NE 45th St Bridge Protected Bicycle Lane Evaluation

NE 45th St from 8th Ave NE to Latona Ave NE

Contents

Background

Introduction

The Seattle Bicycle Master Plan calls for an eventual east/west connection between the Wallingford and University District neighborhood in Council District 4. As part of the Levy to Move Seattle, a line item was included to evaluate, design, and possibly implement potential bicycle and pedestrian crossing enhancements along the NE 45th St corridor ahead of the future opening of the U-District LINK Light Rail station located on Brooklyn Ave NE. A proposed bicycle facility on NE 45th St Bridge has been identified as a potential means to satisfy both interests. In March of 2020, Councilmember Pedersen officially requested that Seattle Department of Transportation (SDOT) evaluate a community proposed concept for a package of bicycle and pedestrian improvements to this corridor.

Project goals

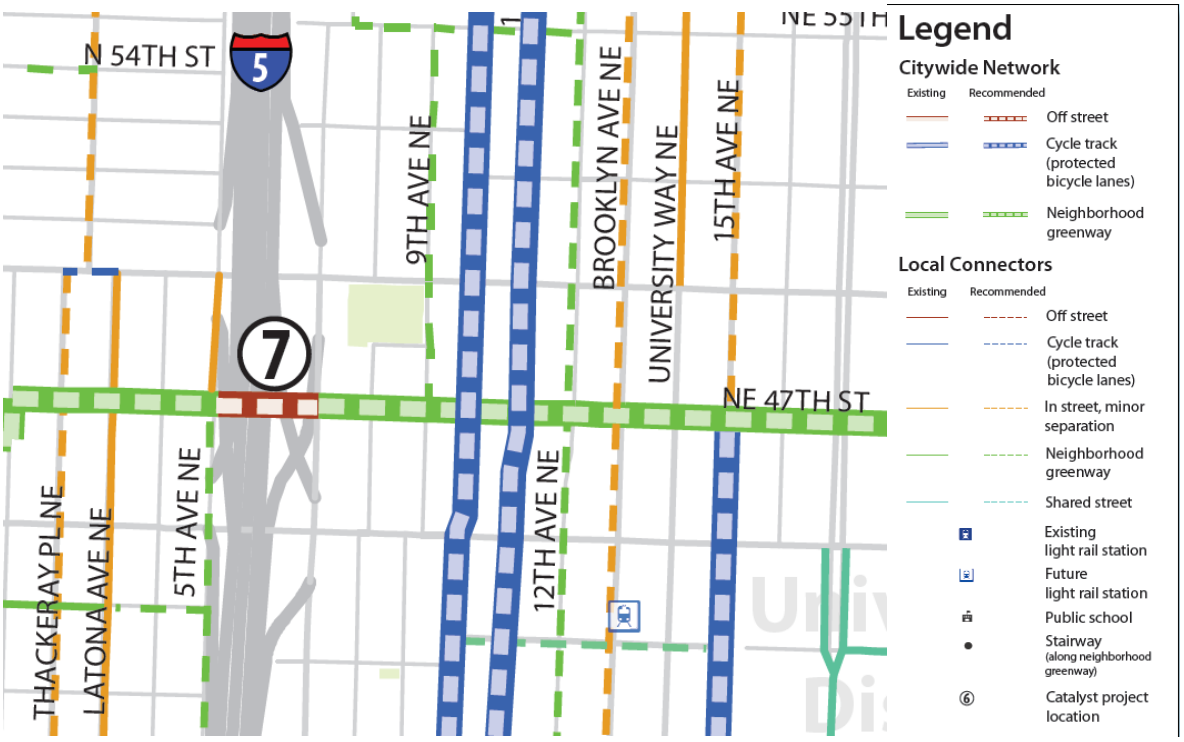
- Produce a concept level design for bicycle and pedestrian crossing enhancements based on the proposal provided by District 4 advocates.
- Produce a concept level cost estimate for potential crew-delivered implementation of said design.
- Produce traffic flow models for the NE 45th St corridor based on the proposed changes.
- Outline potential conflicts and opportunities with other stakeholder agencies, namely King County Metro (KCM) and Washington State DOT (WSDOT).
- Provide an informational package to all stakeholder groups.

Data

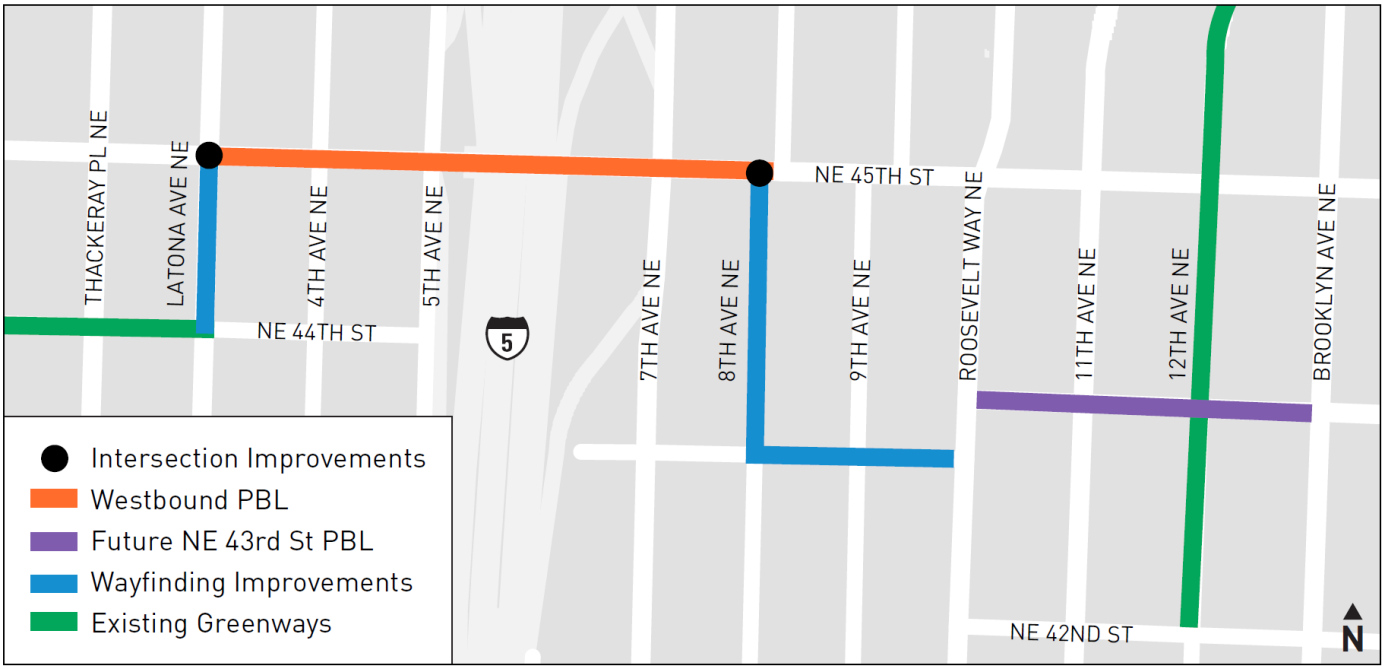
Item	Description
Project/study limits	NE 45th St from Roosevelt Way NE to Thackeray Pl NE
Roadway classification	Principal arterial
Adjacent land uses	• Multi-family residences • Commercial/Mixed Use • State ROW - Interstate Freeway
Speed limit	25 mph
Transit service	NE 45th St: • Routes 44, 810, 821, 855, 860, 871, and 880 7th Ave NE: • Routes 64, 301, 355, 512, 810, 821, 855, 860, 871, and 880 • LINK Light Rail station planned for Brooklyn Ave NE
Average daily traffic	2018 Flow Counts: • 33,000 AWDT (NE 45th St Bridge) • 27,000 AWDT w/o 5th Ave NE
Speeds	At 130th e/o Ashworth (2018) • 50th Percentile: 35.7 mph • 85th Percentile: 40.4 mph
Parking utilization	N/A
5 year collision history (2015-2019)	Total # of collisions - 205 # of injuries - 61 # of serious injuries - 3 # of fatalities – 0
Outreach	N/A – Concept Design Only
Other considerations	• Coordination with WSDOT at I5 • Coordination with KCM at existing stops • Minor Freight Route

Reference Graphics

2013 Bicycle Master Plan



Project Extents and Proposed Scope



Proposed NE 45th St Bridge Bicycle/Pedestrian Improvements

Initial Proposal

- Install westbound PBL from 8th Ave NE to Latona Ave NE/Thackeray Pl NE.
- Install eastbound minor separation bicycle lane from Thackeray Pl NE to 5th Ave NE.
- Implement bicycle and pedestrian wayfinding from 8th Ave NE to U-District LINK Light Rail station at Brooklyn Ave NE and NE 43rd St. Wayfinding route would be via 8th Ave NE and NE 43rd St at the request of applicants and CM Pedersen.
- Implement bicycle wayfinding from PBL termination points to proximate neighborhood greenways and other bicycle facilities.
- Install green bike boxes for bicycle turning movements along corridor.
- Install a physical barrier or buffer between eastbound travel lanes and the south sidewalk of the NE 45th St Bridge.
- Removal of two-way center turn lane on NE 45th St between 7th Ave NE and 8th Ave NE.
- Improve bicycle and pedestrian crossing experience at all intersections along corridor.

Constraints

- Channelization scope limited to Signs and Markings labor.
- Lane widths to be maintained at standard specifications to ensure limited impacts to freight and transit operations on NE 45th St. Includes turning radii for transit, light freight, and heavy freight operations at the intersections of 5th Ave NE and 7th Ave NE.
- Mitigation of impacts to Interstate 5 offramp operations to be heavily prioritized.

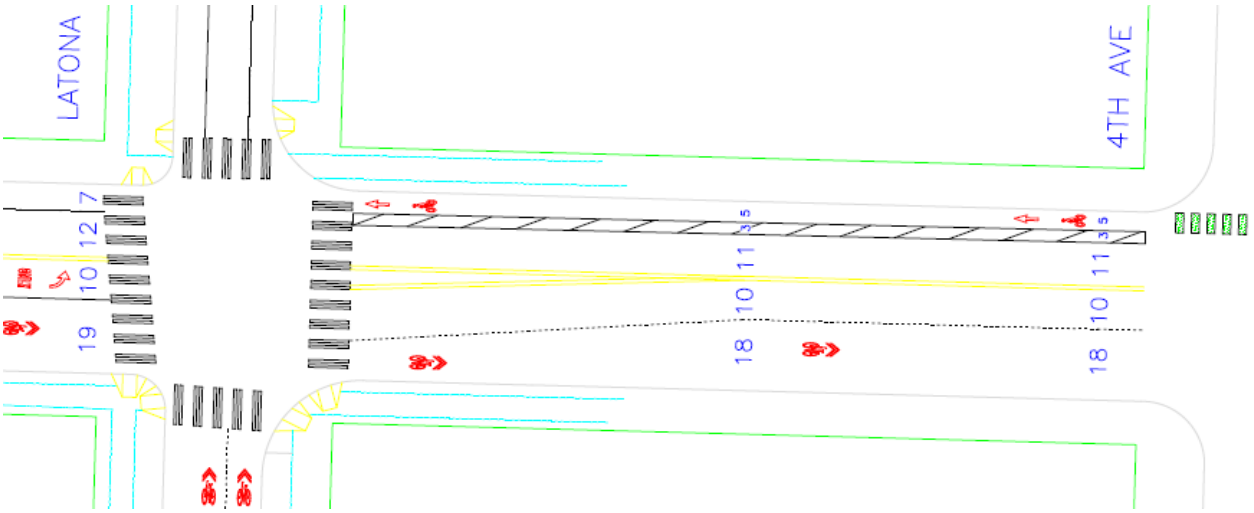
Resolutions

- Westbound PBL is determined feasible from 8th Ave NE to Latona Ave NE. While separation would be dropped at applicable driveways and Metro bus stops, protection would be complete throughout extents without impacts to parking. Potential to extend west to Thackeray Pl NE pending approval to remove parking along this block.
- Eastbound bicycle lane from Thackeray PL NE to 5th Ave NE is determined to be **infeasible**. Due to the available curb-to-curb ROW on NE 45th St between 4th Ave NE and 5th Ave NE, an entire eastbound lane of travel would have to be removed in order to accommodate a bicycle lane. For safety reasons, the hatched median would not be available for eastbound vehicle travel as the eastbound centerline on the west leg of 5th Ave NE must match up with that on the east leg.
- Wayfinding would be feasible on the east and west extents of the proposed project. It is noted that eastbound bicycles and pedestrians would have to make a northbound movement to cross Roosevelt Way NE on NE 43rd St. There is currently no scope for a counterflow bicycle connection at this location, so bicycle users would have to use pedestrian facilities to continue on to the U-District LINK Light Rail station.
- A physical barrier along the south curb of the NE 45th St Bridge is feasible, though only with concessions to lane widths and freight turning movements on both ends of the bridge. Implementation would require shifting stop bars at both west and east ends of bridge lanes to accommodate turning vehicles, thereby reducing available queueing lengths.
- Rechannelization of NE 45th St east of 7th Ave NE is feasible, may require freight to operate only in curb lanes due to reduced inside lane widths and minimum median strip width.

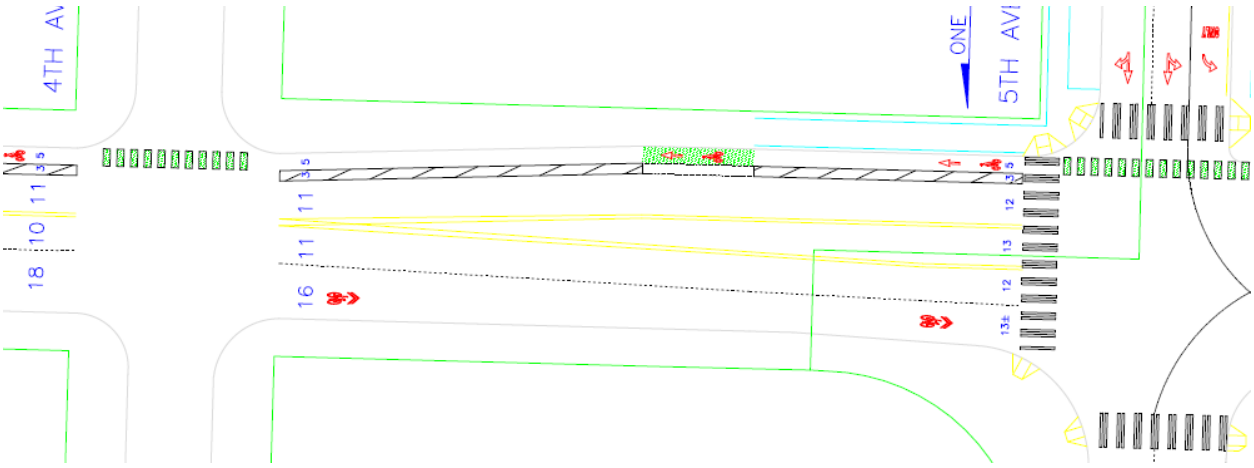
Concept Design

Protected Bicycle Lane

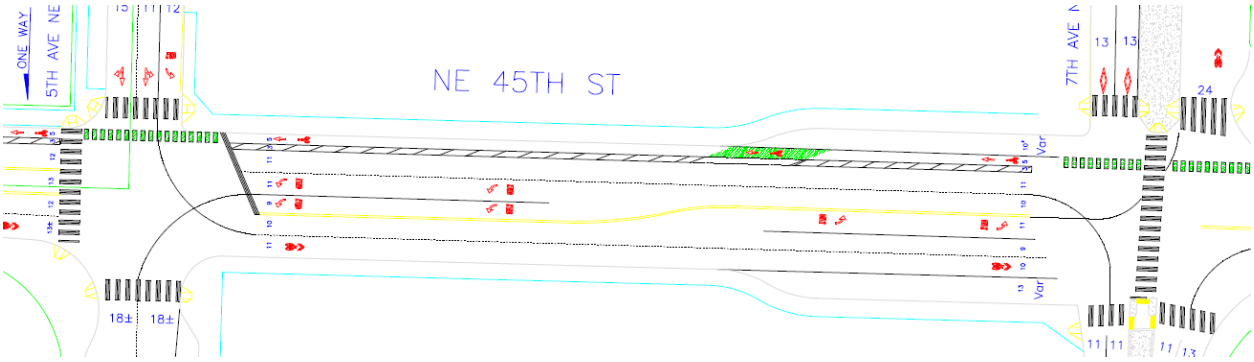
Concept A – Westbound PBL, no Eastbound barrier



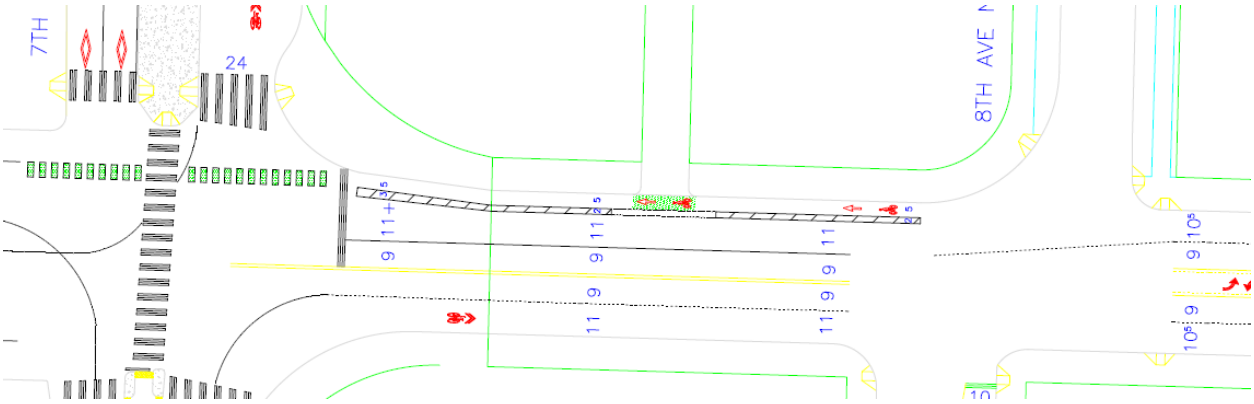
CAD channelization – Latona Ave NE to 4th Ave NE



CAD channelization – 4th Ave NE to 5th Ave NE (no signs/legends at location)

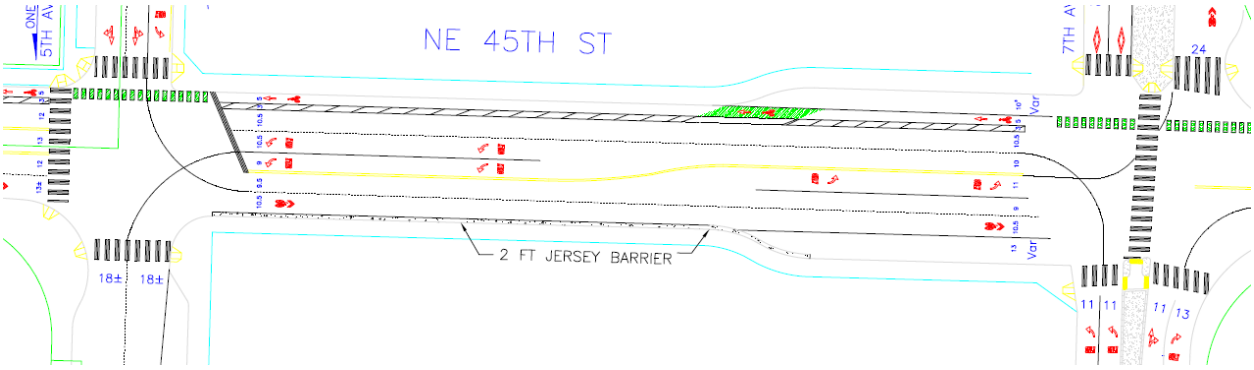


CAD channelization – 5th Ave NE to 7th Ave NE (no signs/legends at location)



CAD channelization – 7th Ave NE to 8th Ave NE

Concept B – Westbound PBL, Eastbound Jersey/Zipper Barrier



CAD channelization – 5th Ave NE to 7th Ave NE

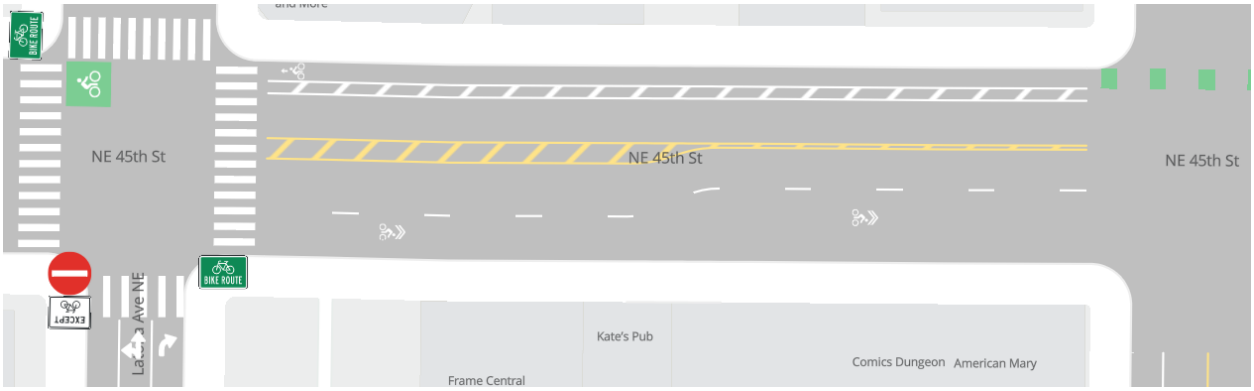
Standard Line Specifications

Channelization striping is determined by the City of Seattle's Standard Specifications (8-22 PAVEMENT MARKINGS):

- L-1T double 4" solid yellow stripe with 4" gap for median centerline markings.
- L-5AT 4" 10'/20' dashed white stripe for lane lines.
- L-5C 4" 2'/4' dashed white stripe for crossing gaps in PBL buffer or intersection guidelines.
- L-6AT 4" solid white stripe for turn lanes.
- L-6B 6" solid white stripe for PBL buffers and hatching.
- L-8B 24" solid white stripe for arterial stop bars
- L-28AT bike with arrow legend for PBLs and driveway treatments.
- L-GRNT variable green markings for PBL crossbikes and driveway treatments.

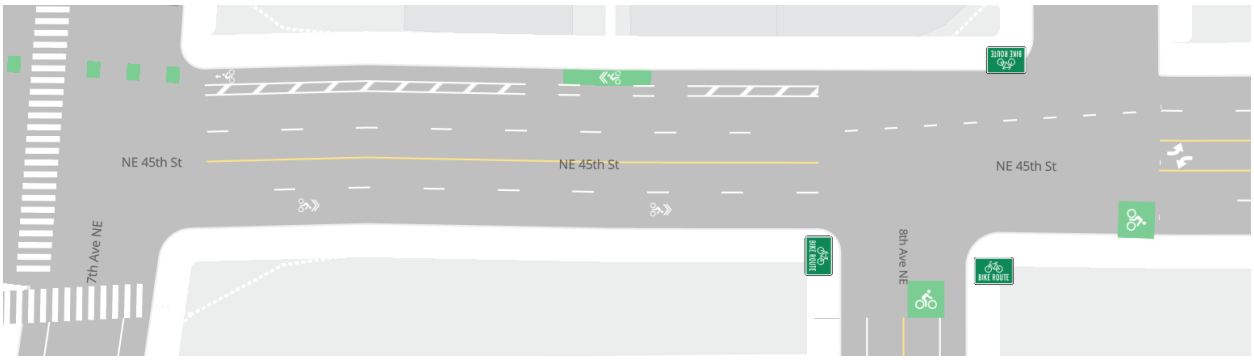
Wayfinding

NOTE: All wayfinding signs will be of the standard M1-8A-[X] or D1-[X] style wayfinding signs. These can be custom designed with specific destinations noted or with frequent destination types (e.g. Neighborhood Greenways) to be determined at a later date.



Remix signs and legends – Latona Ave NE to 4th Ave NE

Westbound bicycle riders will be given wayfinding to connect to the Wallingford Neighborhood Greenway on N/NE 43rd St. The south leg of the intersection will be brought to standards with a north-facing R5-1 and R5-100 "DO NOT ENTER – EXCEPT BICYCLES" couplet of signs. Westbound far-side bike box will be available for two-stage left turns. May require a secondary APS button for bicycles to activate the crossing signal. Cyclists who would prefer to not ride southbound on the sidewalk are able to merge into westbound traffic and make a left at Thackeray Pl NE as they would currently.



Remix signs and legends – 7th Ave NE to 8th Ave NE

Bicycle riders arriving from the north will be presented with wayfinding on westbound NE 45th St to Wallingford. Northbound bicycle riders will be presented with the same wayfinding, along with a bicycle box for left turn queueing at the stop bar. Eastbound bicycle riders will have wayfinding signage for the outlined 8th Ave NE to NE 43rd St route to the U-District LINK Light Rail Station. Other locations may be identified as well. Eastbound left turn bike box will be present for a two stage left turn as needed.

Remix signs and legends – Roosevelt Way NE and NE 43rd St

Eastbound bicycle riders on NE 43rd St will be given wayfinding signs guiding them northbound on the west sidewalk on Roosevelt Way NE. Northbound bicycle riders will be given the same wayfinding as southbound bicycle riders on Roosevelt Way NE to use the north crosswalk to connect to NE 43rd St eastbound. A planned NE 43rd St PBL will continue wayfinding to the U-District LINK Light Rail Station. No contraflow bicycle facility was evaluated on this portion of Roosevelt Way NE as marked crosswalks are currently not warranted at this intersection.

Complete Channelization is included as Exhibit A. Wayfinding reference can be accessed on the Remix website platform using this link.

Turning Radius Modeling

Rechannelization of the NE 45th St Bridge was initially noted as a potential impact to freight turning movements off of the Interstate 5 off-ramps located at either end of the NE 45th St Bridge. As both turns are dual lefts, it was deemed essential to ensure that turning freight did not significantly impact operations of off-ramps so as not to directly impact highway throughput or signal operations. As such, both concepts described above were modeled for freight turning movements to identify conflict points. The following constraints were included in the turning radius modeling presented below:

- Transoft AutoTurn was used to model ideal turning radii at the intersections of 5th Ave NE and 7th Ave NE.
- Turning models were created for the following freight vehicles:
    - SU-30: Box truck (common)
    - SU-40: Extended box truck (common)
    - WB-62: Large freight (uncommon)
    - WB-67: Extended large freight (very uncommon)
- Turning models were created with the following movements restricted:
    - Turning vehicles were not allowed to oversteer into adjacent through lanes.
    - Turning vehicles were not allowed to encroach over curbs and/or barriers.
- The following results were possible:
    - **SUCCESS** – turning vehicles do not encroach on curb line, adjacent turn lanes, or cross over median centerlines.
    - **CHANN FIX** – turning vehicles cannot make turns without encroaching on adjacent turning vehicle paths. Stop bars to be modified to accommodate.
    - **QUEUE FIX** – turning vehicles must cross over existing median centerline to not encroach onto curb or adjacent turn lane. Turning freight will have to be assigned to specific turn lanes from off-ramps or will be required to take both turn lanes to safely exit freeway.
    - **FAIL** – Turning vehicles cannot make left turns without significantly encroaching over curbs or crossing over centerline median. Shifting of stop bars would be detrimental to turn pocket storage to the point that corridor or off-ramp operations were anticipated to significantly deteriorate.

RESULTS

Vehicle	Concept A	Concept B
SU-30	SUCCESS	CHANN FIX
SU-40	CHANN	QUEUE
WB-62	QUEUE	FAIL
WB-67	QUEUE	FAIL

AutoTurn graphics included in Exhibit B.

Recommendation that stop bars be readjusted to accommodate turning movements of SU-30 and SU-40 turning freight as needed. Require WSDOT approval to implement any changes to off-ramp cross sections or operations to accommodate any larger freight turning movements.

Traffic Modeling Results

Using 2018 AM and PM peak hour volumes, the proposed PBL design was modeled for traffic impacts to general transportation operations along the NE 45th St corridor. Synchro Traffic Model was used to evaluate general changes to delays and Level of Service (LOS) for operations along the NE 45th St corridor. Vissim Traffic Model was used to evaluate queueing lengths, delays, and LOS for all signalized intersection approaches (including Interstate 5 off-ramps).

The traffic model proposes the following caveats to operate completely:

- Due to the removal of a westbound lane at NE 45th St and 4th Ave NE, westbound vehicle left turns are recommended to be restricted to maintain throughput.
- Similarly, eastbound vehicle left turns at NE 45th St and 8th Ave NE are recommended to be restricted due to the removal of the two-way center turn lane.
- Presumes that post-Northgate LINK transit operations are in effect.

Traffic modeling for both Synchro and Vissim models concluded the following:

- General traffic operations along the corridor are maintained or otherwise not exacerbated by the implementation of a proposed westbound PBL between 8th Ave NE and Latona Ave NE.
- Modifications to channelization at the intersection of NE 45th St and 4th Ave NE drop Level of Service (LOS) from C to E in the AM peak and from D to F in the PM peak if vehicular left turns are not restricted. In order to mitigate this change, the aforementioned westbound left turn restriction is proposed at this location.
- Queueing lengths at the Latona Ave NE and 7th Ave NE intersections are expected to effectively double during the PM peak, with the latter extending beyond Roosevelt Way NE for westbound vehicular traffic.
- Proposed modifications will increase queue lengths and/or delays to off-ramp operations during the PM peak period.

The complete Traffic Modeling memo is included as Exhibit C.

Concept Level (10%) Cost Estimate

Based on the proposal as shared, SDOT estimates that this project will incur the following costs associated with planning, design, outreach, and implementation. This is a concept-level cost estimate and should not be used for final cost estimation purposes.

- Planning: $10,000+
- Design: $35,000+
- Outreach: $25,000+
- Implementation:
    - Markings: $25,000
        - ~1400 LF L-1T
        - ~1250 LF L-5AT
        - ~600 LF L-5C
        - ~750 LF L-6AT
        - ~2725 LF L-6B
        - ~11 x L-28AT legends
        - ~1150 sqft L-GRNT
        - 3 L-GRNT bike boxes (size TBD)
    - Signs: $5,000
    - Hardscaping: $15,000
        - ~350 LF jersey barrier
    - Labor: $25,000 (straight time – no OT)
    - SPD Traffic Control: TBD
- Pavement improvements*: TBD
- Signal modifications*: TBD

*Potential need for relocation of loop detectors and/or traffic signal heads at 5th Ave NE and 7th Ave NE. UW MICMA project includes improvements at both signals but does not include any required work caused by rechannelization.

Interagency Coordination

Seattle Department of Transportation (SDOT)

Route 44 Transit-Plus Multimodal Corridor (R44TPMC)

- SDOT, in coordination with King County Metro, is implementing multimodal improvements to the Route 44 corridor. This route operates along the entirety of NE 45th St as evaluated in this proposal. Traffic signal modifications as presented by the R44TPMC project do not currently take into account the modified cross sections or operations as identified in this PBL proposal.
- R44TPMC models currently show that significant modifications to off-ramp signals at 5th Ave NE and 7th Ave NE result in queues spilling back onto Interstate 5.

University of Washington Multimodal Integrated Corridor Mobility for All (UW MICMA)

- SDOT Signal ITS, in conjunction with the University of Washington, has outlined a series of improvements to signal operations in the University of Washington subarea of the City of Seattle. This includes NE 45th St from 5th Ave NE east.
- Improvements included in the UW MICMA project include improved crossing timing for bicycle and pedestrians, Leading Pedestrian Intervals, and expansion of Accessible Pedestrian Signal buttons. All improvements may be considered germane improvements per the Levy.

King County Metro (KCM)

- Multiple active and deadhead bus coaches turn at both the 5th Ave NE and 7th Ave NE intersections. Lane widths have been adjusted to accommodate these. SDOT has modeled traffic operations including transit operations throughout the corridor.
- King County Metro operates two bus stops along NE 45th St Bridge. Transit operations at these stops would encroach on a westbound PBL. These stops were evaluated for potential closure and were selected for continued operation. Both stops will be re-evaluated for continued operation as part of the future North Link efforts. Closure of these stops would require changes to the PBL concept design as shared.
- KCM operates routes along the NE 45th St corridor using overhead catenary trolley wires. KCM standards preclude bicycle or pedestrian facilities underneath active trolley wires for safety reasons. As such, implementation of a westbound PBL on NE 45th St would require relocation of overhead trolley wires and associated support infrastructure for the entirety of the adjusted corridor. A concept-level cost estimate of trolley wire adjustments is included as Exhibit D

Washington State Department of Transportation (WSDOT)

- NE 45th St Bridge, a raised structure operating over Interstate 5, is a WSDOT asset operated and maintained by SDOT. WSDOT requires a project submission for review and approval for any changes to channelization on their structures.
- The traffic signals at 5th Ave NE and 7th Ave NE are WSDOT assets operated and maintained by SDOT. WSDOT requires a project submission for review and approval for any changes to off-ramp signal operations or phasing.
- WSDOT has been notified of the proposed PBL concept design and desire for feedback. No response has been received at this time.