

Seattle Department of Transportation

NE 65TH STREET REDESIGN

Shared transit stops, protected bike lanes, and rechannelization

Before and After Study: NE Ravenna Blvd to 39th Ave NE



September 2020



Seattle
Department of
Transportation



CONTENTS

3	NE 65th Street
3	Background
4	Existing Conditions
4	Redesign
9	Results
9	Volumes
10	Speeds
11	Collisions
12	Travel Times
13	Shared Transit Stops
13	Design Guidance
14	Selected Design
16	Observed Operations
20	King County Metro Feedback
21	Conclusion

NE 65TH STREET

BACKGROUND

NE 65th St is an arterial street in northeast Seattle carrying thousands of people walking/rolling, biking, riding the bus, and driving every day. It is home to grocery stores, restaurants, retail, apartments, and single-family homes. Several parks and schools lie within a few blocks north and south of the corridor. In 2021, the Northgate Link Extension and Roosevelt Link Light Rail Station will open, bringing even more activity to NE 65th St.

In recent years significant traffic safety issues have emerged along this growing corridor. From 2014-2018, four people were killed and five people were seriously injured in crashes on NE 65th St. Over 200 other crashes occurred during that period.

In response, community members, former Councilmember Rob Johnson, and the Seattle Department of Transportation (SDOT) collaborated to #Fix65th and improve safety for everyone traveling on the street. Improvements focused on a 1.5-mile stretch of NE 65th St between NE Ravenna Blvd and 39th Ave NE. Throughout 2017-2018, SDOT held community forums and drop-in sessions for the NE 65th Street Vision Zero Project to develop a design aimed at achieving the following goals:

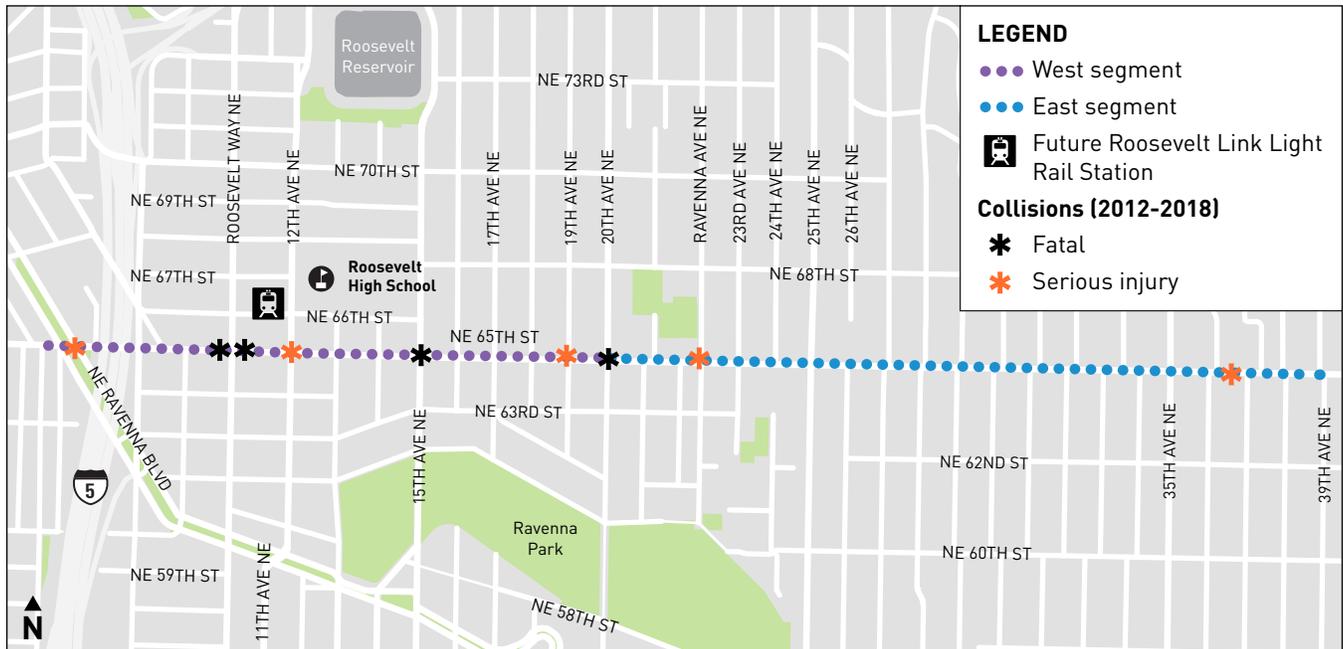
- Enhance safety for everyone by reducing crashes and injuries
- Improve access to the future Roosevelt Link Light Rail Station (“the Roosevelt Station”) for people walking/rolling and biking
- Improve transit service and connections to the future Roosevelt Station

The NE 65th St project is part of SDOT’s Vision Zero program, which is Seattle’s plan to end traffic deaths and serious injuries on city streets by 2030.

FIGURE 1: COMMUNITY MEMBERS MARCH FOR IMPROVEMENTS TO NE 65TH ST IN 2016 (TOP) AND ONE OF THE SDOT DROP-IN SESSIONS IN 2017 (BOTTOM)



FIGURE 2: MAP OF PROJECT AREA



EXISTING CONDITIONS

Before the redesign, the typical cross section of NE 65th St had one travel lane in each direction with off-peak parking on both sides of the street. Parking was restricted on weekdays from 4:00 to 6:00 p.m. and the curbside lane operated as an additional travel lane. During afternoon peak periods, NE 65th St operated as a four-lane roadway. The existing design did not include any dedicated bike facilities.

REDESIGN

Early Enhancements

In response to recent fatal crashes, SDOT made early enhancements to the street in March 2017:

- Lowered the posted speed limit from 30 mph to 25 mph
- Installed pedestrian countdown timers at signalized intersections
- Repainted marked crosswalks
- Installed a hardened centerline at Roosevelt Way NE

Final Design

As part of the final design, SDOT rechannelized NE 65th St and installed protected left turn phases at signalized intersections. King County Metro also consolidated bus stops along the corridor.

The project was divided into an east and west segment based on the roadway width and recommendations in the Seattle Bicycle Master Plan (BMP).

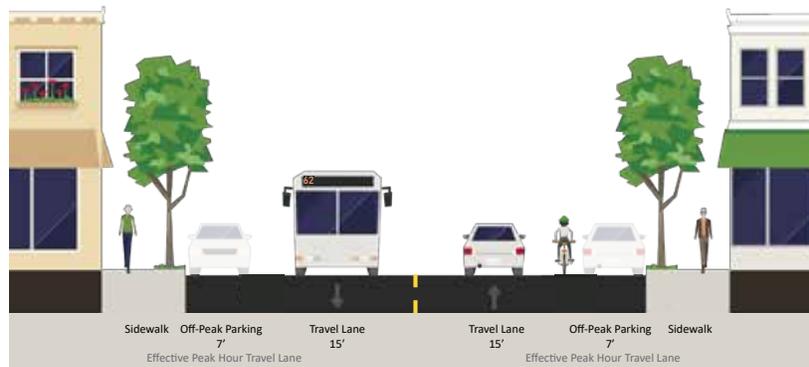
West Segment

The west segment (NE Ravenna Blvd to 20th Ave NE) features one travel lane in each direction and a center left turn lane. Per the BMP, a protected bike lane (PBL) is included in each direction.

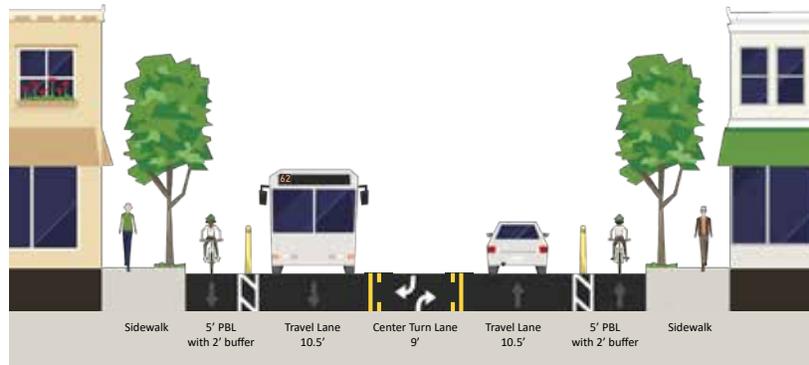
Bus stops on the west segment featured two design elements:

- Wide travel lanes allowing vehicles to pass a stopped bus
- Shared transit stop design accommodating the PBL and bus platform area in the constrained right-of-way; this was a new treatment used in Seattle and is discussed in more detail on page 13.

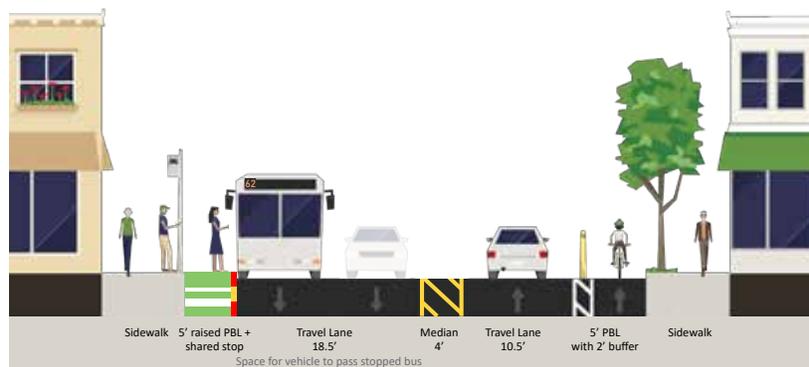
WEST SEGMENT – BEFORE



WEST SEGMENT – AFTER



WEST SEGMENT – AFTER (AT BUS STOPS)



East Segment

The east segment (20th Ave NE to 39th Ave NE) features one travel lane in each direction and parking on both sides of the street.

The east segment design did not include a PBL. Per the BMP, the Wedgwood to Roosevelt Neighborhood Greenway is planned one block north of NE 65th St on NE 68th St.

EAST SEGMENT - BEFORE



EAST SEGMENT - AFTER



FIGURE 4: WEST SEGMENT IN 2017 (TOP) AND IN 2020 (BOTTOM)

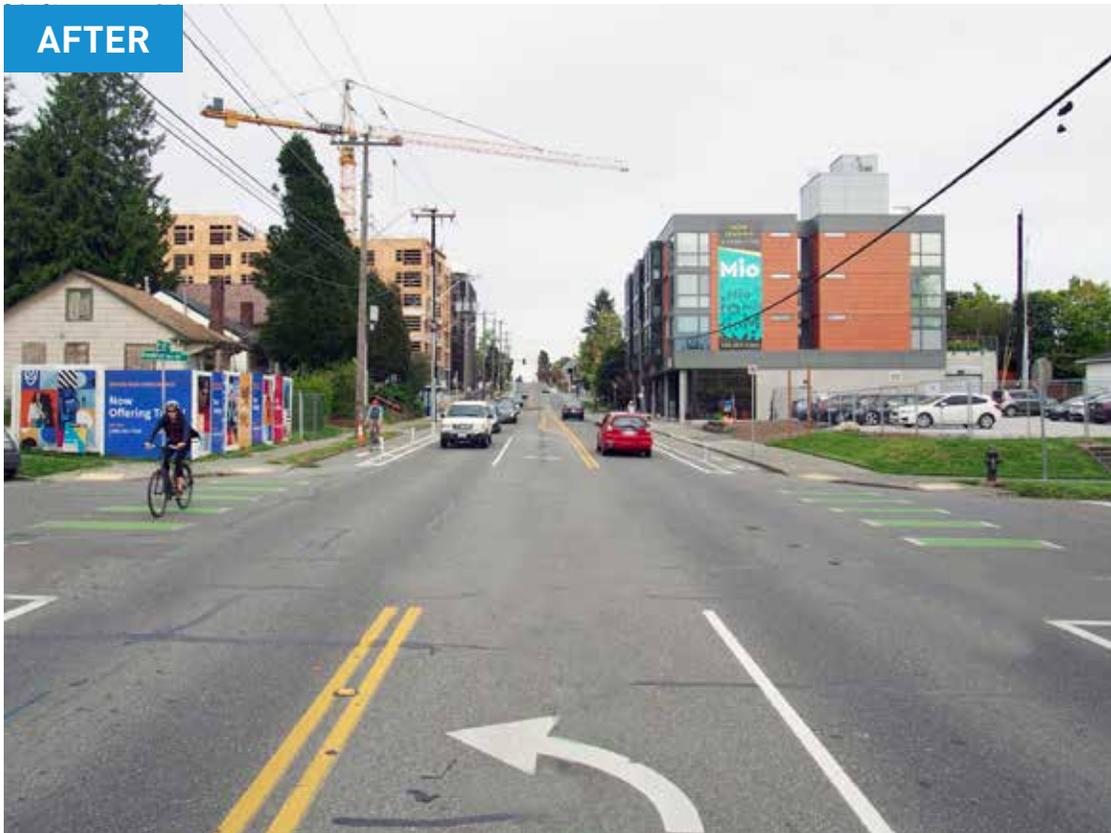
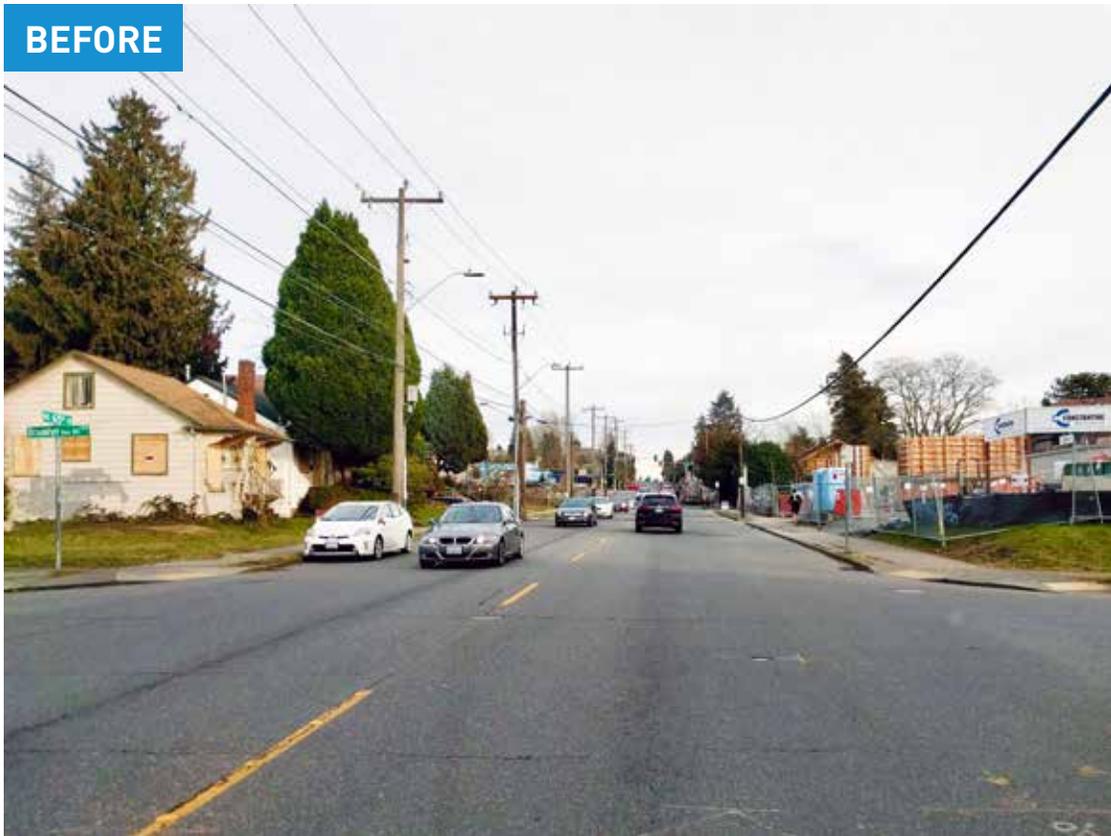


FIGURE 5: EAST SEGMENT IN 2017 (TOP) AND IN 2020 (BOTTOM)



RESULTS

SDOT collected data on traffic volumes, vehicular speeds, collisions, and travel times before and after the redesign. “Before” data was collected in 2017 and earlier. “After” data was collected in 2019. Data from the interim period (2017-2018) is included below where available.

VOLUMES Pedestrians

After the design changes, overall pedestrian volumes on NE 65th St increased. Pedestrian traffic is expected to increase on the west segment of the corridor when the Roosevelt Station opens in 2021.

TABLE 2: PEDESTRIAN TRAFFIC

Segment	Location	Before (2011)	After (2019)	Change
West	12th Ave NE	1,830	2,290	+25%
East	25th Ave NE	530	720	+36%

FIGURE 6: PEDESTRIANS CROSSING NE 65TH ST



Bikes

After implementation of the PBL, bike traffic increased in the west segment and decreased in the east segment.

Lower bike traffic on the east segment may be due to the lack of a bike facility and the opening of the parallel Wedgwood to Roosevelt Neighborhood Greenway on NE 68th St, which includes crossing improvements on NE 68th St at

20th Ave NE and 25th Ave NE. Construction of the neighborhood greenway started in 2019 and will be completed by 2021.

Bike traffic on the west segment is relatively low compared to other bikeways in the Roosevelt and Ravenna area. SDOT anticipates that bike traffic will increase on the west segment as more people become aware of the PBL on NE 65th St, the neighborhood greenway network is completed, and the Roosevelt Station opens.

TABLE 3: BIKE TRAFFIC

Segment	Location	Before (2011)	After (2019)	Change
West (PBL)	12th Ave NE	50	70	+40%
	15th Ave NE	90	100	+11%
East (no PBL)	25th Ave NE	70	40	-43%

FIGURE 7: PEOPLE BIKING IN THE NEW PBL ON NE 65TH ST



Vehicles

Vehicular traffic remained relatively consistent before and after the design changes.

TABLE 4: GENERAL-PURPOSE VEHICLE TRAFFIC

Segment	Location	Before (2016)	After (2019)	Change
West	15th Ave NE	14,389	14,764	+3%
East	25th Ave NE	12,050	12,974	+8%

SPEEDS

Overall motor vehicle speeds decreased after the posted speed limit on NE 65th St was reduced from 30 mph to 25 mph. Targeted traffic enforcement was not included as part of this project.

The overall speed reductions are likely due to rechannelizing the street from four peak hour lanes to two full time lanes. The more substantial change in speeds on the east end may be due to the added friction of full-time parking in both directions. The west segment had no parking and wider lanes to allow for bypasses at bus stops.

TABLE 5: WEST SEGMENT SPEEDS COLLECTED WEST OF 15TH AVE NE

Direction	Before (30 mph speed limit)	After (25 mph speed limit)	% Change
85th Percentile Speeds (mph)			
Eastbound	29.5	29.8	+1%
Westbound	31.7	29.3	-8%
Speeders (Driving over 30 mph)			
Eastbound	14%	14%	0%
Westbound	27%	13%	-53%
Top End Speeders (Driving over 40 mph)			
Eastbound	0.4%	0.2%	-48%
Westbound	0.6%	0.4%	-35%

TABLE 6: EAST SEGMENT SPEEDS COLLECTED WEST OF 25TH AVE NE

Direction	Before (30 mph speed limit)	After (25 mph speed limit)	% Change
85th Percentile Speeds (mph)			
Eastbound	28.1	21.6	-23%
Westbound	28.4	25.2	-11%
Speeders (Driving over 30 mph)			
Eastbound	8%	2%	-75%
Westbound	11%	3%	-67%
Top End Speeders (Driving over 40 mph)			
Eastbound	0.2%	0.1%	-42%
Westbound	0.4%	0.1%	-60%

FIGURE 8: WEST SEGMENT EASTBOUND SPEEDS

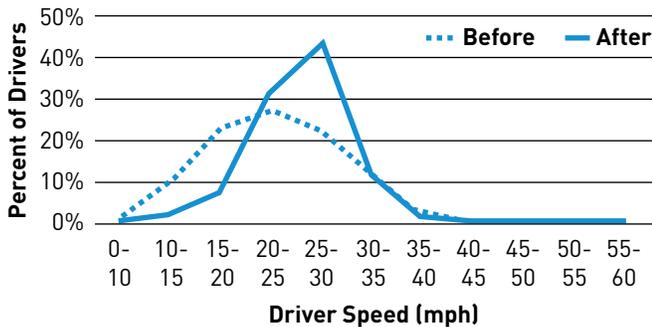


FIGURE 10: EAST SEGMENT WESTBOUND SPEEDS

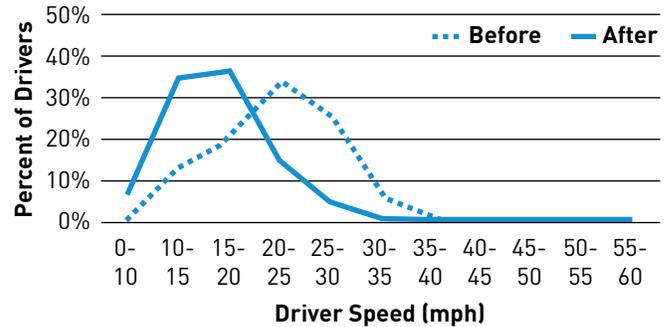


FIGURE 9: WEST SEGMENT WESTBOUND SPEEDS

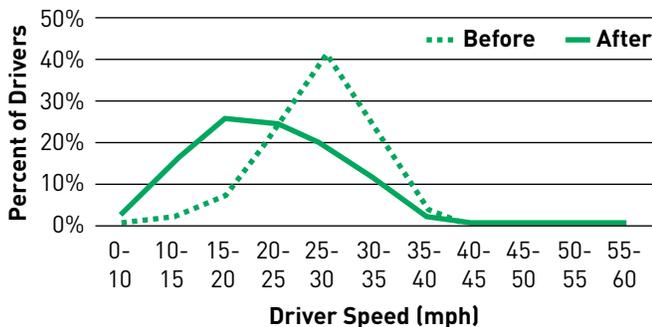
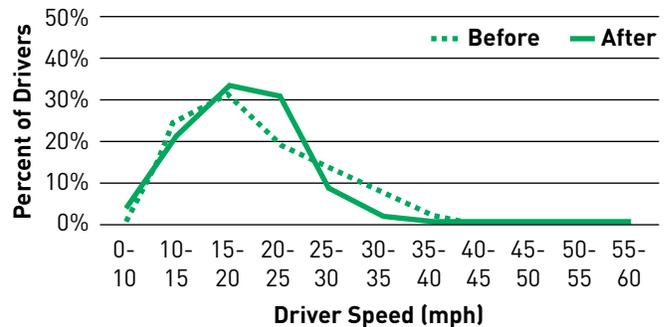


FIGURE 11: EAST SEGMENT WESTBOUND SPEEDS



COLLISIONS

Collisions and injuries along NE 65th St decreased after implementation of the design changes. **There were no serious or fatal collisions after the full design changes were complete in 2019.**

In addition to the overall decrease in collisions, there was also a reduction in specific collision types. On the west segment there was a 100 percent reduction in left turn collisions due to the addition of left turn lanes and protected left turn

phases. Crashes involving pedestrians decreased by 67 percent as a result of the redesign.

After implementation of the project, there was one reported pedestrian collision on NE 65th St at Roosevelt Way NE and one at Ravenna Ave NE. There were three bike collisions on the west segment of NE 65th St – two at 12th Ave NE and one at 15th Ave NE. On the east segment of NE 65th St, there was one bike collision midblock between 24th Ave NE and 25th Ave NE.

FIGURE 12: ANNUAL AVERAGE COLLISIONS BY INJURY SEVERITY

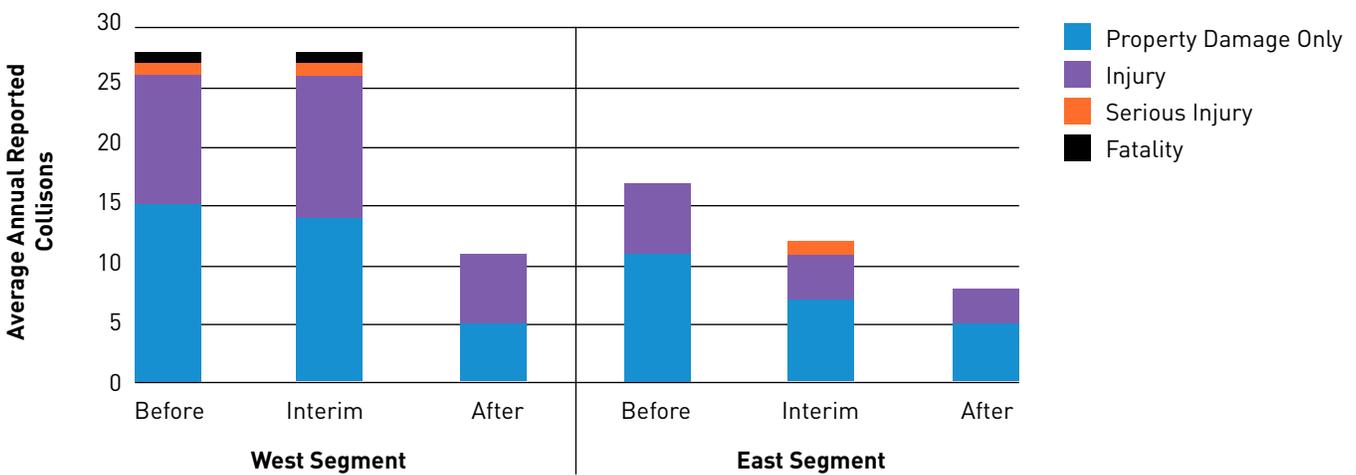


TABLE 7: ANNUAL AVERAGE CRASH TYPE

	West Segment				East Segment			
	Before (2014-2016)	Interim (2017-2018)	After (2019)	% Change	Before (2014-2016)	Interim (2017-2018)	After (2019)	% Change
Angles	4	3	4	0%	7	4	0	-100%
Bike	3	2	3	0%	1	2	1	0%
Head On	0	0	0	0%	0	0	0	0%
Left Turn	6	8	0	-100%	2	2	2	0%
Other	1	1	0	-100%	1	1	0	-100%
Parked Car	5	1	0	-100%	2	1	1	-50%
Pedestrian	3	6	1	-67%	1	1	1	0%
Rear Ended	4	3	1	-75%	3	1	1	-67%
Right Turn	1	2	0	-100%	1	1	0	-100%
Sideswipe	0	3	0	0%	1	0	1	0%
Total	27	29	9	-67%	19	13	7	-63%

TRAVEL TIMES

SDOT and King County Metro collected travel times for transit and general-purpose traffic on NE 65th Street between NE Ravenna Blvd to 25th Ave NE. This one-mile study area included all of the west segment and part of the east segment.

Transit

Transit travel times were provided by King County Metro from onboard bus system data from Route 62.

TABLE 8: TRANSIT TRAVEL TIMES

Direction	Before (2017)	After (2019)	Change
Eastbound	6.0 min	7.0 min	+1.0 min
Westbound	6.7 min	8.5 min	+1.8 min

Increases in transit travel times are likely due to several factors, including:

- Buses sharing two full-time lanes with general purpose traffic (previously, they shared four peak hour lanes)
- New full-time parking on east segment (added friction factor for operators)
- New protected left turn phases at multiple intersections
- Scheduling changes for the Route 62

General-Purpose Traffic

SDOT collected travel times for general-purpose traffic by driving the corridor multiple times during peak hours. The increase in travel times is likely due to general purpose traffic operating in fewer lanes during the afternoon peak hour. While general-purpose travel times increased, the travel times are acceptable because the project prioritized enhancements for people walking/rolling and biking.

TABLE 9: GENERAL-PURPOSE TRAFFIC TRAVEL TIMES

Direction	Before (2017)	After (2019)	Change
Eastbound	6.2 min	6.3 min	+0.1 min
Westbound	5.0 min	6.2 min	+1.2 min

FIGURE 13: TRANSIT AND GENERAL-PURPOSE TRAFFIC ON NE 65TH ST



SHARED TRANSIT STOPS

DESIGN GUIDANCE

The NE 65th St project included a new shared transit stop design. The design aimed to maintain an all ages and abilities (AAA) bike facility at bus stop locations, where a full boarding island stop was not feasible due to limited right-of-way. Pull out stops can be used at locations with limited right-of-way, although this design requires bikes and buses to share space and is not typically considered an all ages and abilities design.

FIGURE 14: A PERSON BIKING INTERACTS WITH A BUS AT A PULL OUT STOP



The shared stops on NE 65th St were the first to be built in Seattle and SDOT used guidance from the National Association of City Transportation Officials (NACTO) to evaluate design options.

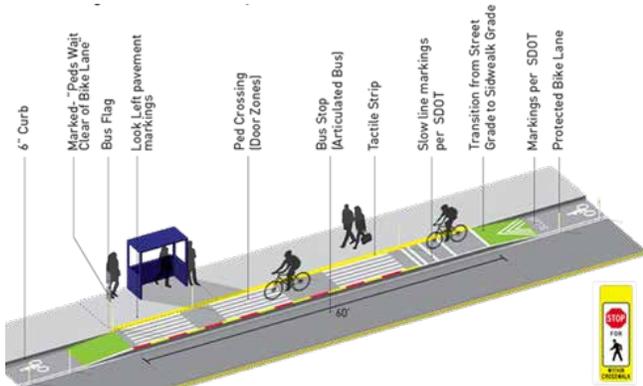
TABLE 10: TRANSIT STOP TYPES (NACTO)

Transit Stop Type	Description	Design
Boarding Island Stop 	<ul style="list-style-type: none"> • Bike lane can be at street or sidewalk level • Bike lane is channelized between sidewalk and platform • Transit passengers cross bike lane to access platform • Bikes must yield to pedestrians crossing bike lane 	<ul style="list-style-type: none"> • AAA design – bike lane protection maintained through stop • Not feasible due to the limited right-of-way along NE 65th St
Shared Stop 	<ul style="list-style-type: none"> • Bike lane raised to sidewalk level • Bike lane located between travel lane and sidewalk • Transit passengers board from and alight (exit) into the bike lane • Bikes must yield to passengers boarding/alighting 	<ul style="list-style-type: none"> • AAA – bike lane protection maintained through stop • Feasible within the constrained right-of-way along NE 65th St
Pull Out Stop 	<ul style="list-style-type: none"> • Bike lane maintained at street level • Bike lane and bus pull out space overlap • Bikes do not interact with transit passengers 	<ul style="list-style-type: none"> • Not typically an AAA design – bike lane protection not possible through stop

SELECTED DESIGN

As part of ongoing collaboration on bikeway and transit design, SDOT and King County Metro (Metro) worked together on a new shared stop design informed by the NACTO guidance and precedent from other cities. This design balanced the desire for an all ages and abilities design with the challenge of working in a constrained corridor.

FIGURE 15: NE 65TH ST SHARED STOP DESIGN FEATURES (DEREK HOLMER, KING COUNTY METRO)



At each stop, the 5-foot wide by 8-foot deep landing area required by the Americans with Disabilities Act was considered to extend to across the 5-foot bike lane into the sidewalk area. In addition to the design features listed above, unique stop announcements were added to buses serving the shared stops. The announcements alert exiting passengers to “watch for bikes when exiting bus” as buses approach the shared stops.

SDOT built four shared stops on the west segment of the project corridor at Oswego Pl NE, 8th Ave NE, 14th Ave NE, and 16th Ave NE.

The table below shows the context of each stop. During peak hour, the combined transit service frequency is every five minutes or less.

Other than design information shared during project outreach and an SDOT blog post about the project opening, Metro and SDOT did not complete additional educational campaign specific to the shared stop design.

TABLE 11: SHARED STOP LOCATIONS

Cross Street	Direction	Orientation	Approach Grade	Length	Routes Served	Daily Activity*			
						Boardings	Alightings	Bikes	Passenger to Bike Ratio
Oswego Pl NE	Westbound	Near side	Flat	120'	45, 62 63E, 64E 76, 542E	485	251	35	21:1
8th Ave NE	Eastbound	Near side	Flat	60'	45, 62	114	113	35	6:1
14th Ave NE	Westbound	Far side	Slight downhill	60'	62, 64E, 76	142	119	50	5:1
16th Ave NE	Eastbound	Far side	Moderate uphill	60'	62, 64E, 71, 76	114	127	50	5:1

*Daily boarding and alighting data from King County Metro, Fall 2019; bike data from adjacent or nearby intersections, Spring 2019. Passenger to bike ratio includes total daily boardings and alightings per stop and 50% of total daily bike traffic on NE 65th St.

FIGURE 16: SHARED STOPS AT OSWEGO PL NE (LEFT) AND 8TH AVE NE (RIGHT)



FIGURE 17: SHARED STOPS AT 14TH AVE NE (LEFT) AND 16TH AVE NE (RIGHT)



FIGURE 18: PASSENGERS BOARDING AT 8TH AVE NE (LEFT) AND TACTILE STRIP AND CROSSWALKS USED AT STOPS (RIGHT)



OBSERVED OPERATIONS

To understand how the new shared stops operate, SDOT collected video¹ in April 2019 at the westbound stop on NE 65th St at 14th Ave NE. Staff observed weekday peak periods from 7:00-9:00 a.m. and 4:00-6:00 p.m. and categorized user behavior. This stop is located one block south of Roosevelt High School and used by students in the morning and afternoons. A nearby control site was selected on Roosevelt Way NE at NE 65th St, which had a conventional far side boarding island design that had been in operation since 2017.

FIGURE 20: VIDEO OF WESTBOUND SHARED STOP ON NE 65TH ST AT 14TH AVE NE (TOP) AND BOARDING ISLAND CONTROL SITE ON ROOSEVELT WAY NE (BOTTOM)

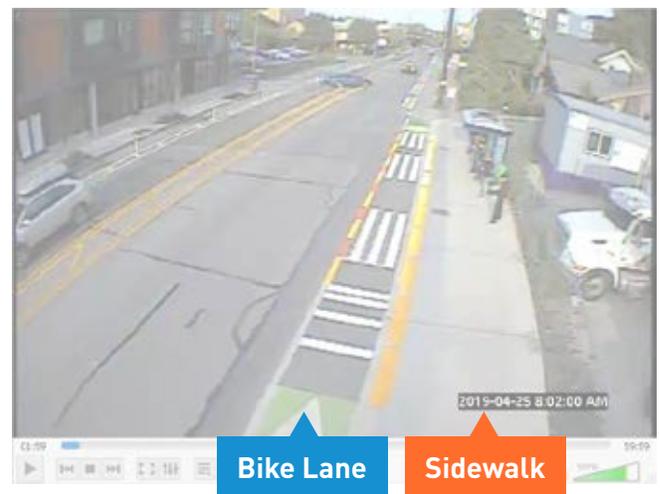
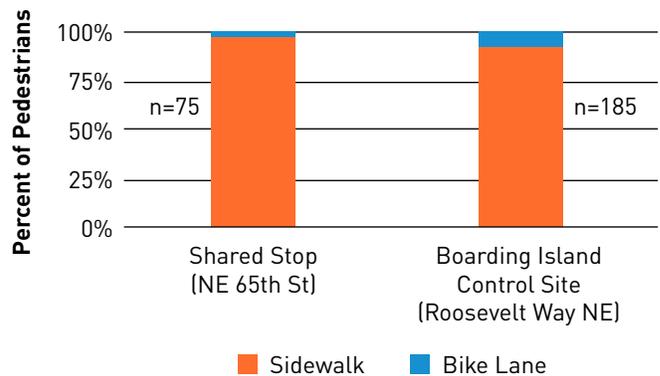


In general, SDOT found people used the shared stops as intended and no conflicts were observed. During Roosevelt High School dismissal, there were pedestrian volume surges, resulting in some unintended behavior. Overall, bike volumes were low, so there were limited opportunities to observe interactions between people biking and transit passengers.

Pedestrian Behavior

Nearly all pedestrians, which, for this report, are defined as non-transit passengers walking along NE 65th St, walked on the sidewalk and did not encroach into the bike lane area. Similar behavior was observed at the Roosevelt Way NE boarding island location.

FIGURE 21: PEDESTRIAN WALKING LOCATIONS

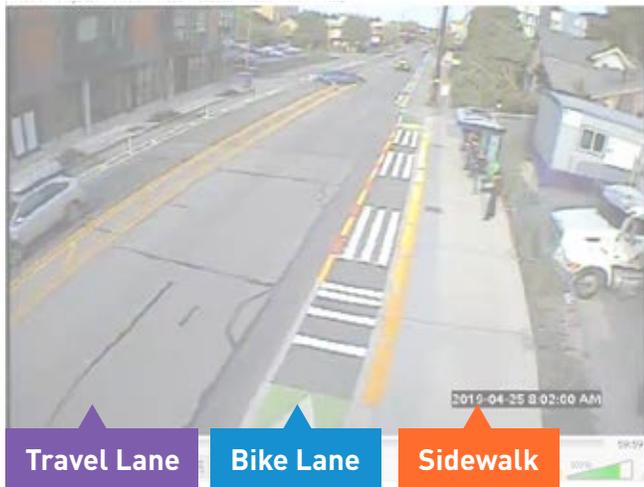
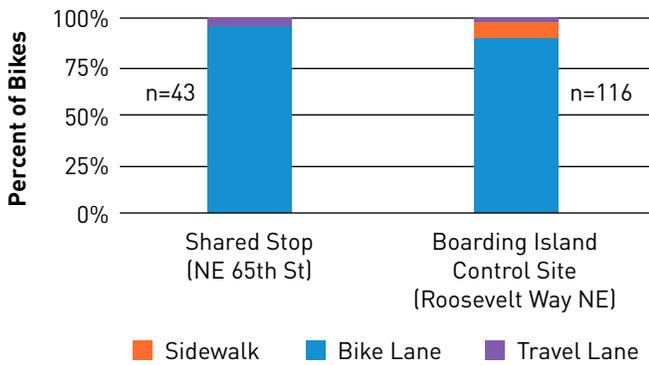


¹The video collected is low resolution and does not contain any personally identifiable information such as people's faces nor license plates.

Bicyclist Behavior

Bicyclist behavior while traveling along NE 65th St were also observed. Nearly all bicyclists rode in the bike lane through the stop area and only a small percentage rode in the adjacent travel lane. Similar behavior was observed at the Roosevelt Way NE location.

FIGURE 22: BIKE RIDING LOCATIONS



Due to the relatively low bike volumes observed during the data collection, the arrival of a bicyclist rarely coincided with a stopped bus. During the morning peak period, one bicyclist was observed riding to the left of a stopped bus in the travel lane. Several bicyclists were observed riding through the stop area shortly after a bus departed from the stop. While the camera angle did not allow staff to see the full approach, it appears that bikes may have slowed down in the approaching block to avoid arriving at the shared stop when a bus was present.

Bike and passenger volumes are expected to increase with the opening of the Roosevelt Station. It will be important to continue to monitor the operation of these designs with higher levels of platform activity.

FIGURE 23: EXAMPLES OF BIKES RIDING THROUGH THE SHARED STOP RIGHT AFTER A BUS PULLS AWAY



Passenger Queuing Behavior

Transit passengers waiting for the bus generally waited outside the through sidewalk area at the platform area or in the transit shelter. No passengers waited in the bike lane area. This was generally consistent with the behavior at the control boarding island on Roosevelt Way NE.

FIGURE 24: BUS PASSENGER QUEUING LOCATIONS

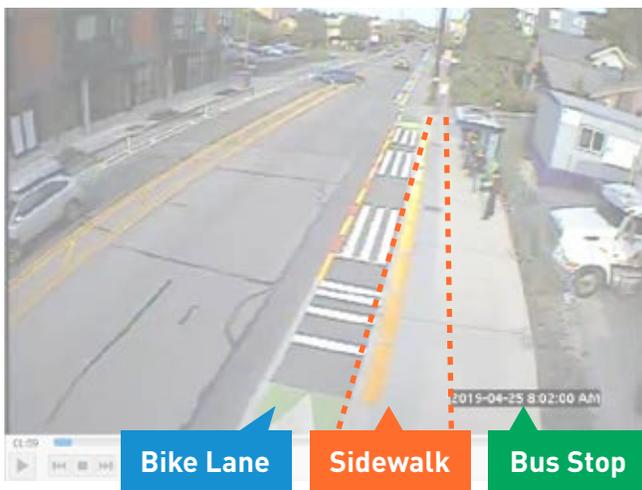
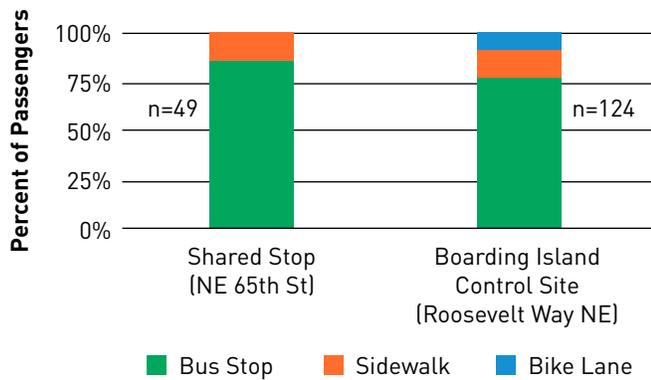


FIGURE 25: EXAMPLE OF PASSENGERS WAITING AT THE BUS STOP (TOP) AND AN EXAMPLE OF PASSENGERS WAITING WHILE PEDESTRIANS WALK ON THE SIDEWALK AND BIKE RIDES THROUGH THE SHARED STOP (BOTTOM)



Passenger Alighting Behavior

Transit passengers alighting (or exiting) the bus used the marked crosswalks or walked directly to the sidewalk. Very few passengers meandered in the bike lane before walking to the sidewalk. This was consistent with the behavior at the control boarding island on Roosevelt Way NE, which includes railings to channelize passengers to the crosswalk.

FIGURE 26: BUS PASSENGER ALIGHTING BEHAVIOR

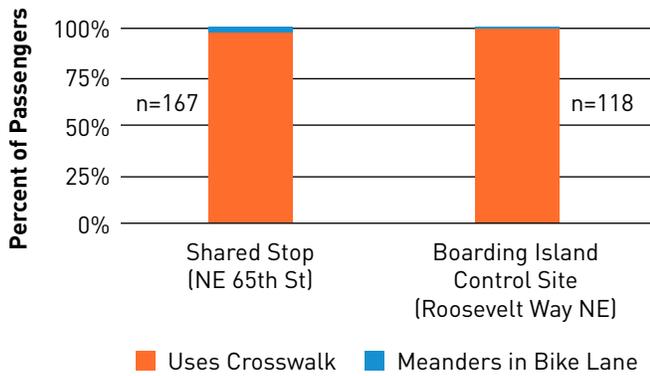


FIGURE 27: EXAMPLE OF PASSENGERS ALIGHTING DURING THE MORNING PEAK PERIOD (TOP) AND AFTERNOON PEAK PERIOD (BOTTOM)



Roosevelt High School Activity

Roosevelt High School is located one block north of the 14th Ave NE stop. The morning bell is at 8:45 a.m., and student arrivals were included in the morning peak period observations. However, dismissal is at 2:20 p.m. and therefore is outside the afternoon peak observations. To understand this afternoon peak period, SDOT watched additional video collected during the afternoon dismissal times.

Around 2:30 p.m. there were up to 30 students waiting for the bus at one time, resulting in some encroachment into the bike lane. These events only lasted a few minutes each and were focused in the 10-15 minutes after dismissal. No conflicts with bikes were observed during these times since it generally did not overlap with the peak for bike traffic.

FIGURE 28: EXAMPLES OF ROOSEVELT HIGH SCHOOL STUDENTS WAITING FOR A BUS AFTER DISMISSAL



Bus Ramp Deployment and Accessible Lift Operations

Since the 5-foot wide by 8-foot deep landing area overlapped with the bike lane area, observing the operation of a bus ramp deployment or accessible lift operation was of particular interest for SDOT and Metro. Unfortunately, no lifts were deployed during the peak period observations. SDOT reviewed many other hours of video outside the peak periods and was not able to see a lift deployment.

KING COUNTY METRO FEEDBACK

King County Metro's Safety Division keeps an inventory of incident reports by year and location. Overall, the average number of incident reports per year for the NE 65th St corridor decreased by 14% from an average of 4.7 per year before to 4.0 in 2019. No reports were related to the shared stops.

Metro also has not received customer or operator comments related to the shared stop design. In 2019, Metro received seven customer comments related to this section of NE 65th St, although those comments related to stop closures and service changes. There was only one operator-submitted report in 2019 regarding the placement of a bollard in the PBL on NE 65th Street approaching 8th Ave NE.

FIGURE 29: A PASSENGER BOARDS A BUS AT A SHARED STOP ALONG NE 65TH ST



CONCLUSION

The design changes to NE 65th St significantly reduced collisions and injuries and expanded access for people walking/rolling, biking, and riding the bus. The NE 65th St improvements resulted in:

- A significant reduction in collisions and injuries with no fatal or severe injury collisions after the design changes.
- An overall reduction in motor vehicle speeds along the corridor, including speeds at or below the new 25 mph posted speed limit on the east segment of the project.
- An increase in pedestrian and bike traffic.
- Slight increases in vehicle and transit travel times, although this increase is acceptable given the project's goal of improving safety through reducing speeds, collisions, and injuries.

The new shared transit stop design operated as intended with no reported operational or safety issues. This shows that the design can be successful at locations with lower volumes of bike traffic and moderate levels of passenger activity. It will be important to continue to monitor the operation of these designs when the North Link Roosevelt Light Rail Station opens and bike and passenger volumes increase.

These positive results directly support Seattle's Vision Zero efforts to end traffic deaths and serious injuries on city streets by 2030.



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