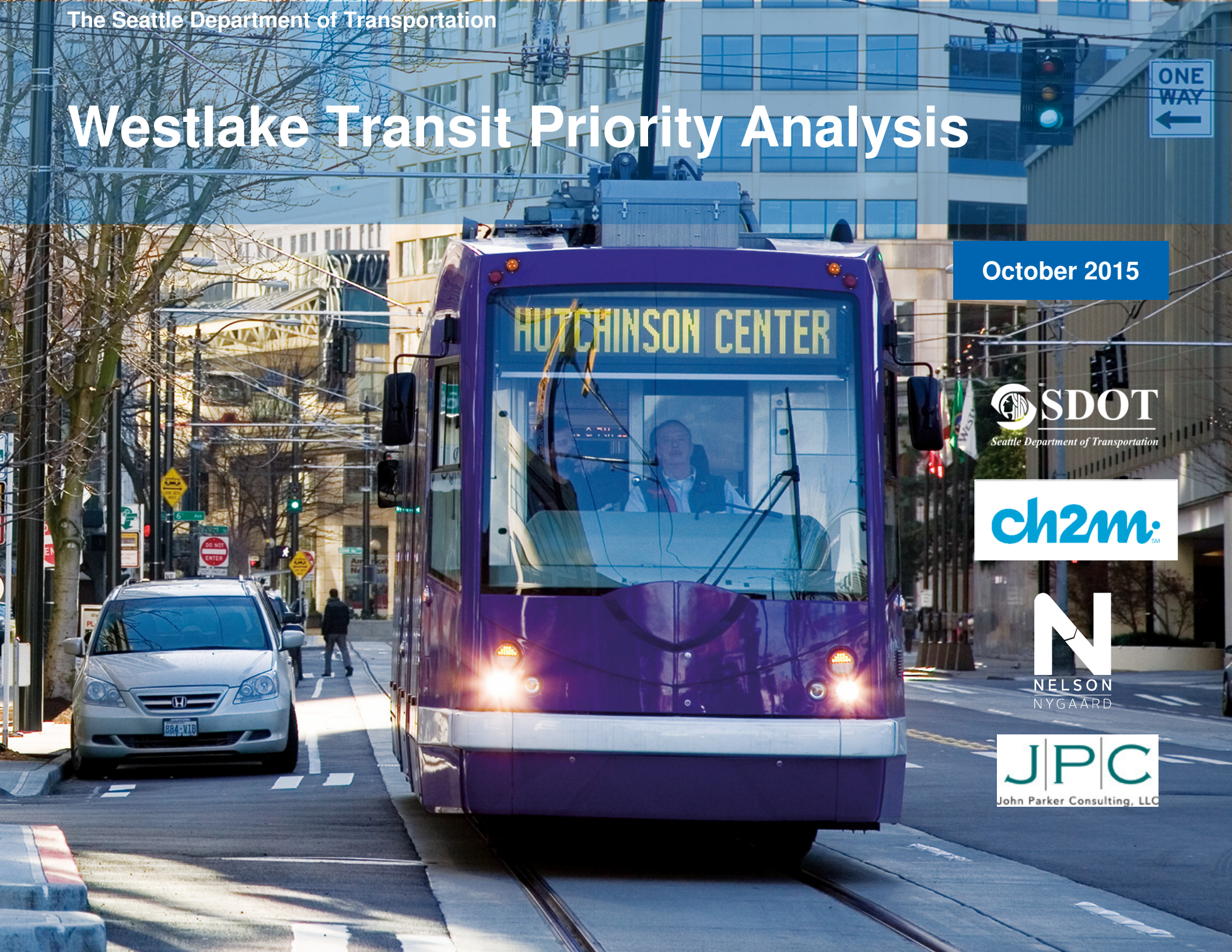
The Seattle Department of Transportation

Westlake Transit Priority Analysis

October 2015



SDOT
Seattle Department of Transportation

ch2m

NELSON NYGAARD

JPC
John Parker Consulting, LLC

Contents

1 Introduction **1**
2 Study Background **1**
3 Study Alternatives **2**
3.1 Business Access and Transit (BAT) Lane Alternative 3
3.2 BAT/Transit Lane Alternative 4
3.3 Transit Lane Alternative 5
4 Initial Screening **8**
5 Alternative Evaluation **9**
5.1 Criteria Definition 9
5.2 Evaluation Results 10
6 Findings and Next Steps **21**

Appendices

A King County Metro Route 40 Design Drawings

B Evaluation Criteria Methods and Assumptions

C Evaluation Data and Results (in progress)

D BAT/Transit Lane Alternative (Option A) Conceptual Drawing

1 Introduction

The City of Seattle (City) is studying the feasibility of improving transit service in South Lake Union. With recent and planned development densifying this area as a robust place to work, live and play, the desire to reliably serve the area with transit is heightened. With traffic congestion in the South Lake Union area continuing to get worse, providing reliable transit service will provide people with a competitive travel choice and likely improve transit ridership.

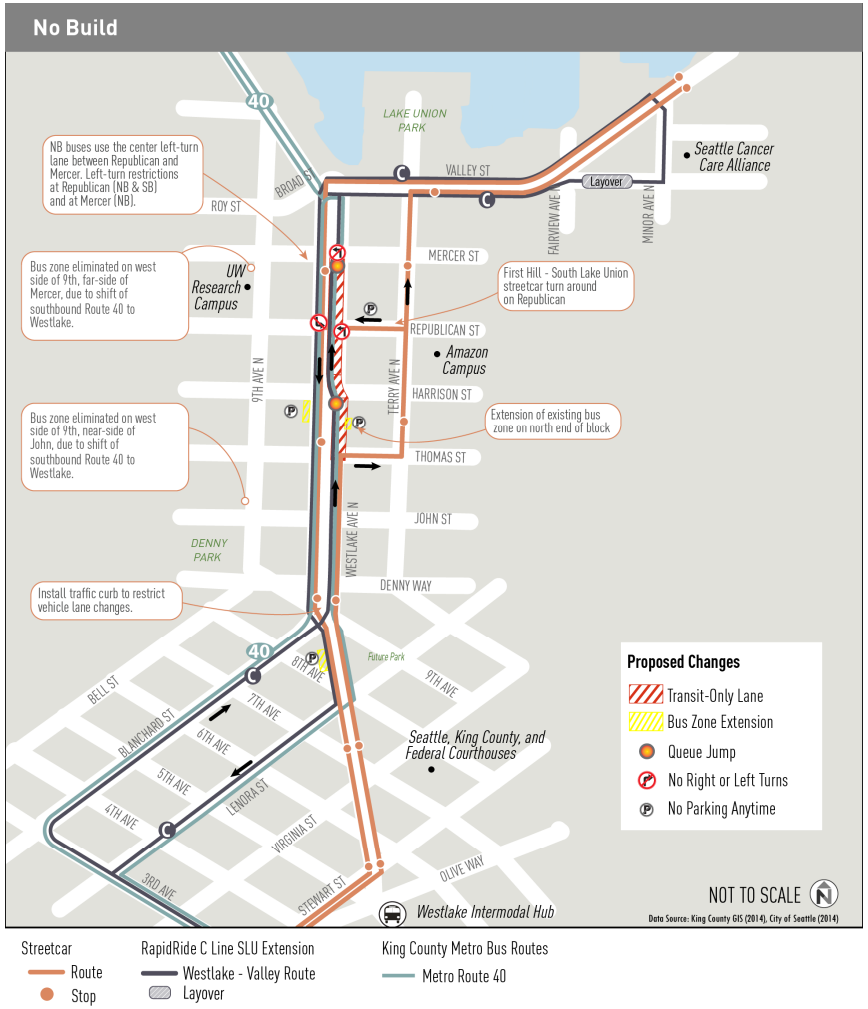
This report summarizes the transit alternatives considered on Westlake Avenue, the two-step evaluation that included an initial screening and then a more rigorous evaluation to identify a preferred alternative and next steps. This report also includes conceptual drawings of the alternatives as well the methods and assumptions that were developed as part of the evaluation.

2 Study Background

The study is focused on evaluating improvements to the transit service along Westlake Avenue between the Westlake Intermodal Hub and South Lake Union. As part of the study, specific near-term transit service changes and improvements are already being implemented by King County Metro (KCM) and the City of Seattle by spring 2016. The study area and future transit services are shown on Figure 1, which include the following:

- Extension of the Rapid Ride C-Line, via Lenora/Blanchard, along Westlake Avenue to a northern terminus at the intersection of Fairview Avenue N/Aloha Street.

Figure 1 Proposed Year 2018 Transit Service



- Center City Connector (CCC) Streetcar Line would have a northern turnaround at Westlake Avenue N/Republican Street. This will result in streetcar headways of 5 minutes on Westlake Avenue N between Stewart Street and Republican Street.
- The southbound path of Route 40 would move from 9th Avenue N over to Westlake Avenue N so that both directions operate on Westlake Avenue. Northbound bus queue jumps on Westlake Avenue N at Harrison Street and Mercer Street designed to improve KCM Route 40. Northbound buses would use the center left-turn lane between Republican Street and Mercer Street to bypass general purpose (GP) congestion in the right lanes approaching Mercer Street. Left-turn restrictions would be required at Westlake Avenue N/Republican Street for both northbound and southbound directions and at Westlake Avenue N/Mercer Street in the northbound direction. Refer to Appendix A for a depiction of the KCM Route 40 improvements.
- Extensions of three bus zones along Westlake Avenue. These three would be located at the northbound curb between Thomas Street and Harrison Street, the southbound curb between those streets, and either the southbound curb south of John Street or the southbound curb south of Blanchard Street. In addition, two bus zones on the west side of 9th Avenue N (far side of Mercer Street and near side of John Street) would be no longer needed with the Route 40 moving to Westlake Avenue and could be repurposed as additional parking spaces.

In addition to these transit service improvements, various spot improvements have been recently built or are in design and would be built prior to this project. These improvements are:

- Fairview/Valley intersection – sign and paint "Don't Block the Box Treatments" in the intersection so the streetcar can proceed through the intersection during its signal phase.
- Westlake/Denny intersection Signal/Curb/Ped flow Improvements. Provide a curb between the northbound streetcar lane and the inside travel lane so vehicles are not able to drive around a streetcar that is stopped at its station. Also provide an exclusive northbound right turn signal phase that does not conflict with the east leg pedestrian crossing.

These improvements were assumed as part of the No-Build condition for comparison to the study alternatives described in the Section 3.

3 Study Alternatives

Three build alternatives were developed for this study: BAT Lane, BAT/Transit-Lane, and Transit Lane. Two variations of the BAT/Transit-Lane Alternative and two variations of the Transit-Only lane alternative were developed. In the No-Build condition, additional and new transit service will be provided along Westlake Avenue between Downtown Seattle and South Lake Union. These service changes and improvements are described in Section 2. The three build alternatives consider different levels of transit treatments to support the new transit service occurring in the No-Build condition.

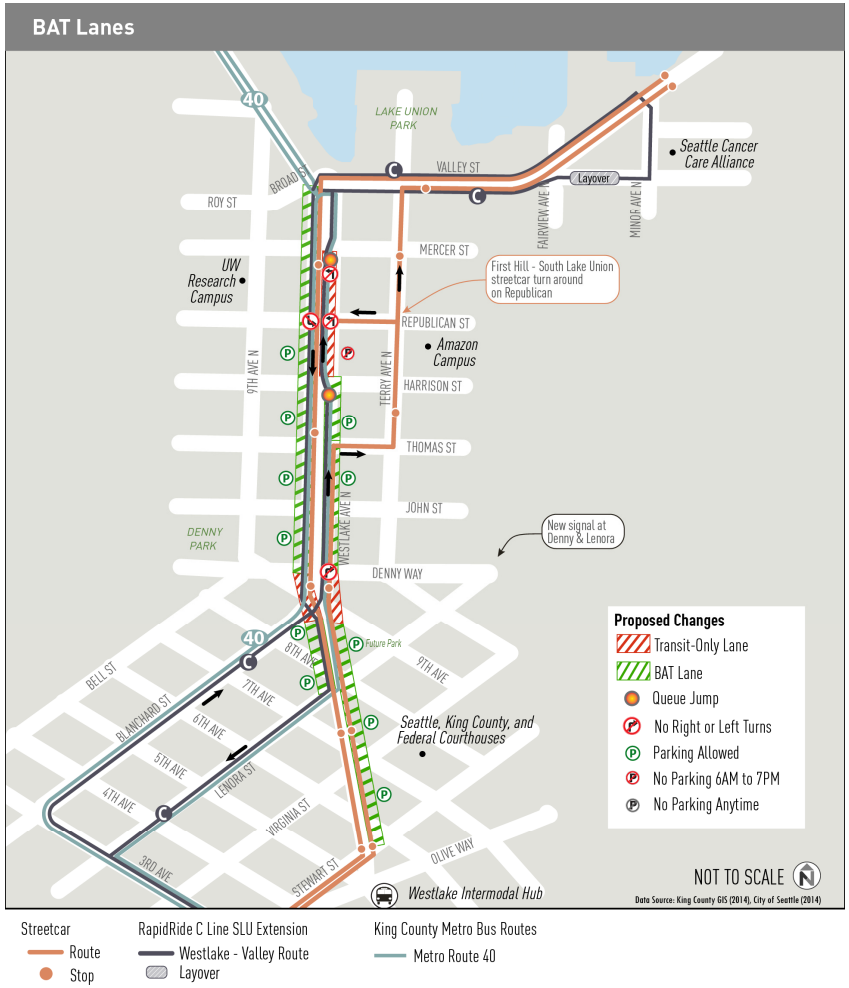
3.1 Business Access and Transit (BAT) Lane Alternative

The BAT Lane Alternative would:

- Convert the curbside GP lane on Westlake Avenue N to a (BAT) lane. The northbound direction would include a BAT lane between 6th Avenue and Harrison Street, while the southbound direction would include a BAT lane between Valley Street and 8th Avenue/Lenora Street. The exception to this would be the northbound block between 9th Avenue/Blanchard Street and Denny Way, which would have GP right-turns restricted. A new signal would be installed at the intersection of Denny Way/Lenora Street to accommodate northbound trips on Westlake traveling eastbound on Denny Way.
- Northbound buses on Westlake Avenue N would use the northbound queue jump phases at Harrison Street and Mercer Street (similar to the No-Build Alternative).
- This alternative would optimize access along Westlake Avenue for general purpose right-turn movements and parking would be restricted between the hours of 6:00–9:00 a.m. and 3:00–7:00 p.m.

Refer to Figure 2 for the depiction of the BAT Lane Alternative.

Figure 2 BAT Lane Alternative



3.2 BAT/Transit Lane Alternative

The BAT/Transit Lane Alternative is similar to the BAT Lane Alternative, with the following exceptions:

- Thomas Street between Westlake Avenue and Terry Avenue would be converted to one-way westbound for auto vehicles to allow for an exclusive eastbound streetcar lane. Parking on the south side of Thomas Street would be permanently removed.
- Republican Street between Westlake Avenue and Terry Avenue would be converted to one-way eastbound for auto flow to allow for an exclusive westbound streetcar lane. Parking on the north side of Republican Street would be permanently removed.[1]
- The northbound curb lane on Westlake Avenue between Blanchard Street/9th Avenue and Harrison Street would be converted to a transit-only lane with right-turns restricted at Denny Way[2], Thomas Street, and Harrison Street. The block between Denny Way and John Street would be a BAT lane with northbound right-turns allowed. A northbound bus queue jump would be provided at Harrison Street, and auto right-turns would be allowed at John, Republican, and Mercer Streets.
- The southbound curb lane on Westlake Avenue would be converted to a transit-only lane between Valley Street and Republican Street[3], with right-turns restricted at Mercer Street and Republican Street. In addition, the southbound block between Harrison Street and Thomas Street and between Denny Way and Blanchard Street/ 9th Avenue would also be converted to a transit-only lane, with right-turns restricted at Thomas Street. Southbound right-turns would be allowed at Broad, Harrison, John Streets, and Denny Way. Also, the southbound curb lane would be a BAT lane between Blanchard Street/9th Avenue and Lenora Street.
- This alternative is more restrictive of right-turns along Westlake Avenue than the BAT Lane Alternative but parking would be retained along street blocks designated for a BAT lane while restricting parking between 6:00 a.m. and 7:00 p.m. along blocks designated for transit-only lanes to provide reliable transit performance.
- A new signal would be installed at the intersection of Denny Way/Lenora Street to accommodate northbound trips on Westlake traveling eastbound on Denny Way (due to the restriction of northbound right turns at the intersection of Westlake Avenue and Denny Way).[2]

---

1 Based on discussions with stakeholders, SDOT will delay this modification and maintain the current two-way auto flow pattern on Republican Street. The one-way assumption is documented to provide a conservative analysis of impacts in the South Lake Union area.
2 The Westlake Avenue/Denny Way improvements will be phased and the initial improvements are to convert the northbound curb lane between 9th Ave/Blanchard and Denny Way to a BAT lane, maintain the northbound right-turn movement and restrict the northbound left-turn. The northbound right-turn restriction and new signal at Denny Way/Lenora Street will be deferred to a later date.
3 Based on discussions with stakeholders, SDOT will convert the southbound curb lane between Mercer Street and Republican Street to a BAT lane to maintain property access and maintain the southbound right turn at the Westlake Avenue/Republican Street intersection.

- The northbound approach at the intersection of Mercer Street and Terry Avenue would be modified to create approximately 150 feet of transit-only lane on the left curb lane restricting autos from using this lane during peak congested periods. Approximately six parking stalls would be removed to accommodate this transit-only lane. In addition, the northbound through movement for autos would be restricted; eliminating the need for an exclusive northbound streetcar phase.

Figure 3 depicts the BAT/Transit Lane Alternative, Option A.

Through the evaluation, an option for the BAT/Transit-Only Lane Alternative was developed that would restrict southbound general purpose auto traffic from crossing Denny Street at Westlake Avenue. This would require southbound through traffic to turn beforehand and use another street, such as 9th Avenue, to cross Denny. Transit, in the southbound direction, would still be able to cross Denny. The remaining auto movements allowed would be the northbound through movement as well as both the northbound and southbound left-turns and right-turns. This option is described as Option B and is shown on Figure 4.

3.3 Transit Lane Alternative

Two options for a Transit Lane Alternative were considered. The first option would retain two-way auto flow on Westlake Avenue and the second option would create a one-way northbound auto flow on Westlake Avenue and one-way southbound auto flow on 9th Avenue. In both options, two-way transit would operate on Westlake Avenue. With these two options specific features include the following:

Figure 3 BAT/Transit Lane Alternative, Option A

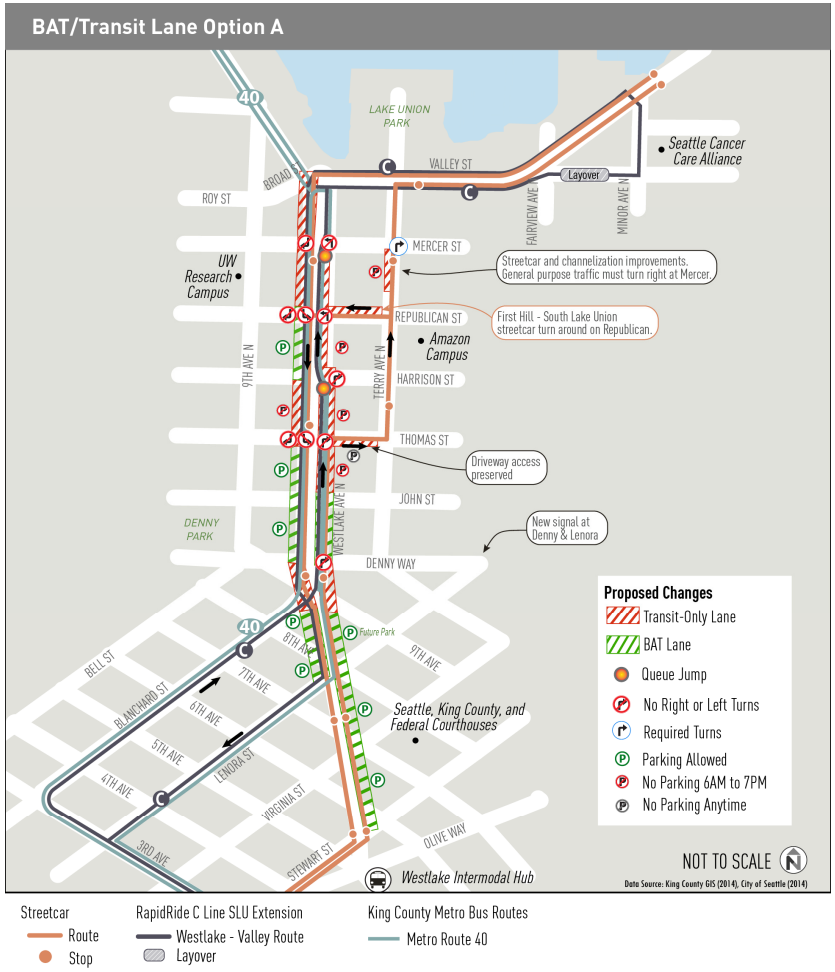
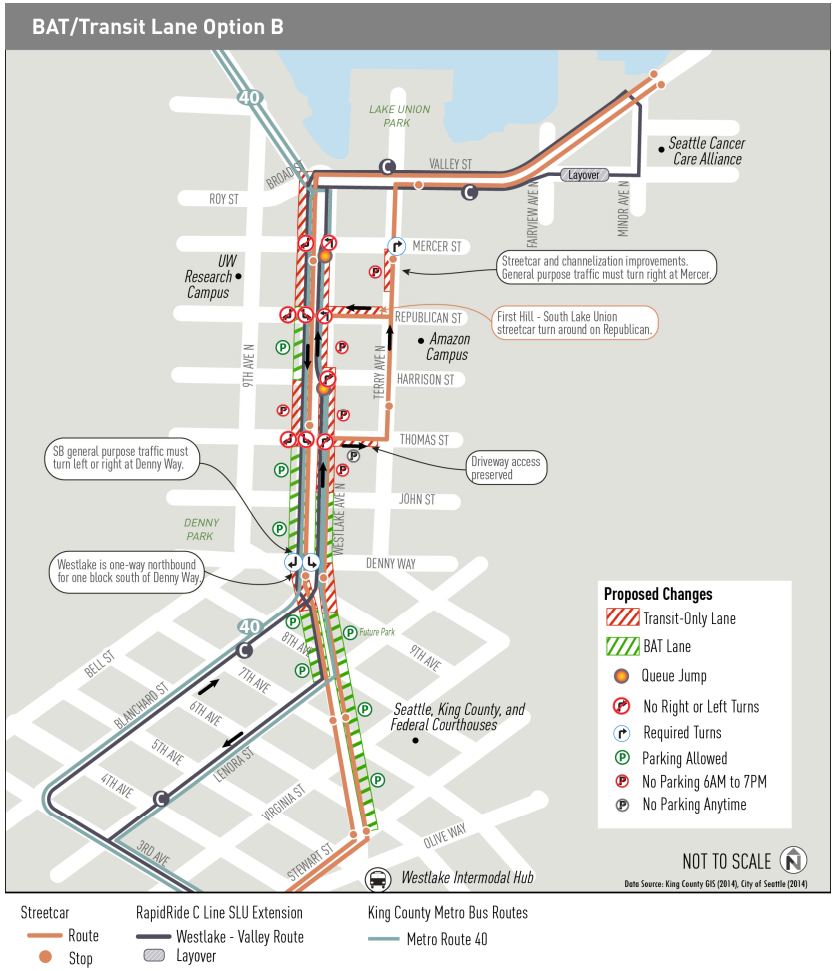


Figure 4 BAT/Transit Lane Alternative, Option B



General Transit Elements:

- The southbound curb lane on Westlake Avenue would be converted to a transit-only lane between Valley Street and Virginia Street.
- The northbound curb lane on Westlake Avenue would be converted to a transit-only lane between Virginia Street and Harrison Street, with the transit lane transitioning to use the middle lane of Westlake Avenue for buses to travel through the intersections at Republican Street and Mercer Street. This would maintain the curb lane for auto right-turns onto Mercer Street.
- This alternative would potentially restrict parking along all transit-only lane segments of Westlake Avenue between 6:00 a.m. and 7:00 p.m. to provide reliable transit performance. There would be no parking restrictions along BAT lane segments.

Two-Way Auto Option:

- The current two-way auto flow would be retained on Westlake Avenue. Generally both directions of Westlake Avenue would have one general auto lane and one transit-only lane along the curb. In the northbound direction this configuration occurs from 6th Avenue in the south to Harrison Street to the north; the southbound direction would have this configuration from Mercer Street in the north to Lenora Street/8th Avenue to the south. Left and right-turns from Westlake Avenue to cross streets would be allowed from the one auto lane, while buses and streetcars

in the transit-only lane would operate in an exclusive signal phase concurrent with pedestrian crossings.

- A northbound bus queue jump would be provided at Harrison Street, and auto right-turns would still be allowed at Republican Street, and Mercer Street, similar to the BAT/Transit Lane Alternative.
- Thomas Street eastbound and Republican Street westbound between Westlake Avenue and Terry Avenue would be converted to transit-only lanes, similar to the BAT/Transit Lane Alternative.

<u>One-Way Auto Option:</u>

- Change north-south traffic flow to a one-way couplet of Westlake Avenue N (northbound) and 9th Avenue N (southbound) between Mercer Street and 8th Avenue/Lenora Street. South of Denny Way, southbound general purpose traffic coming from 9th Avenue N destined to Stewart Street could either use Bell Street or 8th Avenue to continue south.
- Westlake Avenue N and 9th Avenue N would contain two general purpose (one-way) lanes between Mercer Street and Denny Way. 9th Avenue N would also include a two-way protected bike facility.

Figure 5 and Figure 6 depict the two options associated with the Transit-Only Lane Alternative.

Figure 5 Transit Lane Alternative, Two-Way Option

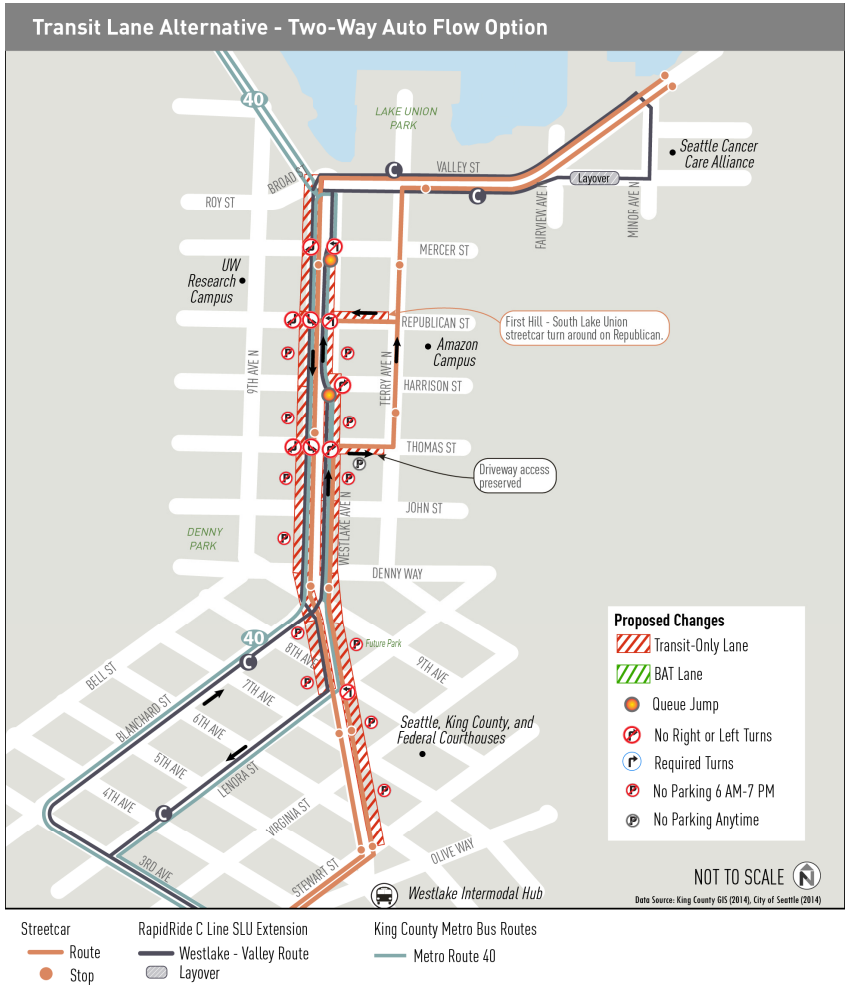
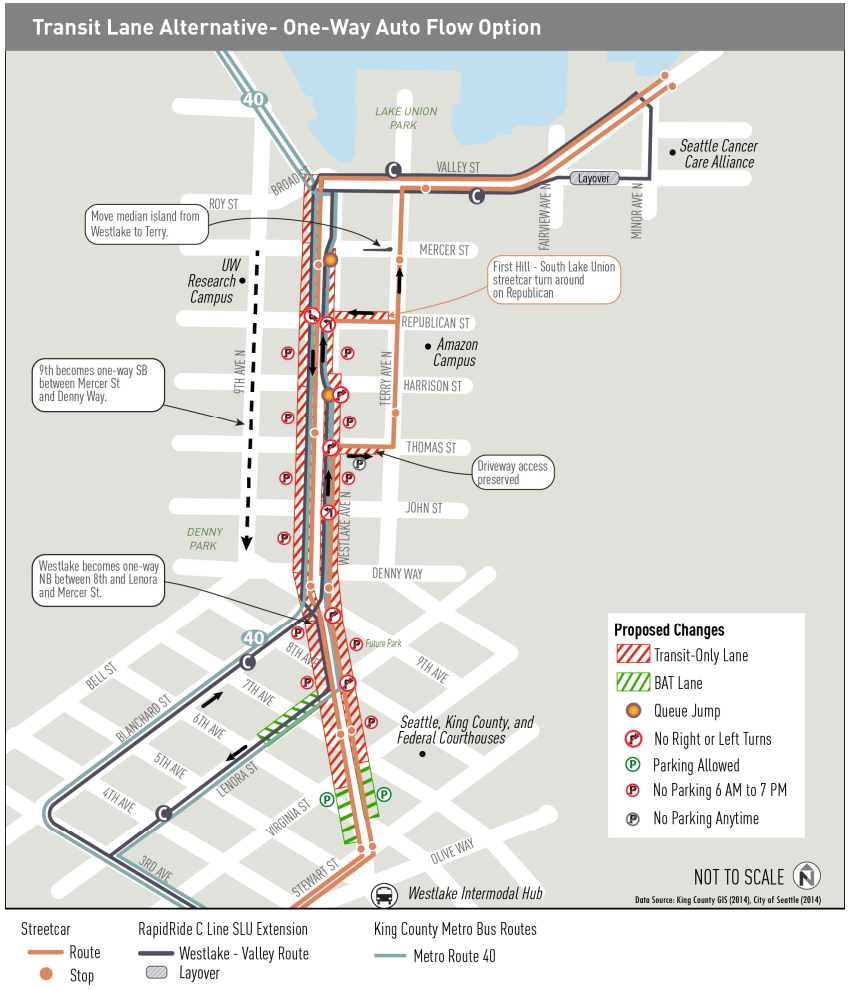


Figure 6 Transit Lane Alternative, One-Way Option



4 Initial Screening

The alternatives were initially screened based on both qualitative and quantitative information. This initial screening considered the following key goals of the study:

- Improve transit reliability and travel times
- Be implementable within the City's current operations budget by spring 2016
- Provide efficient traffic operations along Westlake Avenue that minimizes diversion within the study area

With these considerations, the Transit Lane Alternative with One-Way Auto Flow Option would require substantial signal upgrades and extensive outreach which would likely prohibit this alternative from being built by spring 2016 when some of the service changes would occur. Therefore, this alternative was not considered further. The BAT Lane Alternative was also not further considered as, over time, providing a BAT lane would have diminished transit benefits as vehicles turning right in the BAT lane would delay transit vehicles and likely not provide long-term benefit to the transit system.

The remaining alternatives, BAT/Transit Lane and Transit Lane (Two-Way Auto Flow Option) alternatives, would provide transit benefits and are potentially able to be designed and implemented by spring 2016.

Table 1 provides transit and traffic results of these two alternatives compared to the No Build Alternative. Although the BAT/Transit Lane Alternative provides a 1- to 2-minute time savings for transit than the Transit Lane Alternative, it would still achieve a 5- to 8-

minute savings over the No Build Alternative along Westlake Avenue. The BAT/Transit Lane Alternative also does not have as much traffic impact along Westlake Avenue and to other parallel streets in the study area as the average intersection delay along Westlake Avenue would be similar to No-Build conditions and the amount of traffic diversion from Westlake to other streets in South Lake Union would be about half of the Transit Lane Alternative. Therefore the BAT/Transit Lane Alternative was further evaluated as two options to this alternative were considered and are described in Section 3.

Table 1 Initial Screening Results, 2035 Horizon Year

Criteria	No-Build	BAT/Transit Lane	Transit Lane – Two Way Auto
Transit Travel Time (NB/SB)	19 min. / 22 min.	11 min. / 17 min.	10 min. / 15 min.
Westlake Int. LOS	LOS F: 4 Avg. Delay: 61 sec	LOS F: 2 Avg. Delay: 61 sec	LOS F: 5 Avg. Delay: 87 sec.
Auto Travel Time (NB/SB)	20 min. / 15 min.	19 min./ 16 min.	26 min. / 20 min.
Traffic Diversion (compared to No Build)	N/A	23%	44%

Note: LOS = Level of Service; NB = northbound; SB = southbound;

5 Alternative Evaluation

Section 5.1 describes the evaluation criteria used and the results from this evaluation on the proposed BAT/Transit Lane Alternative. Both options for the BAT/Transit Lane Alternative were compared to the No Build Alternative. These two options are described in Section 3.

5.1 Criteria Definition

The following list summarizes the evaluation criteria, with a brief description of what technical information will be presented:

- ***Transit Travel Times***: Report 2018 and 2035 PM peak hour transit travel times for buses and streetcars along their respective routes within the study area. The streetcar path is generally along Westlake Avenue, except for the northbound segment between Thomas Street and Valley Street which runs along Terry Avenue. For buses, the travel time path is along Westlake Avenue between 8th/Lenora to the south and 9th Avenue N to the north.
- ***Transit Ridership***: Estimate future ridership relying on the estimated transit travel time, stop locations and service frequency assumptions.
- ***Effects on Other Transit Service:*** Identify the transit routes that would most likely be affected by the alternatives based on the level of traffic diversion and intersection LOS.
- ***Travel Patterns***: Quantify the amount of potential diversion associated with the alternatives along parallel

streets to Westlake Avenue, such as Dexter Avenue N and Fairview Avenue N.

- ***Intersection LOS***: 2018 and 2035 PM peak hour intersection LOS results along Westlake Avenue and other adjacent streets.
- ***Auto Travel Times***: 2018 and 2035 PM peak hour travel times along Westlake Avenue from 6th Avenue to Valley Street.
- ***Safety:*** Qualitatively identify any safety concerns that include design concerns, historical safety and conflict points between modes of travel.
- ***Property Access and Circulation:*** Identify conflicts with driveways and circulation patterns.
- ***Freight:*** Identify conflicts between key freight routes and the alternatives.
- ***Non-Motorized***: Identify conflicts with pedestrian movements or existing/planned bike facilities.
- ***Parking***: Identify number and type of on-street parking that would be provided along Westlake Avenue. This is stratified by commercial, passenger, all day and time-restricted parking.

The methodology and assumptions that were used to develop the data for each of these criteria is described in Appendix B.

5.2 Evaluation Results

The evaluation results present a summary of the data and information developed for each of the criteria. For some of these measures data was produced for a year 2018 and 2035 condition. If the trends and conclusions between 2018 and 2035 are similar, then only the data for year 2035 is shown in this section. Refer to Appendix C for the detailed evaluation data.

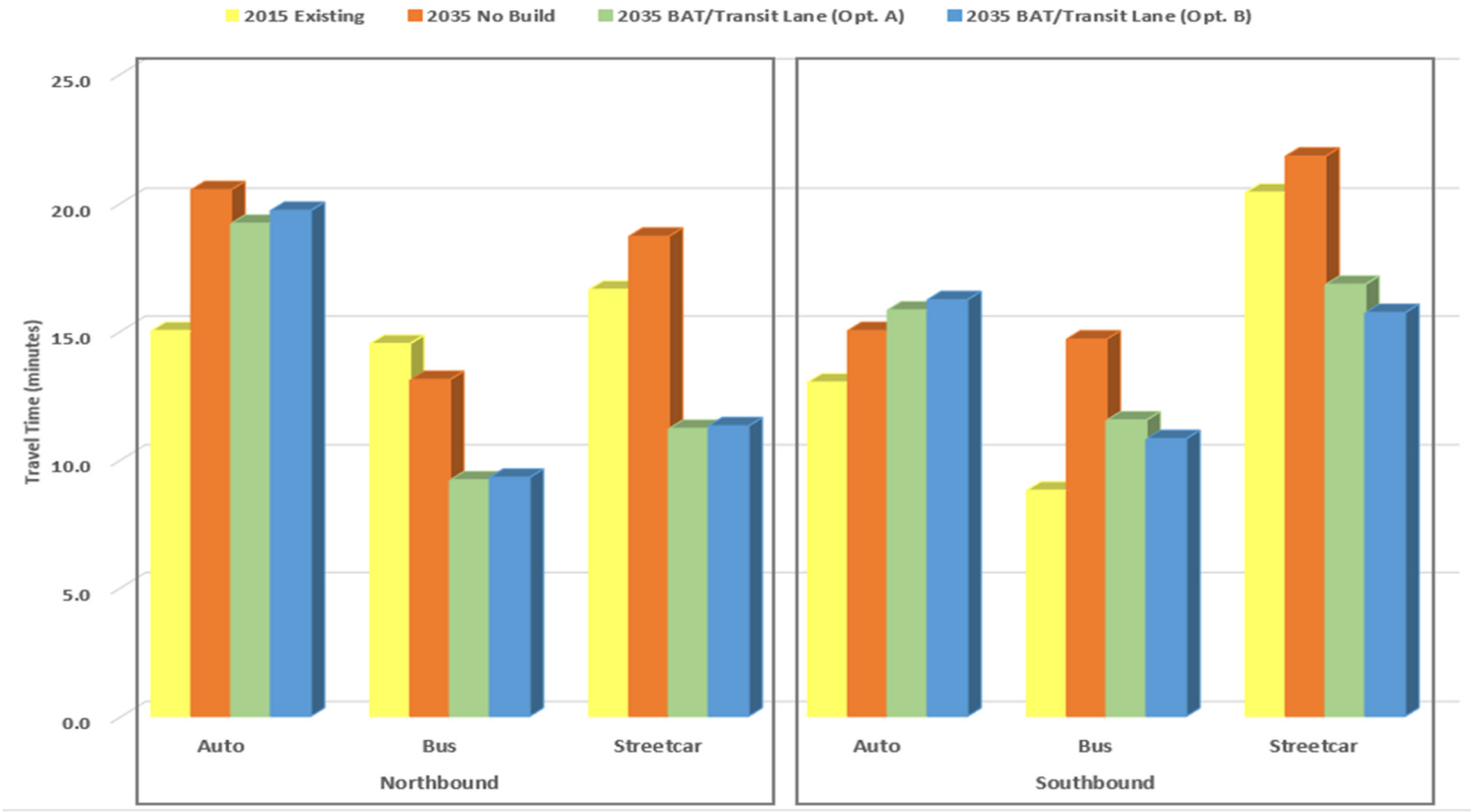
5.2.1 Transit Travel Time

Travel time results for both auto and transit modes along Westlake Avenue are shown on Figure 7 and in table format in Appendix C.

In the No Build Alternative, northbound buses would see an improvement in travel time compared to existing conditions due to the KCM Route 40 improvements near Mercer Street. All other modes would experience an increase in travel time in the future.

The BAT/Transit Lane Alternative provides a 35 to 40 percent savings for northbound transit and a 20 to 28 percent savings for transit in the southbound direction. Both Options A and B provide similar travel time savings for the northbound direction (with most of the saving occurring south of Denny Way. Option B provides up to 1 minute additional savings in the southbound direction compared to Option A. Part of this savings in Option B is caused by general purpose vehicles being restricted from traveling across Denny Way in the southbound direction. General purpose travel times are described in Section 5.2.6.

Figure 7 Westlake Avenue Travel Time by Mode and Alternative, 2035 Horizon Year



Notes: Auto travel time measured on Westlake Ave between the intersections of Stewart St and Valley St. Bus travel time measured on Westlake Ave between the intersections of 8th Ave/Lenora St and Valley St. Streetcar travel time measured on Westlake Ave and Terry Ave between the intersections of Westlake/Stewart and Valley/Fairview.

5.2.2 Transit Ridership

Transit ridership was modeled for the No Build condition and BAT/Transit Lane Alternative using the Federal Transit Administration STOPS model. The results for the BAT/Transit Lane Alternative are representative of both Options A and B, since the difference in travel time between the two options is not likely to cause a change in ridership levels.

Table 2 provides estimated future ridership that would use the proposed improvements by 2035. The BAT/Transit Lane Alternative would result in up to a 15% increase in new transit trips on Westlake Avenue over the No Build condition, with the majority of those trips using the Streetcar mode of travel (71% for streetcar compared to 29% for rubber-tire buses).

The amount of transit trips in the study area could grow even higher than these projections if transit riders using other transit services outside of the study area decide to shift to one of the transit routes (Streetcar, RapidRide C-Line, or KCM Route 40) on Westlake Avenue. Additional details for transit ridership projections are presented in Appendix C.

Table 2 Year 2035 Transit Ridership

Type of Trip	Mode	2035 No Build	Net New Transit Trips with BAT/ Transit Lane Alt
Transit Trips using Westlake (ons, offs, and through trips)	Streetcar/ Bus[a]	11,700	1,800 (+15%)
New Transit Riders by Mode	Streetcar	n/a	1,300 (72%)
	Bus[a]		500 (28%)

Note: Results are from Federal Transit Administration STOPS model.

Total Transit riders using services on Westlake in the No Build Alternative includes any rider on Westlake within the study area. New Transit Rider trips with the BAT/Transit Lane Alternative include only new riders as a result of the transit travel time improvements on Westlake Ave and do not include riders that may shift from other transit routes to transit services along Westlake Ave.

[a] Bus trips using the project include KCM Route 40 and the extended RapidRide C-Line.

5.2.3 Effects on Other Transit

Diversion of auto trips from Westlake Avenue to streets surrounding the project could affect other transit services operating on those streets. Specifically, diversion of auto trips may cause an increase in intersection delay along transit routes running parallel to Westlake Avenue, including on Dexter and Fairview Avenues. Denny Way also contains bus transit routes that operate through the study area and was analyzed to see if any diversion would occur as a result of changes to capacity on Westlake Avenue. Table 3 identifies the number of hourly buses, the change in auto trips, and change in average intersection delay along these streets during the PM peak hour for the BAT/Transit Lane Alternative options A and B.

Traffic diversion is generally moderate in both Build Alternatives on the parallel north-south corridors to Westlake Avenue, but more pronounced in Option B. The same trend can be observed for average intersection delay along those corridors. Option B is estimated to increase auto trips on Dexter Ave N by 14 percent over the No Build Alternative, compared to only 7 percent in Option A. This is because southbound auto trips are forced to turn beforehand (e.g., John Street). Southbound auto trips would also increase on Fairview Avenue at a higher amount in Option B as compared to Option A.

KCM Route 8 travels along Denny Way and crosses Westlake Avenue. The restriction of northbound right-turns at the intersection of Westlake Avenue/Denny Way in Option A would cause traffic volume on Denny Way west of Westlake Avenue to increase, as some people would use Bell Street to access Denny Way. The northbound right-turn at this intersection would be restored in Option B, however delay to east-west movements on Denny Way would increase due to an additional signal phase to protect northbound right turns.

Table 3 Effects on Other Transit Service

Road	KCM Bus Routes	Number of Buses in PM Peak Hour, both directions (existing service levels)	% Auto Diversion from No Build		Average Intersection Delay (sec/veh)		
			BAT/Transit Lane Opt. A	BAT/Transit Lane Opt. B	No Build	BAT/Transit Lane Opt. A	BAT/Transit Lane Opt. B
Dexter	26, 28	12	7%	14%	89	101	121
Fairview	70, 309E	13	4%	6%	81	90	90
Denny	8	11	3%	1%	93	96	107

Note: % diversion on Dexter Ave and Fairview Ave includes both directions of travel and is measured as the average of three east-west screenlines: south of Mercer St, north of Denny Way, and south of Denny Way. % diversion on Denny Way includes both directions of travel and is measured as the average of four north-south screenlines: east of Dexter Ave, west of Westlake Ave, east of Westlake Ave, and west of Fairview Ave. % diversion on Denny Way includes both directions of travel and is measured as the average of four north-south screenlines: east of Dexter Ave, west of Westlake Ave, east of Westlake Ave, and west of Fairview Ave.

5.2.4 Travel Patterns

Travel patterns in the study area were analyzed for the year 2035. The Build Alternatives would convert the curb-side GP lane on Westlake Avenue to either a BAT or Transit Lane which would reduce the general auto capacity on Westlake Avenue and result in potential diversion of vehicles to other streets such as 9th Avenue N, Dexter Avenue N, or Fairview Avenue N.

Demand volumes were measured across two screenlines, one north of and one south of Denny Way, in order to understand the forecasted change in travel patterns with the alternatives. A summary of the demand volumes is shown in Table 4.

The BAT/Transit Lane Option A would cause a volume drop of up to 40 percent on Westlake Avenue and with volume on other streets increasing from 6 to 11 percent. Option B would divert more vehicles from Westlake Avenue onto parallel streets as compared to Option A since vehicles in the southbound direction on Westlake Avenue would not be able to cross Denny Way. Option B would cause a volume drop on Westlake Avenue as much as 61 percent with a corresponding increase between 6 to 27 percent on other streets.

Table 4 2035 Screenline Demand Volumes, PM Peak Hour

Screenline	Roads	No Build	2035 BAT/ Transit (A)		2035 BAT/ Transit (B)	
		Veh/hr	Veh/hr	% Diff	Veh/hr	% Diff
Screenline #1 North of Denny Way	Roads w/o Westlake	2,550	2,820	11	3,100	22
	Westlake	1,890	1,380	-27	970	-49
	Roads e/o Westlake	1,800	1,960	9	1,990	11
	All Roads Combined	6,240	6,160	-1	6,060	-3
Screenline #2 South of Denny Way	Roads w/o Westlake	1,910	2,050	7	2,430	27
	Westlake	1,700	1,040	-39	660	-61
	Roads e/o Westlake	2,690	2,860	6	2,850	6
	All Roads Combined	6,300	5,950	-6	5,940	-6

Notes: w/o = west of; e/o = east of; Veh/hr = vehicles per hour; Diff = difference

Screenline volumes include the total of both northbound and southbound directions. Across screenline #1, roads west of Westlake Ave include Dexter Ave and 9th Ave N while roads east of Westlake include Terry Ave and Fairview Ave. Across screenline #2, roads west of Westlake include Dexter Ave, 8th Ave, and Bell St; roads east of Westlake Ave include Terry Ave, Lenora St, Boren Ave and Fairview Ave.

5.2.5 Intersection Level of Service

A summary of intersection results for the 2035 is presented in Table 5. Detailed intersection LOS and delay results are also provided in Appendix C.

Table 5 Intersection Operations Results

Data	2015 Existing	2035 No-Build	2035 BAT/ Transit Lane Opt A.	2035 BAT/ Transit Lane Opt B.
# Intersections at LOS E and F	10	15	18	19
Avg. Int. Delay on Westlake Ave. (sec/veh)	32	50	49	51
Avg. Int. Delay on other streets (sec/veh)	35	77	80	86

Notes:

sec/veh = seconds per vehicle

Average delay along Westlake Ave was measured at intersections between Stewart St and 9th Ave N. Average delay for parallel roads to Westlake Ave include intersections on 9th Ave N, Dexter Ave N, and Fairview Ave N between Denny Way and Valley St.

There would be 15 intersections in the study area that operate at LOS E or F in the 2035 No Build Alternative compared to 10 in the existing condition. With the densification of land use in the area and increase in demand volumes, the average delay at intersections would increase in the future by 56 percent along Westlake Avenue.

In general, as Option B would divert a higher amount of volume to other streets than Option A, there would be a larger increase in delay on those other streets compared to No Build (12 percent increase compared to a 4 percent increase with Option A). More specifically, the BAT/Transit Lane Alternative Option A would increase the number of intersections that operate at LOS E or F by 3 for Option A and 4 for Option B compared to the 2035 No Build Alternative. Although the intersection delay along Westlake Avenue would be similar for both Options A and B compared to the No Build Alternative as some volume would divert to other corridors. The three intersections that degrade to LOS E in Option A are on 9th Avenue N at Republican Street, Harrison Street, and Denny Way. With Option B, many of those same intersections on 9th Avenue would further degrade and operate at LOS F in addition 8th Avenue and Bell Street would operate at LOS E.

5.2.6 Auto Travel Time

Auto travel times are presented graphically on Figure 7 and in tabular format in Appendix C.

Auto travel times on Westlake Avenue between Stewart Street and Valley Street for the 2035 PM peak hour would take approximately 20 minutes in the northbound direction and 15 minutes in the southbound direction in the No Build Alternative. Auto travel times in both options of the BAT/Transit Lane Alternative would be similar to the No Build Alternative—one minute less in the northbound direction and one minute longer in the southbound direction. Although general purpose capacity would be reduced on Westlake Avenue, the amount of

people using other streets would keep travel times similar to the No Build Alternative.

Southbound auto travel times on 9th Avenue N were also developed as people would likely use this road to cross Denny with Option B. Auto travel time on 9th Avenue in the southbound direction would increase from 15 minutes in the No Build Alternative to 17 minutes in Option A and as high as 19 minutes with Option B.

5.2.7 Safety

A qualitative future safety assessment was conducted for the BAT/Transit Lane Alternative. The safety assessment considered existing crash data for the most recent 5-year period (2009 to 2014). There were no high accident locations or fatal crashes within the study area. Two out of the 37 study intersections had, on average, one crash involving non-motorized modes per year. These two intersections were Denny Way at Dexter Avenue and at Fairview Avenue. Both had five pedestrian crashes over the past 5 years. A detailed existing crash data summary is presented in Appendix C.

Restricting left and right turns at several of the intersections on Westlake Avenue would have a positive effect on safety by reducing the number of conflict points. However, drivers may not be expecting those turn restrictions (especially the restriction of the southbound through movement with Option B) so adequate signing would be necessary to give drivers advanced warning of such turn restrictions. Also, violators of the BAT lane turn restrictions (drivers that travel through the intersection using the BAT Lane when only the right turn is permitted) could cause a safety concern for conflicting vehicles unaware of the violating movement. Additionally potentially restricting parking during peak periods in the segments designated as a transit-only lane would result in fewer conflict points and avoid lane changing across the lane.

The increased volume and delay on other streets such as Dexter Avenue N, 9th Avenue N, and Fairview Avenue N could lead to an increase in the frequency of congestion-related crashes such as rear-end and turning accidents. Higher volumes and congestion would occur on these parallel roads in Option B.

5.2.8 Property Access and Circulation

The BAT/Transit Lane Alternative (Options A and B) would not impact any driveways along Westlake Avenue. The BAT/Transit Lane Alternatives would cause changes in circulation patterns within the study area. Driveways on Thomas and Republican Streets would remain open but would need to be changed to accommodate one-way flow as a result of circulation changes with the BAT/Transit Lane Alternative. In addition, 9th Avenue on the west side of Westlake Avenue (between Denny Way and Blanchard Street) would be converted from a right-out to a left-out in Option B.

Approximately 20 percent of turn movements (northbound and southbound left and right turns) at intersections on Westlake Avenue would be restricted with the BAT/Transit Lane Alternative compared to the No Build Alternative. Most of the turn restrictions are the same between Options A and B, except Option A would restrict northbound right-turns at Denny Way and Option B would restrict southbound through at Denny Way

and southbound left-turn at Blanchard St/9th Avenue. A summary of turn restrictions at intersections along Westlake Avenue is presented in Table 6.

A detailed table of all intersection turn restrictions and driveway changes is presented in Appendix C.

Table 6 Intersection Turn Movements on Westlake Avenue

Alternative	Northbound Turns Allowed	Southbound Turns Allowed	Both Directions
No Build	17	18	35
BAT/Transit Lane Option A	14	14	28
BAT/Transit Lane Option B	15	13	28

Note: Turns allowed are from Westlake Ave onto side streets and includes both left and right turns between Virginia St and Valley St.

5.2.9 Freight

In all future conditions, the major truck streets in the study area are along Mercer Street and then 9th Avenue and Westlake Avenue, north of Mercer Street. The BAT/Transit Lane alternative would not negatively impact those streets.

Future access to State Route 99 in this area will occur at Harrison Street and turn movements on and off of Westlake Avenue will continue to provide access to this regional facility. General circulation and access to properties in the area will change with the BAT/Transit Lane Alternative as some turns at intersections along Westlake Avenue will be restricted. This is further described in Section 5.2.8.

5.2.10 Non-Motorized

Restricting right turns at intersections along Westlake Avenue in the BAT/Transit Lane Alternative (Options A and B) would reduce conflict points for non-motorized travel compared to the No-Build condition. A distinction between the two options with the BAT/Transit Lane Alternative is Option A would restrict northbound right-turns at the intersection of Westlake Avenue/Denny Way while Option B would provide a protected signal phase for northbound right-turns. Protecting this right-turn would slightly reduce the amount of available crossing time for north-south pedestrians.

Option B would also restrict southbound vehicle through movements, forcing trips that would normally continue through on Denny Way to make a southbound right-turn beforehand (e.g., John Street) and potentially return back onto Westlake Avenue south of Denny (e.g., at 8th Avenue/Lenora Street).

The BAT/Transit Lane alternative generally affects the pedestrian environment since there is no bicycle facility on Westlake Avenue. The BAT/Transit Lane Alternative would also not conflict with planned bike improvements by the City, but should be considered with future bicycle improvements to enhance safety.

Table summarizes the future non-motorized conditions. Appendix C provides an assessment of existing pedestrian and bicycle conditions and identifies planned bicycle facilities.

Table 7 Assessment of Non-Motorized Travel Impacts

Street	No-Build Alternative	BAT/Transit Lane Alt. Option A	BAT/Transit Lane Alt. Option B
Denny Way	No turn restrictions	Northbound right-turn restriction removes conflict from heavy pedestrian movement across east leg	Northbound right-turn provided from exclusive turn lane. A protected signal phase would be provided to eliminate conflicts between turning vehicles and transit vehicles coming from the blind side of a right-turn vehicle. This would also eliminate the potential conflict between right-turn vehicles and pedestrians but would reduce the available pedestrian crossing time. This option would also restrict southbound vehicle through movements, forcing southbound through trips to use 9th Ave N via John Street and 8th Ave/Lenora St to return to Westlake Ave. Increasing right-turning movements at those locations could increase pedestrian conflicts if pedestrians do not have a protected signal phase.
Thomas Street	No turn restrictions	Northbound right-turn restriction	
	Existing streetcar tracks are potential safety concern for eastbound cyclists Streetcar travels along proposed neighborhood greenway for one block	No change from No Build condition	
Harrison Street	No turn restrictions	Northbound right-turn restriction	
Republican Street	No turn restrictions	Southbound no turns permitted. Northbound left-turn restriction	
	Proposed streetcar tracks (No-Build) are potential conflict for proposed westbound bike facility.	No change from No-Build condition	
Mercer Street	No turn restrictions	Southbound right-turn and northbound left-turn restrictions	
7th Avenue	Channelized right turn from southbound Westlake onto 7th Ave Future protected bike lane on 7th Ave	No change from No Build condition	

5.2.11 Parking

The streetcar alignment would impact on-street parking and loading conditions along Westlake Avenue. The assessment of these impacts used the City's on-street parking inventory, field survey of existing conditions, and the conceptual design for the streetcar alignment to estimate the change in availability of all-day and peak-restricted parking stalls and commercial and passenger vehicle loading zones. Parking and loading impacts, compared to No-Build, are summarized in Table and on Figure 8, with further detailed data and results in Appendix C.

The No Build Alternative includes the elimination of 19 parking spaces (17 all day parking spaces, 1 passenger loading zone space, and 1 commercial loading zone space) compared to the Existing Condition. This is a result of the planned Center City Connector turnaround on Republican Street, the creation of two new bus zones and one expanded bus zone along Westlake Avenue to accommodate Route 40 and the extended RapidRide C Line, and the removal of two bus zones on 9th Avenue N when the Route 40 moves off of 9th Avenue N and onto Westlake Avenue.

The assessment of the BAT/Transit Lane Alternative impacts assumes that parking would be allowed adjacent to BAT lanes and that time-restricted parking would be allowed adjacent to transit lanes (no parking between 6:00 a.m. and 7:00 p.m.). There is no difference in parking impacts between Options A and B for the BAT/Transit Lane Alternative.

All of the all-day parking impacts associated with the BAT/Transit Lane Alternative are along Westlake Avenue between Republican Street and Denny Way and along Terry Avenue, south of Mercer Street. One passenger load zone is removed with the BAT/Transit Lane Alternative on Westlake Avenue between Thomas Street and Denny Way and one commercial loading zone is removed along Thomas Street, east of Westlake Avenue

Table 8 Parking and Loading Impacts

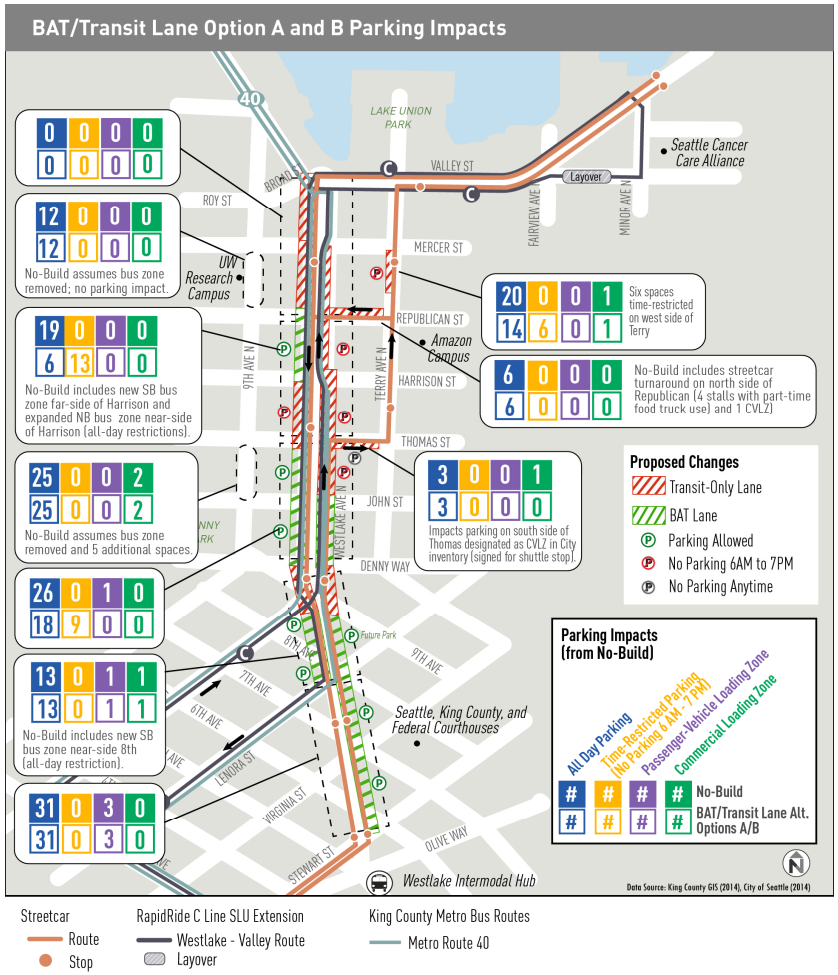
Alternative	All Day Parking	Time-Restricted Parking[1]	Passenger Loading Zone	Commercial Loading Zone	Bus Zone
Existing	172	0	6	6	12
No-Build[2]	155	0	5	5	12
BAT/ Transit Alt	128	28	4	4	12
Diff from No-Build	-27	28	-1	-1	0

Note:

[1] Time-restricted parking is restricted from 6 AM to 7 PM.

[2] Includes removal of two bus zones on 9th Avenue N and addition of two bus zones on Westlake Avenue, extension of one bus zone on Westlake Avenue, and Center City Connector streetcar turnaround on Republican.

Figure 8 BAT/Transit Lane Alternative Parking Impacts



6 Findings and Next Steps

A summary of the evaluation is provided on Figure 9. This summary is a collection of the key findings from each of the evaluation criteria and compares the two options with the BAT/Transit Lane Alternative to the No-Build condition. It is the preference of the City to continue refining the design and conducting stakeholder outreach to advance BAT/Transit Lane, Option A. The City will continue these activities with the intent to implement the BAT/Transit Lane Alternative by spring 2016. A conceptual design drawing and cross sections of this alternative are presented in Appendix D.

This implementation schedule would allow KCM 40 service to operate exclusively on Westlake Avenue and accommodate the extension of the Rapid Ride C Line service through South Lake Union with a turn-around near the intersection of Valley Street and Fairview Avenue. Implementing these improvements would also accommodate the planned Center City Connector streetcar extension that would connect the South Lake Union and First Hill streetcar lines.

As the City prepares design drawings and works through the necessary approvals, the alternative may be adjusted to address comments and developments that are currently not finalized. As this report was being finalized, the City is considering the following potential modifications:

- Modify the northbound transit lane section between Denny and Blanchard to allow right-turns at the Westlake/Denny intersection. This would eliminate the need for a new signal at the intersection of Denny Way and Lenora Street.

- Determine the ability for parking to remain adjacent to the curb lane along Westlake Avenue where BAT and transit lanes would be proposed. If parking remains, there could be time restrictions to maintain transit performance. This review would also consider any established City parking policies and codes.
- Clockwise routing for RapidRide C Line buses turning around at Valley Street/Fairview Avenue/Minor Avenue/Aloha Street. This would require a bus-only signal phase for westbound buses on Valley Street with modification to the right-turn channelized island. This routing scheme would avoid the congestion on the southbound approach of the Valley Street and Fairview Avenue intersection.
- Continue to coordinate with KCM on other potential transit service changes in the area, such as KCM Route 8, and how those changes could be affected by this project.

Figure 9 Evaluation Findings Summary

EVALUATION MEASURES	2035 NO-BUILD*	BAT/TRANSIT LANE DESIGN OPTION A	BAT/TRANSIT LANE DESIGN OPTION B
TRANSIT TRAVEL TIME: STREETCAR, 2035 Stewart-Fairview, PM peak hour, avg. NB & SB	20.2 min	14 min	13.5 min
WESTLAKE TRANSIT TRAVEL TIME: BUS, 2035 Blanchard/Lenora-9th, PM peak hour, avg. NB & SB	13.9 min	10.4 min	10.0 min
WESTLAKE TRANSIT RIDERSHIP, 2035 Average weekday. No-Build assumes Center City Connector streetcar, Route 40, and RapidRide C-Line to SLU	11,700 ons, offs, and through trips using Westlake	1,800 new transit trips using Westlake (1,300 on streetcar)	Comparable to Option A
EFFECTS ON OTHER TRANSIT SERVICES Based on travel times and traffic patterns		Traffic diversion to Fairview and Dexter could affect transit routes on those streets	Similar to Option A but more diversion to Dexter and Fairview
WESTLAKE AUTO TRAVEL TIME, 2035 Westlake, Stewart-9th, PM peak hour, avg. NB & SB	17.8 min	NB: Similar to No-Build SB: 1 min increase	NB: Similar to No-Build SB: 1 min increase
INTERSECTION OPERATIONS, 2035 Number of intersections with Level of Service E or F, PM peak hour	LOS E: 3 LOS F: 12	LOS E/F: 18 2% increase in overall delay in study area	LOS E/F: 19 9% increase in overall delay in study area
TRAFFIC PATTERNS, 2035 § % traffic diverted to other roadways, PM peak hour		Westlake: -39% Parallel: +6%	Westlake: -61% Parallel: +12%
PARKING AND LOADING Total number of spaces along modified blocks: all-day / time-restricted / pass. loading / comm. loading	155 / 0 / 5 / 5	128 / 28 / 4 / 4	128 / 28 / 4 / 4
PROPERTY ACCESS AND CIRCULATION Design issues, historical safety, conflict points	Limited property access on Westlake	No impacts to driveways on Westlake. 20% of turn movements restricted	Similar to Option A but restricts SB through at Denny
SAFETY Design issues, historical safety, conflict points	No high-accident locations or fatal crashes; some crashes with peds/bikes	Turn restrictions, parking restrictions reduce conflict points & lane changes	Similar to Option A but through restriction at Denny could cause driver confusion
FREIGHT Conflicts with freight routes/movements	Westlake is not a truck route	Minimal impact to freight traffic	Minimal impact to freight traffic
NON-MOTORIZED Pedestrian and existing/planned bike facilty conflicts		Turn restrictions reduce conflict points	Similar to Option A, but slight reduction in pedestrian crossing time at Denny

NOTES: * No-Build assumes Center City Connector streetcar with turnaround on Republican, northbound bus queue jumps on Westlake Avenue at Harrison and Mercer Street used by Metro Route 40, and various spot transit improvements recently built or in design.
§Screenline south of Denny used to measure traffic diversion.

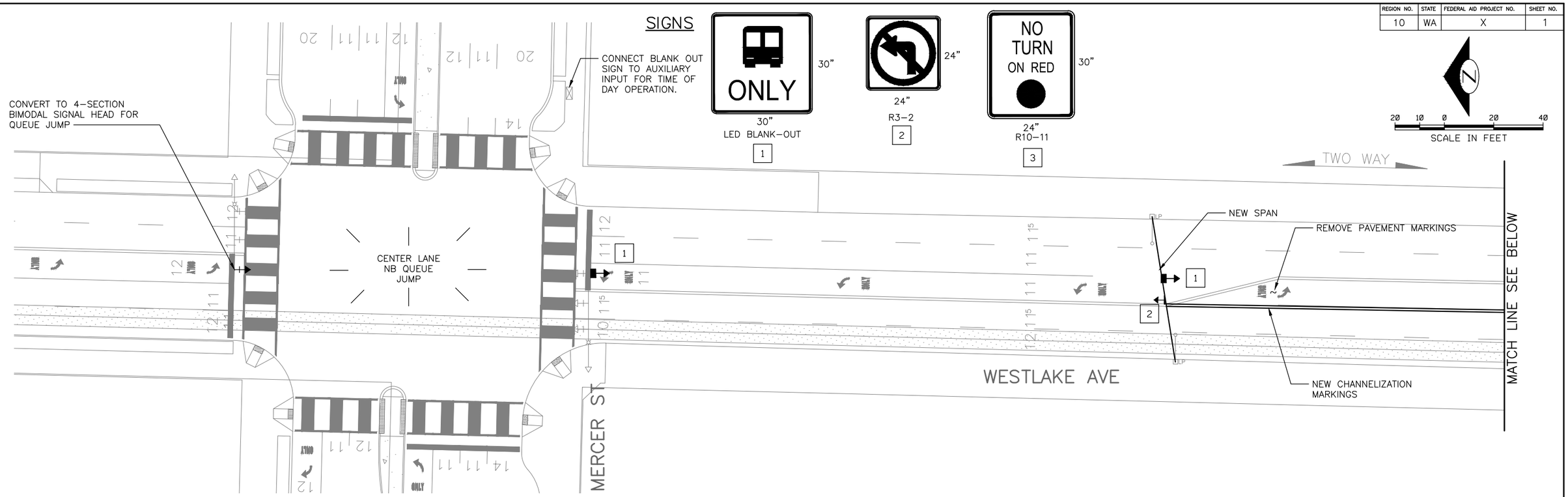
LEAST DESIRABLE — MOST DESIRABLE

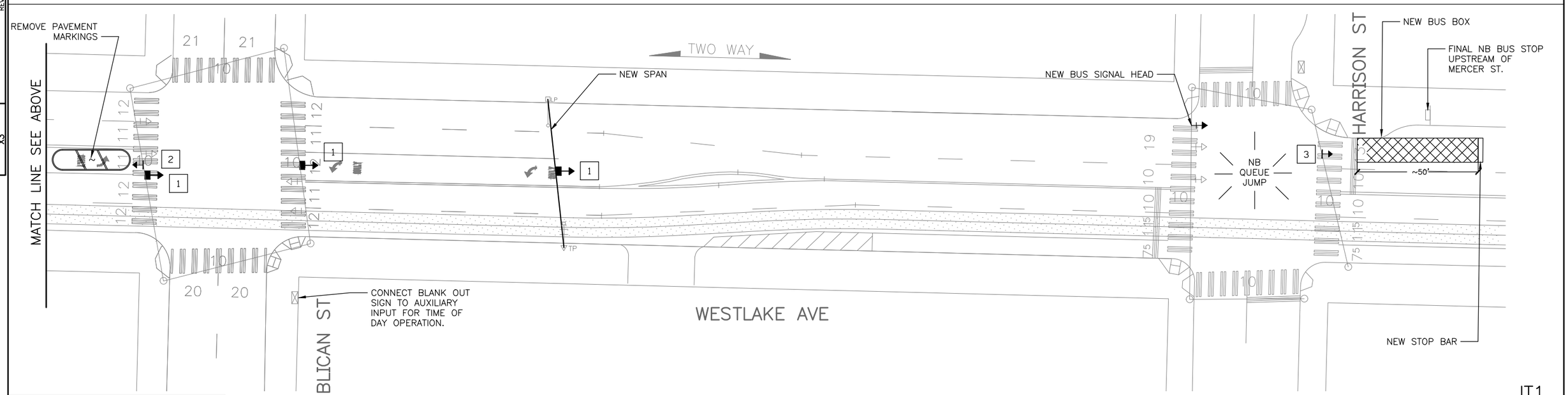
APPENDIX A

King County Metro Route 40 Design Drawings

REGION NO.	STATE	FEDERAL AID PROJECT NO.	SHEET NO.
10	WA	X	1

SIGNS





PRELIMINARY CONCEPT OF OPERATIONS

IT1
WESTLAKE AND MERCER
ITS PLAN

NATURE	MADE	CHK'D	REV'D
REVISIONS			

VAULT SERIAL NO.	DATE	MARK
X3		

H:\(p) Projects\14\14005-008 SDOT Westlake and Mercer\CAD\ITS_Plan Sheets.dwg
Feb-06-15 10:44am
X2-1

DKS
719 Second Ave, Suite 1250
Seattle, WA 98104
(206) 382-9800
www.dksassociates.com

REVIEWED BY SPU/WATER ENGINEERING ..... 20.....
REVIEWED BY SPU/DRAINAGE ..... 20.....
APPROVED BY SDOT STREET IMPROVEMENT PERMITTING ..... 20.....

APPROVED FOR ADVERTISING
NANCY LOCKE
DEPARTMENT OF FINANCE & ADMINISTRATIVE SERVICES
SEATTLE, WASHINGTON . . . . . 20 . . .
BY: . . . . . .
PURCHASING & CONTRACTING SERVICES DIRECTOR

NAME OR INITIALS AND DATE	INITIALS AND DATE
DESIGNED .TNL.	REVIEWED:
CHECKED . RJH	DES. . . . . CONST. . . . .
	SDOT . . . . . PROJ. MGR. . . .
DRAWN . WST.	RECEIVED . . . . .
CHECKED . RJH	REVISED AS BUILT . . . . .

ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE CITY OF SEATTLE STANDARD PLANS AND SPECIFICATIONS AND OTHER DOCUMENTS CALLED FOR IN SECTION 0-02.3 OF THE PROJECT MANUAL.

City of Seattle
Seattle Department of Transportation
ORDINANCE NO. . . . . APPROVED. . . . . .
FUND: . . . . . .
SCALE: H. 1"=20', V. 1"=10' INSPECTOR'S BOOK . . . . . .

TRANSIT SPOT IMPROVEMENTS
WESTLAKE AVE / MERCER ST

JOB NO.	
PC	Z
R/W	X1
CO	Y
VAULT PLAN NO.	X2
SHEET	1 OF 1

APPENDIX B

Evaluation Criteria Methods and Assumptions

Center City Connector: Westlake Transit Improvement Study – Alternative Definitions, Evaluation Criteria and Methodology

PREPARED FOR: Ethan Melone/SDOT

COPY TO: Tom Brennan/Nelson Nygaard

PREPARED BY: Craig Grandstrom/CH2M
Bill Love/CH2M
Oren Eshel/Nelson Nygaard

DATE: May 12, 2015

This memorandum defines the transit improvement alternatives that will be considered on Westlake Avenue, the evaluation criteria used to evaluate the proposed improvements and the methods and assumptions used in developing the data supporting the evaluation criteria. This memo will also describe in greater detail the analysis years, study area limits, travel-demand forecasting and modeling methodologies, and traffic and transit operational parameters as well as non-motorized, transit, parking and safety elements.

Background

The City of Seattle is interested in improving transit service in South Lake Union as recent and future significant development has densified this area to be a robust place to work, live and play. It is expected that traffic congestion in the South Lake Union area will continue to get worse and providing reliable transit service will provide competitive travel choices for people and improve transit ridership.

Documents/Previous Studies

- Denny Way Streetscape Concept Plan, 2009
- Westlake Transportation Hub Strategy, 2009
- South Lake Union / Uptown Triangle Mobility Plan, 2011
- Westlake/7th Concept Plan, 2012
- Mercer Corridor Project EA, 2008
- South Lake Union Streetcar TTR, 2005

1 Alternatives Description

1.1 No Build Alternative

The No Build Alternative would include the following improvements as background projects along the Westlake Corridor. The transit service changes as part of the No-Build alternative along Westlake Avenue are shown in **Figure 1**.

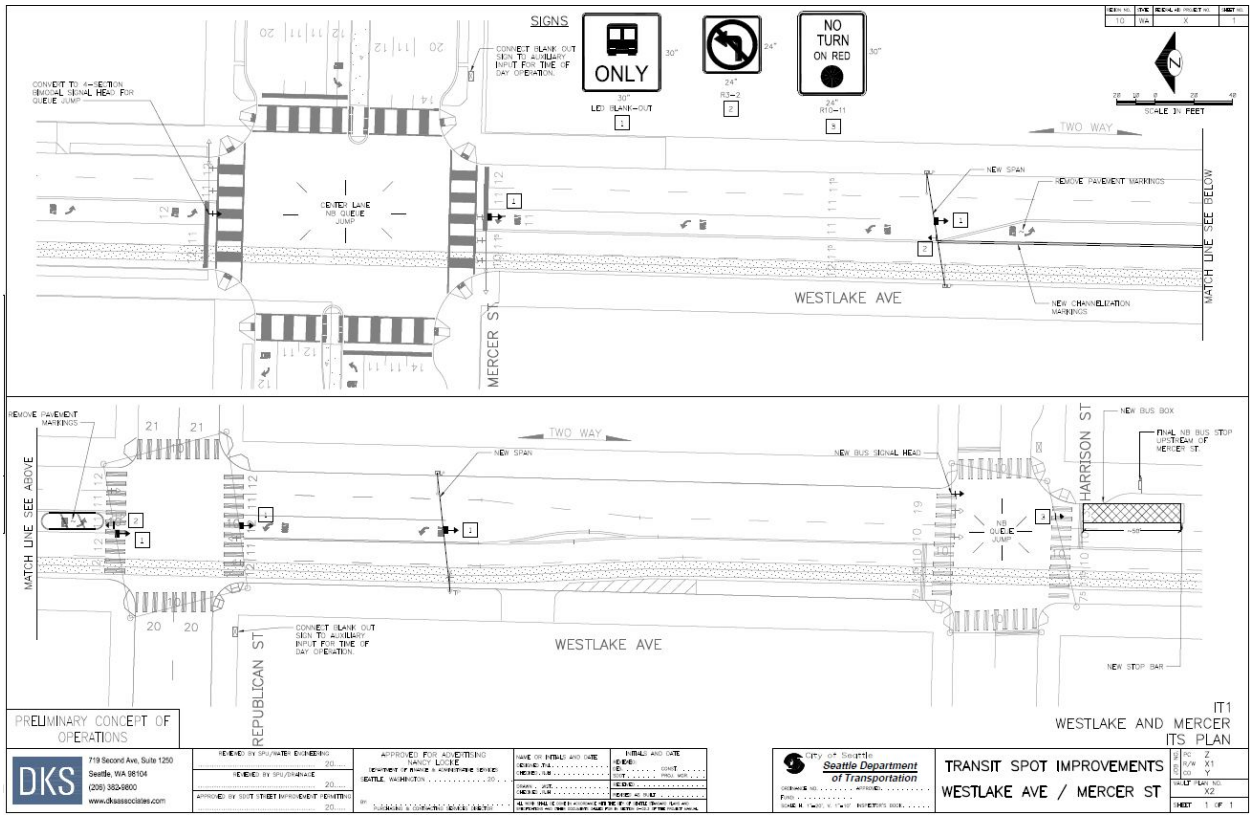
- Extension of the Rapid Ride C-Line to a northern terminus at the intersection of Fairview Avenue N/Aloha Street via Lenora/Blanchard, Westlake Avenue N, and Valley Street.

- Center City Connector (CCC) Streetcar Line will have northern turnaround at Westlake Avenue N/Republican Street. This will result in streetcar headways of 5 minutes on Westlake Avenue N between Stewart Street and Republican Street.

Figure 1 Proposed Year 2018 Transit Service

- Northbound bus queue jumps on Westlake Avenue N at Harrison Street and Mercer Street designed to improve King Count Metro (KCM) route 40. Northbound buses would use the center left-turn lane between Republican and Mercer Street to bypass GP congestion in the right lanes approaching Mercer Street. Left-turn restrictions would be required at Westlake Avenue N/Republican Street for both northbound and southbound directions and at Westlake Avenue N/Mercer Street in the northbound direction. These improvements are shown in **Figure 2**.

Figure 2 - Proposed Westlake/Mercer Transit Improvements



In addition to these transit service improvements, various spot improvements have been recently built or are in design and will be built prior to this project's implementation. These improvements are:

- Fairview/Valley intersection – sign and paint "Don't Block the Box Treatments" in the intersection so the streetcar can proceed through the intersection during its signal phase.
- Westlake/Denny intersection Signal/Curb/Ped flow Improvements. Provide a curb between the northbound streetcar lane and the inside travel lane so vehicles are not able to drive around a streetcar that is stopped at its station. Also provide an exclusive northbound right turn signal phase that does not conflict with the east leg pedestrian crossing.

Refer to **Attachment A** for a depiction of the No Build Alternative.

1.2 Business Access and Transit (BAT) Lane Alternative

The BAT Lane Alternative will:

- Retain the current two-way traffic flow on Westlake Avenue N and 9th Avenue N between Denny Way and Mercer Street
- Convert the curbside general purpose (GP) lane on Westlake Avenue N to a (BAT) lane. The northbound direction will include a BAT lane between 6th Avenue and Harrison Street, while the southbound direction will include a BAT lane between Valley Street and 8th Avenue/Lenora Street. The exception to this would be the northbound block between 9th Avenue/Blanchard Street and Denny Way, which would have GP right-turns restricted. A new signal would be installed at the intersection of Denny Way/Lenora Street to accommodate the diversion.
- Northbound buses on Westlake Avenue N would use the northbound queue jump phases at Harrison and Mercer Streets (similar to the No Build Alternative).
- This alternative will optimize access along Westlake Avenue for general purpose right-turn movements and parking would be restricted between the hours of 6:00-9:00 a.m. and 3:00-7:00 p.m.

Refer to **Attachment B** for the depiction of the BAT Lane Alternative. This alternative can be refined through the evaluation process.

1.3 BAT/Transit-Only Lane Alternative

The BAT/Transit Lane Alternative is similar to the BAT Lane Alternative, with the following exceptions:

- Thomas Street between Westlake Avenue and Terry Avenue would be converted to one-way westbound for auto vehicles to allow for an exclusive eastbound streetcar lane. Parking on the south side of Thomas Street would be permanently removed to accommodate this change.
- Republican Street between Westlake Avenue and Terry Avenue would be converted to one-way eastbound for auto flow to allow for an exclusive westbound streetcar lane. Parking on the north side of Republican Street would be permanently removed to accommodate this change.
- The northbound curb lane on Westlake Avenue between John Street and Harrison Street would be converted to a transit-only lane with right-turns restricted at Thomas and Harrison Streets. A northbound bus queue jump would still be provided at Harrison Street, and GP right-turns would still be allowed at John Street, Republican Street, and Mercer Street.
- The southbound curb lane on Westlake Avenue would be converted to a transit-only lane between Valley Street and Republican Street with right-turns restricted at Mercer and Republican Streets. In addition, the southbound block between Harrison and Thomas Streets would also be converted to a transit-only lane, with right-turns restricted at Thomas Street. Southbound right-turns would still be allowed at Broad Street, Harrison Street, John Street, and Denny Way.

- This alternative is more restrictive of general purpose right-turns along Westlake Avenue than the BAT Lane Alternative and would restrict parking between the hours of 6:00 a.m. and 7:00 p.m.

Refer to **Attachment C** for the depiction of the BAT/Transit Lane Alternative. This alternative can be refined through the evaluation process.

1.4 Transit-Only Lane Alternative

The Transit-Only Lane Alternative will:

- Change north-south traffic flow to a one-way couplet of Westlake Avenue N (northbound) and 9th Avenue N (southbound) between Mercer Street and 8th Avenue/Lenora Street. South of Denny Way, southbound general purpose traffic coming from 9th Avenue N destined to Stewart Street would either use Bell Street or 8th Avenue to continue south.
- Westlake Avenue N and 9th Avenue N would contain two general purpose lanes in each direction between Mercer Street and Denny Way. 9th Avenue N would also include a two-way protected bike facility.
- The southbound curb lane on Westlake Avenue N will be converted to a transit-only lane between Valley Street and Virginia Street, with the segment between Mercer Street and 8th Avenue/Lenora Street operating as a contra-flow lane adjacent to northbound-only GP lanes on Westlake Avenue.
- The northbound direction of Westlake would contain a curb-side transit-only lane between Virginia Street and Harrison Street, with the transit lane switching to the left side of Westlake for buses to travel through the intersections at Republican and Mercer Street. This would allow for the curb lane to accommodate GP right-turns onto Mercer Street.
- This alternative would restrict parking along Westlake Avenue between the hours of 6:00 a.m. and 7:00 p.m.

Refer to **Attachment D** for the depiction of the Transit-Only Lane Alternative. This alternative can be refined through the evaluation process.

2 Evaluation Criteria

The following section will describe each of the evaluation criteria used to evaluate the proposed Build Alternatives. Below is a summary of the evaluation criteria with a brief description of what technical information will be presented.

- **Intersection LOS**: 2018 and 2035 pm peak hour intersection LOS results
- **Auto Travel Times**: Develop 2018 and 2035 pm peak hour auto travel times along Westlake Avenue from 6th Avenue to Valley Street, except for the Transit Only Lane Alternative which would have southbound autos traveling along 9th Avenue N between Broad Street and Denny Way.

- **Traffic Patterns**: Quantify the amount of potential diversion associated with the alternatives along parallel streets to Westlake Avenue, such as Dexter Avenue N and Fairview Avenue N.
- **Safety**: Identify any safety concerns that include design concerns, historical safety and conflict points between modes of travel
- **Transit Bus Delay and Travel Times**: Develop 2018 and 2035 pm peak hour transit aggregate bus delay and travel times for buses and streetcars along their respective routes within the study area. The streetcar path is generally along Westlake Avenue, except for the northbound segment between Thomas Street and Valley Street which runs along Terry Avenue. For buses, the travel time path would be along Westlake Avenue between 8th/Lenora to the south and and 9th Avenue N to the north.
- **Property Access and Circulation**: Identify conflicts with driveways and circulation patterns.
- **Freight:** Identify conflicts between key freight routes and the alternatives.
- **Non-Motorized**: Identify conflicts with pedestrian movements or existing/planned bike facilities.
- **Parking**: Identify number and type of on-street parking that would be provided along Westlake Avenue

2.1 Traffic Operations Criteria

The information presented in this section will be used to develop the intersection LOS, auto travel times and traffic patterns data.

2.1.1 Traffic Analysis Methods and Assumptions

2.1.1.1. Analysis Years and Time Periods

The data used for the traffic operations criteria will be for three study years:

- Existing Year (2015)
- Near-Term Year (assumed 2018)
- Design Year (2035)

The traffic analysis will be conducted for the PM peak hour as it is considered to be the highest congested time period in downtown Seattle. This is consistent with the Center City Connector (CCC) NEPA analysis.

2.1.1.2. Study Area

All of the transportation study area is within the jurisdiction of the City of Seattle. **Figure 3** shows the study area and proposed study intersections for the traffic analysis. The study area includes 38 intersections, as seen in **Table 1**.

The study area includes each intersection directly affected by transit improvements on Westlake Avenue N and 9th Avenue N. The remaining intersections were chosen to analyze potential traffic diversion on corridors parallel to Westlake Avenue N.

2.1.1.3. Data Collection

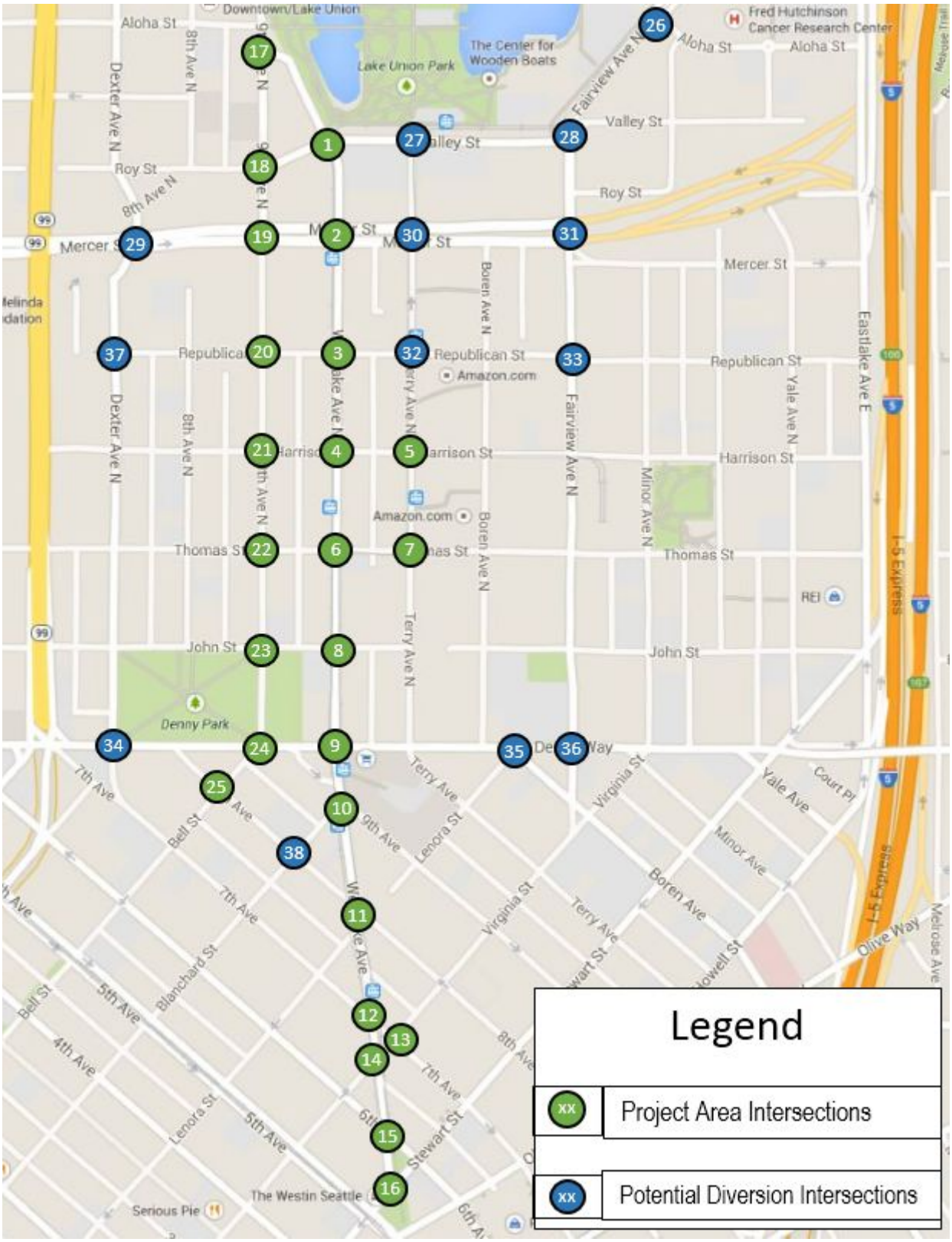
Traffic analysis files from other relevant projects, such as the Seattle Center City Connector Streetcar Environmental Assessment, King County Metro Route 40 Improvements, and Alaskan Way Viaduct FEIS will be used to develop the traffic models. The data from these files, such as traffic volumes, signal timing, travel demand forecast models, and roadway alignment will be used to establish project models for the alternatives. Data gaps will be filled in through data obtained from SDOT or collected in the field, including intersection turning movement counts, crash data, travel times, and freight data.

Existing and future planned transit services and non-motorized plans from King County Metro and Sound Transit will also be obtained. Pedestrian and bicyclist counts will be obtained at intersections. Supply and demand inventory of on- and off-street public parking facilities along Westlake Avenue will be obtained. Data sources include SDOT and Puget Sound Regional Council (PSRC).

Table 1 Westlake Transit Improvements Project - Study Intersections

ID #	Intersection	ID#	Intersection
Intersections Associated with Build Alternatives			
1	Westlake Ave N & Valley St	14	Westlake Ave & Virginia St
2	Westlake Ave N & Mercer St	15	Westlake Ave & 6th Ave
3	Westlake Ave N & Republican St	16	Westlake Ave & Stewart St
4	Westlake Ave N & Harrison St	17	9th Ave N & Westlake Ave N
5	Terry Ave N & Harrison St	18	9th Ave N & Roy St/Valley St/Broad St
6	Westlake Ave N & Thomas St	19	9th Ave N & Mercer St
7	Terry Ave N & Thomas St	20	9th Ave N & Republican St
8	Westlake Ave N & John St	21	9th Ave N & Harrison St
9	Westlake Ave N & Denny Way	22	9th Ave N & Thomas St
10	Westlake Ave & Blanchard St/9th Ave	23	9th Ave N & John St
11	Westlake Ave & Lenora St/8th Ave	24	Bell St/9th Ave N & Denny Way
12	Westlake Ave & 7th Ave	25	8th Ave & Bell St
13	7th Ave & Virginia St		
Intersections Associated with Potential Diversion			
26	Fairview Ave N & Aloha St	33	Fairview Ave N & Republican St
27	Terry Ave N & Valley St	34	Dexter Ave N & Denny Way
28	Fairview Ave N & Valley St	35	Lenora St/Boren Ave & Denny Way
29	Dexter Ave N & Mercer St	36	Fairview Ave N & Denny Way
30	Terry Ave N & Mercer St	37	Dexter Ave N & Republican St
31	Fairview Ave N & Mercer St	38	8th Ave & Bell St
32	Terry Ave N & Republican St		

Figure 3 Westlake Avenue Transit Improvements Study Intersections



2.1.1.4. Land Use and Travel Demand Forecasting

Future auto demand volumes for the Opening Year (assumed 2018) and Design Year (2035) will be based on the latest available travel-demand forecast models from the PSRC and Washington State Department of Transportation (WSDOT) as was used for the Seattle's City Center Connector NEPA Analysis. The travel-demand forecast will be conducted to estimate traffic demand along Westlake Avenue N as well as adjacent parallel streets based on any diversion that is predicted to occur from the Build Alternatives that requires the reduction of general-purpose travel lanes on Westlake Avenue N.The underlying land use assumptions will be updated to reflect the latest set of City's land-use forecasts as being considered for the City's comprehensive plan update to provide a level of development consistent with the City's planning efforts. From conversations with SDOT, the high intensity land use, Alternative 2, is assumed for this study's demand modeling. This land use alternative has 3% annual growth in employment and 5% annual growth in households within the SLU area.

Existing intersection turn-movement counts will be used for the existing conditions analysis. Future-year intersection turn movement volumes will be estimated using a combination of future volume growth projections from the forecast model and post-processing adjustments based on existing counts, in accordance with standard methods from National Cooperative Highway Research Program Report 255.

2.1.1.5. Background Transportation Projects

The significant future transportation infrastructure improvements near the project vicinity that are considered reasonable and foreseeable will be assumed in the No Build Alternatives for 2018 and 2035, and are consistent with the assumptions made for the Seattle CCC NEPA analysis. These projects have been through an environmental review, have identified design and construction funding or are expected to be near-term improvements by the City. The relevant projects within the study area include:

- Alaskan Way Viaduct Replacement and SR 99 Tunnel North Portal: Trips using the State Route 99 (SR 99) tunnel would be tolled and access in the north portal would be reconfigured. New surface street connections across SR 99 would be provided at John, Thomas, Harrison streets.
- Mercer West Improvements: Complete the conversion of Mercer Street and Roy Streets to two-way flow between 5th Avenue N and Queen Anne Avenue N
- Seattle Center City Connector Streetcar Line as previously described in Section 1.1.
- Protected Bike Lanes: Completion of protected 2-way bicycle lanes on Dexter Avenue N between Roy Street and Denny Way and 7th Avenue between Denny Way and Union Street.

2.1.2 Intersection LOS Criteria

All intersections in the study area will be modeled using Synchro software, version 8. Synchro utilizes methods from the Highway Capacity Manual (HCM) 2000. Level of Service (LOS) is a qualitative measurement of intersection operation based on control delay. LOS is reported as letter grades A (low delay per vehicle, favorable traffic progression) through F (extremely high delay per vehicle, could involve long queues).

The reported results for intersections affected by the project will include intersection LOS and average control delay. If transit signal priority is included as a potential improvement, intersection LOS and delay will be calculated by a combination of Synchro and Excel.

2.1.3 Auto Travel Times Criteria

Travel times will be estimated for autos on Westlake Avenue between Stewart Street and Valley Street. Existing auto travel time will be based on data provided by the City. Future auto travel times will be developed from a combination of existing data provided by the City and differences between Existing and Future Synchro model travel time results.

2.1.4 Traffic Patterns Criteria

This criterion will assess the amount of diversion expected with each alternative compared to the No-Build condition. For intersections that could potentially be affected by diversion, reported results will include intersection LOS and delay from Synchro and percent change in demand volumes. In some cases, it is expected that the traffic pattern adjustments could improve traffic flow when coupled with the transit improvements.

2.2 Safety Criteria

A safety analysis will be conducted along Westlake Avenue N and 9th Avenue N. Existing intersection crash histories will be documented based on type, severity, and frequency. Historic crash-rate summaries will be based on the most recent 5 years of crash data available from SDOT.

For future-year conditions, a qualitative assessment of safety will be discussed describing how the project may affect the existing crash type and frequency. Potential effects of the project on safety will be discussed for all modes within the study area, including auto, transit, freight, bicycle, and pedestrian modes. This will be developed by evaluating the number of conflicts between modes and driver expectations.

2.3 Transit Travel Time and Bus Delay Criteria

The transit systems analysis will analyze the impact of the Westlake Transit Improvements on King County Metro Route 40, Rapid Ride C Line and South Lake Union Streetcar in the study area. The analysis will be for 5 to 6 p.m. during the weekday PM peak, which is assumed to have the highest passenger load and traffic impacts. Bus volumes will be compiled for blocks along the alignment as well as on intersecting transit streets.

Transit travel times will be estimated for transit vehicles (buses and streetcar) on Westlake Avenue between Stewart Street and Valley Street. Existing streetcar travel time will be based on data provided by the City, while bus travel time will be developed by a combination of GP travel time provided by the City and bus stop dwell time. Future transit travel times will be developed from a combination of the existing data provided by the City and the difference between the Existing and Future Synchro model results.

In addition, an aggregate bus delay value will be calculated based on the bus volumes and bus delay per block between the No-Build to Build conditions. Bus delay will be calculated for a 2018 and 2035 analysis year. This measure will be used to identify impacts on bus operations.

Buses operating on the proposed alignment and bus stop and bus layover locations will be documented. Conflicts both along the alignment and at stop locations will be identified and mitigation measures will be documented.

2.4 Property Access and Circulation Criteria

A qualitative assessment of the property access, circulation, and freight conditions will be conducted within the study area. The assessment of property access and circulation will document any physical change to the traffic patterns to intersections and roadway segments along the proposed streetcar alignment.

2.5 Freight Criteria

The assessment of freight will be based on observed freight volumes and routes and designated freight routes and their connections. This includes identification of any at-grade crossings and traffic impacts that would affect freight movements. Key freight routes considered will be between I-5 and Westlake Avenue, north of South Lake Union area and between I-5 and SR 99.

2.6 Non-Motorized Criteria

The non-motorized operations assessment will analyze the impact of the Westlake Avenue Transit Improvements on pedestrian and bicyclist access and connectivity.

Existing pedestrian conditions and compliance with Americans with Disabilities (ADA) accessibility requirements will be field-reviewed and evaluated at street, intersection, and sidewalk connections in the study area. The condition of sidewalks, curb ramps, pedestrian push button locations, and other applicable features will be documented in a GIS database.

Based on the current Bicycle Master Plan for the City of Seattle, GIS and field analysis will be used to identify all existing and planned bikeways that intersect with the Westlake Transit Improvements. Proposed solutions will be developed to maintain safe and comfortable bicycling conditions in the area without decreasing access. Planned and funded bicycle facilities will be assumed for the assumed 2018 Opening Year. Priority bicycle facilities from the Bicycle Master Plan (to be identified by SDOT) will be assumed for the 2035 Design Year.

2.7 Parking Criteria

The parking assessment will identify potential changes to on-street parking and loading availability with the implementation of the Westlake Transit Improvements. Using the on-street parking GIS inventory from the City of Seattle, the parking assessment will determine the number of existing parking and loading spaces in the City’s inventory. It will then estimate the parking and loading spaces that would be present along each block face of the planned alignment. The impact will be quantified as the difference between the existing inventory of parking and loading spaces and the estimated number of spaces remaining after implementation of the proposed streetcar. The assessment will classify spaces by use: all-day or peak-restricted parking and truck loading. Impacts to passenger loading spaces will also be identified. Potential mitigation strategies will be identified, when appropriate.

The City of Seattle's parking utilization data will identify occupancy of these spaces during midday, PM peak, early evening, and weekend time frames.

The number of existing off-street parking stalls and their utilization will also be assessed. PSRC and SDOT's parking inventory data will be used to identify publicly- and privately-owned parking garages and lots. These data also include a.m. and p.m. occupancy data. Any anticipated reductions in off-street parking spaces, as a result of implementation of the Westlake Transit Improvements will be documented.

No difference is anticipated between the proposed 2018 Opening Year (assumed) and the 2035 Design Year.

APPENDIX C

Evaluation Data and Results

C-1 2018/2035 Travel Time Results by Mode

C-2 Transit Ridership Evaluation Data and Results

C-3 2018/2035 Intersection LOS and Delay Summary

C-4 Existing Crash Data Summary

C-5 Property Access & Circulation Summary

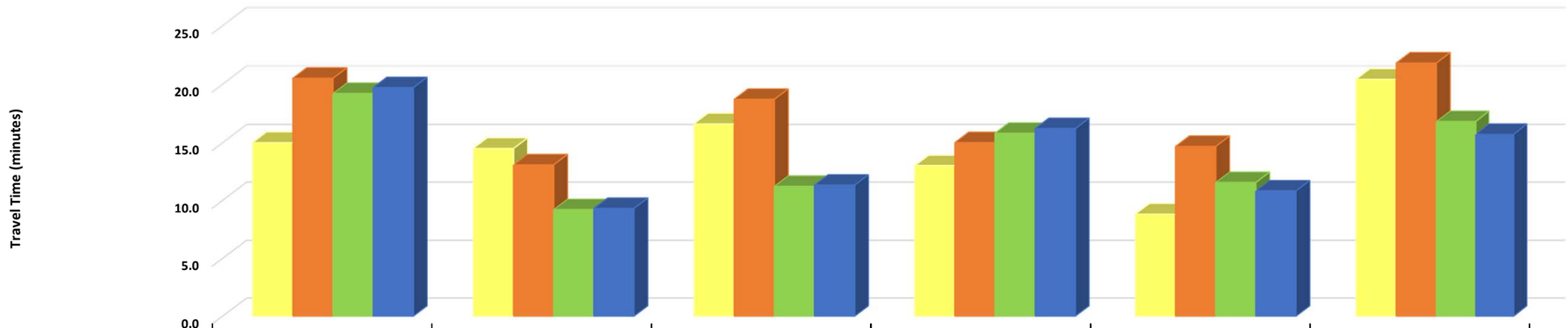
C-6 Nonmotorized Evaluation Data and Results

C-7 Parking Evaluation Data and Results

Westlake Transit Improvement Study
Table C-1.1: 2018 Travel Time Results

						2015 Existing		2018 No Build				2018 BAT/Transit Lane (Opt. A)					2018 BAT/Transit Lane (Opt. B)				
Direction	Mode	From	To	Via	Distance (mi)	Travel Time (min)	Speed (mph)	Travel Time (min)	Speed (mph)	TT % Change compared to Existing	TT Delta compared to Existing (min)	Travel Time (min)	TT Delta compared to No Build (min)	TT % Change compared to 2015 Existing	TT % Change compared to No Build	Speed (mph)	Travel Time (min)	TT Delta compared to No Build (min)	TT % Change compared to 2015 Existing	TT % Change compared to No Build	Speed (mph)
Northbound	Auto	Westlake Ave/ 6th Ave	Westlake Ave/ 9th Ave N	Westlake Ave	0.90	15.0	3.6	16.1	3.3	7%	1.1	14.9	-1.2	-1%	-7%	3.6	14.8	-1.3	-1%	-8%	3.6
	Bus	Westlake Ave/ 9th Ave/ Blanchard St	Westlake Ave/ 9th Ave N	Westlake Ave	0.68	14.5	2.8	12.3	3.3	-15%	-2.2	9.1	-3.2	-37%	-26%	0.0	9.1	-3.2	-37%	-26%	0.0
	Streetcar	Westlake Ave/ Stewart St	Fairview Ave/ Valley St	Westlake Ave / Thomas St/ Terry Ave/ Valley St	0.99	16.6	3.6	16.5	3.6	-1%	-0.1	11.0	-5.5	-34%	-33%	5.4	11.3	-5.2	-32%	-32%	5.3
Southbound	Auto	Westlake Ave/ 9th Ave N	Westlake Ave/ Stewart St	Westlake Ave	0.93	13.0	4.3	13.3	4.2	2%	0.3	14.0	0.7	8%	5%	4.0	14.9	1.6	15%	12%	4.2
		Westlake Ave/ 9th Ave N	Westlake Ave/ Stewart St	9th Ave N/ Bell St/ 8th Ave/ Westlake Ave	0.98	10.2	5.8	13.8	4.3	36%	3.7	11.8	-2.0	16%	-15%	5.0	14.1	0.3	39%	2%	4.2
	Bus	Westlake Ave/ 9th Ave N	Westlake Ave/Lenora St	Westlake Ave	0.71	8.8	4.1	13.5	3.1	54%	4.7	10.6	-2.9	21%	-22%	3.4	10.8	-2.8	22%	-21%	3.4
	Streetcar	Fairview Ave/ Valley St	Westlake Ave/ Stewart St	Valley St/ Westlake Ave	1.04	20.4	3.0	19.5	3.2	-4%	-0.9	15.9	-3.6	-22%	-18%	3.9	15.3	-4.2	-25%	-22%	4.1

Westlake Transit Improvement Study
Table C-1.2: 2035 Travel Time Results



	Northbound			Southbound		
	Auto	Bus	Streetcar	Auto	Bus	Streetcar
2015 Existing	15.0	14.5	16.6	13.0	8.8	20.4
2035 No Build	20.5	13.1	18.7	15.0	14.7	21.8
2035 BAT/Transit Lane (Opt. A)	19.2	9.2	11.2	15.8	11.5	16.8
2035 BAT/Transit Lane (Opt. B)	19.7	9.3	11.3	16.2	10.8	15.7

						2015 Existing		2035 No Build				2035 BAT/Transit Lane (Opt. A)					2035 BAT/Transit Lane (Opt. B)				
Direction	Mode	From	To	Via	Distance (mi)	Travel Time (min)	Speed (mph)	Travel Time (min)	Speed (mph)	TT % Change compared to Existing	TT Delta compared to Existing (min)	Travel Time (min)	TT Delta compared to No Build (min)	TT % Change compared to 2015 Existing	TT % Change compared to No Build	Speed (mph)	Travel Time (min)	TT Delta compared to No Build (min)	TT % Change compared to 2015 Existing	TT % Change compared to No Build	Speed (mph)
Northbound	Auto	Westlake Ave/ 6th Ave	Westlake Ave/ 9th Ave N	Westlake Ave	0.90	15.0	3.6	20.5	2.6	37%	5.5	19.2	-1.3	28%	-6%	2.8	19.7	-0.8	31%	-4%	2.7
	Bus	Westlake Ave/ 9th Ave/ Blanchard St	Westlake Ave/ 9th Ave N	Westlake Ave	0.68	14.5	2.8	13.1	3.1	-10%	-1.4	9.2	-3.9	-37%	-30%	4.5	9.3	-3.8	-36%	-29%	4.4
	Streetcar	Westlake Ave/ Stewart St	Fairview Ave/ Valley St	Westlake Ave / Thomas St/ Terry Ave/ Valley St	0.99	16.6	3.6	18.7	3.2	13%	2.1	11.2	-7.5	-33%	-40%	5.3	11.3	-7.4	-32%	-40%	5.3
Southbound	Auto	Westlake Ave/ 9th Ave N	Westlake Ave/ Stewart St	Westlake Ave	0.93	13.0	4.3	15.0	3.7	15%	2.0	15.8	0.8	22%	5%	3.5	16.2	1.2	25%	8%	3.9
		Westlake Ave/ 9th Ave N	Westlake Ave/ Stewart St	9th Ave N/ Bell St/ 8th Ave/ Westlake Ave	0.98	10.2	5.8	15.1	3.9	49%	5.0	17.2	2.1	69%	14%	3.4	18.9	3.8	87%	25%	3.1
	Bus	Westlake Ave/ 9th Ave N	Westlake Ave/Lenora St	Westlake Ave	0.71	8.8	4.1	14.7	2.9	67%	5.9	11.5	-3.1	31%	-21%	3.2	10.8	-3.9	23%	-26%	3.4
	Streetcar	Fairview Ave/ Valley St	Westlake Ave/ Stewart St	Valley St/ Westlake Ave	1.04	20.4	3.0	21.8	2.9	7%	1.4	16.8	-5.0	-18%	-23%	3.7	15.7	-6.1	-23%	-28%	4.0

APPENDIX C.2 TRANSIT RIDERSHIP EVALUATION DATA AND RESULTS

Introduction

This section provides additional data and analysis of the transit ridership of the proposed Westlake Transit Improvements.

The transit ridership implications of the Westlake alternatives were evaluated using the FTA's Simplified Trips on Project Software (STOPS) model. All underlying inputs for the model were consistent with those used in the Seattle Center City Connector (CCC) Streetcar project. However, in order to isolate the impact of the travel time changes to the affected segment along Westlake Avenue, the stations/stops along the segment were defined as the "project." STOPS defines any trip that goes to, from, or through a station or stop along this segment as a "project trip." Results presented in this appendix are taken from the STOPS outputs for these alternatives.

The following alternatives were modeled for the Horizon Year 2035:

- No Build
- BAT/Transit Lane Option A

The No Build Alternative included background improvements such as the CCC Streetcar Line with a northern turnaround on Republican Street between Terry and Westlake Avenues and changes to King County Metro (KCM) Route 40 and RapidRide C-Line. In the case of the KCM Route 40 the southbound path was rerouted to Westlake Avenue (the northbound path was already using Westlake Avenue). RapidRide C-Line was assumed to become a separate route from RapidRide D-Line (currently interlined in downtown Seattle) and extended to run along Westlake Avenue and Valley Street and terminate at the intersection of Fairview Avenue & Valley Street, with a turnaround around the block bounded by Fairview Avenue, Valley Street, Minor Avenue, and Aloha Street.

The BAT/Transit Lane Alternative was assumed as the Build condition to compare against the No Build condition for the transit ridership modeling. Results for the BAT/Transit Lane Alternative are representative of both Options A and B, since the difference in travel time between the two options is not likely to cause a change in ridership levels.

The maps below illustrate the configuration of these routes in the No-Build condition (Figure C.2-1) and the BAT/Transit Lane Alternative (Option A shown) (Figure C.2-2).

Figure C.2-1 No-Build Alternative

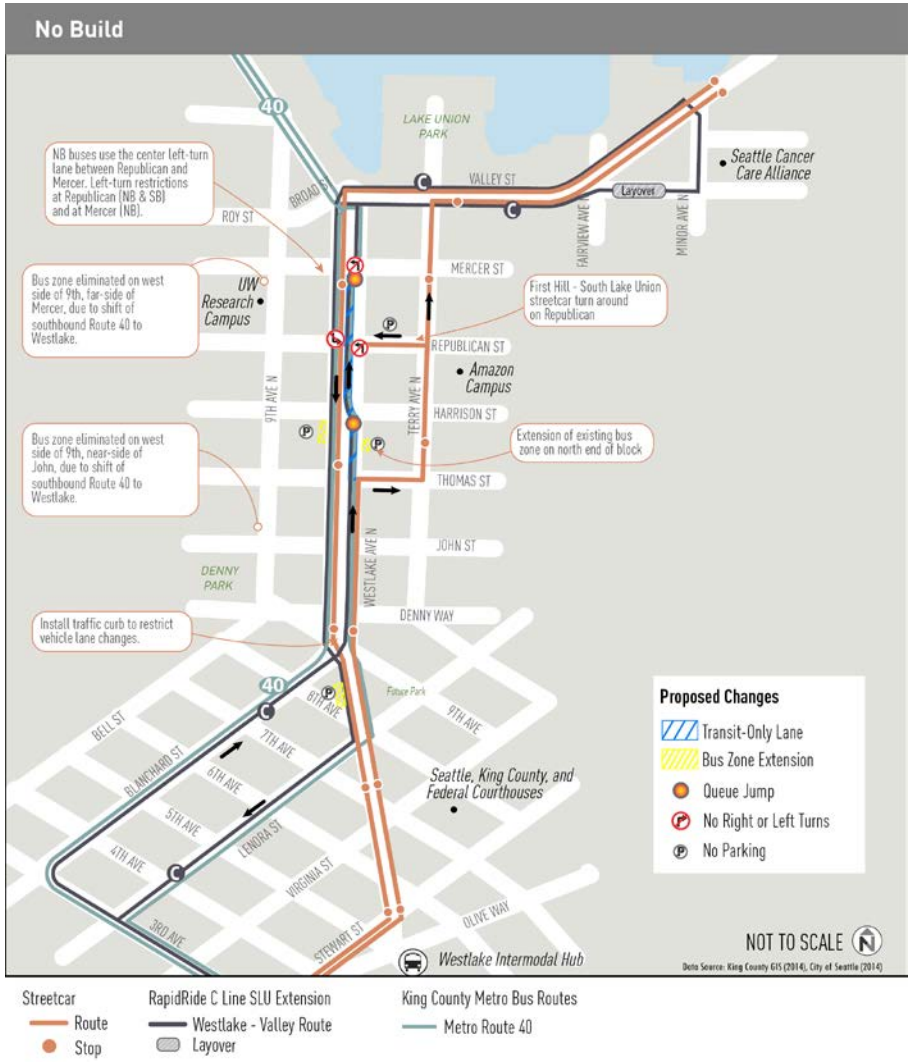
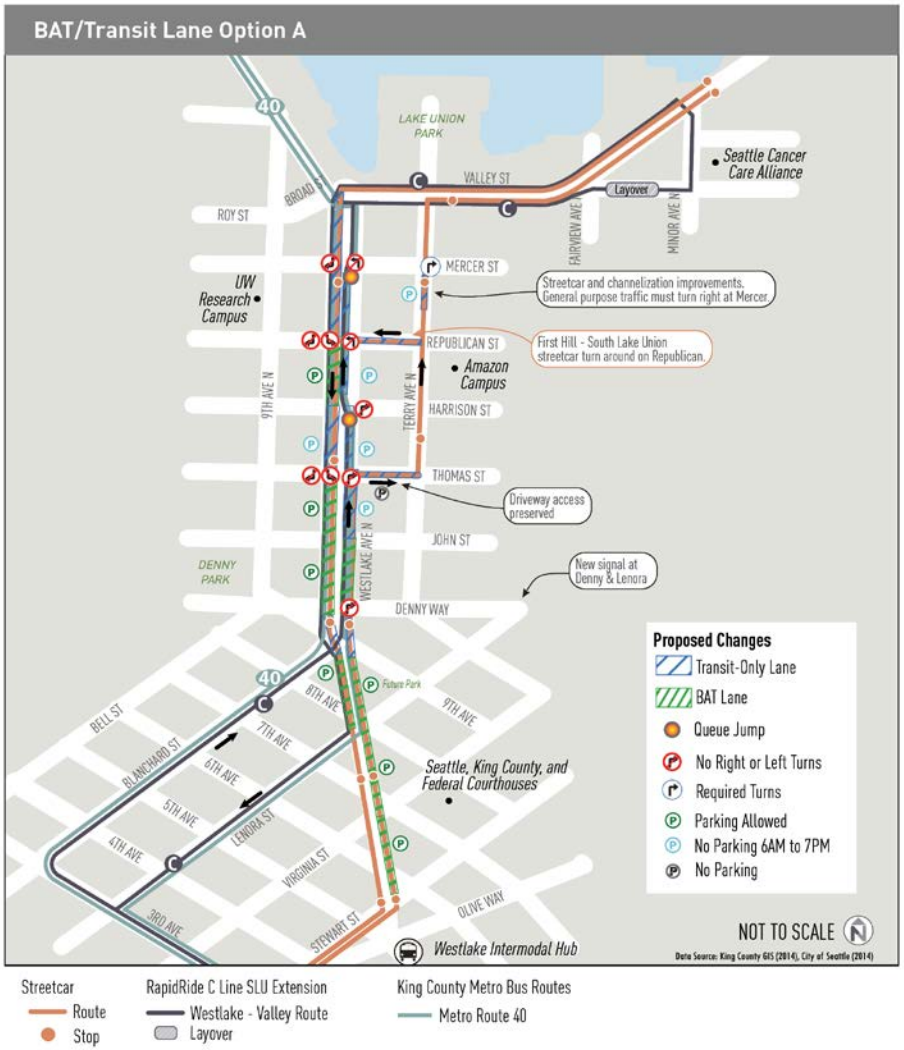


Figure C.2-2 BAT/Transit Lane Alternative Option A



Travel Times

Travel times for the No-Build condition assumed improvements described above for Westlake Avenue for the segment on which the streetcar, Route 40, and the C-Line operate. These improvements would primarily reduce northbound travel times for Route 40 and the C-Line relative to the existing condition. Other transit travel times would be projected to increase in the 2035 No-Build condition. Bus and streetcar travel times that reflect the Build alternative improvements were used as input to the STOPS model runs. These times were based on the traffic modeling conducted for this study (see Appendix C-1). Table C.2-1 summarizes projected travel times in 2035 along Westlake for the streetcar and bus (i.e., Route 40 and C-Line) in the No-Build and Build alternatives.

- **Streetcar:** In the northbound direction the streetcar showed an approximately 40% reduction in travel times relative to No-Build. Southbound streetcar travel times were 23% lower in the BAT/Transit Lane Alternative Option A.
- **Bus:** In the northbound direction, No-Build bus travel times were reduced by 10% from the existing condition, reflecting improvements for northbound Route 40 that are already planned for near-term implementation along Westlake (see Chapter 2), and further reduced by 37% with the Build alternative, relative to No-Build. Southbound No-Build bus travel times showed a 67% increase relative to the existing condition, but were reduced by 21% in the Build alternative relative to No-Build.

Table C.2-1 Travel Time Assumptions, No-Build and BAT/Transit Lane Alternative Option A, Year 2035

		2015 Existing		2035 No-Build		2035 Build (BAT Option A)	
		SC [2]	Bus [3]	SC [2]	Bus [3]	SC [2]	Bus [3]
Northbound	Travel Time, Minutes [2,3]	16.6	14.5	18.7	13.1	11.2	9.2
	% Change from Existing	-	-	13%	-10%	-33%	-37%
	% Change from No-Build	-	-	-	-	-40%	-30%
Southbound	Travel Time, Minutes [2,3]	20.4	8.8	21.8	14.7	16.8	11.5
	% Change from Existing	-	-	7%	67%	-18%	31%
	% Change from No-Build	-	-	-	-	-23%	-21%

Notes: [1] Assumes northbound bus improvements on Westlake. [2] Streetcar travel time between Westlake/Stewart and Fairview/Valley [3] Bus travel time between Westlake/9th/Blanchard and Westlake/9th.

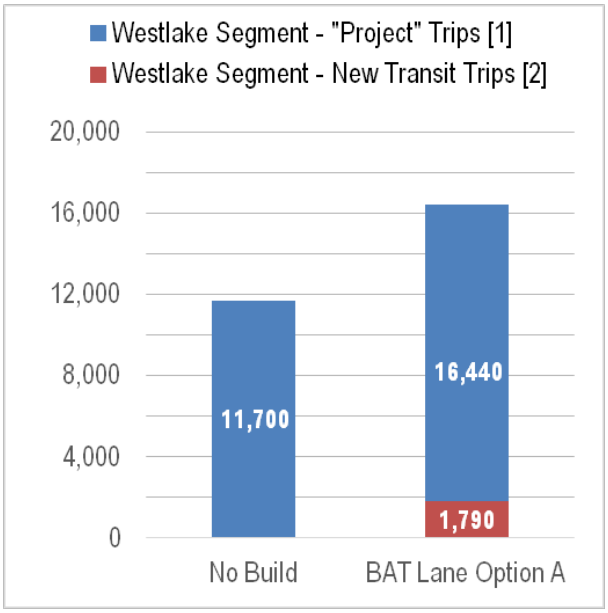
Ridership Projections

This section describes weekday daily ridership projections for the Westlake Transit Study No-Build Alternative and BAT/Transit Lane Alternative Option A. Ridership projections are presented for a 2035 horizon year, assuming an integrated streetcar system including the CCC, South Lake Union (SLU), and First Hill streetcar lines.

Project Trips

Figure C.2-3 shows the Trips on Project measure that reflects total boardings for any trip that is to/from or through one of the stations/stops that is affected by the travel time improvements associated with this study. For example, if someone gets on the SLU Streetcar and travels through the project area to a location along the CCC segment of the integrated streetcar system, they would be captured in this number. In the same way, any trips on the Route 40 or C-Line that start either north or south of and travel through the study area are counted in the project trips number even if they do not board or alight in the study area. It should be emphasized that the project trips number reflects anyone utilizing the project but is not an indicator of new transit trips. In other words, project trips include riders on Route 40 or the Streetcar prior to the improvements who benefit from the alternatives.

Figure C.2-3 Westlake Project Trips and New Transit Trips, Average Weekday, 2035



Project trips for the BAT/Transit Lane Alternative Option A would increase by over 4,000 trips or about 40% over the No-Build condition — responding to the travel time improvements in the range of 23% to 40% for streetcar and 21% to 30% for bus, relative to No-Build (see above). As noted above, this increase does not represent trips that are entirely new to transit and, in a number of cases, the results indicate that trips would shift from other routes in order to take advantage of time savings in this segment. New trips and trips that shift from other routes will be discussed in more detail in the next section.

New Transit Trips

As noted above, ridership using the project is made up of new trips and trips that may have shifted from another transit route as a result of travel time savings from the Build Alternative, as well as trips that may have already been using the transit routes prior to the change. New trips make up approximately 11% of total project trips.

Figure C.2-4 shows aggregated origin/destination areas and Table C.2-2provides details of origin/destination locations of new trips for the alternatives. Analysis of these trips indicates that over 75% would have destinations in either the SLU area or the CBD. The primary origin of the trips would be the SLU and Denny Triangle areas that are most affected by the travel time improvements. Riders from north of downtown Seattle (along the Route 40 alignment) would also contribute a large portion of origins for new trips. In addition, trips from south of downtown Seattle to destinations in the SLU area would make up approximately 15% of total new trips. Those trips would be commute or home-based work trips (primarily park and ride

trips that would use Sounder and transfer to Central Link or a bus in downtown). The improved travel times and access for Route 40 appear to be the cause of the increased ridership.

Figure C.2-4 Origin/Destination Areas

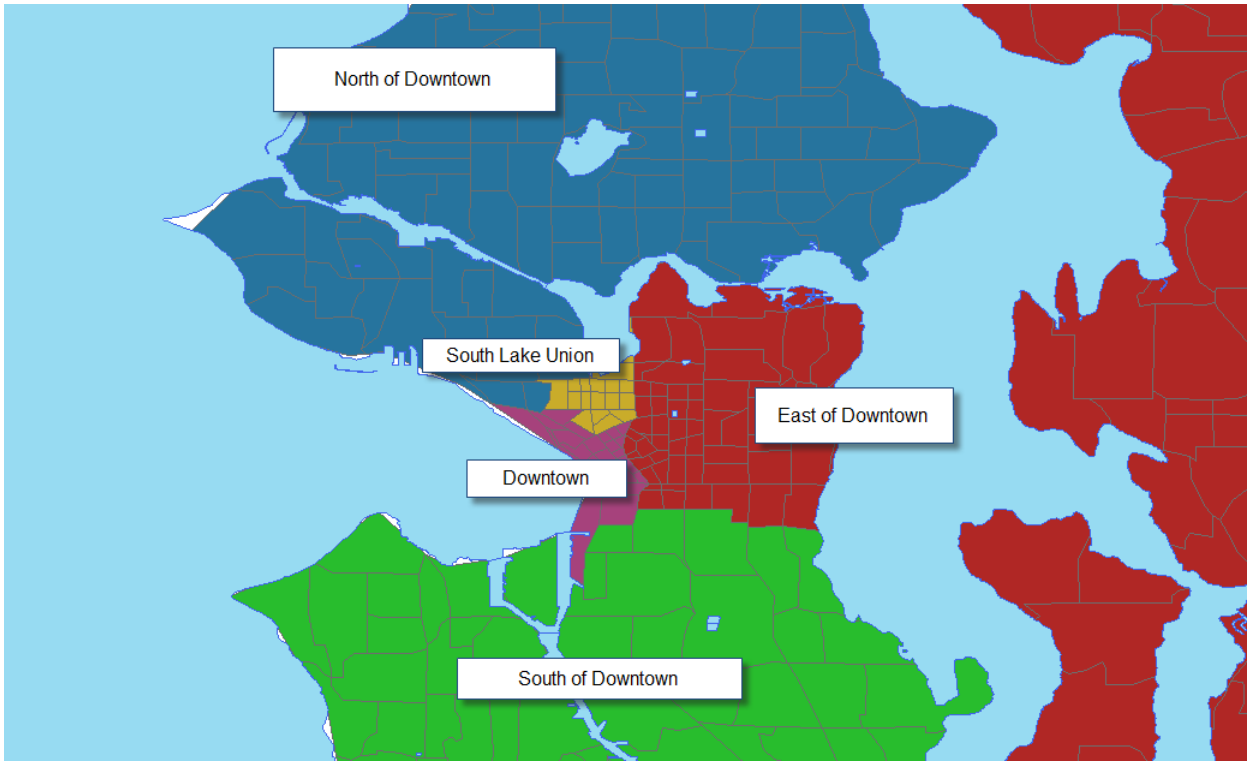


Table C.2-2 New Transit Trips by Origin/Destination Areas, 2035, BAT/Transit Lane Build Alternative

		Destination Areas							
		South Lake Union	Downtown	North of Downtown	South of Downtown	East of Downtown	Other	Total	Row % of Total
Origin Areas	South Lake Union	40	420	0	0	10	0	470	26%
	Downtown	70	90	20	0	10	0	190	11%
	North of Downtown	30	270	20	90	120	-60	470	26%
	South of Downtown	270	20	40	10	40	0	380	21%
	East of Downtown	140	90	40	0	-10	0	260	15%
	Other	10	-10	10	10	0	0	20	1%
	Total	560	880	130	110	170	-60	1,790	
	Column % of Total	31%	49%	7%	6%	9%	-3%		

Notes: Rounded to nearest 10. Negative cell values are the result of trips moving from one Origin/Destination to another after introduction of service changes.

Overall route level ridership between the No-Build and BAT/Transit Lane alternative indicates that there would be a shift in trips away from Central Link to both streetcar and Route 40/C-Line. C-Line shows a more minimal increase compared to both streetcar and Route 40.

Westlake Avenue Transit Improvement Study
Table C-3
Intersection Results

						2018 Year of Opening						2035 Horizon Year					
				2015 Existing		2018 No Build		2018 BAT/Transit Lane Opt. A		2018 BAT/Transit Lane Opt. B		2035 No Build		2035 BAT/Transit Lane Opt. A		2035 BAT/Transit Lane Opt. B	
ID#	North-South Street	East-West Street	Traffic Control	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Westlake Corridor Intersections																	
1	Westlake Ave N	Valley St/Broad St	Signal	D	51	D	40	D	41	D	51	D	47	D	44	D	45
2	Westlake Ave N	Mercer St	Signal	E	63	E	78	E	78	D	36	F	106	F	109	F	108
3	Westlake Ave N	Republican St	Signal	C	30	F	101	F	136	F	119	F	177	F	177	F	196
4	Westlake Ave N	Harrison St	Signal	C	29	B	18	C	28	C	24	C	33	E	73	D	41
6	Westlake Ave N	Thomas St	Signal	C	27	B	15	B	12	B	13	B	18	B	17	B	14
8	Westlake Ave N	John St	TWSC/Signal	F	231	B	11	B	17	B	12	B	14	B	18	B	13
9	Westlake Ave N	Denny Way	Signal	E	61	F	96	D	38	D	45	F	125	E	73	F	125
10	Westlake Ave	Blanchard St/9th Ave	Signal	C	35	B	20	C	27	C	22	C	27	C	30	C	21
11	Westlake Ave	Lenora St/8th Ave	Signal	E	63	E	58	D	48	E	63	F	85	E	78	F	93
12	Westlake Ave	7th Ave	Signal	B	13	B	18	B	16	B	18	C	21	C	22	B	18
13	7th Ave	Virginia St	Signal	B	14	A	7	A	10	A	6	A	7	A	7	A	8
14	Westlake Ave	Virginia St	Signal	A	6	B	12	B	15	B	14	A	7	B	11	B	10
15	Westlake Ave	6th Ave	Signal	B	14	B	17	B	16	B	16	B	13	B	11	B	12
16	Westlake Ave	Stewart St	Signal	A	9	B	10	B	15	B	17	B	13	B	13	B	13
17	9th Ave N	Westlake Ave N	Signal	C	35	D	54	D	41	D	37	E	56	D	43	D	47
Adjacent Intersections																	
5	Terry Ave N	Harrison St	AWSC	A	10	B	13	B	14	B	14	C	17	C	21	C	21
7	Terry Ave N	Thomas St	AWSC	B	11	B	12	A	10	A	10	C	16	B	11	B	11
18	9th Ave N	Roy St/Broad St	Signal	C	21	D	37	C	21	C	20	D	39	D	52	E	60
19	9th Ave N	Mercer St	Signal	B	19	D	52	D	47	E	64	F	98	F	106	F	114
20	9th Ave N	Republican St	Signal	B	17	B	20	C	26	C	23	D	41	E	63	F	106
21	9th Ave N	Harrison St	Signal	C	20	B	20	C	24	C	29	D	48	E	77	F	104
22	9th Ave N	Thomas St	TWSC	C	19	F	64	F	121	F	183	F	300	F	300	F	300
23	9th Ave N	John St	TWSC/Signal	C	23	B	20	B	18	C	21	D	41	D	46	D	48
24	Bell St/9th Ave N	Denny Way	Signal	A	9	C	29	C	23	C	27	D	47	E	68	E	57
25	8th Ave	Bell St	AWSC	A	9	B	10	B	12	C	16	C	16	C	23	E	40
26	Fairview Ave N	Aloha St	Signal	A	9	B	14	B	14	B	13	B	15	B	15	B	15
27	Terry Ave N	Valley St	Signal	C	21	B	16	B	11	B	14	C	24	B	18	B	18
28	Fairview Ave N	Valley St	Signal	D	48	D	45	D	42	D	41	E	58	E	60	E	60
29	Dexter Ave N	Mercer St	Signal	E	56	E	76	E	71	E	72	F	114	F	103	F	102
30	Terry Ave N	Mercer St	Signal	D	41	F	233	F	104	F	112	F	300	F	170	F	169
31	Fairview Ave N	Mercer St	Signal	F	141	F	129	F	142	F	148	F	176	F	204	F	207
32	Terry Ave N	Republican St	AWSC	B	10	B	15	B	11	B	11	C	20	B	14	B	14
33	Fairview Ave N	Republican St	Signal	E	72	C	33	C	28	C	33	D	43	D	48	D	48
34	Dexter Ave N	Denny Way	Signal	E	59	E	64	F	82	F	81	F	87	F	119	F	124
35	Lenora St/Boren Ave	Denny Way	TWSC/Signal	F	300	F	300	C	33	F	330	F	300	F	105	F	300
36	Fairview Ave N	Denny Way	Signal	F	97	E	61	E	67	E	69	F	114	F	123	F	120
37	Dexter Ave N	Republican St	TWSC/Signal	C	24	C	28	D	40	E	69	E	65	F	82	F	136
38	8th Ave	Blanchard St	Signal	B	11	B	16	B	16	B	17	B	18	B	18	C	20

Westlake Transit Improvement Study

Appendix C-4: Existing Crash Data Summary

ID	Intersection	Crash Frequency (2009 - 2014)				Total Entering	AADT	Crash Rate	Control	Avg Crash/ Year	Bike	Ped	
		Fatal	Injury	PDO	Total								
1	Westlake Ave N and Valley St	0	0	0	0	2,000	20,000	0.00	Sig	0	0	0	
2	Westlake Ave N and Mercer St	0	18	12	33	4,645	46,450	0.39	Sig	6.6	3	1	x
3	Westlake Ave N and Republican St	0	4	0	4	1,300	13,000	0.17	Sig	0.8	0	1	
4	Westlake Ave N and Harrison St	0	2	4	6	1,370	13,700	0.24	Sig	1.2	1	1	
5	Terry Ave N and Harrison St	0	0	1	1	720	7,200	0.08	Unsig	0.2	0	0	
6	Westlake Ave N and Thomas St	0	5	1	6	1,430	14,300	0.23	Sig	1.2	1	0	
7	Terry Ave N and Thomas St	0	1	0	2	780	7,800	0.14	Unsig	0.4	0	1	
8	Westlake Ave N and John St	0	3	7	10	1,405	14,050	0.39	Unsig	2	1	1	
9	Westlake Ave N and Denny Way	0	3	7	12	3,340	33,400	0.20	Sig	2.4	1	0	
10	Westlake Ave and Blanchard St/9th Ave	0	1	0	1	1,455	14,550	0.04	Sig	0.2	1	0	
11	Westlake Ave and Lenora St/8th Ave	0	4	6	12	1,295	12,950	0.51	Sig	2.4	2	1	x
12	Westlake Ave and 7th Ave	0	4	4	11	740	7,400	0.81	Sig	2.2	0	2	x
13	7th Ave and Virginia St	0	11	6	18	1,075	10,750	0.92	Sig	3.6	0	0	
14	Westlake Ave and Virginia St	0	4	7	11	1,135	11,350	0.53	Sig	2.2	2	0	x
15	Westlake Ave and 6th Ave	0	3	4	8	1,061	10,610	0.41	Sig	1.6	0	1	
16	Westlake Ave and Stewart St	0	2	0	2	677	6,770	0.16	Sig	0.4	0	0	
17	9th Ave N and Westlake Ave N	0	0	0	0	2,390	23,900	0.00	Sig	0	0	0	
18	9th Ave N and Roy St/Valley St/Broad St	0	2	7	11	1,085	10,850	0.56	Sig	2.2	0	0	
19	9th Ave N and Mercer St	0	3	19	25	3,670	36,700	0.37	Sig	5	0	0	
20	9th Ave N and Republican St	0	2	1	4	680	6,800	0.32	Sig	0.8	0	0	
21	9th Ave N and Harrison St	0	2	0	2	605	6,050	0.18	Sig	0.4	0	0	
22	9th Ave N and Thomas St	0	5	5	10	680	6,800	0.81	Unsig	2	0	2	x
23	9th Ave N and John St	0	0	2	2	660	6,600	0.17	Unsig	0.4	0	0	
24	Bell St/9th Ave N and Denny Way	0	3	2	5	2,380	23,800	0.12	Sig	1	2	0	x
25	8th Ave and Bell St	0	0	0	0	555	5,550	0.00	Unsig	0	0	0	
26	Fairview Ave N and Aloha St	0	0	4	4	1,290	12,900	0.17	Sig	0.8	1	0	
27	Terry Ave N and Valley St	0	1	2	3	1,081	10,810	0.15	Sig	0.6	0	0	
28	Fairview Ave N and Valley St	0	3	14	18	1,645	16,450	0.60	Sig	3.6	0	0	
29	Dexter Ave N and Mercer St	0	8	12	25	3,775	37,750	0.36	Sig	5	0	0	
30	Terry Ave N and Mercer St	0	1	10	12	4,481	44,810	0.15	Sig	2.4	0	0	
31	Fairview Ave N and Mercer St	0	4	22	30	7,085	70,850	0.23	Sig	6	0	0	
32	Terry Ave N and Republican St	0	1	0	1	725	7,250	0.08	Unsig	0.2	1	0	
33	Fairview Ave N and Republican St	0	1	6	7	2,040	20,400	0.19	Sig	1.4	0	0	
34	Dexter Ave N and Denny Way	0	18	21	41	2,845	28,450	0.79	Sig	8.2	2	5	x
35	Lenora St/Boren Ave and Denny Way	0	3	9	13	2,635	26,350	0.27	Sig	2.6	1	1	
36	Fairview Ave N and Denny Way	0	10	13	25	3,625	36,250	0.38	Sig	5	1	5	x
37	Dexter Ave N and Republican St	0	8	7	16	1,320	13,200	0.66	Unsig	3.2	3	0	x

Notes:

*No HAL intersections

**No fatalities/fatal crashes

Westlake Transit Improvement Study

Appendix C-5.1

Property Access Summary

Total Existing Driveways =	16

Change to Driveway

Alternative	Unaffected	Some Movements Restricted	Closed
No Build	15	1	0
BAT/ Transit Opt A	11	5	0
BAT/ Transit Opt B	10	6	0

Street	Block along Street	Side of Road	No Build		BAT/ Transit Lane Opt A		BAT/ Transit Lane Opt B		Description of Change to Property Access
			Restricted	Closed	Restricted	Closed	Restricted	Closed	
Westlake Ave	Broad/Valley to Mercer	West	No	No	No	No	No	No	
		East	No	No	No	No	No	No	
	Mercer to Republican	East	Yes	No	Yes	No	Yes	No	Driveway to parking lot on east side of Westlake assumed to be converted to right-in/right-out when center lane on Westlake Ave is converted to northbound Transit-Lane in No Build.
	Republican to Harrison	West	No	No	No	No	No	No	
	Thomas to John	West	No	No	No	No	No	No	
	John to Denny	West	No	No	No	No	No	No	
	Denny to 9th Ave/Blanchard	West	No	No	No	No	Yes	No	Short segment of 9th Ave between Westlake Ave and Denny Way (one-way EB) would be converted to left-out only for Option B.
	9th Ave/Blanchard to 8th Ave/Lenora	West	No	No	No	No	No	No	
		East	No	No	No	No	No	No	
	8th Ave/Lenora to 7th	East	No	No	No	No	No	No	
	Virginia to 6th	East	No	No	No	No	No	No	
	6th to Stewart	West	No	No	No	No	No	No	
Thomas St	Westlake to Terry	North	No	No	Yes	No	Yes	No	BAT/Transit Lane Alt (both options A & B) would change south side to "Transit-Only" and north side to WB only for Auto. Alley on north side would become right-out.
		South	No	No	Yes	No	Yes	No	BAT/Transit Lane Alt (both options A & B) would change south side to "Transit-Only" and north side to WB only for Auto. Driveway to surface parking lot on south side would be changed to left-in/left-out.
Republican St	Westlake to Terry	North	No	No	Yes	No	Yes	No	BAT/Transit Lane Alt (both options A & B) would change north side to "Transit-Only" and south side to EB only for Auto. Alley on north side would be changed to left-in/left-out.
		South	No	No	Yes	No	Yes	No	BAT/Transit Lane Alt (both options A & B) would change north side to "Transit-Only" and south side to EB only for Auto. Alley on south side would be changed to right-in/right-out.

Westlake Transit Improvement Study

Appendix C-5.2

Turns from Westlake Avenue

Cross Street on Westlake	Northbound						Southbound					
	Left-Turn Allowed			Right-Turn Allowed			Left-Turn Allowed			Right-Turn Allowed		
	No Build	BAT/ Transit Opt A	BAT/ Transit Opt B	No Build	BAT/ Transit Opt A	BAT/ Transit Opt B	No Build	BAT/ Transit Opt A	BAT/ Transit Opt B	No Build	BAT/ Transit Opt A	BAT/ Transit Opt B
Broad/Valley	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mercer	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Republican	No	No	No	Yes	Yes	Yes	No	No	No	Yes	No	No
Harrison	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Thomas	Yes	Yes	Yes	Yes	No	No	Yes	No	No	Yes	No	No
John	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Denny	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
9th Ave/Blanchard	n/a			Yes	Yes	Yes	Yes	Yes	No	n/a		
8th Ave/Lenora	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
7th Ave	n/a			Yes	Yes	Yes	Yes	Yes	Yes	n/a		
Virginia	n/a			Yes	Yes	Yes	Yes	Yes	Yes	n/a		
Total Allowed =	6	6	6	11	8	9	10	9	8	8	5	5
Total Restricted =	2	2	2	0	3	2	1	2	3	0	3	3

Notes:

* 7th Ave is assumed to be converted to 1-way southbound between Lenora and Westlake in all alternatives

Alternative	Northbound Turns Allowed	Southbound Turns Allowed	Both Directions Combined	
No Build	17	18	35	
BAT/Transit Opt. A	14	14	28	-20%
BAT/Transit Opt. B	15	13	28	-20%

APPENDIX C.6 NON-MOTORIZED DATA AND RESULTS

Introduction

This section provides additional data and analysis of the impact of the proposed Westlake Transit Improvements on access and connectivity for non-motorized modes (pedestrian and bicyclist). Elements that were considered in evaluating the alternatives include:

- **Turn restrictions**. Are there potential benefit from auto turn restrictions that reduce potential conflicts between pedestrians/bicyclists and turning vehicles?
- **Impact on street crossings**. Does any alternative impact a person's ability to cross the street near planned stops?
- **Planned bicycle facilities**. Does any alternative affect right-of-way where a future bicycle facility is planned? In the case of a side street, does the alternative affect the ability of a current or planned bicycle route to cross these streets?
- **Parking restrictions**. Would any parking restriction preclude the possibility of placing a bike share station or bike corral in an on-street parking space?

Existing Conditions Assessment

This section analyzes the current conditions of the pedestrian environment in the Westlake corridor. Figure C-6.1 summarizes qualitative information that was recorded in the field. The corridor generally provides a comfortable pedestrian environment with wide sidewalks, street trees, and signalized street crossings. However, several large construction projects have closed blocks to pedestrian access (for example, Mercer Street - Valley Street and Virginia Street - 7th Avenue). These temporary barriers to pedestrian movement in the area also preclude assessment of future conditions in some locations.

Figure C-6.2 provides a map of existing pedestrian conditions, including signalized intersections, and Figure C-6.3 illustrates existing and planned bicycle facilities along the corridor. Future bicycle facilities would intersect Westlake at Valley, Republican, Thomas, and 7th.

Figure C-6.1 Westlake Corridor Existing Conditions

Segment, Street, and Stop Location	Along the Corridor		Crossing the Corridor	
	Sidewalk Quality	Obstructions	Proximity to Crossings	Curb Ramps
Westlake Avenue, south of Denny Way				
Stops: Blanchard St (SB) / Denny Way (NB)	Sidewalks are present on both sides of Westlake Avenue throughout the section, and are generally in good condition. A street tree with large roots has raised the sidewalk between 6th Ave and Westlake Ave on the east side of the street.	Some obstructions are present, but most are simply overgrown plantings. Ongoing construction projects have intermittently closed sidewalks to pedestrians.	All stops are near intersections with marked crossings.	Curb ramps are present at all intersections.
Westlake Avenue N, north of Denny Way				
Stops: Harrison Mercer	Sidewalks present on both sides of the street and are generally in good condition. There is a pothole in the crosswalk between Republican St and Mercer St.	Sidewalk widths vary but offer occasional obstructions for people using mobility devices. Ongoing construction projects have intermittently closed sidewalks to pedestrians.	All stops are near or between intersections with marked crossings.	Most intersections have curb ramps and tactile warning strips. No marked crossing and only partial curb ramps across Westlake at John, however there is not stop at this intersection.

Figure C-6.2 Existing Pedestrian Conditions

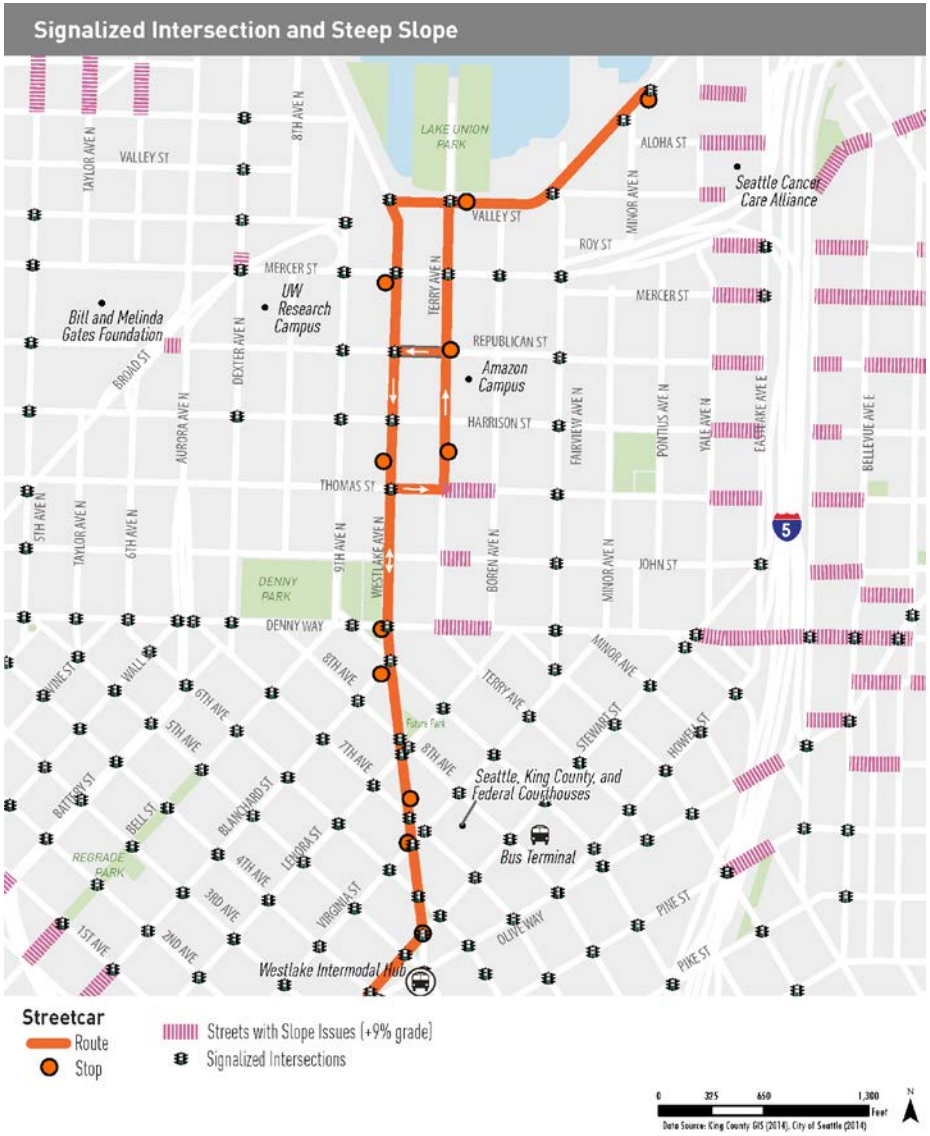
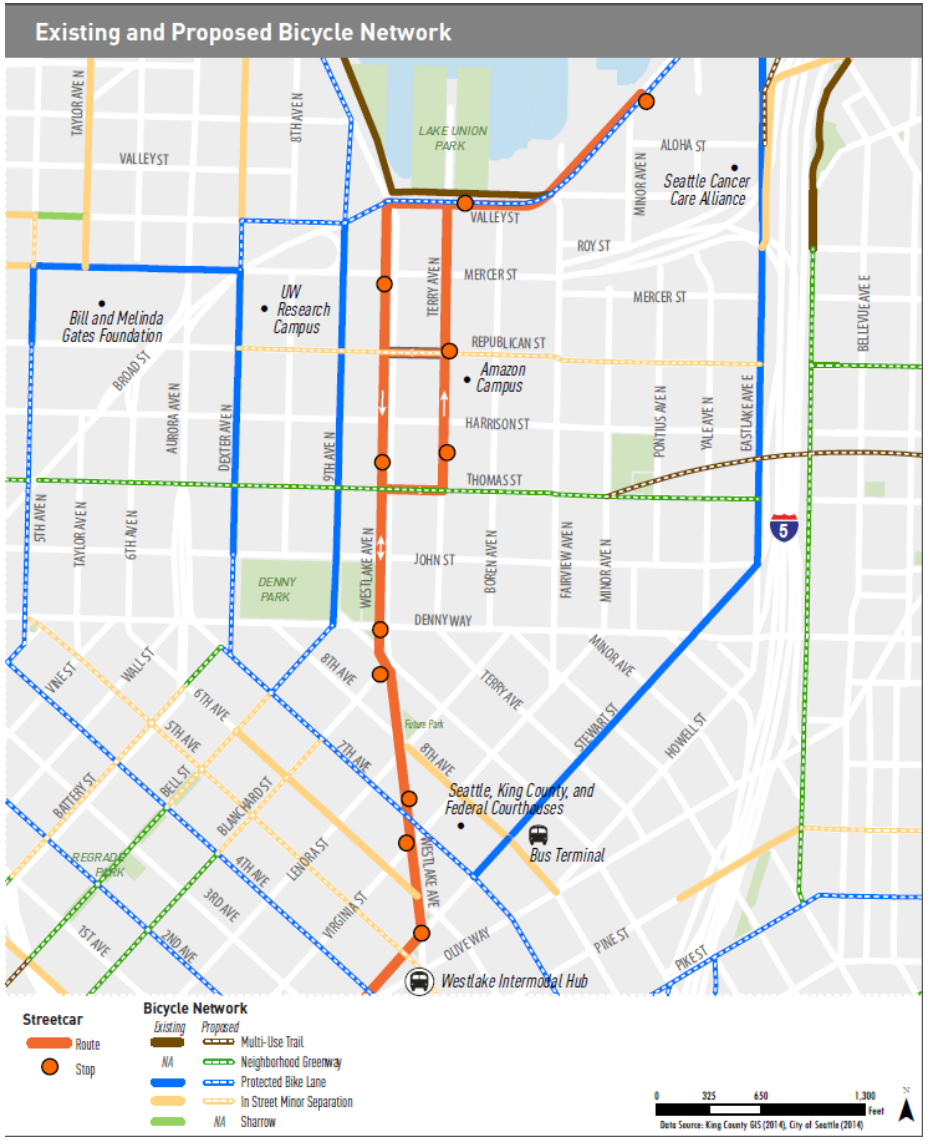


Figure C-6.3 Existing/Planned Bicycle Facilities



Westlake Avenue, south of Denny Way

Marked crossings with advance stop bars are present at most intersections with the exception of where 9th Avenue meets Westlake Avenue. Crossings at the intersections of Stewart Street, 6th Avenue, Virginia Street, 7th Avenue, Lenora Street, and 8th Avenue are up to a third longer in some locations due skewed intersections resulting from the non-orthogonal street grid. The intersection of Westlake Avenue, Blanchard Street, and 9th Avenue features design treatments that regularize the intersection to right angles, offering shorter pedestrian crossing distances, greater pedestrian visibility, and traffic calming that reduces the likelihood of rolling merges onto Westlake Avenue. The crossing of Lenora on the east side of Westlake required a two-stage crossing (Lenora and 8th) prior to ongoing construction that closed Lenora east of Westlake; it is assumed that the current more direct one-stage crossing of Lenora and 8th Avenue along Westlake will be preserved when construction is complete.

Due to the intersection geometries, right-turn bypass islands are used at some locations along the segment, e.g., 7th. These islands offer refuge and a level of protection for pedestrians, but may increase conflicts with bicycles crossing Westlake.

Figure C-6.4 Right-Turn Bypass Island Used Due to Intersection Geometry

Sidewalks are present on both sides of Westlake Avenue throughout the section, with varying widths and sidewalk conditions. Curb ramps are present at all intersections.

With the exception of the intersection of Westlake Avenue and 9th Avenue, all intersections in this segment are signalized, with pedestrian crossing signals. Most intersections have automatic pedestrian recall, where the signal gives the walk phase with every cycle rather than requiring the pedestrian to push a button to actuate the signal. Pedestrian actuation is required at Westlake Avenue and Denny Way, and Westlake Avenue-Blanchard Street-9th Avenue.

Westlake Avenue N, north of Denny Way

North of Denny Way, a more traditional street grid is present along Westlake with right angle intersections. Marked crossings with advanced stop bars are present at most intersections between Denny Way and Valley Street. The exception is the intersection of John Street and Westlake Avenue, which has no marked crossing of Westlake from the north and south sides of John Street and no marked crossing of John Street on the east side of Westlake.

Sidewalks are present on both sides of Westlake throughout the section. While sidewalk widths vary, they are generally in good condition and offer limited obstructions for people using mobility devices.

All corners along Westlake have curb ramps and most have tactile warning strips. Intersections without tactile warning strips on all corners are located at Westlake and Harrison Street, and at John Street on the west side of Westlake, where curb ramps are present only to cross John Street and no curb ramps or tactile warning strips are available to cross Westlake.

9th Avenue N, north of Denny Way

North of Denny Way, 9th Avenue N features marked crossing at some, but not all intersections. Intersections without marked crossing at all approaches include:

- The intersection of 9th Avenue and John Street, advance stop bars are located at the approach to 9th Avenue and a marked continental crossing is located on the south side of John Street, crossing 9th Avenue
- Advance stop bars are located at the intersection of 9th Avenue and Thomas Street approaching 9th Avenue
- A marked crossing of Mercer Way only available on the west side of 9th Avenue.

Sidewalks are present on both sides of 9th Avenue. Sidewalk condition is generally good, but sidewalks tend to be narrow in sections, about 4-4.5 feet wide. Fixed objects such as utility poles also narrow the functional width of the sidewalk in sections.

At the signalized intersections of Denny Street, Harrison Street, Republican Street, Mercer Street, and Broad Street pedestrian crossing signals provide a crossing signal and a countdown timer. All of these crossings require pedestrian actuation.

Terry Avenue N, north of Denny Way

North of Denny Way, Terry Avenue N features marked crossings at few intersections. Intersections without marked crossing at any approach include the intersection of Denny Way and John Street where they intersect Terry Avenue N. The intersections of Thomas Street, Harrison Street, and Republican Street are stop controlled with stop bars and no marked crosswalks where they intersect Terry Avenue N. At the intersection of Mercer Way and Terry Avenue N marked crossings with pedestrian refuge islands are located on both sides of Terry Avenue N. Pedestrian actuation is required. At the intersection of Valley Street and Terry Avenue N marked crossings are located at south, north, and west approaches. The crossings require pedestrian actuation.

Sidewalks are present on both sides of Terry Avenue N in most, but not all sections. On the east side of Terry Avenue N, between Denny Street and John Street, loading docks and parking either

block or encroach into the pedestrian zone. From John Street to the Thomas Street there are no sidewalks on the east side of Terry Avenue N and only partial sidewalks on the west side of the street. North of Thomas sidewalks are available on both sides of the street and are generally in good condition.

Where sidewalks are present, curb ramps are located at all four corners of intersections. Most, but not all, curb ramps include tactile warning strips with truncated domes.

Assessment of Alternatives

This section provides an assessment of pedestrian and bicycle impacts of the Business Access and Transit (BAT) Lane Alternatives, Options A and B.

Business Access and Transit Lane Alternative, Option A

Pedestrian Environment

Generally, the BAT/Transit Lane Alternative Option A would not negatively affect the pedestrian environment. All marked crossings are preserved. Right-turn restrictions from northbound Westlake Avenue onto Denny Way in Option A may make crossing Denny safer for pedestrians. Similarly, right-turn restrictions at Thomas Street, Republican Street, and Mercer Street may also increase safety for pedestrians crossing those streets.

Bicycling Environment

At the intersection of Westlake Avenue and 7th Avenue, the alternative intersects with the proposed bikeway network, crossing a protected bike lane. Unrestricted right turn movements from Westlake, especially the southbound lane's bypass island, may increase conflicts between people in motor vehicles and people on bicycles. However, this project does not specifically affect these conditions.

Thomas Street is designated as a Neighborhood Greenway, traveling east to west. Between Westlake Avenue and Terry Street, the presence of existing streetcar tracks may present a challenge for people on bicycles travelling eastbound. The proposed transit-only lane and associated parking restrictions would not affect bicycle conditions. The right turn restriction from northbound Westlake Avenue N may reduce turning conflicts with people bicycling eastbound on Thomas Street.

Similarly, Republican Street is designated to have in street minor separation for bicycle facilities. In this alternative, between Westlake Avenue N and Terry Avenue N, the Transit Only Lane and presence of streetcar tracks may present a challenge for people on bicycles travelling westbound.

Business Access and Transit Lane Alternative, Option B

Pedestrian Environment

Generally, the BAT/Transit Lane Alternative Option B does not negatively affect the pedestrian environment and has similar implications for people walking to Option A. The most substantial change in Option B, relative to Option A, is the conversion of the blocks between 9th Ave and Blanchard St and Denny to a one-way northbound only route. There would be a right-turn only lane from northbound Westlake onto Denny with a protected signal phase that would reduce

conflicts between pedestrians and turning vehicles, but would also slightly reduce the available pedestrian crossing time.

Bicycling Environment

Generally, the BAT/Transit Lane Alternative Option B would have similar implications for people bicycling to Option A. The most substantial change, the one-way conversion of Westlake in the block south of Denny, would not specifically impact bicyclists since Westlake does not have a designated bicycle facility. However, any bicyclists who currently use Westlake would need to divert to an alternate facility, such as 9th Avenue N.

APPENDIX C.7 PARKING DATA AND RESULTS

Introduction

This section provides additional data and analysis of the impact of the proposed Westlake Transit Improvements on on-street parking spaces and loading zones. The inventory of existing spaces used the City of Seattle's on-street parking inventory, verified through field survey of existing conditions, to count the number of all-day and peak-restricted parking stalls and commercial and passenger vehicle loading zones under existing, No-Build, and Build conditions.

Parking Summary

Table C-7.1 summarizes parking and loading impacts for existing, No-Build, and Build conditions. The following sections elaborate on these impacts.

Table C-7.1 Summary of Parking Impacts

	All Day Parking	Time-Restricted Parking [1]	Passenger Loading Zone	Commercial Loading Zone	Bus Zone
Existing	172	0	6	6	12
No-Build	155	0	5	5	12
BAT A	128	28	4	4	12
BAT B	128	28	4	4	12
Diff from No-Build	-27	28	-1	-1	0

Notes: [1] Time-restricted parking is restricted from 6 AM to 7 PM. [2] Includes removal of two bus zones on 9th Avenue N, additional of two bus zones on Westlake Avenue, extension of one bus zone on Westlake Avenue, and Center City Connector streetcar turnaround on Republican (Terry-Westlake).

Existing Conditions

Table C-7.2 details existing on-street parking along Westlake Avenue and segments of Terry Avenue (Republican-Mercer), Thomas Street (Westlake-Terry), Republican Street (Terry-Westlake), and 9th (Mercer-Republican and Thomas-John) where modifications are planned as part of No-Build alternative or proposed in one of the Build alternatives. This inventory includes the following classifications:

- **All-day parking.** Parking stalls available for all-day use, including during peak periods.
- **Time-restricted parking**. There are currently no time-restricted parking spaces in the study area.
- **Passenger load zone (PLZ)**. Curb space designated for use by passenger vehicles or taxis; often signed as a 3-minute passenger loading zone.

- **Commercial vehicle load zone (CVLZ)**. Curb space designated for use by commercial vehicles.
- **Bus zones**. Curb space designated for use as bus stops or for bus layover.

Overall, there are 172 existing on-street parking stalls along these streets or street segments. Utilization is generally high, with peak occupancy of over 95 percent on many blocks during the three highest-occupancy hours between 8 a.m. and 7 p.m. There are 6 existing passenger loading zones, 6 commercial vehicle loading zones, and 12 bus zones.

Table C-7.2 Existing On-Street Parking Inventory by Block and Direction

Segment	West/South Side						East/North Side					
	All Day Parking	Time Restricted Parking	Comm. Vehicle Loading	Pass. Loading	Bus Zone	Avg. Peak Occupancy*	All Day Parking	Time-restricted Parking	Comm Vehicle Loading	Pass. Loading	Bus Zone	Avg. Peak Occupancy*
WESTLAKE BETWEEN STEWART AND 6TH	0	0	0	0	1	NA	0	0	0	0	0	N/A
WESTLAKE BETWEEN 6th AND VIRGINIA	7	0	0	0	0	95%	7	0	0	1	0	105%
WESTLAKE BETWEEN VIRGINIA AND 7TH	0	0	0	0	1	N/A	0	0	0	0	0	N/A
WESTLAKE BETWEEN 7TH AND 8TH	9	0	0	0	0	96%	8	0	0	2	1	104%
WESTLAKE BETWEEN 8TH AND BLANCHARD	13	0	0	0	0	104%	8	0	1	1	0	133%
WESTLAKE BETWEEN 9TH AND DENNY WAY	0	0	0	0	1	N/A	0	0	0	0	1	N/A
WESTLAKE BETWEEN DENNY WAY AND JOHN	5	0	0	0	0	N/A	0	0	0	0	0	N/A
WESTLAKE BETWEEN JOHN AND THOMAS	13	0	0	0	0	118%	8	0	0	1	0	100%
WESTLAKE BETWEEN THOMAS AND HARRISON	12	0	0	0	1	92%	3	0	0	1	1	80%
WESTLAKE BETWEEN HARRISON AND REPUBLICAN	6	0	0	0	0	111%	4	0	0	0	0	75%
WESTLAKE BETWEEN REPUBLICAN AND MERCER	0	0	0	0	1	N/A	0	0	0	0	0	N/A
WESTLAKE BETWEEN MERCER AND VALLEY	0	0	0	0	0	N/A	0	0	0	0	1	N/A
TERRY BETWEEN REPUBLICAN AND MERCER	15	0	0	0	1	111%	5	0	1	0	0	120%
THOMAS BETWEEN WESTLAKE AND TERRY	0	0	1	0	0	N/A	3	0	0	0	0	100%
REPUBLICAN BETWEEN WESTLAKE AND TERRY	6	0	0	0	0	100%	8	0	1	0	0	88%
9TH BETWEEN JOHN AND THOMAS	8	0	1	0	1	NA	12	0	1	0	0	NA
9TH BETWEEN REPUBLICAN AND MERCER	8	0	0	0	1	NA	4	0	0	0	0	NA
Total	**102**	**0**	**2**	**0**	**8**	**-**	**70**	**0**	**4**	**6**	**4**	**-**

Notes: *Peak occupancy calculated as an average of the three hours with highest occupancy from SDOT curb space utilization data.

No-Build Conditions

Figure C.7-1 illustrates No-Build parking conditions. These conditions reflect changes to the following blocks that would occur even if the Westlake Transit Improvements are not implemented:

- **Westlake, Harrison-Thomas and 8th-Blanchard.** Additional bus zones would be (1) created on the west side of Westlake, far-side of Harrison; (2) extended on the east side of Westlake, near-side of Harrison; and (3) created on the west side of Westlake, near-side of 8th.
- **9th, West Side, Far-Side of Mercer and Near-Side of John.** Two bus zones can be eliminated based on the re-routing of southbound Route 40 to Westlake Avenue: (1) South of Mercer, construction on the east side of 9th has temporarily closed part of the street right of way, but assuming that the right-of-way is eventually used to extend existing bike lanes on 9th Street to Mercer, there likely would not be right-of-way to provide additional parking where the bus zone is currently designated. (2) With the elimination of the Route 40 bus zone north of John, it is assumed that approximately 70 linear feet could be converted into on-street parking (approximately 5 stalls), partially offsetting impacts of new/extended bus zones on Westlake.
- **Republican, Terry-Westlake.** The northern turnaround for the Center City Connector is planned on Republican Street between Westlake and Terry Avenues. There are 14 total parking spaces: 6 all-day spaces on the south side including 2 reserved for food trucks during lunchtime, and 8 all-day spaces on the north side, including 2 that are reserved for food trucks during lunchtime, and 1 commercial loading space. The streetcar turnaround would eliminate all spaces on the north side.

These changes would reduce all-day spaces by 17 net spaces, 1 passenger loading zone, and 1 commercial vehicle loading zone. There would be no net change in the number of bus zones.

BAT/Transit Lane Alternative

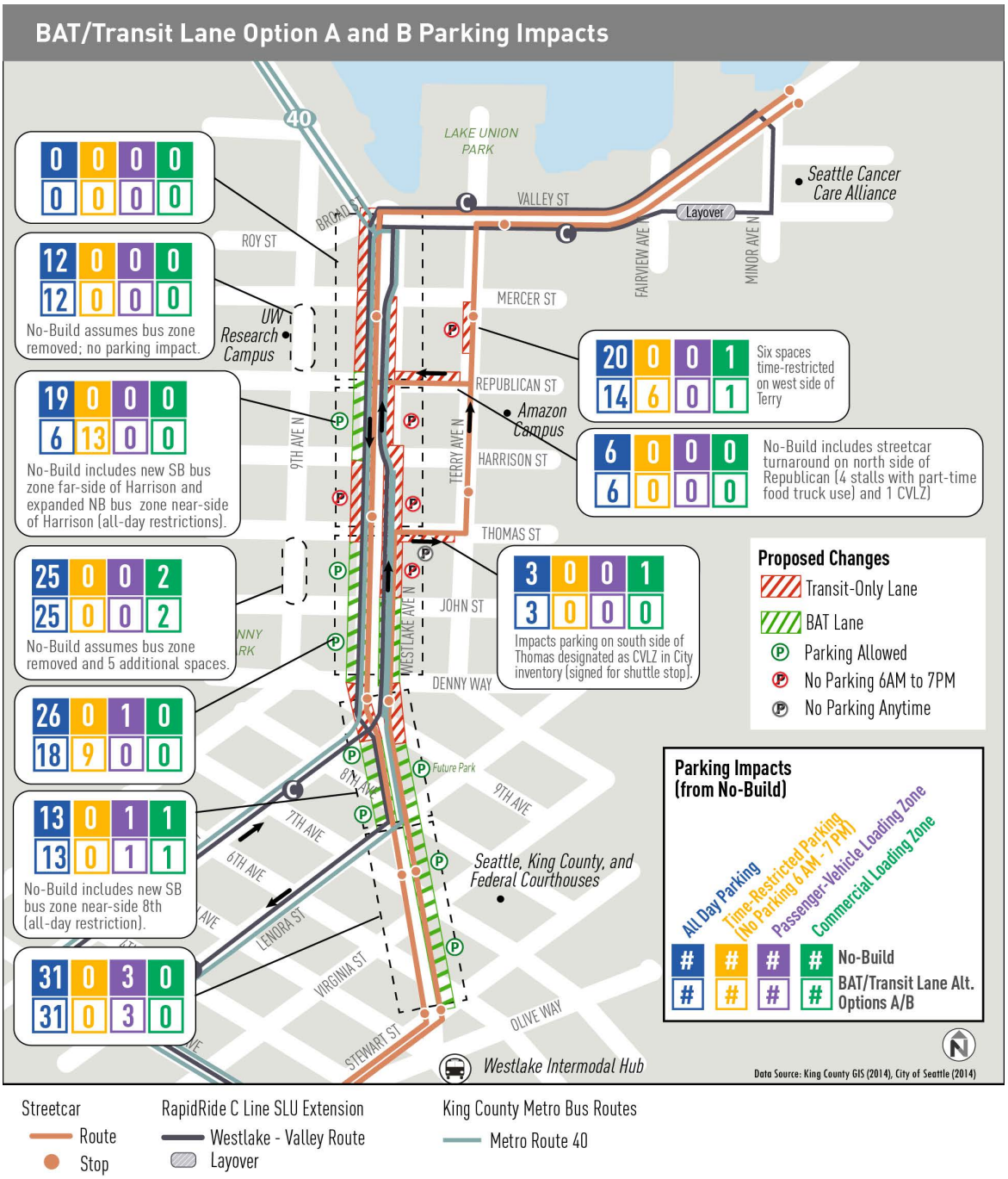
Figure C.7-1 illustrates Build alternative parking conditions for BAT/Transit Lane Alternative Options A and B for each block affected, compared to No-Build. There is no difference between Options A and B. The No-Build alternative assumes the changes detailed in the previous section.

The evaluation of impacts for the BAT/Transit Lane alternative assumes the following:

- **BAT Lanes.** Parking is permitted adjacent to BAT lanes at all times.
- **Transit-Only Lanes.** Parking adjacent to transit-only lanes becomes time-restricted (i.e., not allowed between 6 AM and 7 PM) in most cases. The exception is along Thomas Street between Westlake and Terry Avenues where parking on the south side of the street is restricted at all times for the one space that is affected.

These changes would reduce all-day spaces by 27 and eliminate one passenger loading zones and one commercial vehicle loading zone. Most of the spaces affected would be time-restricted, a total of 28 spaces.

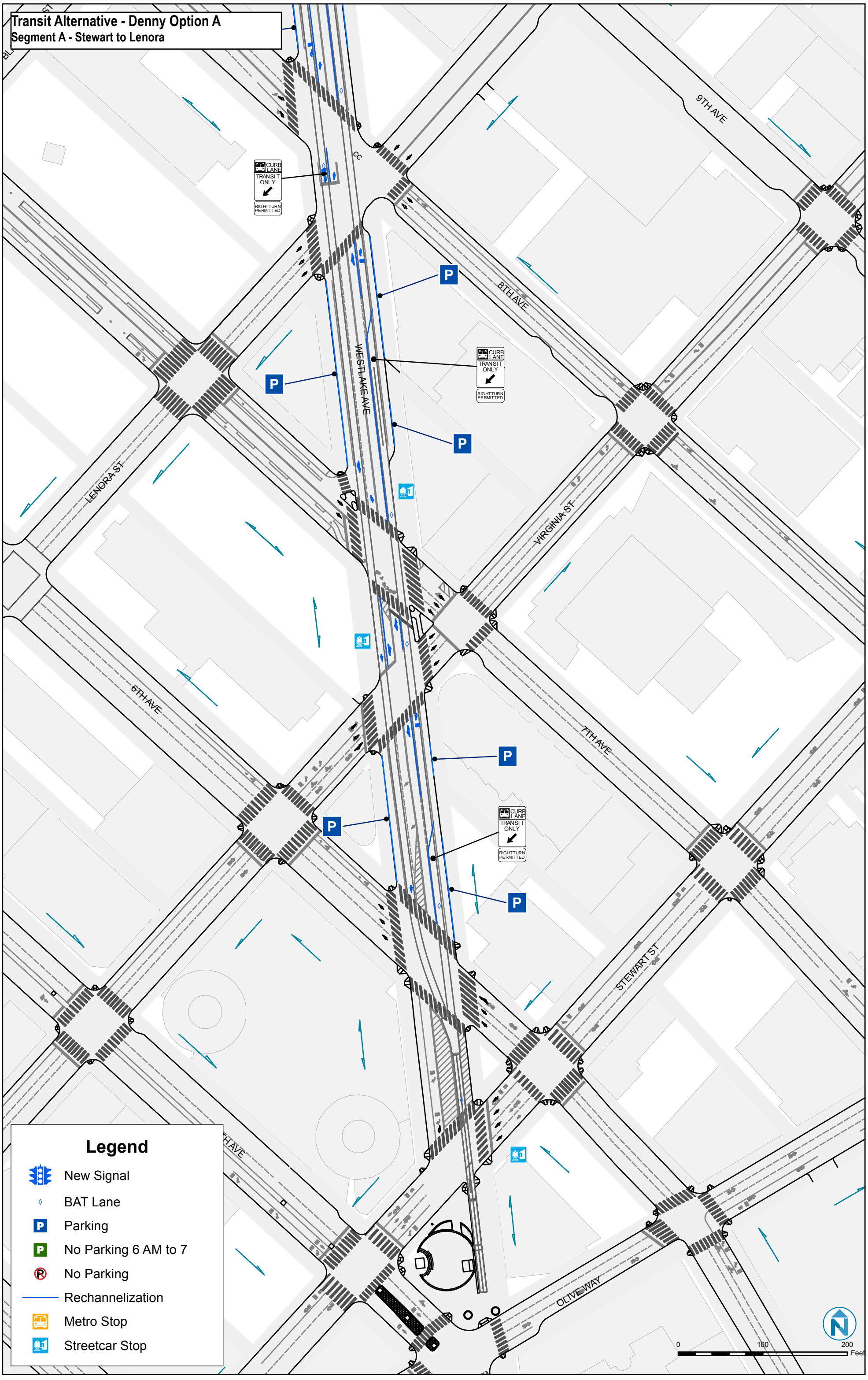
Figure C.7-1 BAT/Transit Lane Alternative Parking Impacts (Relative to No-Build)

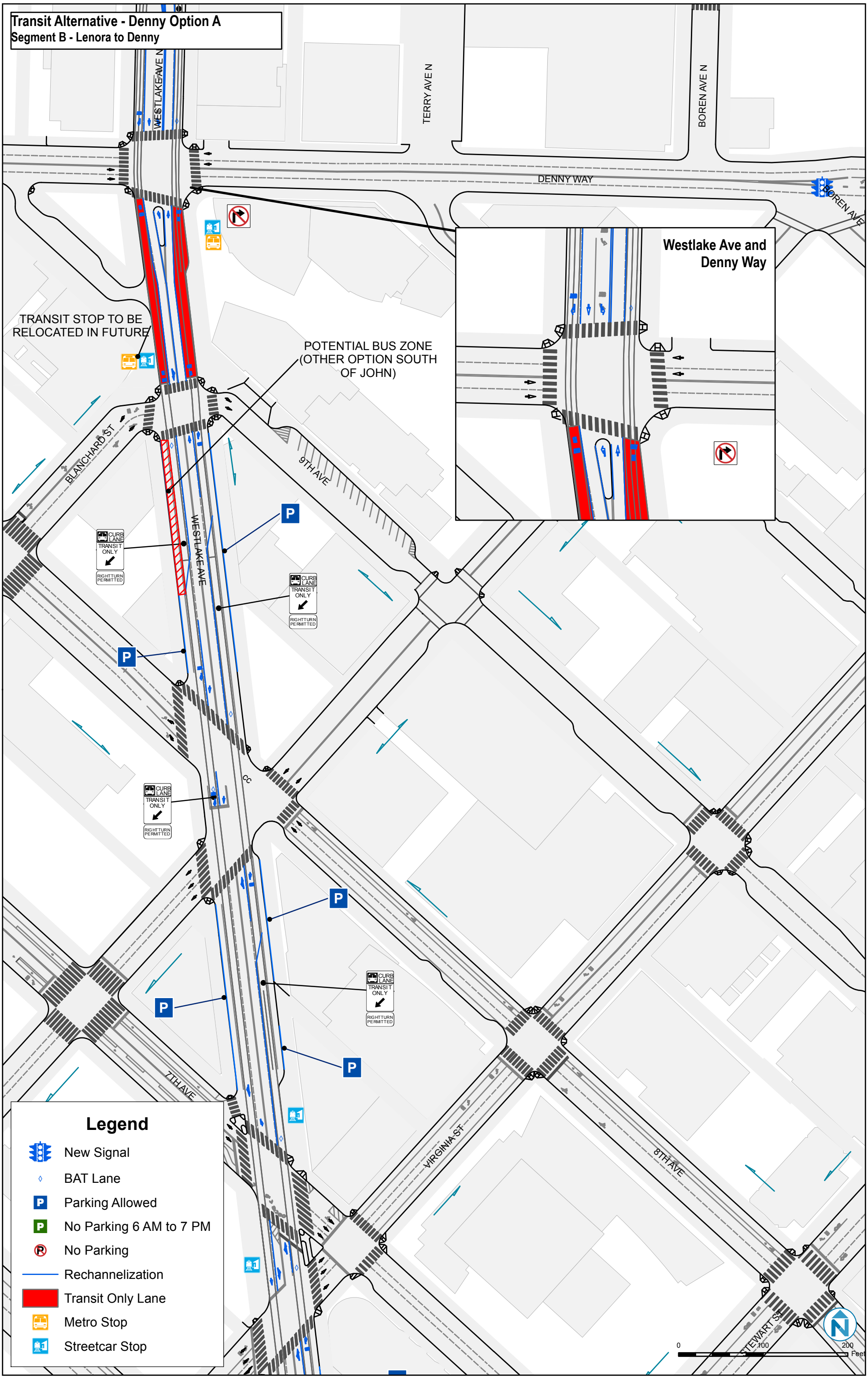


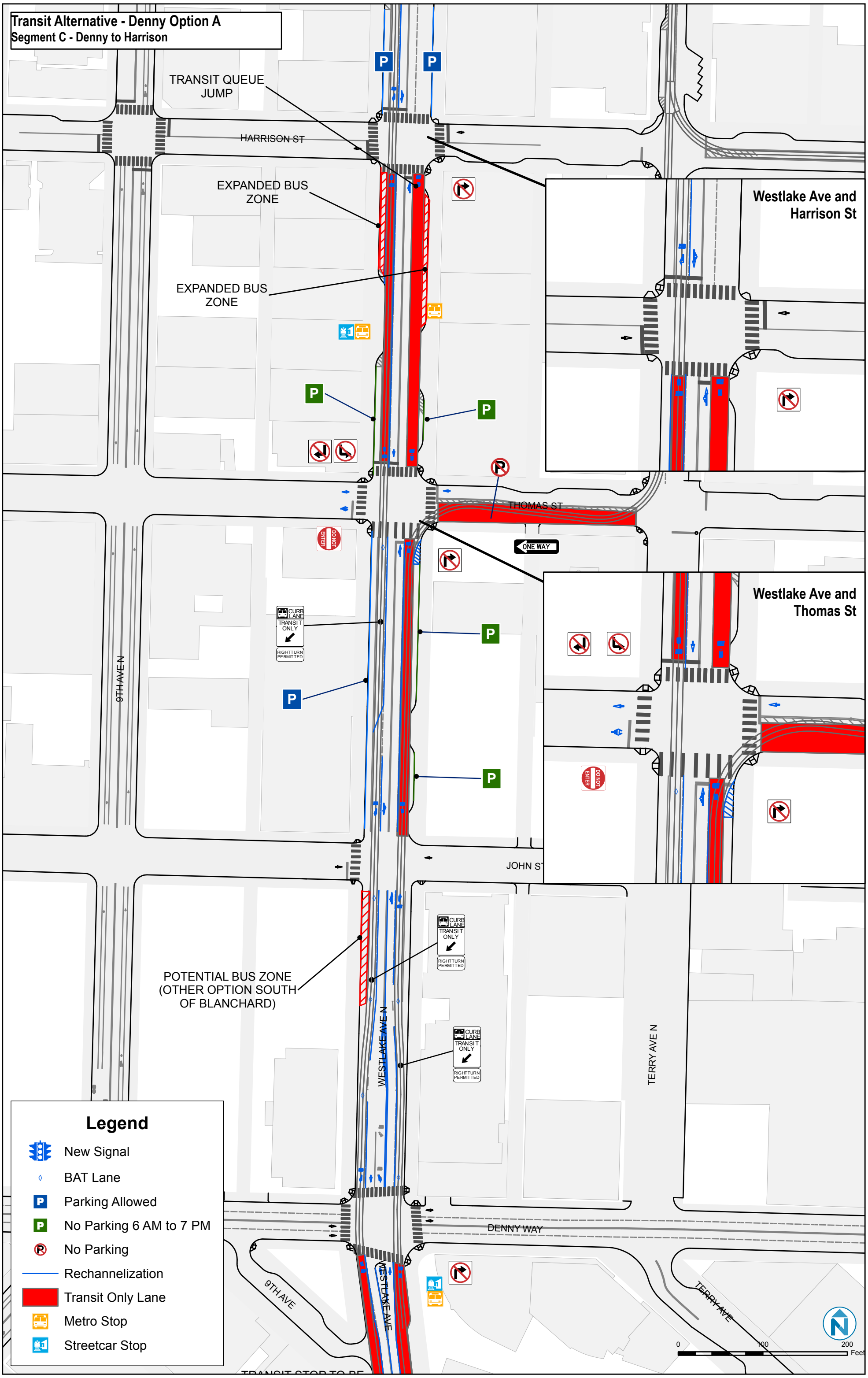
APPENDIX D

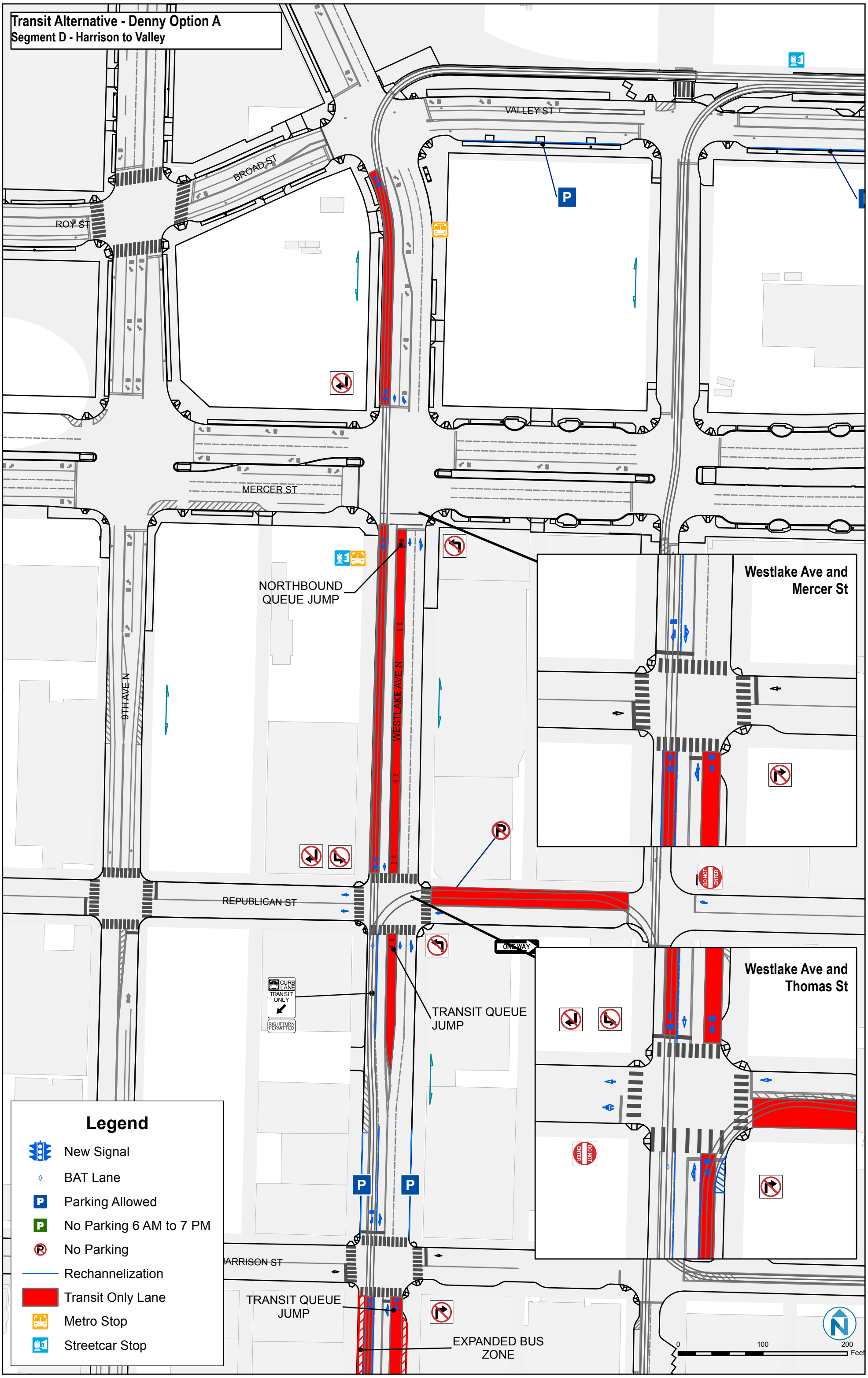
BAT/Transit Lane (Option A) Alternative Conceptual Drawing and Cross Sections

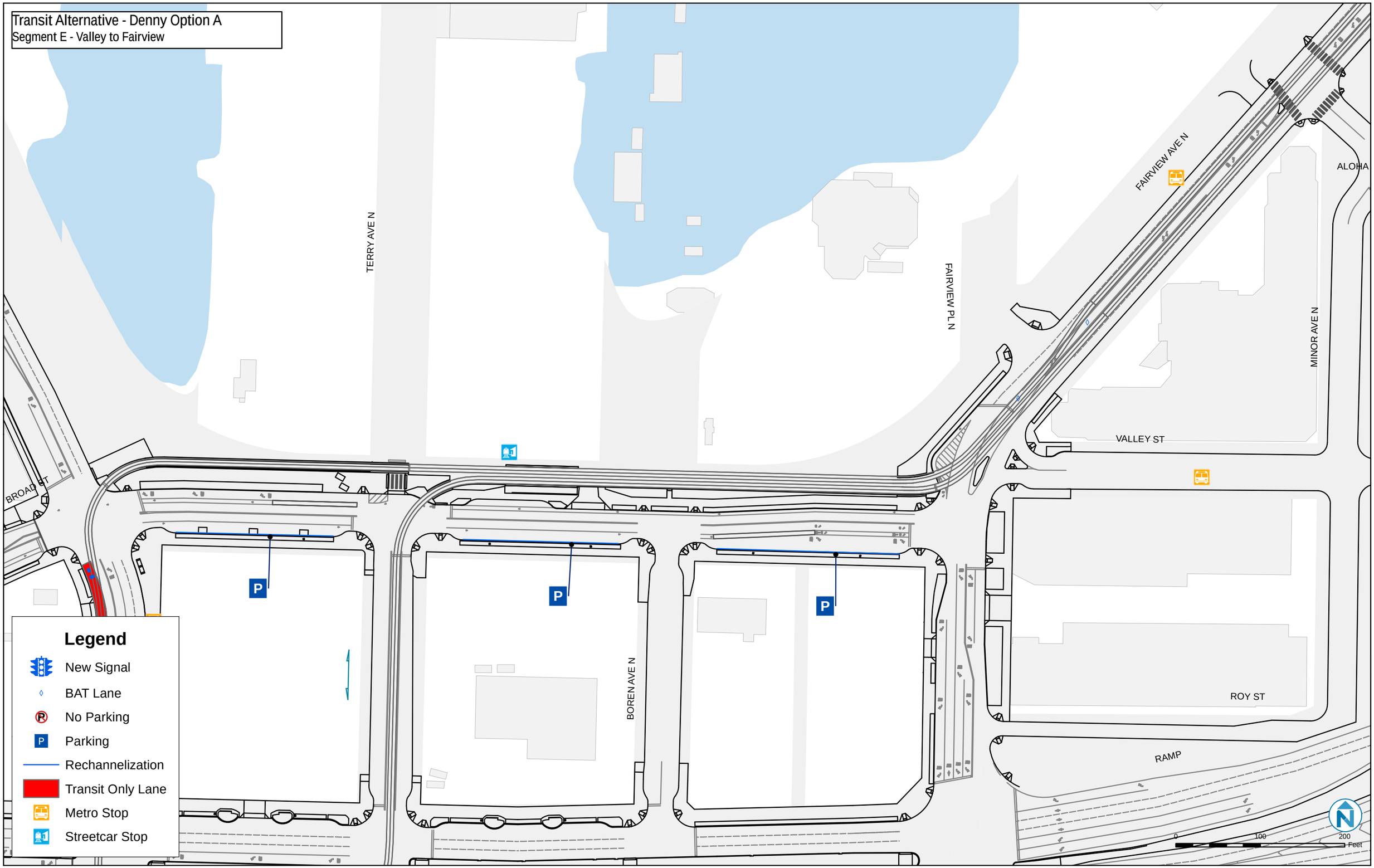
Transit Alternative - Denny Option A
Segment A - Stewart to Lenora




Transit Alternative - Denny Option A
Segment B - Lenora to Denny
WESTLAKE AVE N
TERRY AVE N
BOREN AVE N
DENNY WAY
BOREN AVE
Westlake Ave and Denny Way
TRANSIT STOP TO BE RELOCATED IN FUTURE
POTENTIAL BUS ZONE (OTHER OPTION SOUTH OF JOHN)
BLANCHARD ST
9TH AVE
WESTLAKE AVE
CURB LANE TRANSIT ONLY
RIGHT TURN PERMITTED
CC
7TH AVE
VIRGINIA ST
8TH AVE
STEWART ST
Legend
New Signal
BAT Lane
Parking Allowed
No Parking 6 AM to 7 PM
No Parking
Rechannelization
Transit Only Lane
Metro Stop
Streetcar Stop
0
100
200
Feet

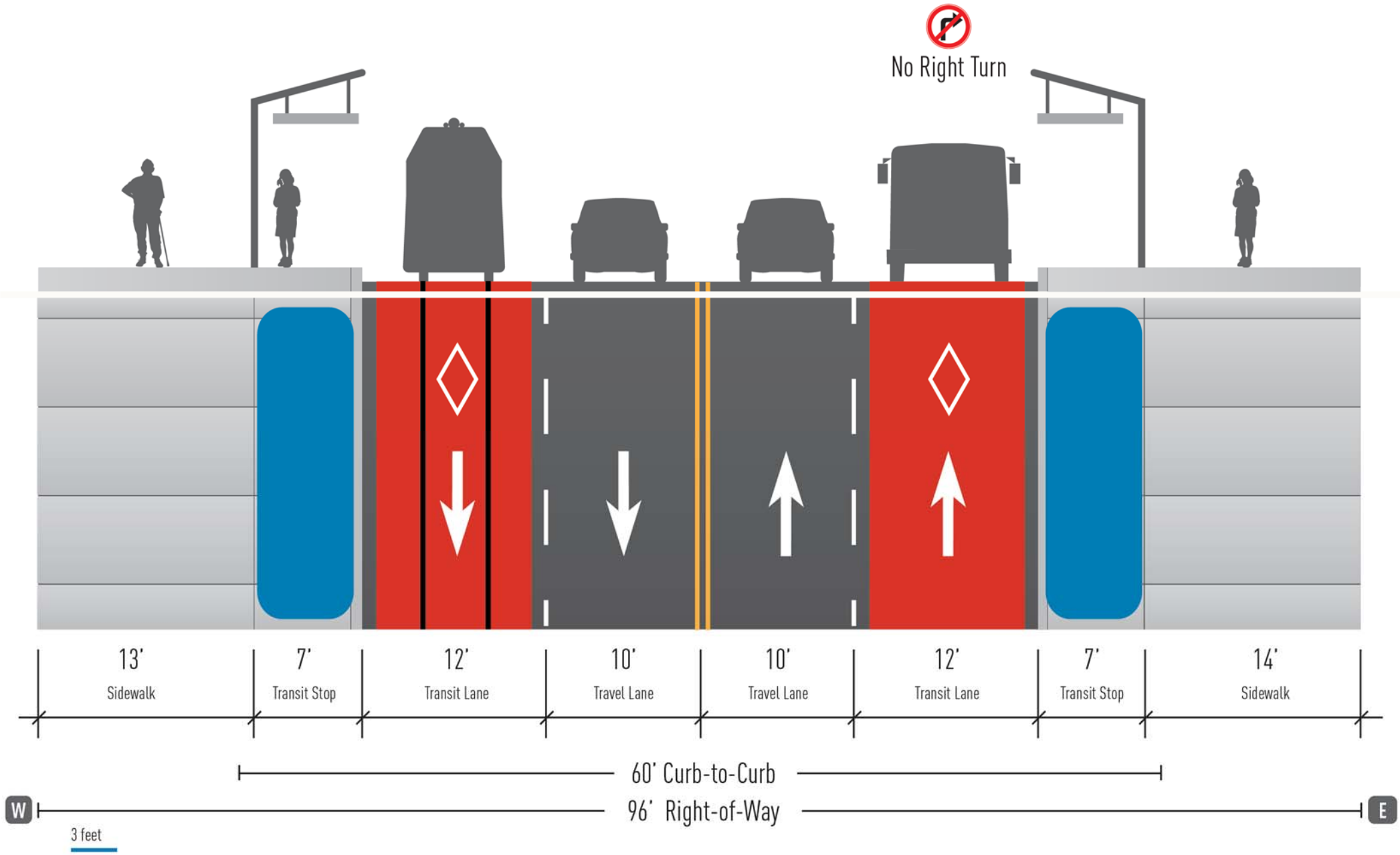

Transit Alternative - Denny Option A
Segment C - Denny to Harrison
TRANSIT QUEUE JUMP
HARRISON ST
EXPANDED BUS ZONE
EXPANDED BUS ZONE
Westlake Ave and Harrison St
THOMAS ST
ONE WAY
Westlake Ave and Thomas St
CURB LANE TRANSIT ONLY
RIGHT TURN PERMITTED
9TH AVE N
JOHN ST
POTENTIAL BUS ZONE (OTHER OPTION SOUTH OF BLANCHARD)
WESTLAKE AVE N
TERRY AVE N
DENNY WAY
9TH AVE
WESTLAKE AVE
TERRY AVE
0
100
200
Feet
Legend
New Signal
BAT Lane
Parking Allowed
No Parking 6 AM to 7 PM
No Parking
Rechannelization
Transit Only Lane
Metro Stop
Streetcar Stop


Transit Alternative - Denny Option A
Segment D - Harrison to Valley
VALLEY ST
BROAD ST
ROY ST
MERCER ST
NORTHBOUND
QUEUE JUMP
9TH AVE N
WESTLAKE AVE N
Westlake Ave and
Mercer St
REPUBLICAN ST
ONE WAY
CURB LANE
TRANSIT ONLY
RIGHT TURN PERMITTED
TRANSIT QUEUE
JUMP
Westlake Ave and
Thomas St
HARRISON ST
TRANSIT QUEUE
JUMP
EXPANDED BUS
ZONE
DO NOT ENTER
Legend
New Signal
BAT Lane
Parking Allowed
No Parking 6 AM to 7 PM
No Parking
Rechannelization
Transit Only Lane
Metro Stop
Streetcar Stop
0
100
200
Feet


Transit Alternative - Denny Option A
Segment E - Valley to Fairview
TERRY AVE N
FAIRVIEW PL N
FAIRVIEW AVE N
ALOHA
MINOR AVE N
VALLEY ST
BROAD ST
BOREN AVE N
ROY ST
RAMP
Legend
New Signal
BAT Lane
No Parking
Parking
Rechannelization
Transit Only Lane
Metro Stop
Streetcar Stop
0
100
200
Feet

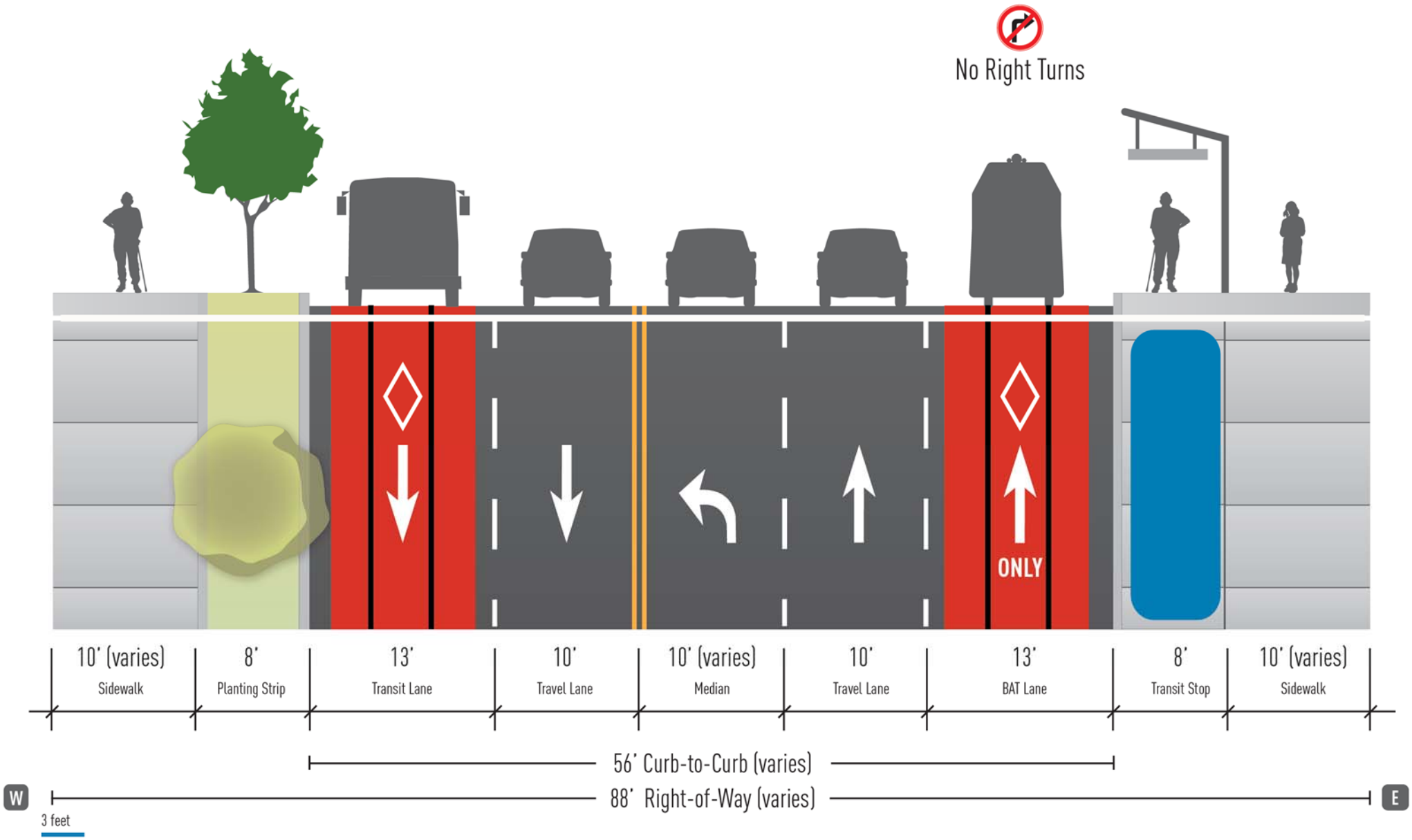
BAT/Transit Lane Option A

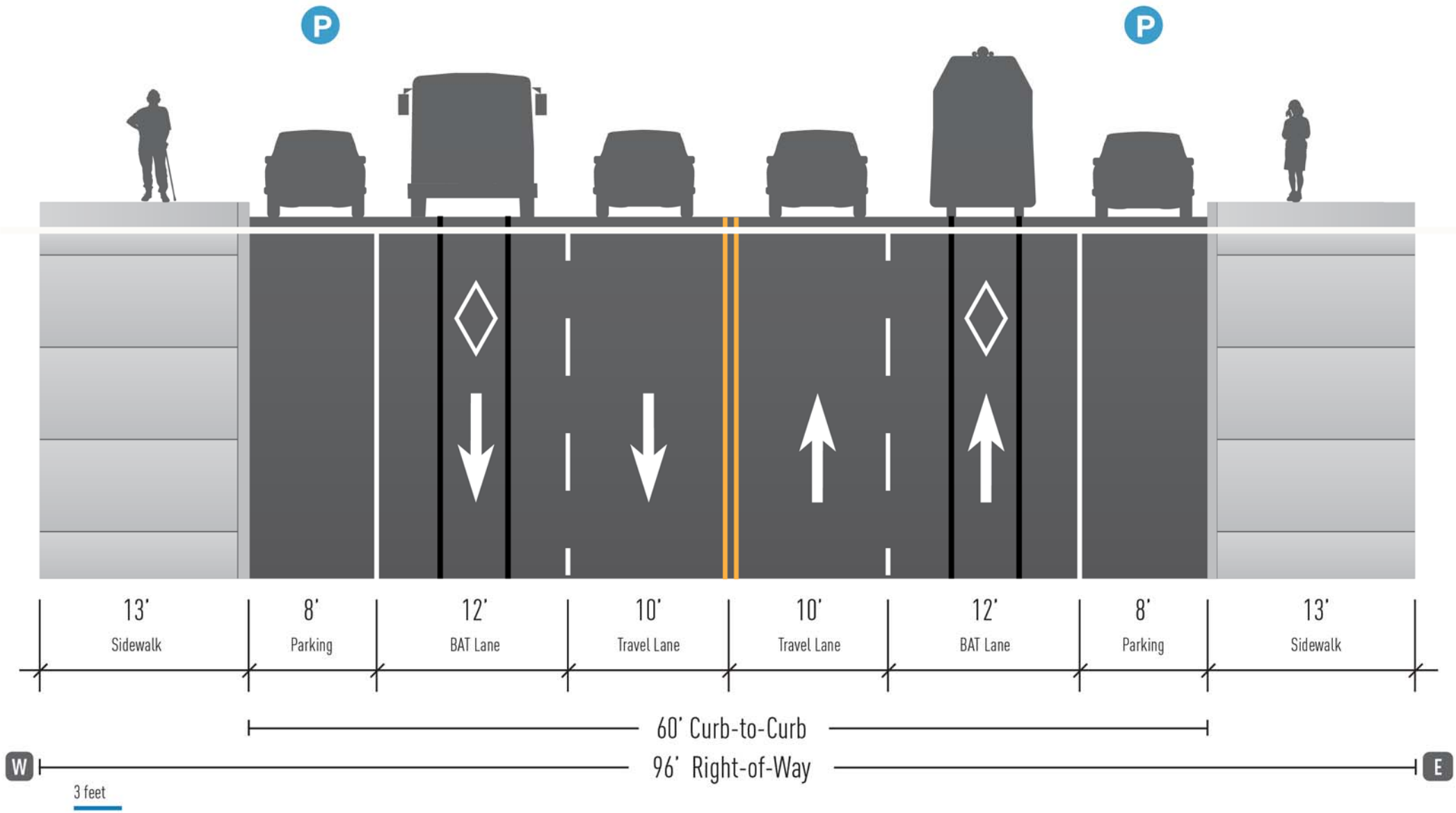
Westlake Avenue mid-block between Thomas and Harrison, looking north



BAT/Transit Lane Option A

Westlake Avenue Two-Way / South of Denny Way, looking north



BAT/Transit Lane Option A

Westlake Avenue between 8th/Lenora and 9th/Blanchard, looking north