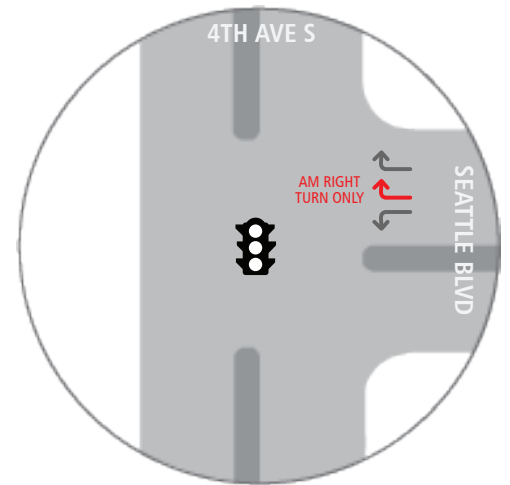
SEATTLE BLVD & 4TH AVE S

Routes: 212, 217, 522, 554; many deadhead trips

ISSUE

Buses turning right from westbound Seattle Blvd onto northbound 4th Ave S experienced long delays due to traffic congestion during AM peak periods. Although traffic was allowed to turn right from two lanes, the center lane also allowed left turns, which would often block the lane for right turns. The close spacing of the 4th and 5th Avenue S intersections caused traffic to back up onto Dearborn St, Seattle Blvd, and 5th Ave S. Buses had to wait through multiple signal cycles to get through these two intersections. When the I-90 HOV ramps and Rainier Ave Freeway Stop closed in September 2018, additional bus routes from East King County were routed through this intersection.

Peak frequency is 11 buses/hour.



IMPROVEMENTS

Channelization – In preparation for the closure of the I-90 HOV ramps, Sound Transit, SDOT, WSDOT, and Metro worked together to identify a series of improvements to help buses flow better on surface streets. At Seattle Blvd and 4th Ave S, a LED sign was installed that designates the center westbound lane as right turn only during the AM peak. This effectively creates a second right turn lane when traffic flows are heaviest into Downtown Seattle. Traffic signal timing was also adjusted to reflect the change.

Transit delay for the westbound right turn at this intersection was reduced in the AM peak period.

TRANSIT BENEFITS

IMPROVED RELIABILITY

ROUTE BENEFIT

DAILY PASSENGER BENEFIT (PER 1000)



Acknowledgements:
John Arnesen (Sound Transit), Jonathan Dong (SDOT),
Carter Danne (SDOT), John Marek (SDOT),
Reiner Blanco (SDOT)



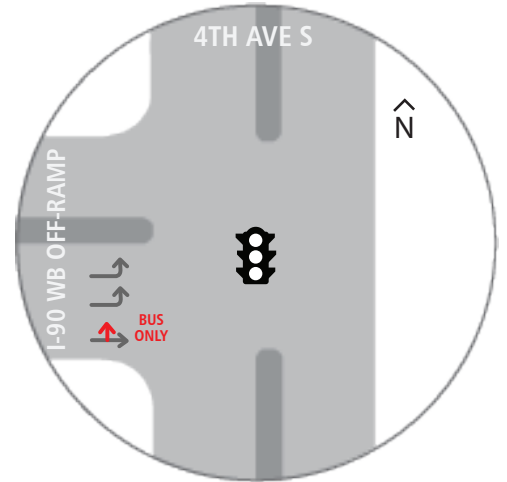
I-90 WESTBOUND OFF-RAMP AND 4TH AVE S

Routes: 111, 114, 212, 214, 216, 218, 219, 550; deadhead trips

ISSUE

Buses turning left from the I-90 westbound off-ramp onto northbound 4th Ave S experienced long delays due to traffic congestion during peak periods. Although a northbound bus lane is provided on northbound 4th Ave S, buses had to mix with general traffic within the off-ramp in order to get into the bus lane. When the I-90 HOV ramps and Rainier Ave Freeway Stop closed in September 2018, additional bus routes from East King County were routed through this intersection.

Peak frequency is 40 buses per hour.



IMPROVEMENTS

Channelization – In preparation for the closure of the I-90 HOV ramps, Sound Transit, SDOT, WSDOT, and Metro worked together to identify a series of improvements to help buses flow better on surface streets. At the I-90 off ramp, the right-most lane was designated as RIGHT TURN ONLY EXCEPT BUSES, and buses can now use it to turn left directly into the 4th Ave S bus lane. In addition, the lane configuration on the ramp approaching the intersection was modified to help keep the right lane clear of vehicles.

Transit delay for the eastbound left turn at this intersection was reduced on average by 17% in the AM peak period.

TRANSIT BENEFITS

BUS DELAY IMPROVEMENTS

ROUTE BENEFIT

DAILY PASSENGER BENEFIT (PER 1000)

DELAY
SAVED
AM PEAK



17%

40
BUSES
PER HOUR



9,000
PASSENGERS



Acknowledgements:
John Arnesen (Sound Transit), Mike Swires (WSDOT),
Carter Danne (SDOT)



Routes: 7,9

ISSUE

Rainier Ave S is a congested traffic and transit corridor and has a history of frequent traffic collisions. The City would like to reduce the number of traffic lanes on Rainier Avenue to reduce speeding and improve the overall safety of the corridor; however, this could lead to additional transit delays and unreliable operation if transit speed & reliability improvements are not installed along with any reductions in the number of traffic lanes.

Peak frequency is 11 buses/hour.



IMPROVEMENTS

Bus Lanes – Although Rainier Ave S is undergoing a comprehensive corridor study over the next few years, some early-action improvements were identified and implemented as a spot improvement in 2019. On the southern portion of the corridor between Hillman City and Rainier Beach, general-purpose lanes were converted to Business Access and Transit (BAT) lanes at selected locations. These BAT lanes were painted red.

The conversion of general-purpose lanes into BAT lanes improves the speed & reliability of transit service along the corridor with peak travel time reduced by 15 seconds and also improves overall traffic safety.

TRANSIT BENEFITS

BUS DELAY IMPROVEMENTS (IN SEC)

ROUTE BENEFIT

DAILY PASSENGER BENEFIT (PER 1000)

15
SECONDS
DELAY
SAVED

11
BUSES
PER HOUR

12,600
PASSENGERS

Acknowledgements:
Jonathan Dong (SDOT), James Le (SDOT),
Enrique Garcia (SDOT)



SEATTLE RED BUS LANES (MULTIPLE LOCATIONS)

Routes: 5, 10, 11, 19, 24, 26, 28, 29, 33, 37, 40, 41, 43, 47, 49, 74, 76, 77, 101, 102, 111, 114, 116, 118, 119, 124, 131, 132, 150, 177, 178, 190, 212, 214, 216, 217, 218, 219, 252, 255, 257, 268, 301, 308, 311, 312, 316, 402, 405, 410, 412, 413, 415, 416, 417, 421, 422, 424, 425, 435, 510, 511, 512, 513, 522, 545, 550, 554, 578, 590, 592, 594, C Line, 98/SLU Streetcar

ISSUE

Violations of Bus-Only lanes by general traffic are a problem throughout the County. General purpose vehicles can block bus movement, cause delays to bus riders, and render the bus lane ineffective. Enforcement of bus-only lanes is challenging due to limited police resources and the logistical difficulties of issuing citations without causing further blockages of the bus lane.

IMPROVEMENTS



Bus Lanes – The City of Seattle and Metro identified a set of bus lanes that could benefit from the installation of red paint. Red paint has been proven to reduce the number of vehicles violating the bus-only restrictions. Red bus lanes were installed at the following locations in 2019:

- 5th Ave northbound between Washington St and Marion St
- Pike Street between 2nd Ave and 8th Ave
- Westlake Ave between Stewart St and Valley St
- Olive Way between 4th Ave and 8th Ave
- 4th Ave S between Royal Brougham Way and Jackson St
- Terry Ave between Thomas St and Mercer St (South Lake Union Streetcar)

Bus-only restrictions are clearer to other motorists at these locations, which should help reduce violations and improve the effectiveness of these bus lanes.

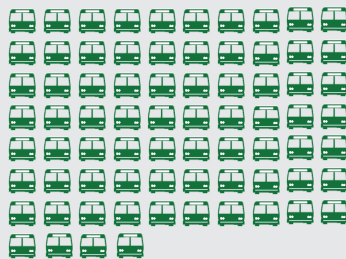
TRANSIT BENEFITS

BAT LANE



ROUTE BENEFIT

74 ROUTES



DAILY PASSENGER BENEFIT (PER 10,000)

75,000 PASSENGERS



Acknowledgements:
Jonathan Dong (SDOT), Alex Phillips-White (SDOT),
Pauh Wang (SDOT), Summer Xia (SDOT)



SEATAC, KENT, COVINGTON SIGNAL RETIMING

Routes: 159, 168

ISSUE

Metro will implement all day frequent service connecting the cities of SeaTac, Kent, and Covington to the light rail station in SeaTac in 2025. There is currently no transit priority on this corridor. Given the future investment on service on this corridor, Metro wanted to ensure that it would be fast and reliable and best serve riders in this important and growing part of the county.

Peak frequency is 4 buses/hour.



IMPROVEMENTS

Traffic Signals, Signs, and Channelization – Metro partnered with WSDOT, City of Kent, City of Seatac, and the City of Covington to retime signals along SE 272nd St, Kent Kangley Road, and S Kent-Des Moines Road to better serve the needs of buses traveling along those roads. The traffic signal timing was modified for optimal bus progression along the corridor. Travel times for general purpose traffic was maintained. Metro worked with our municipal and state partners, as well as consultants DKS, and Concord engineering to plan, model, and implement new signal timings at 15 intersections.

Delay for both buses and general traffic on the corridor was reduced by 5-10%. Overall general purpose travel time on streets intersecting the transit corridor were unaffected.

TRANSIT BENEFITS

DELAY IMPROVEMENTS

ROUTE BENEFIT

DAILY PASSENGER BENEFIT (PER 1000)



Acknowledgements:

John Holdren (WSDOT), Hayden Wong (WSDOT), Florendo Cabudol (City of Seatac), Bob Lindskov (City of Covington), Mike Sorenson (City of Kent)



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