

Transit Priority and HOV Lanes

Introduction

How were transit priority and HOV lanes addressed in the preferred alternative?

The SR 520 I-5 to Medina project's preferred alternative included arterial transit/HOV lanes on Montlake Boulevard between the SR 520 corridor and the Pacific Street intersection. However, the preferred alternative did not describe lane location details or descriptions of where the transit/HOV lanes ended. It was assumed that those two details would be resolved through the Technical Coordination Team (TCT) meetings, which included transit and transportation experts from SDOT, King County Metro, Sound Transit and WSDOT. The preferred alternative also described the addition of transit signal priority to the Montlake interchange area, in an effort to improve transit reliability. The specific locations where transit signal priority would be implemented were also assumed to be determined by the TCT.

Addressing the problem

How did we identify possible solutions?

A subgroup of the TCT was formed to identify approaches to enhance transit reliability on the Montlake corridor. The subgroup included participants from the SDOT, King County Metro, Sound Transit, WSDOT, and one external transit expert to provide an unbiased perspective for consideration. This subgroup focused their efforts on providing additional detail for Transit/HOV lane placement and transit signal priority, but also considered other design refinements that might improve transit reliability.

Through a series of meetings, the subgroup developed a list of goals, boundaries and measures for use in developing their recommendations. The subgroup used the current project assumption for HOV occupancy of three or more (3+) people on the arterials and the freeway. Though final occupancy requirements are not set by project staff, the subgroup assumed a 3+ occupancy requirement by the year 2030 is reasonable. Transit elements considered by the subgroup included:

- HOV lane location
- HOV lane termini
- Transit signal priority
- Queue jumps
- Bus stop locations

Recommendations

What did we consider?

The primary objective of the first subgroup meeting was to develop a list of goals, measures and boundaries to be used in the subgroup's development and assessment of transit design refinements. The list included:

Goals

- Improve transit speed and reliability between Roanoke Street and the Montlake multimodal center without adversely affecting traffic operations on SR 520.
- Minimize right of way impacts.
- Optimize walking distances and minimize delays for transit transfers.
- Accommodate potential future transit stop locations and capacity requirements.

Measures

- Right of way effects.
- Travel time.
- Delay/level of service.
- Queue lengths.
- Bus zone capacity.
- Pedestrian use of bus stops.

Boundaries

- No changes to the right of way identified in the SDEIS on Montlake Boulevard between the westbound off-ramp intersection and the second drawbridge.
- No widening of Montlake Boulevard south of Roanoke Street.
- No widening of Montlake Boulevard north of Pacific Street (an added southbound HOV/transit lane on Montlake Boulevard north of Pacific Street was discussed and could be implemented as a separate project at a later time—the SR 520 project improvements would not preclude this from happening since there will be three continuous southbound lanes on Montlake Boulevard south of Pacific Street).

The various options considered by the subgroup were evaluated using these defined goals, boundaries, and measures. Some additional preliminary transportation analysis was completed to support the evaluation process, work that supplemented previous analyses completed for the SDEIS and the Legislative Workgroup process.

The subgroup discussed the complexities of the Montlake interchange area and the transit service operations. On Montlake Boulevard, local bus service competes for traffic signal time with regional bus service leaving or entering SR 520. The Montlake Boulevard corridor is also a primary urban arterial, serving over 60,000 vehicles per day crossing the Montlake cut. These high traffic volumes and competition between local and regional transit service, coupled with the constraint of not widening the roadway through the area, mean that options are limited for adjusting signal timing in any one direction without impacting the other.

The subgroup also discussed the challenges with serving bus stops northbound on Montlake Boulevard

between SR 520 and Pacific Street. Bus stops located in the outside lanes north of the SR 520 interchange would require buses to then cross over two lanes to turn left onto Pacific Street for access to the Montlake multi-modal station. This turning movement is made by approximately 300 bus trips operating on Montlake Boulevard each day. The subgroup recommended minimizing these complex arterial weaves by limiting the number of buses that would need to make a stop in that roadway section.

When considering signal timing, the subgroup recognized that any options resulting in additional delay for traffic south of Roanoke Street or northwest of Pacific Place would also cause additional delay for buses. Local bus trips make up nearly 65% of the bus trips that cross the Montlake drawbridge, with local buses traveling in the same lanes as the general purpose traffic on Montlake Boulevard.

After discussing these goals and measures, the subgroup identified a number of transit design refinement options, and identified which options would provide improved transit reliability. The evaluation measures were assessed at a qualitative level based on traffic operations information available from the SR 520 program transportation team. A quantitative analysis to evaluate selected options will be conducted for the preferred alternative and documented in the Transportation Discipline Report of the Final Environmental Impact Statement. A summary of the options and evaluation follow.

Transit/HOV lane location and termini

The subgroup first determined the transit/HOV lane location and then discussed the length of the lane. The termination point of the transit/HOV lane is only described in the option that was selected to move forward as a recommendation to the Workgroup.

Inside transit/HOV lane both northbound and southbound. An inside lane is the left most through lane in the direction of travel.

- A southbound Montlake Boulevard inside transit/HOV lane was not determined to be a functional solution for the buses leaving Pacific Street. Those buses travel in the outside arterial transit/HOV lane on Pacific Street and would need to cross two lanes to use an inside transit/HOV lane. Because the majority of bus passengers traveling southbound are using local bus service (i.e., buses that need to stay in the outside lane), an inside transit/HOV lane would not serve the majority of the riders.
- A northbound Montlake Boulevard transit/HOV lane located on the inside would align the buses turning right from the SR 520 westbound direct access ramps directly into the transit/HOV lane. This alignment would provide SR 520 buses with a bypass lane for any northbound backups resulting from traffic congestion and Montlake drawbridge openings. The inside transit/HOV lane placement also directs the buses into the right-most left turn lane at the Montlake Boulevard/Pacific Street intersection, from which they can easily access the Montlake multi-modal station on Pacific Street. There are approximately 300 daily bus trips that make that left turn.

Outside transit/HOV lane both northbound and southbound. An outside lane is the right most through lane in the direction of travel.

- An outside southbound transit/HOV lane on Montlake Boulevard would provide a seamless connection from the existing outside arterial transit/HOV lane on Pacific Street. The outside southbound transit/HOV lane would also allow all buses to bypass congestion created by a Montlake drawbridge opening. Buses destined for SR 520 would have enough space and open roadway to change lanes after Shelby Street from the outside transit/HOV lane to the direct access ramp left turn, because it is anticipated that southbound congestion on Montlake Boulevard will be substantially reduced as a result of the improvements being made on the SR 520 corridor. Those design improvements include a two-lane on-ramp to eastbound SR 520, a new transit/HOV direct access on-ramp to eastbound SR 520, a two-lane westbound on-ramp and improved on-ramp merge lengths onto the freeway.
- A northbound outside transit/HOV lane on Montlake Boulevard would not be functional for buses coming from SR 520. The SR 520 buses will exit the freeway from the westbound direct access ramp, which is south of the general purpose ramp. All three lanes are dedicated right-turn lanes. A bus right turn from the direct access ramp into an outside northbound lane would be a very difficult movement; buses would need to cross over three lanes to drive a short distance in the transit/HOV lane and then cross back to turn left onto Pacific Street. Local buses would also need to exit the transit/HOV lane early to turn left onto Pacific Street.

Inside transit/HOV lane northbound and outside transit/HOV lane southbound. The subgroup recommended that an outside southbound transit/HOV lane and an inside northbound transit/HOV lane would provide the most reliable service for passengers along the Montlake Boulevard corridor.

- The northbound transit/HOV lane limits reach from the direct access ramps at SR 520 across the Montlake drawbridge. The limits were set to ensure easy access between the SR 520 direct access ramps and the Montlake Boulevard corridor for northbound traffic. The lane could not continue to the intersection of Montlake Boulevard and Pacific Street because of turning movement capacity constraints at the intersection.
- Continuing the outside transit/HOV lane in the southbound direction from Pacific Street on to Montlake Boulevard to Hamlin Street allows for continuity of the transit/HOV movements. This enhances transit/HOV operations and allows buses to bypass congestion resulting from drawbridge openings.

Transit signal priority locations

Current traffic operations analysis for the preferred alternative shows that the congestion along

Montlake Boulevard would not warrant transit signal priority after improvements by the SR 520 project are implemented. Traffic operations improvements from the SR 520 I-5 to Medina project result in reduced congestion on the Montlake Boulevard corridor, and therefore less of a need for transit signal priority. However, transit agency and City of Seattle staff understand that at times there could be congestion levels that warrant the use of signal priority, such as during major University of Washington events (e.g., football games, commencement ceremonies, or other unique events on campus), special events in Seattle or necessary Montlake Bridge opening events (e.g., opening day of boating season). To ensure transit operates reliably during these periods of high activity, the subgroup recommended that WSDOT provide all signal controllers installed as part of the project with the ability to accept transit signal priority. This design refinement would allow the City of Seattle and the transit agencies to manage transit service and traffic operations as conditions change into the future and on a daily basis. As the City, transit agencies, and WSDOT implement transit signal priority strategies, they will continue to evaluate whether they result in adverse effects to SR 520 mainline traffic or to bus service outside of the HOV/transit lane limits.

The following locations were considered for transit signal priority:

- Montlake Boulevard/Pacific Street
- Montlake Boulevard/Shelby Street
- Montlake Boulevard/Hamlin Street
- Montlake Boulevard/westbound ramps
- 24th Avenue/westbound ramps

The level of operations at the eastbound ramp intersection did not warrant the consideration of transit signal priority. The subgroup discussed the function of transit signal priority and its affect on intersections that operate at level of service F. The subgroup determined that if signal time was reallocated to provide bus priority, it would cause severe congestion in other directions and could adversely affect other transit services and traffic operations on the SR 520 corridor. The potential for these effects did not meet the goals or boundaries defined by the subgroup.

Queue jump locations

Queue jumps were discussed at the following locations:

- Northbound Montlake Boulevard at Lake Washington Boulevard
- Northbound Montlake Boulevard at westbound ramps
- Southbound Montlake Boulevard at Shelby Street

All of the potential queue jump locations were determined to not meet the goals set by the subgroup, particularly the goal for right-of-way impacts. Installing queue jumps would require additional right-of-way to implement. Queue jumps at the ramp intersections would also result in adverse effects on SR 520 traffic operations because additional signal time would be required for the queue jump.

Bus stop locations

The subgroup discussed potential bus stop locations; a separate white paper will present those conversations.

Final TCT recommendation

The TCT supported the following recommendations based on the work of the subgroup.

- Transit/HOV lane location on Montlake Boulevard
 - Inside transit/HOV lane northbound
 - Transit/HOV lane limits between westbound off-ramp and the northern end of the Montlake drawbridge
 - Outside transit/HOV lane southbound
 - Transit/HOV lane limits between Pacific Street and Shelby intersection
- Transit signal priority

Traffic signal equipment installed along Montlake Boulevard will be compatible with future hardware installation for transit signal priority at the following intersections:

 - Montlake Boulevard/Pacific Street
 - Montlake Boulevard/Shelby Street Montlake Boulevard/Hamlin Street
 - Montlake Boulevard/westbound ramps
 - 24th Avenue/westbound ramps
- Transit queue jumps

Additional right-of-way would be required to provide transit/HOV queue jumps on freeway on-ramps, which would result in additional right-of-way impacts. In an effort to respect the historical nature of the community, the addition of transit/HOV queue jump lanes was not recommended.