Appendix I

Transportation Discipline Report and Addendum

Mercer Corridor Improvements
Project Environmental Assessment

Transportation Discipline Report

Prepared for

Seattle Department of Transportation

Prepared by

CH2MHILL

November 2006

Table of Contents

Summary ..... ***ix***
Introduction ix
Affected Environment x
Methodology xiv
Project Construction Effects and Mitigation xiv
Project Operation Effects and Mitigation xvi
Cumulative Effects xx
Significant Effects xxi
No Action Alternative Effects xxi

Acronyms and Abbreviations Used in This Report ..... ***xxv***

Glossary ..... ***xxvii***

1. Introduction ***1***

2. Description of Alternatives ***2-1***
2.1 Build Alternative, Option 1 2-1
2.2 Build Alternative, Option 2 2-8
2.3 No Action Alternative 2-11
2.4 Other Improvements in the Project Vicinity 2-12
2.5 Construction of the Build Alternatives 2-13

3. Methodology ***3-1***
3.1 Forecast Methodology 3-1
3.2 Analysis Software and Output 3-2

4. Affected Environment ***4-1***
4.1 Motor Vehicle Traffic 4-1
4.2 Traffic Operations 4-2
4.3 Pedestrian Facilities 4-4
4.4 Bicycle Facilities 4-5
4.5 Public Transit 4-6
4.6 Truck Facilities 4-7
4.7 Safety 4-8
4.8 On-Street Parking 4-11

5. Environmental Consequences ***5-1***
5.1 Build Alternative 5-1
5.2 No Action Alternative 5-22

6. Significant Unavoidable Adverse Effects ***6-1***

7. References ***7-1***

Appendix TR-A. Accident Data

Appendix TR-B. Traffic Analysis Exhibits

Appendix TR-C. I-5/Mercer Street Ramps and Freeway Travel Time Analysis

Exhibits

S-1 Mercer and Valley Streets Cross-Sections

S-2 Study Area

S-2 Typical Sidewalk Conditions in the Mercer Corridor

S-3 Current East- and Westbound Travel paths

S-4 Typical Sidewalk Conditions in the Mercer Corridor

S-5 South Lake Union Pedestrian Path

S-6 Screenline Boundaries

S-7 Future 2030 East- and Westbound Travel Paths

2-1 Mercer Corridor Project Location

2-2 Build Alternative - Option 1

2-3 Mercer and Valley Street Cross Sections

2-4 Proposed Interim Design with Eastbound Broad Street Tie-In at Mercer and Eighth

2-5 Optional Interim Design with Eastbound Broad Street Tie-In at Mercer and Ninth

2-6 I-5 Off-Ramp Area

2-7 Build Alternative Option 2

3-1 Forecast Assumptions

3-2 Study Intersections and Current Traffic Controls

3-3 Travel Time Paths

3-4 Travel Time Run Limits

3-5 Screenline Boundaries

4-1 City of Seattle Arterial Streets within South Lake Union Area

4-2 Existing Hourly Volumes on Mercer and Valley Streets

4-3 Existing Intersection Operations

4-4 2005 Existing Travel Times

4-5 Existing Pedestrian Facilities

4-6 Path Conditions adjacent to Valley Street

4-7 Multi-Use Trail around Lake Union

4-8 Existing Bicycle Routes

4-9 Existing Transit Routes

4-10 Existing Major Truck Streets

4-11 Mercer Corridor Study Area High Accident Intersections (Jan. 2001 to Dec. 2003)

4-12 Mercer Corridor Study Area Street Segments With Five or More Accidents (Jan. 2001 to Dec. 2003)
4-13 On-Street Parking
5-1 Background Transportation Improvements
5-2 Year 2010 Screenline Comparison
5-3 2010 No Action and Build AM Peak Hour Intersection Operations
5-4 2010 No Action and Build PM Peak Hour Intersection Operations
5-5 Year 2030 Screenline Comparison
5-6 2030 No Action and Build AM Peak Hour Intersection Operations
5-7 2030 No Action and Build PM Peak Hour Intersection Operations
5-8 2010 Travel Time Comparison
5-9 2030 Travel Time Comparison
5-10 2010 and 2030 Freeway Travel Time Results
5-11 Existing and Proposed Pedestrian Facilities
5-12 No-Action Transportation Improvements
5-13 Streetcar Route
5-14 Existing and 2010 No Build Screenline Comparison
5-15 2010 and Existing AM Peak Hour Intersection Operations
5-16 2010 and Existing PM Peak Hour Intersection Operations
5-17 Existing and 2030 No Build Screenline Comparison
5-18 2030 No Action and Existing AM Peak Hour Intersection Operations
5-19 2030 No Action and Existing PM Peak Hour Intersection Operations

Summary

Introduction

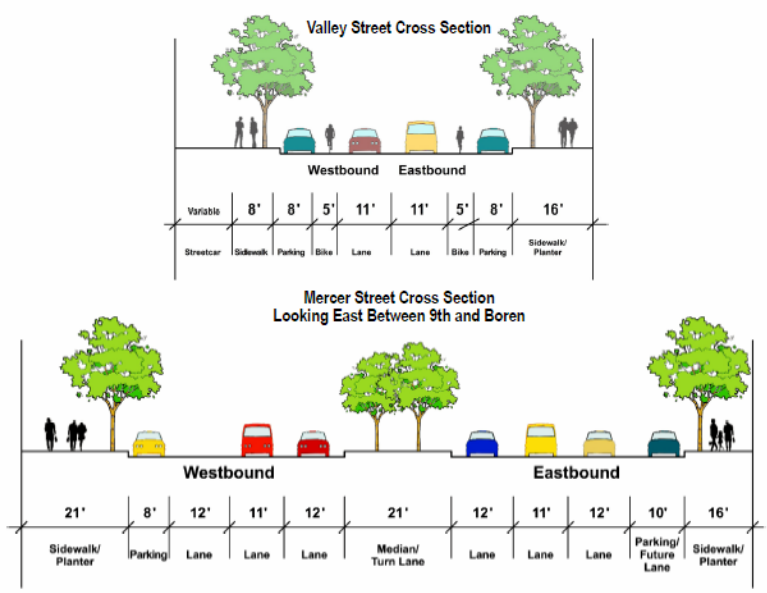


Exhibit S-1. Mercer and Valley Streets Cross-Sections

The Mercer Corridor Improvements project is intended to provide vehicular and pedestrian improvements in the Mercer Street corridor in the South Lake Union (SLU) area of Seattle. The purpose of the project is to improve local safety, access, and circulation within SLU for vehicles, bicycles, and pedestrians, and provide for more direct movement of traffic and freight through the corridor. This project would better accommodate anticipated urban density in the SLU area as well as anticipated regional and local traffic growth by improving the efficiency of the available grid network, providing direct connections between I-5 and South Lake Union and improving connections for freight and general traffic between I-5 and Westlake Avenue North and areas to the north and west. Currently, Mercer Street is a one-way principal arterial street in the eastbound direction. In the SLU area, Mercer Street operates as a couplet with Valley Street, which carries the westbound traffic in addition to eastbound traffic destined for the Eastlake area. The proposed project would replace the existing Mercer/Valley streets couplet with a widened two-way Mercer Street. The widened Mercer Street would have three lanes in each direction, providing widened sidewalks, on-street parking, and a landscaped median with left turn pockets (Exhibit S-1). Valley Street would be narrowed to a two-lane street with sidewalks, bicycle lanes, and on-street parking (Exhibit S-1). This project also completes the two-way conversion of Ninth and Westlake avenues, north of Mercer Street. Ninth Avenue between Westlake Avenue North and Mercer Street would generally provide two lanes in each direction with a separate bike lane or shared wide outside lane for bicyclists, on-street parking and sidewalks. Westlake Avenue would include two lanes in each direction with a center turn lane, on-street parking and sidewalks.

Affected Environment

Study Area

The study area boundaries defined for the transportation analyses of the Mercer Corridor Improvements project are shown in Exhibit S-2. The transportation team focused on the operations of 30 intersections within the outlined study area.

Travel times, a measure of effectiveness (MOE), were calculated within a slightly larger study area to represent trips to/from major destinations that use this corridor. The expanded area included Seattle Center to the west, the west Lake Union area to the north, and downtown Seattle (Denny Way/Lenora Street) to the south.

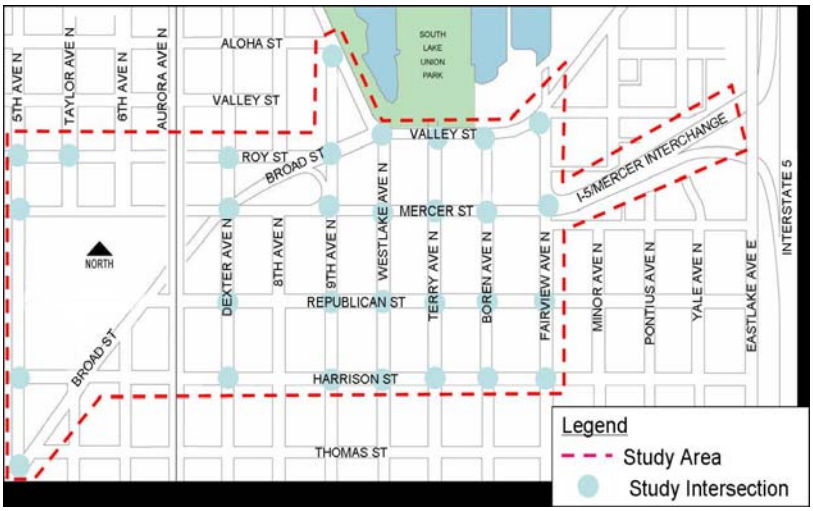


Exhibit S-2. Study Area

Motor Vehicles/ Circulation

In the westbound direction, vehicle travel follows a circuitous path of multi-lane, high-volume right and left turns (Photo 1). A return trip in the eastbound direction can also be confusing as drivers are required to either locate Mercer Street (west of Aurora Avenue) or use Broad Street and then perform two quick turns (right and left) to get onto Mercer Street to proceed onto Interstate 5. East/west travel is constrained at SR 99 (Aurora Avenue) because it acts as a barrier; vehicles can only cross SR 99 on Broad Street (via Valley Street) in the westbound direction and on Mercer Street and Broad Street in the eastbound direction. As a result, most east- and westbound traffic in the study area travels along the Mercer Street and Valley Street corridors. These east-west paths are shown in Exhibit S-3. Other east-west routes such as Harrison, Republican and Thomas streets are vastly underutilized as they do not provide access across SR 99. North- and southbound travel is divided along a number of routes, including Fairview Avenue North, Dexter Avenue North, Fifth Avenue North and the one-way couplet of Ninth Avenue North and Westlake Avenue North. There are plans to convert Westlake Avenue North to two-way operations by 2007 with the South Lake Union Streetcar.

Photo 1. Current East-West Circuitous Travel Fairview Avenue North at ValleyStreet

Currently, traffic volumes represent a directional flow during the commuter peak periods. The AM peak serves an inbound demand, flowing through the study area towards the west and south. The PM peak serves an outbound travel demand with heavier traffic in the east- and northbound directions.

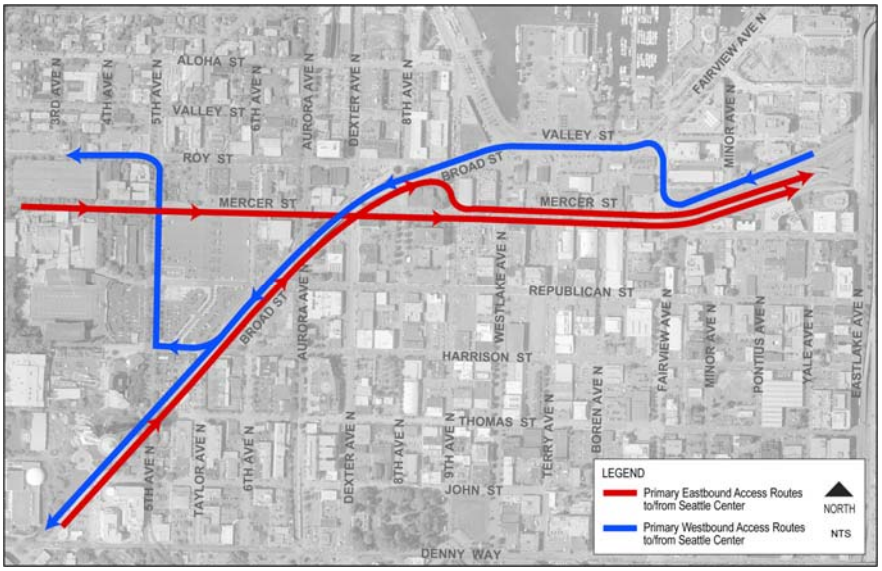


Exhibit S-3. Current East- and Westbound Travel Paths

Traffic Operations

Traffic operations are quantified in terms of level of service (LOS) grades. LOS A represents free-flowing operations with vehicles experiencing minimal delays, while LOS F represents congested traffic conditions where motorists experience lengthy delays. Most of the study area currently operates at LOS D or better conditions. Two intersections along Valley Street operate at LOS E/F during both AM and PM peak hours, Fairview Avenue and Terry Avenue North. Three additional intersections operate at LOS E/F conditions during the afternoon peak, Fifth Avenue North/Roy Street, Dexter Avenue North/Republican Street, and Mercer Street/I-5 interchange. Lastly, the Fifth Avenue and Broad Street intersection operates at LOS E in the morning peak.

Pedestrian Facilities

Pedestrian facilities are provided in the form of sidewalks throughout most of the study area. However, the quality and continuity of the sidewalk segments are in poor or unacceptable condition within much of the project limits. Two corridors have short segments of missing sidewalks. Poor pedestrian conditions are present intermittently throughout the study area (Exhibit S-4); some facilities are non-compliant with the Americans with Disabilities Act (ADA), most have worn and cracked surfaces, and some have narrow sidewalk widths. There is typically no buffer between the high-volume travel lanes and pedestrians. Signalized crosswalk locations within the study area are also limited, and again are of poor quality with faded striping and uneven, worn pavement caused by vehicle tracks.

Exhibit S-4. Typical Sidewalk Conditions in the Mercer Corridor

A pedestrian path is located around the south side of Lake Union from approximately Galer Street on the east to just east of the Aurora Bridge on the west. Through the study area, the path is situated north of Valley

Street, separated from traffic by a narrow shoulder and traffic curb (Exhibit S-5). In the SLU area, the pavement condition varies, but significant portions are in poor shape and characterized by cracks, patches, and uneven pavement, which allow puddles to form. Uneven sidewalk poses a safety concern for pedestrians, especially those with disabilities.

Exhibit S-5. South Lake Union Pedestrian Path

Bicycle Facilities

Existing bicycle facilities within the study area are limited. Dexter Avenue North is the only roadway with bicycle lanes within the study area. The extent of the bicycle lanes are from the Fremont Bridge to Denny Way.

The pedestrian path around the south side of Lake Union also allows bicycle use, but is limited in utility for commuter bicyclists who prefer higher speed facilities because of the mix of pedestrians and bicycles.

Transit Service

Transit service is provided on each of the north-south arterial streets in the study area and links South Lake Union with the Downtown area, University District, and other neighborhoods to the north. King County Metro buses serve the Fairview Avenue North, Westlake Avenue North/Ninth Avenue North, Dexter Avenue North, Fifth Avenue North and Aurora Avenue North corridors. Coverage along the east/west corridors is limited to Denny Way to the south outside the study area. Transit service from I-5 is currently not provided as efficient access and linkages are not available.

Truck Facilities

The study area serves commercial traffic to and from I-5 and major commercial industrial destinations, including South Lake Union, Fremont, Ballard, Interbay, and North Downtown. The Valley Street and Mercer Street couplet is a designated “Major Truck Street” to and from Westlake and Ninth Avenues North and Broad Street in the Seattle Comprehensive Plan. The westbound route requires trucks to perform weaving maneuvers and many multi-lane turn movements to access Valley Street (Photo 2). Broad Street, Westlake Avenue North and Ninth Avenues North, north of Mercer Street, are also designated Major Truck Streets by the City of Seattle.

Photo 2. Truck Maneuvering through Mercer/Valley Turns

Aurora Avenue North also serves as a Major Truck Street that traverses the study area limits.

Safety

Seattle Department of Transportation (SDOT) defines a high accident intersection as having 10 or more accidents per year if the intersection is signalized, and 5 or more if unsignalized. There are six high accident intersections within the Mercer Corridor study area. Six street segments (between intersections) within the Mercer Corridor study area also have higher than the city's average numbers of accidents. (Valley Street between Westlake and Terry avenues is a high accident segment; see Photo 3.)

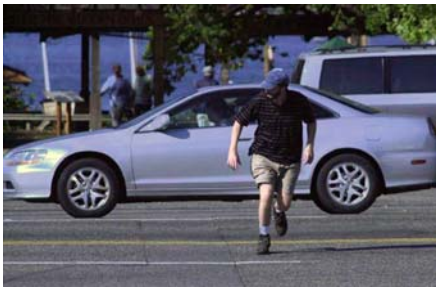


Photo 3. Pedestrian Crossing Valley Street

Within the last three years, at least one accident involving a motorized vehicle and a pedestrian or bicyclist was reported at most study intersections. Along Mercer Street, pedestrian or bicyclist accidents occurred at Dexter, Westlake, Terry, Boren, and Fairview Avenue intersections. Along Valley Street, pedestrian or bicyclist accidents occurred at Westlake Avenue and Broad Street intersections. Within mid-blocks segments, pedestrian or bicycle accidents occurred along Mercer Street between Terry and Boren and Boren and Fairview avenues and along Fairview Avenue between Mercer Street and Valley Street. Accidents involving pedestrians and bicyclists could be attributed to few protected pedestrian crossing opportunities, narrow or missing sidewalks, narrow lanes and lack of delineated bicycle facilities, and/or high-volume vehicle turning conflicts.

WSDOT defines a high accident location (HAL) as a section of state highway less than a mile long that has experienced a higher than the state's average rate of severe accidents during the previous 2-year period. Six locations on I-5 in the vicinity of the Project are identified by WSDOT as being HALs. Five of those locations are segments of I-5 ramps within the Mercer Street interchange, and one location is I-5 southbound mainline between Mile Post 164.90 and 167.52 (Lakeview entrance ramp to just north of the South Jackson Street undercrossing). In addition to these locations, the I-5 ramp terminal intersection with Mercer Street/Fairview Avenue North experienced a high number of accidents during the 3-year period reviewed.

On-Street Parking

Existing on-street parking was inventoried as part of the South Lake Union On-Street Parking Plan, November 2005. On-street parking is allowed throughout most of the study area, with the exception of Mercer and Valley streets. On-street parking can be useful in supporting retail development.

The Mercer and Valley Street corridors generally have no on-street parking. Within the proposed project limits, only two segments allow unrestricted parking: the north side of Mercer Street, between Terry Avenue North and Boren Avenue North, and the north side of Valley Street between Boren Avenue North and Fairview Avenue North.

Methodology

Three scenarios were analyzed in detail: existing, future no action, and build conditions. Analyses were performed for 2 forecast years to illustrate the short- and long-term effects of the project on the transportation system. All scenarios included analysis of both the AM and PM peak hours of traffic.

The City of Seattle travel demand model provided forecasts for years 2010 and 2030. This model projects person trips, mode share (auto, transit, walk, and bike), and traffic volumes on arterial streets and highways/freeways for a four-county region, with a more detailed network within the Seattle city limits.

Two software packages (Synchro and Corsim) were used to capture the full traffic-related impacts. The Synchro software was used to analyze all of the study intersections. The Synchro analysis quantified traffic operations in terms of level of service and vehicle delays and queuing. Traffic operations analysis was performed for 30 intersections within the Mercer Corridor study area. Intersection results presented in this report are based on *Highway Capacity Manual* (HCM) (Transportation Research Board, 2000) methodologies from Synchro software.

The Corsim software was used to develop measures of effectiveness (MOEs) for the I-5 freeway and the interface between the freeway and local roadway system. Operations were quantified in terms of travel time, vehicle delay and queuing. Vehicle queue results were used to support the design to ensure appropriate channelization is provided.

Additionally, two MOEs were used to analyze traffic operations, travel times, and screenline volumes. Existing travel times were calculated and physically verified. Year 2010 and 2030 travel times were derived from speed and delay output from the Synchro and Corsim analyses. A screenline is an imaginary boundary through which all of the entering/exiting vehicles are collectively viewed. In this study, one screenline was placed on each side of the Mercer Corridor study area to compare vehicle demand between scenarios (Exhibit S-6).

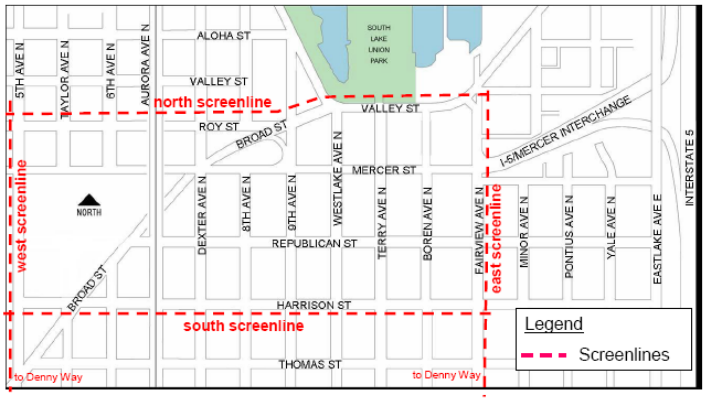


Exhibit S-6. Screenline Boundaries

Project Construction Effects and Mitigation

The construction of the Mercer Corridor Improvements Project would occur in three major phases, occurring over approximately a 2.5-year period.

To maintain maximum capacity and circulation within the study area, improvements to Mercer Street (Phases 1 and 2) would be completed prior to construction of improvements along Valley Street (Phase 3). Construction along the parallel corridors of Ninth Avenue North and Westlake Avenue North would be performed independently of each other to maintain mobility while minimizing disruptions. Generally, Mercer Street would be widened to the north side within new right-of-way to be acquired for the project. This would minimize disruptions, leaving the south side of Mercer available for eastbound traffic movements. During most of the construction, three eastbound lanes would be maintained on Mercer Street to minimize congestion and vehicle queues.

Driveway and cross-street access would generally be maintained throughout the construction period to minimize impacts to properties and businesses within the study area. Necessary closures would be outlined in the contractor's Traffic Management Plan (TMP) and approved by the City. The TMP would detail any detours, signing plans, and duration/timing of required closures. To minimize congestion and emergency response impacts, lane closures would be scheduled outside of the peak travel demand periods, such as commute peak travel hours and special events at Seattle Center. Temporary signals can provide emergency vehicle pre-emption to minimize impacts for emergency responders. Lane widths would be a minimum of 11 feet through all construction zones, similar to existing conditions. In addition, a shoulder would be provided for all roadway segments with only one travel lane in each direction. This provides vehicles an area to pull-over and allow emergency vehicles to pass.

Ninth and Westlake Avenues North, would maintain two-lane roadways with shoulders for vehicles to pull over for emergency vehicle access. Bicycle and freight travel would generally maintain the same travel patterns within the study area, and would be provided with lane geometry similar to existing conditions.

The contractor would maintain ADA accessible pedestrian paths and design pedestrian detours in their TMP. Pedestrian paths along the roadway lanes would be separated from vehicular traffic with a barrier.

During construction, on-street parking would be removed on Westlake Avenue North, Ninth Avenue North, and a one-block section of Mercer Street between Boren Avenue North and Terry Avenue North.

Public outreach communications would inform motorists of construction activities. These would include informational and variable message signs, radio announcements, and website postings. Construction activities would be coordinated with other projects and services within the study area, such as the streetcar project and Metro Transit, to minimize disruptions. Existing CCTV cameras in the corridor would allow SDOT staff opportunities to monitor and adjust traffic control for various conditions during construction (e.g., special events).

Existing Major Truck Streets in the study area, designated in the Seattle Comprehensive Plan, would be maintained during the first two phases of construction. For Phase 3, the area's Major Truck Streets would be relocated to Mercer Street (both directions) and Ninth/Westlake Avenues North corridors.

Construction impacts for the Build Alternative Option 2 (widening on both sides of Mercer Street) would require an additional construction phase for improvements to the center lanes of Mercer Street. The overall construction period would be extended by 6 to 12 months in comparison to Build Alternative Option 1 (widening to the north only).

Project Operation Effects and Mitigation

The Mercer Corridor Improvements project would provide three through-travel lanes for both east- and westbound travel on Mercer Street through the study area. By providing westbound access on Mercer Street, travel demand would be greatly reduced on Valley Street, allowing the roadway to be downsized to one travel lane in each direction. The two-way operations on Westlake Avenue implemented in conjunction with the streetcar project would be extended north of Mercer Street as part of this project. The two way operations on Ninth Avenue North implemented under a separate project would also be extended to the north with the two-way Mercer Street project. The two north-south two-way conversions would extend north to the Ninth Avenue North /Westlake Avenue North intersection.

In general, the project would place a higher travel demand on the Mercer Street corridor due to the improved westbound route. Operations for eastbound traffic would be slightly negatively affected; however, westbound travel would follow a less circuitous path, reducing driver confusion and circuitous travel in neighborhoods, thereby improving access, removing barriers (turn restrictions), and improving pedestrian/bike access and safety. It is expected that the westbound operations would be improved providing shorter travel times with better access by modifying the current lower capacity right and left movement with a more direct through movement at the I-5 off-ramp.

Emergency response times are expected to improve in the westbound direction as there are additional routes for travel and 2030 travel time estimates are expected to be shorter for this direction. In the eastbound direction, response times along Mercer Street are expected to be similar to No Action or slightly worse. By improving the circulation in the South Lake Union area, overall emergency response times should not be degraded. Providing emergency vehicles with route options would be a benefit during congested periods.

Along Valley Street, even with only one travel lane in each direction the response times may get slightly better as intersection LOS improves at key intersections due to significantly reduced traffic on this street. By

providing a bike lane and parking in each direction, adequate space would be provided for a vehicle to pull over, allowing emergency vehicles to pass. All new traffic signals would be equipped with emergency vehicle pre-emption to minimize impacts to response times.

2010 Operations

Intersection operations along Valley Street would improve due to the reduced vehicular demand on this corridor, making it an excellent corridor for pedestrian and bicycle travel. Mercer Street intersections at Ninth and Westlake avenues would experience higher delays with the proposed connection to Broad Street and the two-way operations along Ninth Avenue and Westlake avenues (constructed by others). The intersection of Mercer Street and Fairview Avenue is expected to improve with the additional lane capacity and revised configuration of Mercer Street and the I-5 ramps. Instead of forcing vehicles to perform two low-capacity turns to access South Lake Union from I-5, vehicles would have a direct through movement that improves drivers' expectations.

Travel time savings are expected in the AM peak hour for the westbound travel paths, while eastbound travel times remain similar. During the PM peak hour, travel times are expected to degrade slightly, particularly in the westbound direction due to increased delays along Mercer Street at the intersections with Ninth and Westlake avenues. Between I-5 and Westlake Avenue North, directly west of Lake Union, travel times are expected to slightly improve in the PM peak hour. In both AM and PM peak hours, the north-south paths are expected to have similar travel times between the No Action and Build scenarios.

Safety and mobility for non-motorized modes would be improved within the study area. Pedestrian connections to the proposed South Lake Union Park would have new sidewalks, ADA accessible ramps, new signalized crosswalks, curb bulbs, and significantly shorter crossing times along the Valley Street corridor. Tight intersection turn radii (20-foot radius) combined with on-street parking and curb bulbs are proposed at most intersection corners along Valley and Roy streets to increase pedestrian visibility, reduce vehicle speeds, and improve the pedestrian experience and safety. On Mercer Street, pedestrian crossing times would be longer than they are currently but the traffic signals along Mercer Street would allow pedestrians to cross in one cycle. In addition, intersection bulb-outs would reduce the pedestrian crossing distance, delineate on-street parking areas, and provide better pedestrian visibility for right-turning traffic. New traffic signals (as part of the Streetcar project) on both Mercer and Valley Streets at Terry Avenue would create a safe place for pedestrian crossings. Sidewalks would be improved and widened throughout the Mercer Street corridor. Sidewalks would also be constructed to at least meet the City standard of 10.5 feet along other cross streets to complete the pedestrian grid within the South Lake Union area. Pedestrian access across Aurora Avenue North would be maintained along Broad Street, with connections at Mercer Street and Eighth/Ninth Avenue North.

Bicycle lanes would also be constructed along Valley Street to complete the bicycle system along the south side of Lake Union and would connect riders from Fairview Avenue North to the existing lanes along Dexter Avenue North and the proposed lanes on Ninth Avenue North.

To further enhance the pedestrian connections across Mercer Street, there is an option to provide a protected pedestrian crossing at Boren Avenue. This option would reduce the out-of-distance travel pedestrians would experience walking to protected crossings at Fairview or Terry avenues and would reduce the potential for jaywalking. This signalized crossing would not accommodate any vehicular movements; therefore it would only be activated when pedestrians are present and would be coordinated with the traffic signal at the Mercer Street and Fairview Avenue intersection. East-west travel times on Mercer Street may be slightly impacted with the addition of a new signal; however, the pedestrian crossing time needed at Boren would be timed concurrent with the north-south pedestrian and vehicle crossing times needed at Fairview Avenue.

The proposed truck route to the Fremont and Ballard areas would utilize the Mercer Street/Ninth Avenue North/Westlake Avenue North corridor. Truck movements to and from Interbay would likely utilize the Mercer/Broad Street connection to Elliott Avenue. Intersection curb radii would be designed to accommodate a 75-foot design vehicle, resulting in longer pedestrian crossings at:

- Mercer Street at Fairview Avenue intersection – southwest, southeast and northeast corners
- Mercer Street at Ninth Avenue intersection – northeast corner

A new signal would also be constructed at the Ninth Avenue North/Westlake Avenue North intersection and would provide movement priority to the Ninth Avenue North to Westlake Avenue North movement. It would also provide a new signalized pedestrian crossing.

Existing parking on Ninth Avenue North and Westlake Avenue North (north of Mercer Street) would be removed during peak periods. Overall, the on-street parking in the South Lake Union area would increase with the new stalls on Mercer Street and Valley Street. To improve overall operations in the year of opening, some on-street parking along the south side of Mercer Street could be limited (potentially by time of day restrictions) to provide more throughput during peak periods.

While no changes to transit service are proposed as part of this project, transit is a realistic and viable mode within this dense urban environment. This project would better accommodate transit service on east-west streets such as Valley, Republican and Harrison Streets and the north-south corridors. As recommended in the South Lake Union Transportation Study, with the types of land use planned in the area there will be significant growth in the area and therefore demand for increased and additional transit services.

Overall vehicle and pedestrian safety in the corridor is expected to improve with the proposed direct route to and from I-5 via Mercer Street, which would reduce driver confusion, especially for tourists visiting the Seattle Center and South Lake Union area, and reduce pedestrian conflicts with high-volume turning movements. Vehicular and pedestrian safety would improve along the narrowed Valley Street corridor as traffic demand and truck traffic are redirected to the Mercer Corridor. Improving access with additional pedestrian crossings and delineated bicycle lanes as well as updating and completing substantial portions of the study area's sidewalks would improve the safety for pedestrians and bicyclists. The potential for additional vehicle conflicts, such as opposite direction left-turns, would be introduced to Mercer Street associated with two-way traffic, and on-street parking may contribute to an increase in side-swipe and rear-end accidents. However, opposite direction vehicle conflicts would be minimized with the proposed median and protected left-turn signal phasing for all intersections on Mercer Street.

2030 Operations

By year 2030, with anticipated growth in the SLU area and other areas served by the Mercer Corridor, any available capacity will be reached as traffic is expected to become more balanced throughout the network. Likewise, many intersections in the South Lake Union study area would operate at levels of service E or F without the project. These levels are expected for a densely developed urban environment such as the SLU area. In both AM and PM peak hours, the Mercer Corridor Improvements project would improve intersections along Valley Street/Roy Street and Republican Street as vehicular demand is shifted to Mercer Street. Most intersections along Mercer Street would operate at LOS E or F with the proposed project.

Overall, slight travel time savings are exhibited during both the AM and PM peak hours under the Build scenario for the east-west paths. Changes in the travel patterns would result from the direct connections at Mercer Street with two-way operations, combined with the new Aurora Avenue North crossing opportunities at Harrison and Thomas streets, and removal of the interim Broad Street connection to Mercer Street. These changes would improve the overall efficiency of the SLU grid network and result in the accommodation of more trips than the no-build condition. Travel-time savings would occur during the PM for northbound travel as a result of the extension of the two-way traffic along Ninth Avenue North. Exhibit S-7 depicts the direct east-west route on Mercer Street and additional SR 99 crossings at Harrison and Thomas Streets.

Overall, the pedestrian and bicycle operations would be improved over Year 2010 conditions. Improvements in the pedestrian sidewalk and crossing locations will occur along Mercer Street, west of Ninth Avenue, as part of the Alaskan Way Viaduct Replacement project. The Broad Street roadway and pedestrian connection will be removed. In conjunction with this, the north-south pedestrian crossing of Mercer Street at Eighth

Avenue North would be removed. Those facilities would be replaced by continuation of the Mercer Street sidewalk to the west, with new north-south crossings at Ninth Avenue North and Dexter Avenue North intersections. By 2030, with new connections across SR 99/Aurora Avenue, transit becomes a more viable alternative. Transit along Republican and Harrison avenues could provide key east-west transit connections while serving the South Lake Union area.

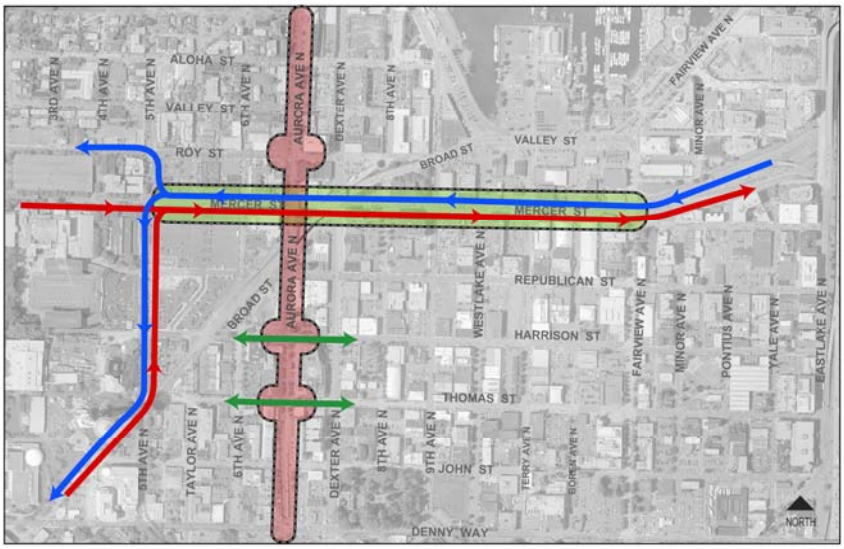


Exhibit S-7. Future 2030 East- and Westbound Travel Paths

Truck, transit, and vehicular safety would be similar to the Year 2010 operations. On-street parking would also be similar, with some additional parking along both sides of Mercer Street between Dexter and Ninth Avenue North intersections.

While some intersections would operate at LOS E and F by 2030, this is not uncommon given the system and dense urban environment of the future SLU neighborhood. Of more importance is ensuring the most efficient use of the transportation network. Linkages across Aurora Avenue and improved property access would make greater use of the roadways. This also provides greater opportunities to implement intelligent transportation systems (ITS) with this project throughout the study area to improve system efficiency. Strategies include advanced traveler information systems (linked to Seattle Center and downtown traffic) as well as signal timing, cameras and coordination strategies. Coordination with WSDOT on ITS and integration of operations would be emphasized during the design phase to ensure maximum benefit to travelers to and from I-5. Improved detection of vehicles and possibly pedestrians, and signal timing and phasing changes throughout the day would provide the most efficient use of the grid street network in SLU.

Cumulative Effects

Many of the current roads in the SLU area are underutilized, and completing the comprehensive package of projects identified in the South Lake Union Transportation Study will better utilize the street system for all modes. In conjunction with the SLU Streetcar Project and Alaskan Way Viaduct Replacement Project (AWVRP) including Lowered Aurora, the Mercer Corridor project would create a base transportation network to accommodate planned growth in the SLU neighborhood. The projects were initially identified in the SLU Transportation Study and would build a grid roadway system where automobiles, trucks, pedestrians, bicyclists, and transit can circulate efficiently. Potential cumulative transportation

impacts could occur as a result of two planned construction projects within the study area; the South Lake Union streetcar and the Alaskan Way Viaduct. The streetcar is proposed to be completed prior to the beginning of the Mercer Corridor Improvements project. If the schedule is delayed, concurrent construction through the Mercer Street intersections of Terry Avenue North and Westlake Avenue North could occur as well as along Valley Street. If concurrent construction is anticipated, detailed scheduling of lane closures and staging areas would be required.

The Mercer Street improvements are projected to be completed prior to the Alaskan Way Viaduct construction. If Mercer project construction is delayed and overlaps the AWVRP construction period, the City would coordinate construction activities and schedules.

Potential cumulative effects on the transportation system upon completion of the project involve changes in travel patterns due to the Alaskan Way Viaduct Replacement Project. Overall travel time is expected to improve as a result of the combined effects of completing the SLU identified improvements. In both the AM and PM peak hours, east-west travel times savings occur as a result of the completion of the projects identified for the South Lake Union area.

Crossings of Aurora Avenue North would occur at Thomas Street, Harrison Street, and Mercer Street, allowing for alternative travel routes within the South Lake Union Area. Providing drivers with options will reduce the reliance on Mercer Street and improve the corridor reliability and sustainability. With new connections across SR 99/Aurora Avenue, transit would become a more viable alternative along Republican, Harrison, and/or Thomas streets.

Significant Effects

Overall, the Mercer Corridor Project would not create any significant impacts on the transportation system. For certain conditions, a few isolated impacts are expected. These impacts are not considered significant as the Mercer Corridor is expected to incur overall improved operations with this project.

During the opening year 2010, westbound and eastbound travel would improve in the AM peak hour with the direct east-west route along Mercer Street. However in the PM peak hour, eastbound and westbound traffic operations and travel times along Mercer Street would decline slightly compared to No Action conditions as a result of the project. The intersection operations at Mercer Street with Ninth and Westlake avenues would degrade in year 2010.

The Mercer Street improvements would complement the travel patterns created by the revised Aurora Avenue North ramps and crossings proposed in the AWVRP, which will be completed by the design year 2030. Intersection operations and travel times would be similar to or

better than No Action conditions during the design year. Overall, both the AM and PM peak hours would accrue travel time savings along the more direct westbound route on Mercer Street. In the eastbound direction, travel times get slightly worse than in the No Action condition, but are not considered a significant impact to the study area.

No Action Alternative Effects

No Action Alternative conditions were analyzed for both the opening year 2010 and design year 2030. Planned projects within the study area were included in the No Action travel demand model to depict an accurate portrait of travel patterns during the study years. Three No Action improvement projects were assumed to occur with major impacts to the study area: the new South Lake Union streetcar (running between Westlake Center and the Fred Hutchinson Cancer Research Center), Ninth Avenue North reconstruction to two-way traffic, and the AWVRP. While the streetcar and Ninth Avenue projects are assumed in both 2010 and 2030 conditions, the AWVRP project is assumed in only year 2030.

Overall, the 2010 and 2030 population and employment forecasts show a high level of growth; however, the forecasts and screenline analyses indicate fairly low annual traffic growth rates. This low traffic growth is due to many factors including peak-hour spreading, increased internal trips due to new mixed land uses, mode shifts to higher occupancy vehicles and transit, mode shifts to non-motorized travel, and the inability for trips entering and exiting the SLU area due to regional capacity constraints outside of the study area. The current state of pedestrian infrastructure is poor. Sidewalks are uneven and in disrepair and provide a poor pedestrian experience and do not link or provide amenities for current and planned transit connections such as the SLU streetcar. Pedestrian facilities are not well defined or delineated, creating safety issues for pedestrians. Some bicyclists may choose not to use Westlake or Terry Avenue due to the streetcar tracks, but will have new options with bicycle lanes on Ninth Avenue North. Overall, the lack of pedestrian and bicycle improvements in the study area would limit the system's ability to support any mode shift to transit and non-motorized modes.

2010 and 2030 Traffic Volumes

Generally, annual traffic growth rates around 1 percent per year or less are forecasted through 2010 and 2030 for both AM and PM peak hours with the No Action Alternative. The PM peak hour is expected to exhibit slightly more growth than the AM peak hour.

2010 and 2030 Operations

The 2010 AM peak hour LOS operations remain similar to 2005 conditions. However, there would be operational impacts along the streetcar route on Valley Street as additional delays occur due to the

revised traffic signal phasing to accommodate the streetcar. In the PM peak hour, similar impacts would be created by the streetcar as it increases delays along Terry Avenue and at the Mercer Street approach to Terry Avenue. While LOS improvements are expected at the Terry Avenue approach to Valley Street when it is signalized during the streetcar project, the dominant eastbound and westbound traffic will encounter some additional delay caused by the traffic signal. Throughout the system, increased pedestrian activity will need to be balanced with vehicle use at the signals.

During Year 2030 operations, intersections along the streetcar route would continue to experience additional delays. In addition operations at several intersections in the vicinity of the Aurora Avenue North access points at Roy and Republican streets would deteriorate. If the two-way Mercer project is not constructed, circulation and routing would continue to be confusing and circuitous and business access limited. Even with the AWVRP, east-west circulation would be constrained, especially in the westbound direction as Broad Street is removed, and overall travel in this direction is not expected to achieve significant benefits unless the two-way Mercer is constructed.

Acronyms and Abbreviations Used in This Report

ADA	Americans with Disabilities Act
AM	morning
AWVRP	Alaskan Way Viaduct Replacement Project
COS	City of Seattle
EB	eastbound
FGTS	Freight and Goods Transportation System
FHWA	Federal Highway Administration
HAL	high accident location
HCM	*Highway Capacity Manual* (Transportation Research Board, 2000)
HOV	high-occupancy vehicle
ITS	intelligent transportation system
LOS	level of service
MOEs	measures of effectiveness
NB	northbound
NEPA	National Environmental Policy Act
PM	afternoon/evening
PSRC	Puget Sound Regional Council
SB	southbound
SDOT	Seattle Department of Transportation
SLU	South Lake Union
TWSC	two-way stop-controlled [intersection]
vph	vehicles per hour
WB	westbound
WSDOT	Washington State Department of Transportation

Glossary

Angle accident – accident involving at least one vehicle entering the roadway at an angle or performing a turning movement.

Design year – The design year is a 20-year or more assessment of the traffic operations within the study area. The operational results from this condition are generally used for design purposes as it provides a sustainable period of traffic operations.

High accident intersection – an intersection having 10 or more accidents per year if the intersection is signalized, and 5 or more if unsignalized.

High accident location (HAL) – a section of state highway, less than a mile long, that has experienced a higher than average rate of severe accidents during the previous 2-year period.

Level of service (LOS) – describes typical traffic conditions in terms of speed and travel time, freedom to maneuver, traffic interruptions, comfort, convenience, and safety. There are six LOS classifications, each given a letter designation from A to F. LOS A represents the best operating conditions and LOS F represents the worst. For intersections, LOS is measured in terms of delay (seconds per vehicle)

Peak hour – The highest hour of traffic volumes throughout a day. The typical morning and evening urban commuter hours on weekdays are considered the peak hour of traffic. The evening peak generally has more vehicle activity than the morning peak.

Screenline analysis – a screenline is an imaginary boundary through which all of the entering/exiting vehicles are collectively viewed. Screenlines are generally along a specific geographic feature or roadway corridor.

Travel time – travel time is the time it takes to traverse a section of roadway, calculated as roadway length divided by travel speed plus movement delay at intersection (or freeway ramp).

1. Introduction

The Mercer Corridor Improvements project would provide vehicular, bicycle, and pedestrian improvements in the Mercer Street corridor in the South Lake Union (SLU) area of Seattle. The purpose of this Transportation Discipline Report is to describe existing transportation characteristics and evaluate both positive and negative effects that the project would have on these characteristics.

While other discipline reports for this project analyze two Build Alternative options, this report discusses the potential effects of only one general Build Alternative and the No Action Alternative. Any differences between the two Build Alternative options are discussed; however, the transportation effects of the two options are similar.

The study area boundaries defined for the transportation analyses of the Mercer Corridor project are shown in Exhibit S-1. The limits for the area are the I-5 interchange to the east and Fifth Avenue North to the west. The north limit is Valley Street, while the south limit is Harrison Street. Detailed traffic operations analyses were performed for 30 intersections within this area.

An expanded study area provides a broader perspective of the transportation effects surrounding the corridor to and from major destinations including Downtown Seattle and Seattle Center. Measures of effectiveness (MOEs), such as travel time, were calculated within the larger study area.

2. Description of Alternatives

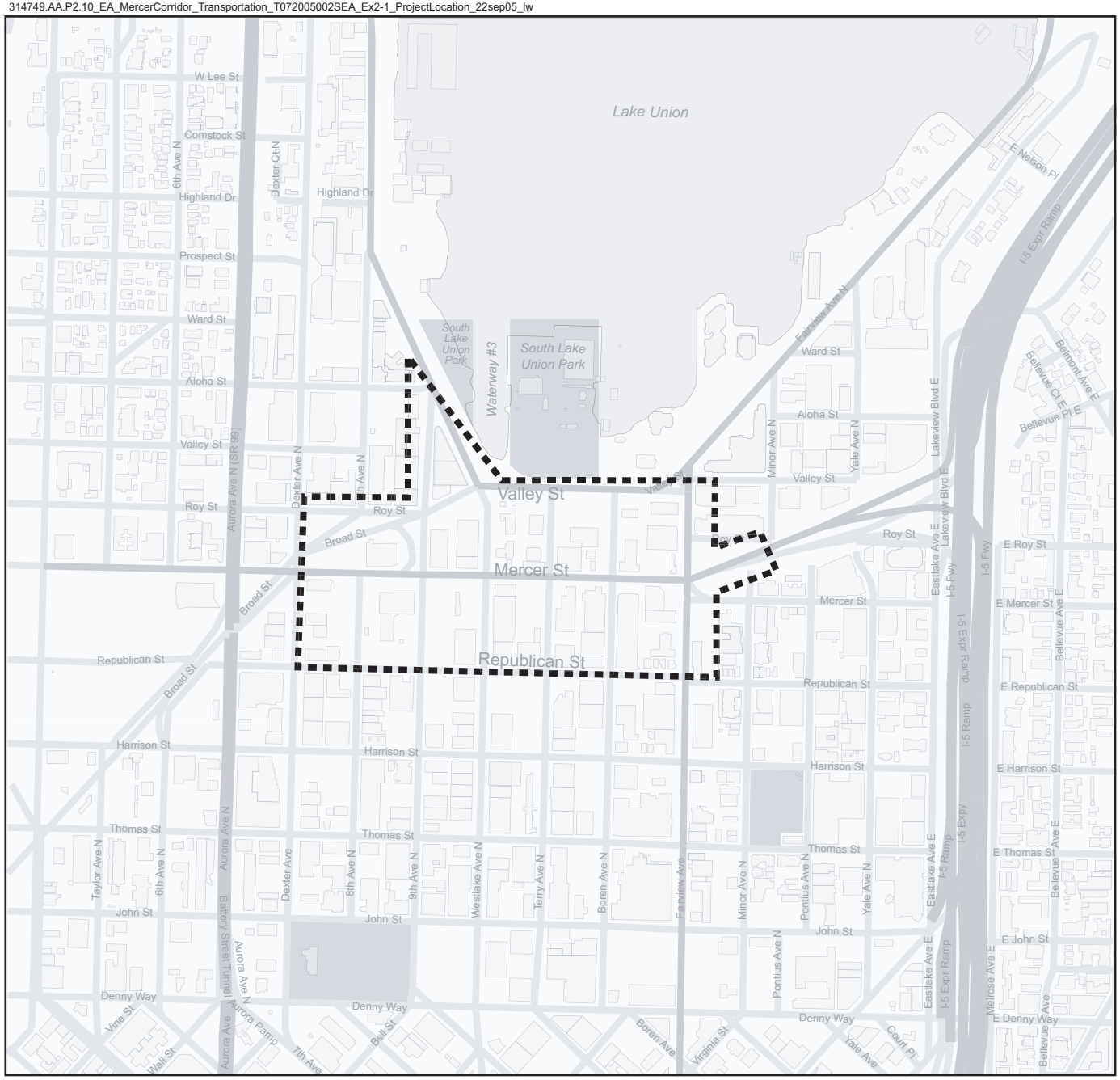
The City of Seattle, Washington, in cooperation with the Federal Highway Administration (FHWA), proposes to make improvements to the Mercer Corridor, which includes Mercer and Valley streets, in the South Lake Union neighborhood of Seattle (Exhibit 2-1). The purpose of the project is to improve local safety, access, and circulation within South Lake Union for vehicles, bicycles and pedestrians, and provide for more direct vehicular movement through the corridor. Mercer Street currently is a one-way principal arterial with four lanes in the eastbound direction. In the South Lake Union area, Mercer Street operates as a couplet with Valley Street, via Fairview Avenue, from I-5. Mercer Street is also linked to Broad Street in the eastbound direction to provide a connection to SR 99 (Aurora Avenue). Valley Street is a principal arterial with five lanes (two eastbound and three westbound) and serves as the westbound segment of the Mercer/Valley couplet.

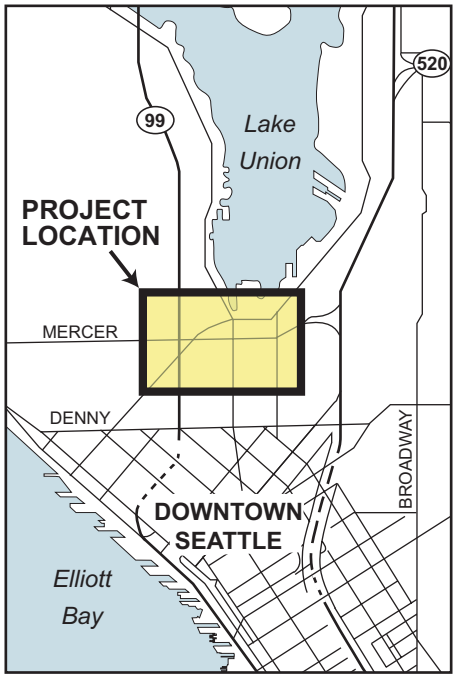
2.1 Build Alternative, Option 1

The Build Alternative would replace the existing Mercer/Valley couplet with a widened two-way Mercer Street, which would provide more direct access to and from I-5 (Exhibit 2-2). Valley Street would be narrowed to a two-lane street with bicycle lanes in each direction and on-street parking. Pedestrian and bicycle circulation would be improved with widened sidewalks, removing the barriers caused by turn signal prohibitions and crossing restrictions, and by providing additional protected pedestrian crossings of Mercer and Valley streets. For Option 1, Mercer Street would be widened to the north.

2.1.1 Mercer Street Improvements

The two-way Mercer Street would be a principal arterial street with a landscaped median, left-turn lanes, parking, and sidewalks (Exhibit 2-3). The street would be widened primarily to the north to accommodate the new westbound travel lanes, median, parking lanes, and wider sidewalks. The street would have three eastbound lanes and three westbound lanes to accommodate traffic demand between Dexter and Fairview avenues and to facilitate movement of freight from I-5 to the Ballard/Interbay manufacturing and industrial center, South Lake Union, Seattle Center, Fremont, Queen Anne and North Downtown areas. A 21-foot landscaped median would be constructed to enhance pedestrian safety and provide aesthetic benefits. At intersections with left-turn lanes (most locations), the median would be narrowed to accommodate the turn lane and to provide a 10-foot curbed pedestrian refuge for those unable to cross the entire street in one traffic signal phase. Parking lanes would be added on each side of the street to support retail uses. On the north side of the street, the parking lane would be 8 feet wide. On the south side of the street, the parking lane would be 10 feet wide to allow potential future or





LEGEND

Project Limits

NORTH

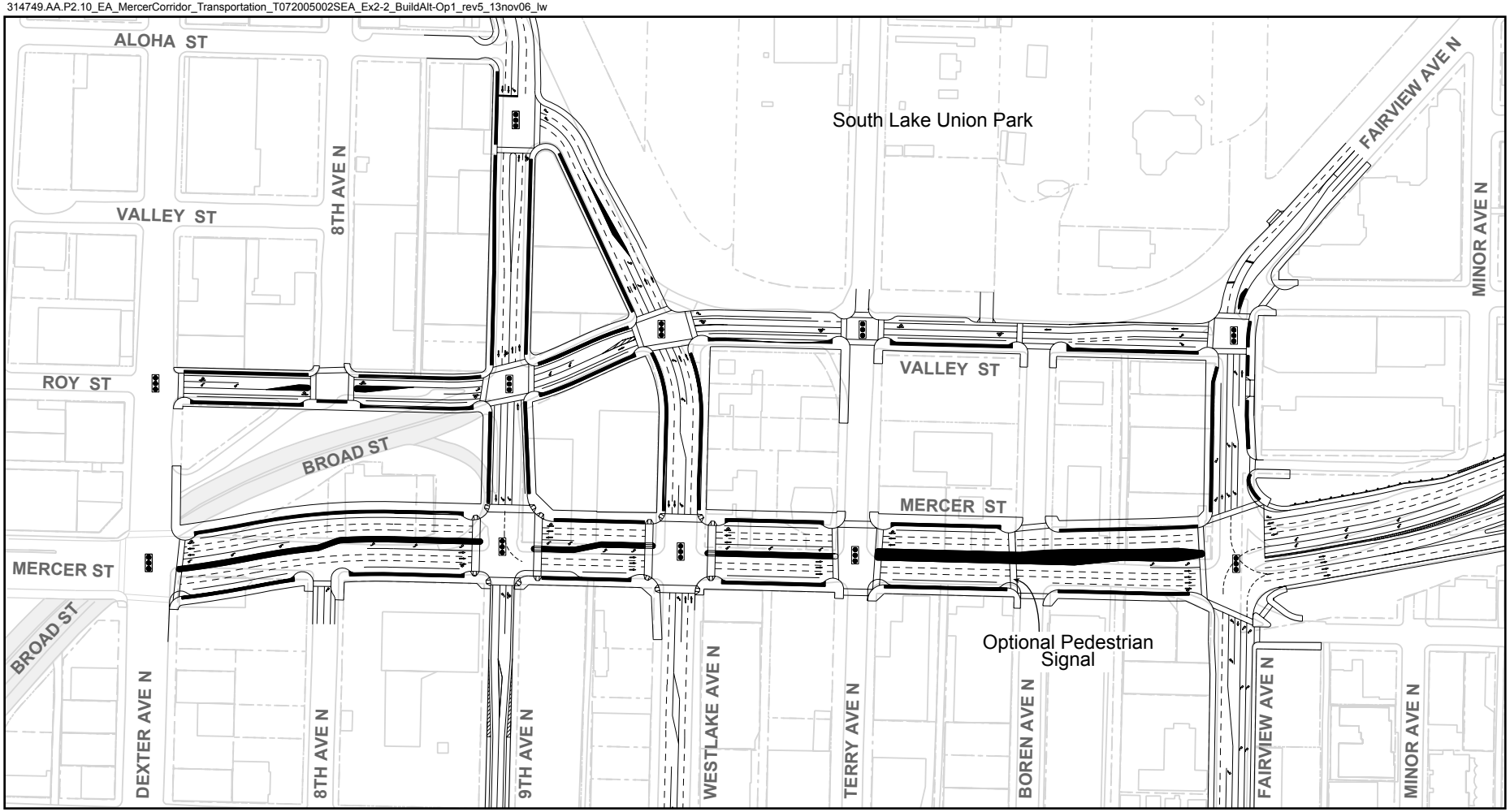
0 0.125 0.25 Mile

Exhibit 2-1

Mercer Corridor Project Location

MERCER CORRIDOR IMPROVEMENTS PROJECT

314749.AA.P2.10_EA_MercerCorridor_Transportation_T072005002SEA_Ex2-2_BuildAlt-Op1_rev5_13nov06_lw



LEGEND

Broad Street Removed
Alaskan Way Viaduct and Seawall Replacement Project

Planting Strips and Median

Signalized Intersection

NORTH

0 100 200 Feet

Exhibit 2-2

Build Alternative – Option 1

MERCER CORRIDOR IMPROVEMENTS PROJECT

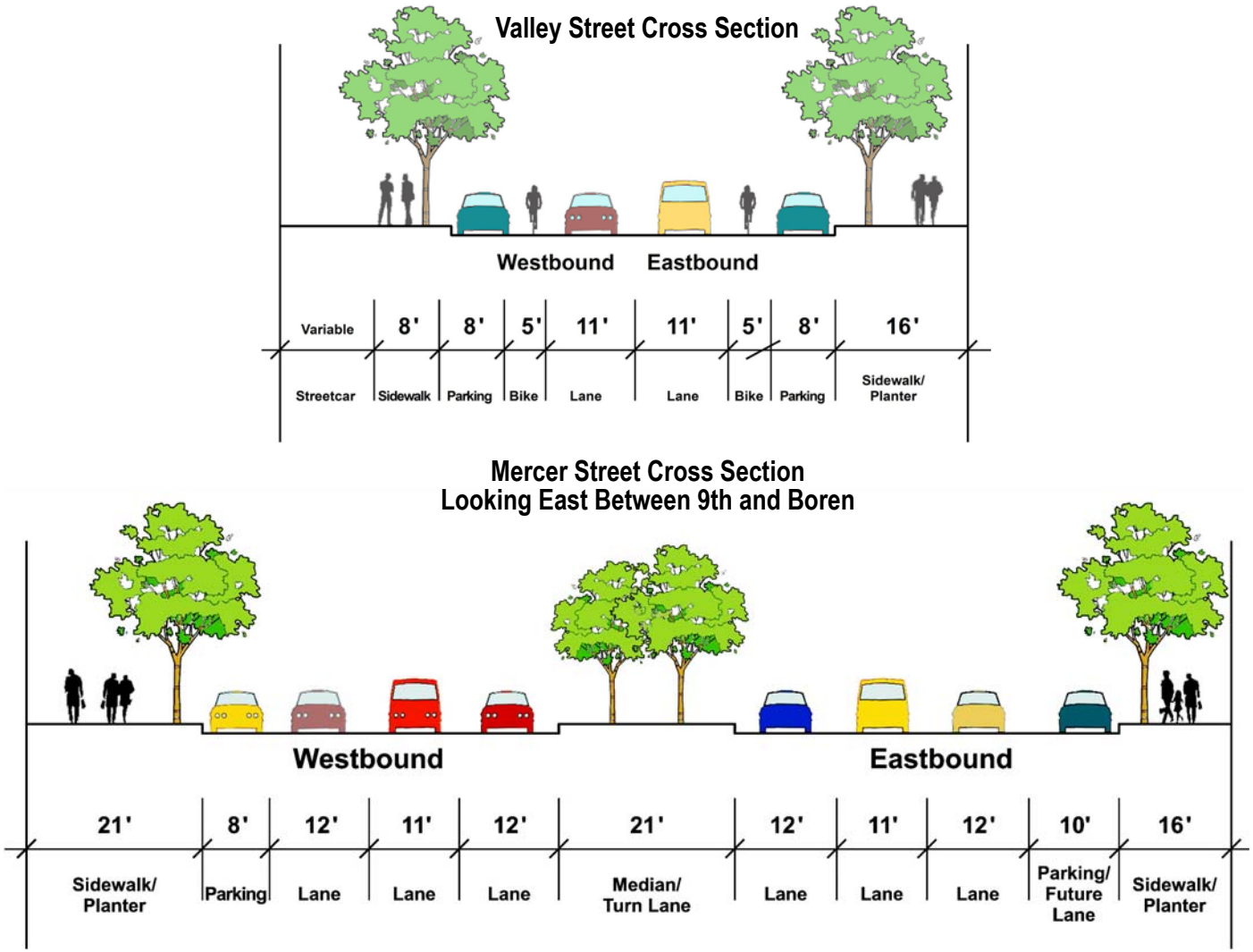


Exhibit 2-3

Mercer and Valley Street Cross Sections

MERCER CORRIDOR IMPROVEMENTS PROJECT

temporary use as an additional eastbound lane for transit or general purpose traffic.

The sidewalks along Mercer Street would be widened to accommodate anticipated pedestrian activity associated with a high-density urban neighborhood. Sidewalks would be widened to 16 feet on the south side of the street to provide a 10-foot walkway and a 6-foot safety buffer and planting area. On the north side of the street, the sidewalk would be widened to 21 feet to allow for additional space along building frontages for window shopping and possible sidewalk cafes, as well as a 6-foot safety buffer and planting strip. A new traffic signal at Terry Street, constructed by the South Lake Union Streetcar project, would provide safe crossing opportunities for pedestrians and vehicles. Driveway access to properties between Boren Avenue and Fairview Avenue would be removed or restricted to reduce conflicts and improve traffic flow entering and exiting I-5, with alternate access provided from side streets.

At Dexter Avenue North, the western end of the project, the ultimate configuration of Mercer Street would be designed to tie in to a future widening of Mercer Street west of Dexter Avenue North to Fifth Avenue North and removal of Broad Street, planned to occur as part of the proposed Alaskan Way Viaduct Replacement Project (AWVRP). Depending on progress on that project, an interim connection to Broad Street and the existing Mercer Street configuration to the west could be constructed, if needed, until Mercer Street is widened west of Dexter Avenue North.

For the Year 2010 analyses, it was assumed that the interim Broad Street connection is required. The proposed design (Exhibit 2-4) connects the westbound Mercer Street lanes to Broad Street at Ninth Avenue North. The eastbound Broad Street lanes connect to Mercer Street across from Eighth Avenue North, creating a new signalized intersection and protected pedestrian crossing on Mercer Street. The Eighth Avenue connection requires lowering of the speeds through the curve due to geometric constraints for the assumed 75-foot tractor-trailer design vehicle. This interim design accommodates a single westbound lane between Eighth and Dexter avenues to allow connections to Queen Anne and SR 99.

An alternate design (Exhibit 2-5) was also examined which provides adequate design speeds and can be constructed with fewer impacts than the Eighth Avenue connection. Full connection of Broad Street would form a fifth leg to the Ninth/Mercer Street intersection. This design, however, complicates operations at the intersection and creates extended travel time delays which are described in Section 5. While both interim designs include the fourth eastbound lane on Mercer Street, an option remains to maintain the on-street parking on the south side of Mercer Street, creating a balanced three lanes in each direction on Mercer Street. If the fourth lane is desired, this lane could be accommodated by

314749.AA.P2.10_EA_MercerCorridor_Transportation_T072005002SEA_Ex2-4and2-5_InterimDesign_v8_14nov06_lw

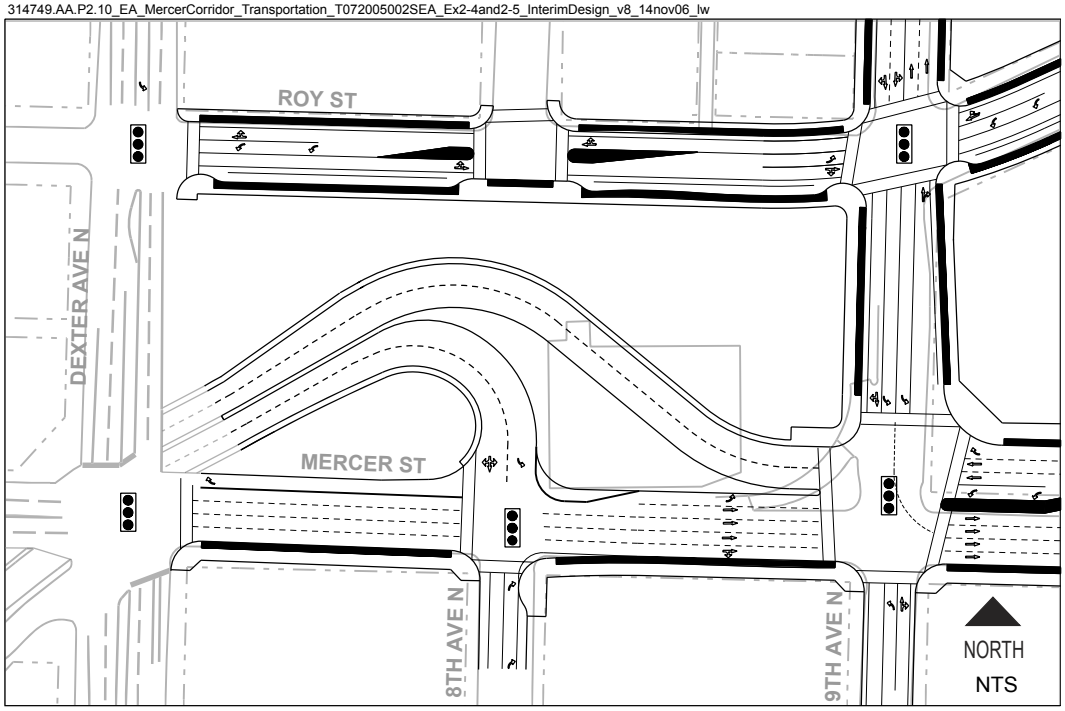


Exhibit 2-4

Proposed Interim Design with Eastbound Broad Street Tie-in at Mercer and Eighth

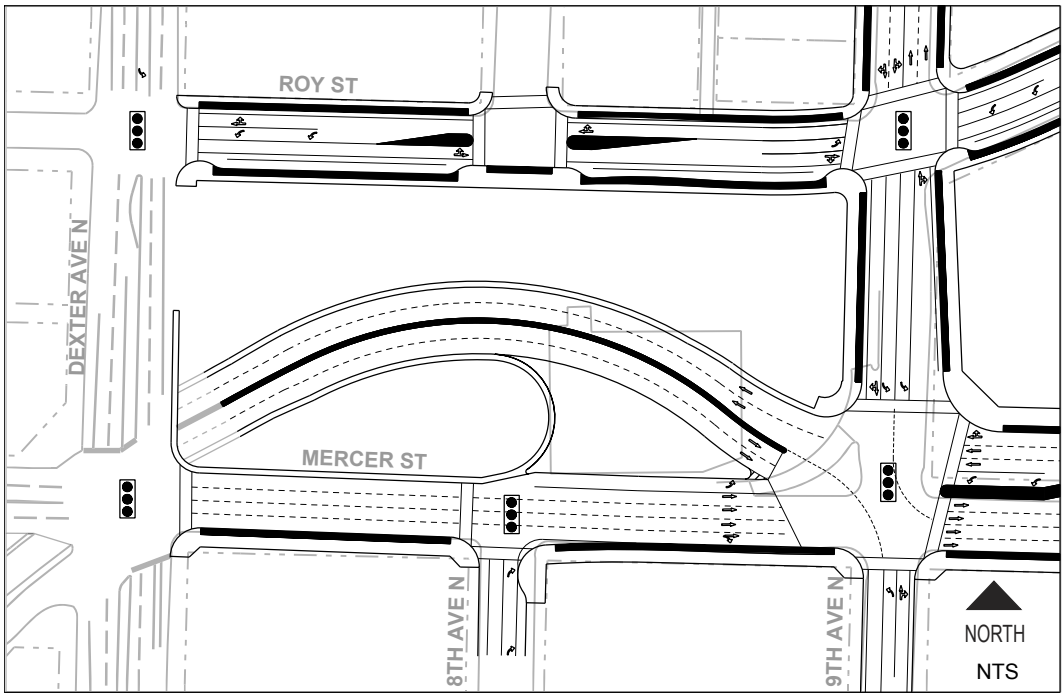


Exhibit 2-5

Optional Interim Design with Eastbound Broad Street Tie-in at Mercer and Ninth

MERCER CORRIDOR
IMPROVEMENTS PROJECT

providing peak-hour parking restrictions on the south side of Mercer Street.

The Ninth Avenue North connection is recommended only for a short-term interim connection. If an extended interim Broad Street connection is required, the Eighth Avenue North alternative provides for a more efficient connection to the transportation system.

2.1.2 Valley Street Improvements

Valley Street would be designed to be sensitive to its location adjacent to South Lake Union Park. Because most traffic would be diverted to the new two-way Mercer Street, Valley Street would be used primarily for local traffic, including travel between the east and west sides of Lake Union. Valley Street would be narrowed to have one travel lane in each direction, with bike lanes, parking, and sidewalks on each side of the street (see Exhibit 2-3). The bike lanes would be 5 feet wide and extend west from Fairview Avenue to connect to existing bike lanes on Dexter Avenue North. The sidewalk on the south side of the street would be widened to 16 feet, and a new 8-foot sidewalk on the north side would be constructed adjacent to the street. Improved crossings of Valley Street at Fairview, Boren, Terry, and Westlake avenues, along with a new signal at Terry Avenue (constructed by the streetcar project), would create more convenient, safe pedestrian access to South Lake Union Park. Valley Street would be used primarily for local traffic and vehicles traveling around the south side of Lake Union, and would be designed as an extension of South Lake Union Park.

2.1.3 Other Improvements

At the eastern end of the project, the I-5 ramp termini at Fairview Avenue would be widened to provide three through lanes to Mercer Street and four through lanes from Mercer Street to the I-5 ramps. The existing nonstandard configuration that provides an eastbound Mercer Street connection across Fairview Avenue to Eastlake Avenue would remain. To prevent long traffic queues on the I-5 off-ramp, there would also be two left-turn lanes and one right-turn lane onto Fairview Avenue. The I-5 off-ramp lane configuration provides more capacity because the westbound through-movement provides more efficient traffic flows compared to the combined dual-right and triple-left turns under the current condition. The configuration also provides a greater percentage of signal green time compared to the current combination of traffic signals on Fairview Avenue at Mercer and Valley streets. As part of this reconfiguration of the off-ramp, the project removes a substantial merge/weaving condition and introduces new weaving maneuvers. Currently, the large volume of traffic heading west through the corridor is required to turn right at Fairview, of this volume the portion coming from the south is required to make up to 2 lane changes. This creates a significant bottleneck for northbound off-ramp vehicles as this is the

predominant movement (between 700 and 950 vehicles per AM and PM peak hours, respectively, are expected by 2030) and gaps in the southbound lanes are infrequent. Similarly, vehicles in the southbound general purpose off-ramp lane who desire to turn left at Fairview Avenue and head downtown have one lane change (weaving across the northbound off-ramp traffic stream) to get into the left-turn lanes, while traffic from the southbound express-lanes off-ramp does not have to change lanes for the left-turn movement at Fairview. This weave is performed by slightly less than 500 vehicles in either the AM or PM peak hours. These lane changes are within a short distance and create a weave that is illustrated in Exhibit 2-6.

With the project, the predominant movement from both the northbound and southbound off-ramps would be to Mercer Street and would require no lane changes. Vehicles from the southbound off-ramp that desire to turn left onto Fairview Avenue would need to make a minimum of 2 lane changes, but this weave is only expected to be performed by 340 (AM) or 225 (PM) vehicles per hour. Likewise, vehicles from the northbound off-ramp desiring to turn right onto Fairview Avenue would need to make at least 3 lane changes. Again, this movement would be a relatively minor volume movement performed by 340 vehicles in the AM peak hour and 125 vehicles in the PM peak hour. These two maneuvers are not predominant movements on the off-ramp as a significant portion of the off-ramp traffic would proceed through the ramp termini (Exhibit 2-6).

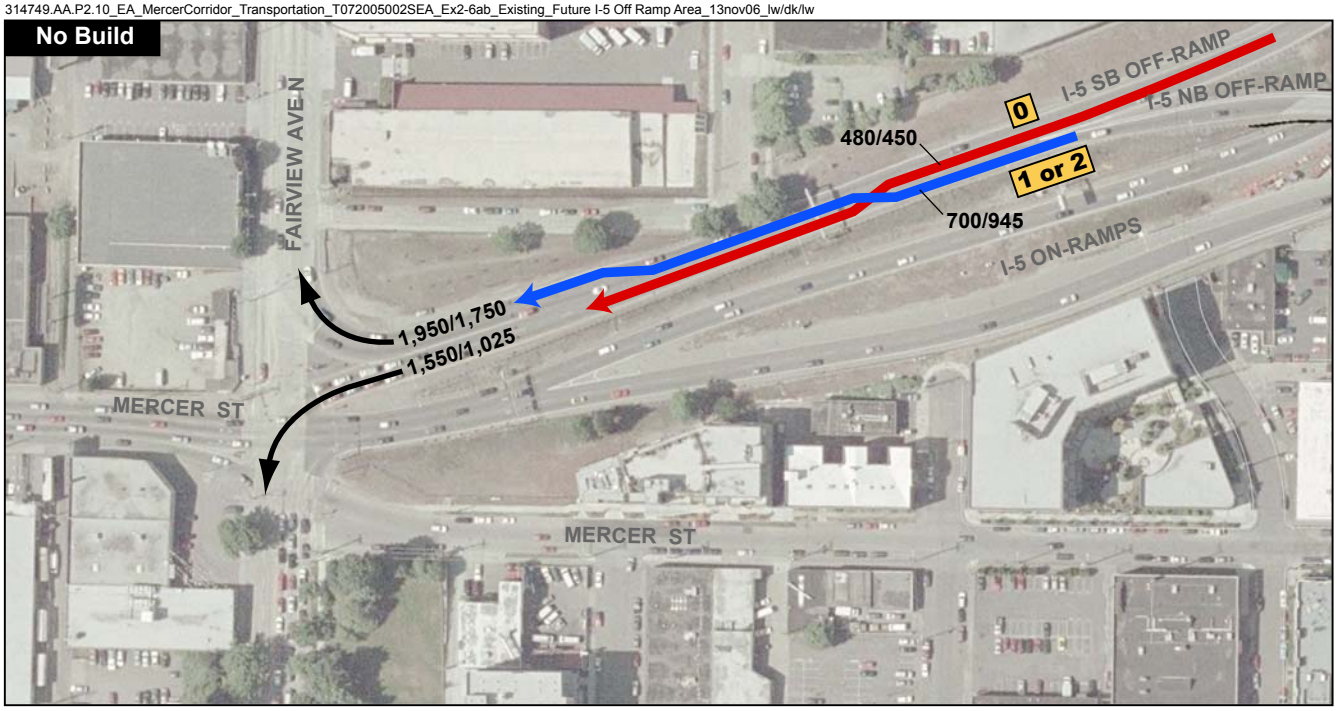
Pedestrian improvements would also be provided at the I-5 ramp termini at the Fairview Avenue intersection. An additional pedestrian crossing would be provided on the north side of the intersection, while maintaining the pedestrian crossings on the west and south side approaches. The east side approach would not provide a pedestrian crossing, similar to current conditions.

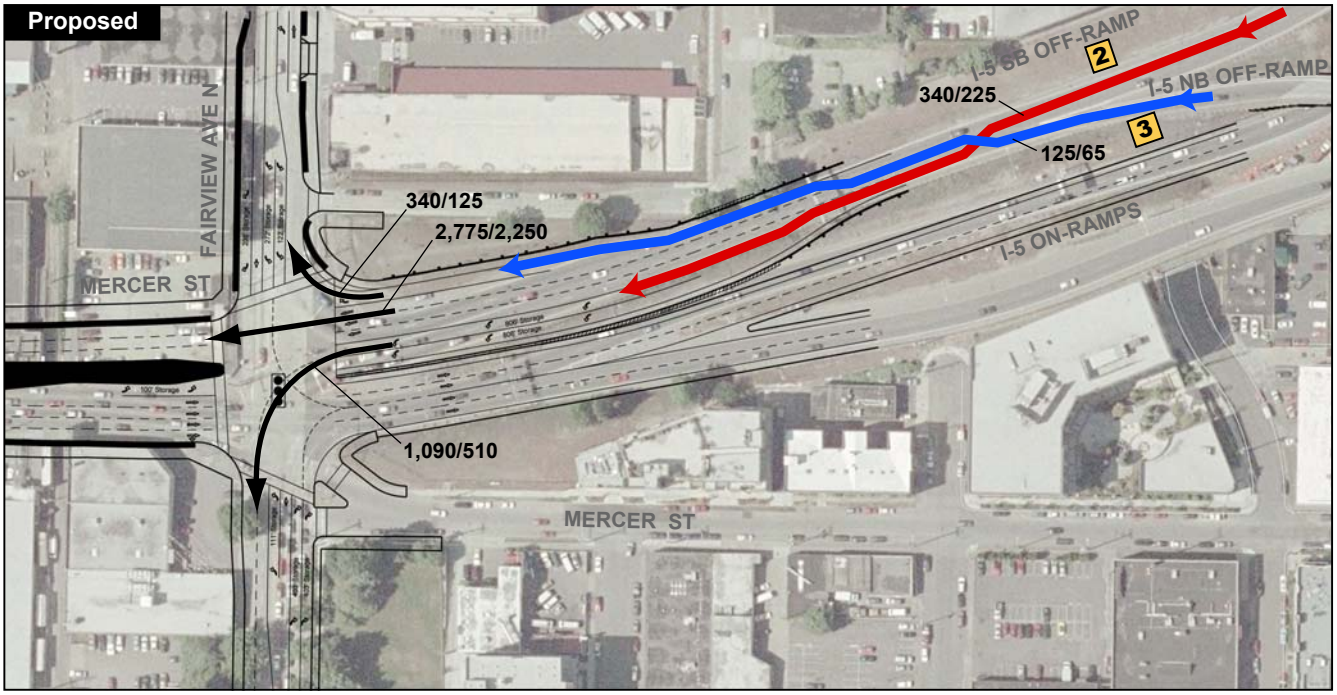
Currently, westbound truck traffic from I-5 is routed along Valley Street. With the Build Alternative Option 1, this truck traffic would be routed on the new two-way Mercer Street. The intersection at Mercer Street and Ninth Avenue North would be designed to have sufficient space and a wider turning radius to accommodate 75-foot-long trucks traveling to and from Ballard and Interbay via Ninth Avenue North and Westlake Avenue North. Westlake Avenue North and Ninth Avenue North between Mercer and Aloha streets would be converted from one-way streets to two-way streets to improve local access. The conversion would tie into the two-way operations south of Mercer Street constructed under separate City of Seattle contracts.

2.2 Build Alternative, Option 2

Similar to Option 1, Build Alternative Option 2 would replace the existing Mercer/Valley couplet with a widened two-way Mercer Street and a narrowed Valley Street (Exhibit 2-7). For Option 2, Mercer Street would be widened to both the north and the south.

314749.AA.P2.10_EA_MercerCorridor_Transportation_T072005002SEA_Ex2-6ab_Existing_Future I-5 Off Ramp Area_13nov06_lw/dk/lw





LEGEND

- 2 — Minimum Number of Lane Changes by Off-Ramp
- Southbound Off-Ramp Vehicle Path for Lane Changing Maneuvers
- Northbound Off-Ramp Vehicle Path for Lane Changing Maneuvers
- **xxx/xxx** — 2030 AM/PM Peak Hour Traffic Volumes

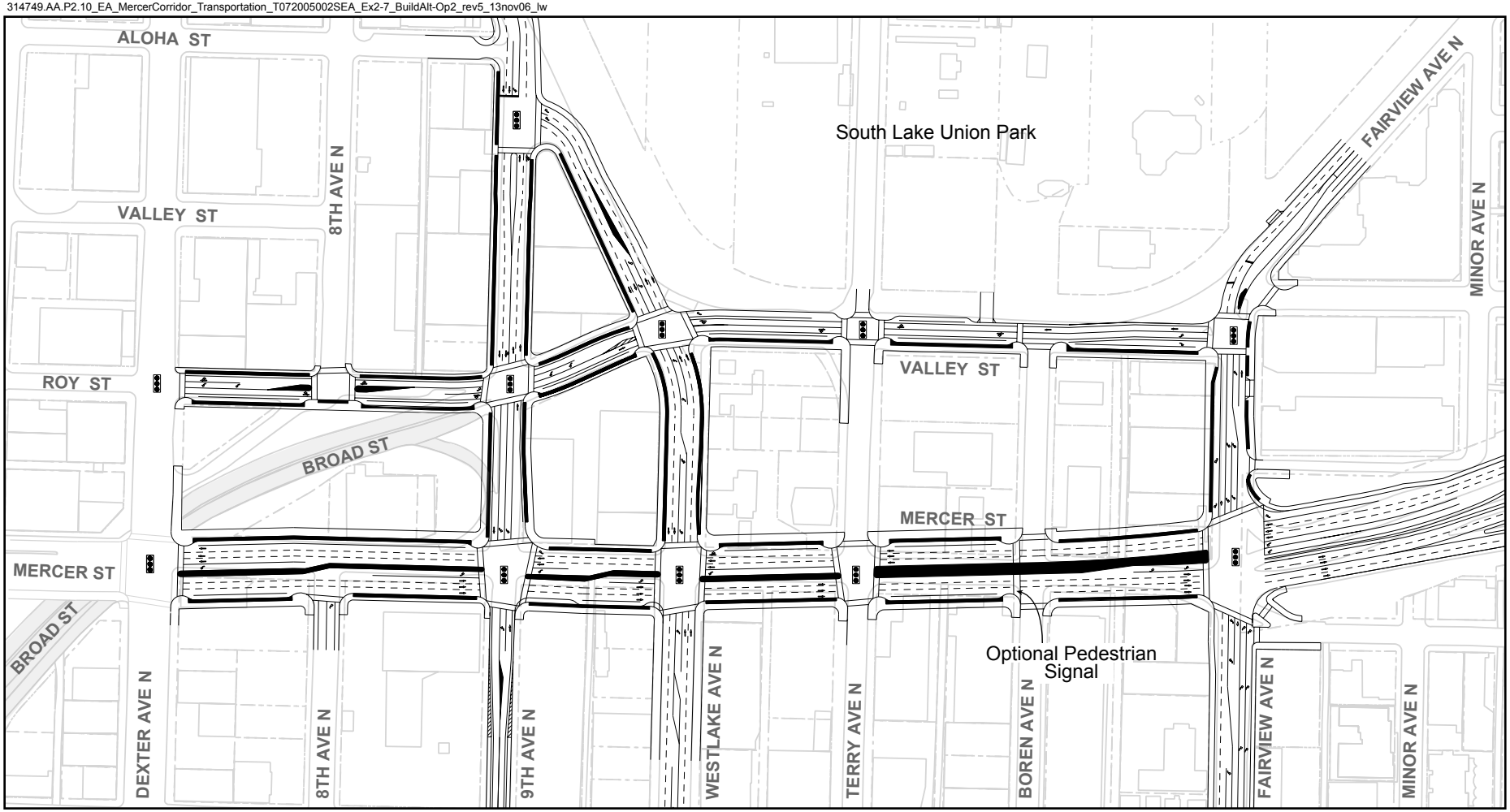
NORTH NTS

Exhibit 2-6

I-5 Off-Ramp Area

MERCER CORRIDOR IMPROVEMENTS PROJECT

314749.AA.P2.10_EA_MercerCorridor_Transportation_T072005002SEA_Ex2-7_BuildAlt-Op2_rev5_13nov06_lw



LEGEND

Broad Street Removed
Alaskan Way Viaduct and Seawall Replacement Project

Planting Strips and Median

Signalized Intersection

NORTH

0 100 200 Feet

Exhibit 2-7

Build Alternative – Option 2

MERCER CORRIDOR IMPROVEMENTS PROJECT

2.2.1 Mercer Street Improvements

The cross-section for the widened two-way Mercer Street would generally be the same as Option 1; however the widening would primarily be shifted to the south. Some widening would occur to the north to tie into the existing I-5 ramps at the eastern end of the corridor.

At some locations between Westlake Avenue North and Eighth Avenue North, sidewalk widths would be reduced from 21 and 16 feet to 12 feet and median widths would be reduced from 10 feet to 8 feet to minimize adverse effects on existing buildings. The reduced cross-section would occur for approximately a 100-foot section. No parking would be provided on the north side of the street between Westlake Avenue North and Ninth Avenue North.

2.2.2 Valley Street Improvements

Proposed improvements to Valley Street would be the same as Option 1.

2.2.3 Other Improvements

The proposed widening of the I-5 ramp termini at Fairview Avenue would be the same as Option 1. Similar to Option 1, Westlake Avenue North (between Mercer Street and Ninth Avenue North) and Ninth Avenue North (between Mercer Street and Westlake Avenue North) would be converted from one-way streets to two-way streets. The conversion would tie into the two-way operations south of Mercer Street constructed under separate City of Seattle contracts. The intersection at Mercer Street and Ninth Avenue North would be designed to have sufficient space and a wider turning radius to accommodate 75-foot-long trucks traveling to and from Fremont, Ballard, and potentially Interbay via Ninth Avenue North and Westlake Avenue North.

2.3 No Action Alternative

The No Action Alternative (also referred to as the No Build Alternative) is included in the environmental analysis as a comparative alternative. This alternative evaluates what would occur if nothing were done to solve the project's identified problem. This alternative serves as the baseline for measuring and comparing the effects of the Build Alternatives.

Under the No Action Alternative, the Mercer –Valley Street Couplet would remain, and no significant roadway, pedestrian, or bicycle improvements to the project area would be made. As development occurs, incremental improvements to the sidewalk quality and continuity would occur but would likely occur in a piecemeal fashion and may not meet the SLU plan objectives for a uniform pedestrian-friendly corridor with wide

sidewalks and buffer. Overall, travel would remain circuitous and confusing. Business access would continue to be limited.

2.4 Other Improvements in the Project Vicinity

Under either of the Build Alternative options or the No Action Alternative, the South Lake Union area would experience travel pattern and/or transportation infrastructure changes due to other projects. The planning horizon for the Mercer Corridor Improvements Project is 2030. Additional transportation projects proposed in the area include:

- South Lake Union Streetcar Project (which includes Westlake Avenue North two-way conversion south of Mercer Street)
- Ninth Avenue North (two-way conversion south of Mercer Street)
- Alaskan Way Viaduct Replacement Project (includes Lowered Aurora)

A number of non-transportation projects will affect travel patterns in the area. Some may include localized changes to the street infrastructure but would not directly affect Mercer Street. Some of the more substantial projects are:

- South Lake Union Park Master Plan
- University of Washington Medical Research Campus
- 2201 Westlake mixed use development
- Interurban Exchange mixed use development

All of these local road and land use improvements are projected to occur under either the Build Alternative or the No Action Alternative. However, under the No Action Alternative, improvements to Valley Street would eventually be needed to improve pedestrian and bicycle access to South Lake Union Park, as called for in the South Lake Union Park Master Plan.

The effects of these projects, together with the proposed Mercer Corridor improvements, are evaluated as cumulative effects in this discipline report.

2.5 Construction of the Build Alternatives

Below is a summary of the preliminary construction staging proposed for the Mercer Corridor Project. For more discussion of the construction effects and proposed mitigation on the transportation system refer to Section 5.1.1.

2.5.1 Option 1

The construction of the Mercer Corridor Improvements Project would occur in three major phases, occurring over approximately a 2.5-year period. Construction of Option 1 would be as follows:

Phase 1

- Construct improvements on the north side of Mercer Street in new right-of-way. Provide three eastbound lanes on the south side of the roadway.
- Construct improvements on the east side of Westlake Avenue North. Provide one southbound, one northbound, and one two-way turn lane.
- Construct improvements on the east side of Ninth Avenue North. Provide one southbound, one northbound, and one two-way turn lane north of Mercer Street, and one southbound and one northbound lane south of Mercer Street.
- Construct improvements on the north side of the I-5 off-ramp. Maintain two right turn lanes and one left turn lane onto Fairview Avenue North and three lanes for on-ramps.

Phase 2

- Construct improvements on the south side of Mercer Street. Divert traffic to the three new lanes on the north side of the roadway.
- Construct improvements on the west side of Westlake Avenue North. Provide one southbound, one northbound, and one two-way turn lane.
- Construct improvements on the west side of Ninth Avenue North. Provide one southbound and one northbound lane.
- Construct improvements on the south side of the I-5 off-ramp. Maintain two right turn lanes and one left turn lane onto Fairview Avenue North. Also construct improvements on the north side of the I-5 on-ramps and maintain three lanes for on-ramps.
- Construct improvements on the east side of Fairview Avenue North. Provide one southbound and two northbound lanes north of Mercer, and one lane in each direction south of Mercer Street.

- Construct Broad Street connection to the Mercer Street/Ninth Street intersection.

Phase 3

- Construct improvements on the Valley/Broad/Roy Corridor. Maintain one lane of traffic in each direction. Shift traffic to new two-way Mercer Street.

2.5.2 Option 2

Option 2 would require an additional 6 to 12 months of construction. The buildings on the south side of Mercer Street affected by this option would require additional time for demolition and asbestos mitigation. Because Mercer Street would be widened to both the north and the south, construction required for this option is less efficient, and would occur as follows:

- Construct improvements on the north side of Mercer Street in new right-of-way; route traffic as far as possible to the south side.
- Construct improvements on the south side of Mercer Street in new right-of-way; route traffic as far as possible to the north side.
- Divert traffic to new lanes on the north and south sides, construct improvements on existing Mercer Street.

Construction of the other street improvements would be the same as for Option 1.

3. Methodology

Three scenarios were analyzed in detail: existing, future no action, and build conditions. In addition to current conditions, analyses were performed for 2 forecast years to illustrate the short- and long-term effects of the project on the transportation system. All scenarios included analysis of both the AM and PM peak hours of traffic.

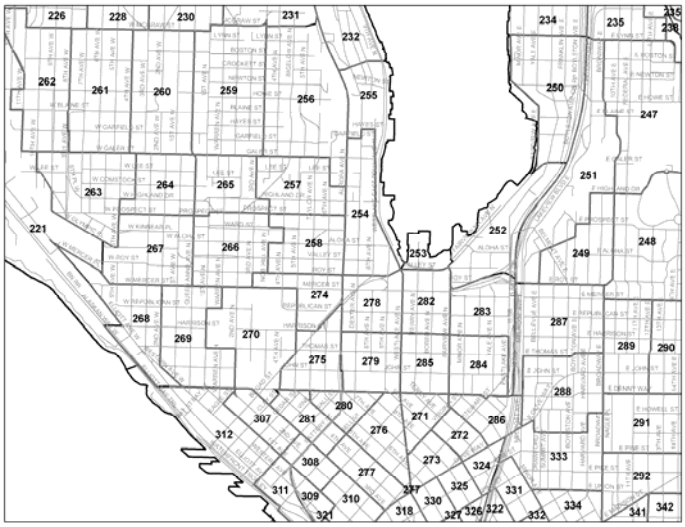
Existing conditions. A snapshot of current 2005 traffic operations was taken to provide a point of reference to compare with the future scenarios.

No Action condition. No Action Alternative traffic operations were analyzed for both the proposed year of opening (2010) and a future design horizon year (2030). The No Action condition includes all planned infrastructure and land developments within the area. Background projects included as part of this condition are described in detail in Section 5.2.

Build condition: The Build condition (Build Alternative) is also analyzed for both the year of opening and forecast conditions. As stated in Section 1, for traffic forecasting and operational analysis there are no distinguishable traffic operational differences between the two Build Alternative options, and therefore only one Build alternative was analyzed for this discipline report. The Build condition includes the background projects included as part of the No Action Alternative and incorporates the Mercer Street Improvements Project, including redistribution of traffic within the study area due to the two-way traffic on Mercer Street.

3.1 Forecast Methodology

The forecasting for this study was based on the most recent version (January 2005) of the City of Seattle (COS) travel demand model, which was developed to be consistent with the most current Puget Sound Regional Council (PSRC) travel demand model. The Seattle model provided forecasts for years 2010 and 2030. The model projects person trips, mode share (auto, transit, walk, and bike), and traffic volumes on arterial streets and highways/freeways for a four-county region, with a more detailed network within the Seattle city limits.



City of Seattle: South Lake Union TAZ Structure

Projections of population and employment are consistent with regional projections by PSRC, and are shown in Exhibit 3-1. The South Lake Union area is expected to have

the highest growth rate in the city of Seattle in terms of both population and employment. By 2030 SLU is expected to experience a population growth of 20,000 people and close to 10,000 new jobs.

Exhibit 3-1. Forecast Assumptions

	City of Seattle				South Lake Union Area			
Year	Population	Growth	Employment	Growth	Population	Growth	Employment	Growth
2000	563,374	-	535,840	-	1,858	-	22,952	-
2010	584,432	3.7%	603,025	12.5%	7,172	286%	34,404	50%
2030	683,923	21.4%	706,552	31.9%	27,688	1390%	44,280	93%

Source: Draft Report Seattle Travel Model Forecasts, 2030 Future Baseline, Cambridge Systematics, Inc.

The forecasting model also includes special generators that are coded to reflect the unique trip volumes and patterns of specified businesses. Within and near the study area there are four special generators: Seattle Center, Pacific Place Shopping Mall, City Center, and the Port of Seattle.

3.2 Analysis Software and Output

Due to the complexity of the transportation system within the study area, various software packages were used to capture the full traffic-related impacts.

3.2.1 Traffic Operations

Synchro (Version 6) software, which implements *Highway Capacity Manual* methods, was used to analyze all of the study intersection operations. The Synchro analysis quantifies traffic operations in terms of level of service (LOS), intersection delays, and vehicle queuing. These three measures provided key measures of effectiveness (MOEs) for the project. Traffic operations analysis was performed for 30 intersections within the Mercer Corridor study area. Exhibit 3-2 identifies these intersections and categorizes them by traffic control.

Signalized Intersection LOS

LOS	Delay (sec./veh.)
A	0 to ≤ 10
B	> 10 to ≤ 20
C	> 20 to ≤ 35
D	> 35 to ≤ 50
E	> 50 to ≤ 80
F	> 80

The traffic analysis in the Synchro software included the effects of the streetcar project. The South Lake Union streetcar is expected to operate in the Westlake and Terry avenue travel lanes with other vehicles and receive no signal priority. As the streetcar is planned to operate north of Valley Street, an additional signal phase is required at the Westlake and Fairview avenue intersections to accommodate the streetcar through the intersections. See Chapter 5 for the streetcar route.

Corsim software was used to develop MOEs for Interstate 5 and the interface between the freeway and local roadway system. A Corsim

simulation model was developed to simulate the I-5 freeway ramps and Mercer Street and Fairview Avenue ramp termini intersection. This analysis was used to gauge any impacts to the I-5 ramps and I-5 mainline in the vicinity of the Mercer Street interchange.

Exhibit 3-2. Study Intersections and Current Traffic Controls

Signalized Intersections[1]	Unsignalized Intersections[1]
Mercer Street & Fairview Ave	Mercer Street & Boren Ave
Mercer Street & Ninth Ave	Signalized Mercer Street & Terry Ave[1]
Mercer Street & Westlake Ave	Valley Street & Boren Ave
Mercer Street & Dexter Ave	Signalized Valley Street & Terry Ave[1]
Mercer Street & Fifth Ave	Roy Street & Taylor Ave
Valley Street & Fairview Ave	Republican Street & Boren Ave
Valley Street & Westlake Ave	Republican Street & Terry Ave
Broad Street & Fifth Ave	Republican Street & Dexter Ave
Broad Street & Ninth Ave	Harrison Street & Boren Ave
Roy Street & Dexter Ave	Harrison Street & Terry Ave
Roy Street & Fifth Ave	
Republican Street & Fairview Ave	
Ninth / Aloha / Westlake	
Republican Street & Ninth Ave	
Republican Street & Westlake Ave	
Harrison Street & Fairview Ave	
Harrison Street & Fifth Ave	
Harrison Street & Ninth Ave	
Harrison Street & Westlake Ave	
Harrison Street & Dexter Ave	

[1] The traffic control is based on the existing conditions. Future conditions include installing traffic signals at some of the unsignalized locations planned as part of other area projects, such as the SLU Streetcar.

Unsignalized Intersection LOS

LOS	Delay (sec./veh.)
A	0 to ≤ 10
B	> 10 to ≤ 15
C	> 15 to ≤ 25
D	> 25 to ≤ 35
E	> 35 to ≤ 50
F	> 50

Note: two-way stop-controlled (TWSC) reports delay only for the minor–street stop-controlled approaches.

3.2.2 Travel Times

Travel time is one of the most intuitive MOEs. This MOE was identified by stakeholders as a key measure to the project's success. Ten representative paths were chosen to quantify east-west and north-south travel time differences through the study area. Travel time runs were driven to validate the calculated existing travel times for the paths listed in Exhibit 3-3. Exhibit 3-4 identifies each of the current travel time paths, including the starting and ending location for the paths.

Travel Time

Travel time = roadway length/ travel speed + movement delay at intersection (and/or freeway/ramp)

For the purposes of these analyses, travel time in the westbound direction included the I-5 off-ramps to capture any I-5 mainline impacts and delays associated with the ramp weaving and ramp terminal intersection

operations. For the eastbound travel times, the I-5 on-ramps were not included in the analyses because the Mercer Corridor Project does not alter the operations of vehicle access to I-5 from the ramps. Mercer Street at the Fairview Avenue North intersection was the selected eastbound terminus for the travel time calculations as there are no traffic control devices east of this intersection.

Exhibit 3-3. Travel Time Paths

East-West Paths	From	To
1 - WB - I-5 to (north) Seattle Center[1]	I-5 Off-Ramp at Mercer	Roy Street/Fourth Avenue
2 - EB – (north) Seattle Center to I-5	Fourth Avenue/Mercer Street	I-5 On-Ramp at Mercer
3 - WB - I-5 to (south) Seattle Center[1]	I-5 Off-Ramp at Mercer	Fifth Avenue/Broad Street
4 - EB – (south) Seattle Center to I-5	Fifth Avenue/Broad Street	I-5 On-Ramp at Mercer
5 - WB - I-5 to Westlake[1]	I-5 Off-Ramp at Mercer	Ninth Avenue/Westlake Avenue
6 - EB - Westlake to I-5	Ninth Avenue/Westlake Avenue	I-5 On-Ramp at Mercer
North-South Paths	**From**	**To**
7 - NB - Westlake Avenue[2]	Denny Way	Valley Street
8 - SB – Westlake Avenue[2]	Valley Street	Denny Way
9 - NB – Ninth Avenue[2]	Denny Way	Valley Street
10 - SB - Ninth Avenue[2]	Valley Street	Denny Way

[1] Travel times from I-5 are a vehicle weighted average between the northbound and southbound off-ramps.
[2] Westlake Avenue and Ninth Avenue are proposed to be converted to two-way operations in the future (by other projects). Existing travel times only reflect northbound travel on Westlake Avenue and southbound travel on Ninth Avenue.

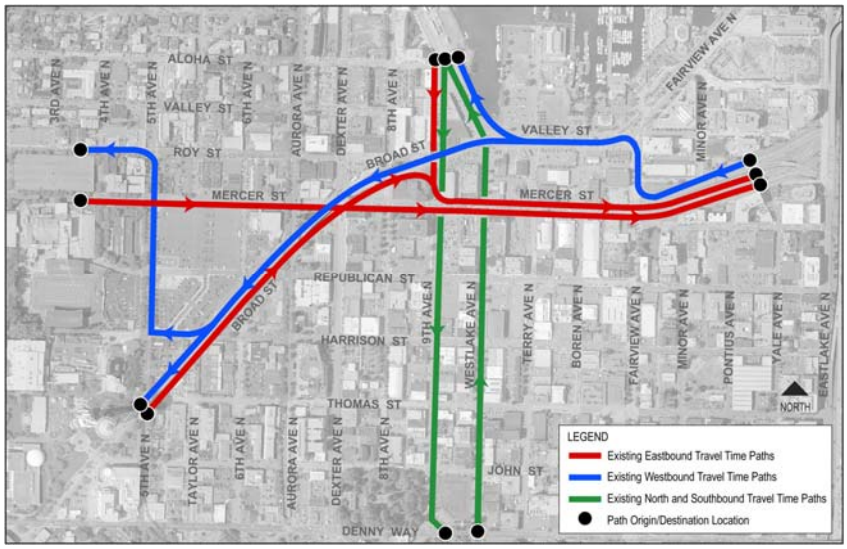


Exhibit 3-4. Travel Time Run Limits

Year 2010 and 2030 travel times were derived from speed and delay output from the Synchro and Corsim analyses. The Synchro model provided the local street and intersection data, which was incorporated with the Corsim freeway and ramp travel times, when applicable.

3.2.3 Screenline Volume Analysis

Another MOE used to review overall traffic growth and travel patterns is a screenline volume analysis. A screenline is an imaginary boundary through which all of the entering/exiting vehicles are collectively viewed. Screenlines are generally along a specific geographic feature or roadway corridor. For this analysis, one screenline was placed on each side of the Mercer Corridor study area (see Exhibit 3-5).

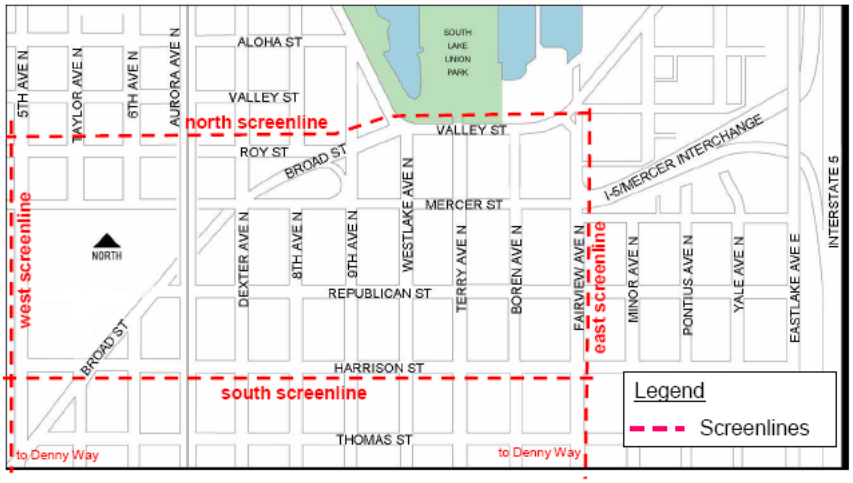


Exhibit 3-5. Screenline Boundaries

The screenline volumes are created by compiling the individual intersection volumes on key arterials for each analysis scenario. The east screenline includes the volumes on Valley Street, Mercer Street, the Mercer/I-5 interchange, Republican Street, Harrison Street, and Denny Way. The west screenline is comprised of traffic on Roy, Mercer, Harrison, Broad, and Denny Way. The north screenline includes Fairview, Terry, Westlake, Ninth, Fifth, Taylor, and Dexter avenues. The south screenline includes Fairview, Terry, Boren, Westlake, Ninth, Dexter, and Fifth avenues.

4. Affected Environment

The study area roadway system is a network serving both regional and local traffic north of the Seattle central business district. Aurora Avenue North (SR 99), however, serves as a barrier to continuous east-west traffic. Within the study area, Mercer Street and Broad Street provide the only access across Aurora Avenue, via underpass structures. In addition, many study area roads currently serve one-way travel. These characteristics hinder the ability of the study area roadway network to operate as an effective grid network.

The major access route to and from the regional transportation facilities occurs along Mercer Street and Fairview Avenue/Valley Street and additionally Ninth and Westlake avenues. These corridors support traffic to and from I-5 and major destinations including; downtown Seattle, South Lake Union, Seattle Center, Queen Anne, Fremont, and Interbay. Based on Seattle's arterial classifications, all of these roads are considered Principal Arterials. Refer to Exhibit 4-1 for the arterial classification map.

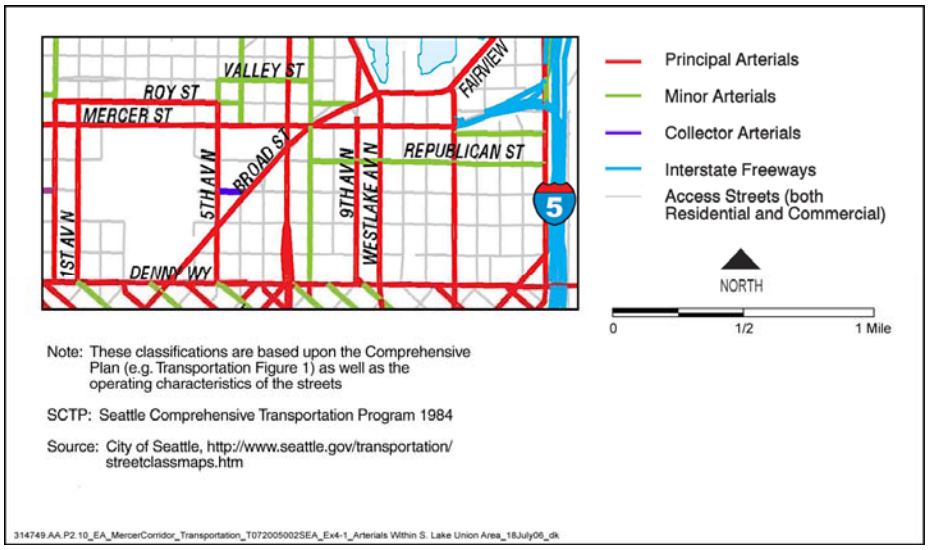


Exhibit 4-1. City of Seattle Arterials within the South Lake Union Area

4.1 Motor Vehicle Traffic

Morning and afternoon peak-hour traffic volumes were collected throughout the Mercer Corridor area. The data show that the majority of east- and westbound traffic is confined to the Mercer Street and Valley Street corridors. North and southbound travel is divided along a number of routes including Fairview Avenue North, Dexter Avenue North, Fifth Avenue North, and the one-way couplet of Ninth Avenue North and Westlake Avenue North.

The 2005 traffic volumes for the Mercer Street/I-5 interchange provide a portrait of travel demand. Traffic volumes from the I-5 off-ramp are 30 percent higher in the morning peak than the evening peak (3,230 vehicles during the morning peak hour and 2,265 during the afternoon peak). The I-5 on-ramp volumes are 55 percent higher in the PM peak (1,860 during the AM peak and 4,050 during the PM peak). The ramp volumes indicate directional traffic flow varying by time of day. The morning peak serves

an inbound demand, flowing through the study area towards the west and south. The afternoon peak serves an outbound travel demand with heavier traffic in the east and northbound directions.

Combining Valley and Mercer Street traffic volumes west of Fairview Avenue, the morning peak becomes more directionally balanced, while in the afternoon peak the heavy eastbound volume is still evident (Exhibit 4-2). Considering both Valley and Mercer streets, over 6,000 vehicles traverse these corridors in the afternoon peak hour. In the morning peak, slightly over 5,000 vehicles travel on Valley and Mercer streets combined.

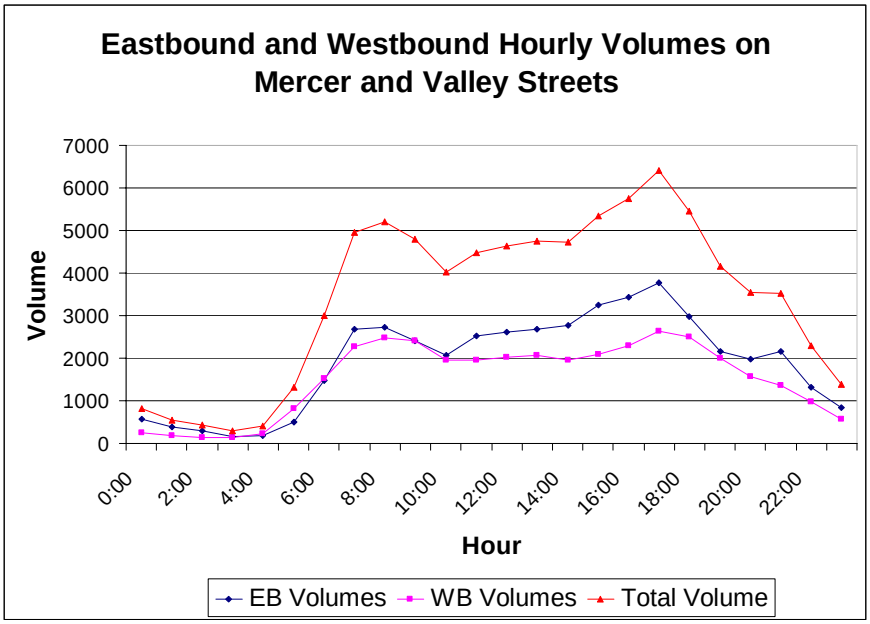


Exhibit 4-2. Existing Hourly Volumes on Mercer and Valley Streets

4.2 Traffic Operations

Traffic operation analyses at the study intersections were performed using the existing AM and PM peak hour traffic volumes, traffic controls, and roadway characteristics. Operations are quantified in terms of level of service. Exhibit 4-3 shows the LOS at the study intersections within the Mercer Corridor (see also Exhibit TR-B-1 in Appendix TR-B for detailed intersection information on the intersection channelization and control, AM and PM peak hour volumes, LOS and intersection delay). The majority of the study area operates at LOS D or better conditions. Two intersections along Fairview Avenue North operate at LOS E/F during both peak hours: Mercer Street and Valley Street. Three additional intersections operate at LOS E/F during the afternoon peak: Fifth Avenue North/Roy Street, Dexter Avenue North/Republican Street, and Valley Street/Terry Avenue North. Lastly, the Fifth Avenue and Broad Street intersection operates at LOS E in the morning peak.

Terry Avenue/Valley Street and Republican Street/Dexter Avenue North are both two-way stop-controlled intersections. The volume of traffic along the free-flowing corridor provides insufficient gaps for the stop-controlled vehicles' access, thus causing long delays and poor LOS for the stop-controlled approaches. The intersections of Fairview Avenue North/Valley Street and Mercer Street/I-5 interchange have significant volumes during the peak traffic hours associated with I-5 access. In addition, the current one-way traffic on Mercer Street requires numerous low-capacity turning movements at both of these intersections. The combination of these conditions creates high levels of delay. The Fifth Avenue North and Roy Street intersection operates poorly during the PM peak primarily as a result of its signal timing interaction with the Mercer Street's signal coordination plan and the high volume of northbound vehicles turning left onto Roy Street due to Mercer and Roy streets one-way couplet.

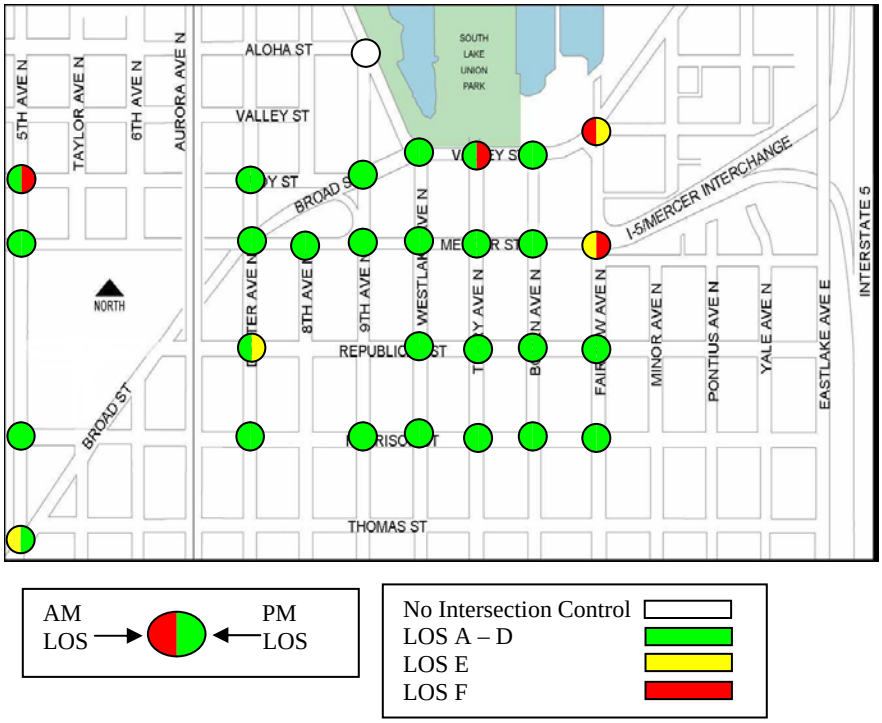


Exhibit 4-3. Existing Intersection Operations

Exhibit 4-4 presents existing travel times through the study area. This includes the ten travel time routes described in the methodology section. Calculated travel times were verified in the field to calibrate the analysis software to reflect accurate operating conditions. Between I-5 and the Seattle Center (paths 1 and 3), the westbound travel time is approximately 7 to 11 minutes. In the eastbound direction (paths 2 and 4), the travel time is approximately 2 to 7 minutes.

Exhibit 4-4. 2005 Existing Travel Times

East-West Paths	AM Peak Hour Existing (min.)	PM Peak Hour Existing (min.)
1 - WB - I-5 to (north) Seattle Center[1]	8.9	11.5
2 - EB – (north) Seattle Center to I-5	2.9	3.9
3 - WB - I-5 to (south) Seattle Center[1]	8.6	7.1
4 - EB – (south) Seattle Center to I-5	3.7	7.6
5 - WB - I-5 to Westlake[a]	6.4	5.7
6 - EB - Westlake to I-5	2.6	5.3
7 - NB - Westlake Avenue	3.2	4.3
8 - SB – Westlake Avenue[b]	N/A	N/A
9 - NB – Ninth Avenue[b]	N/A	N/A
10 - SB - Ninth Avenue	3.5	4.9

Note: Travel times are averaged based on the composition of vehicle for each road segment.
[a] Travel times from I-5 are a vehicle weighted average between the northbound and southbound off-ramps.
[b] Existing travel times reflect northbound travel on Westlake Avenue and southbound travel on Ninth Avenue.

The freeway and ramp modeling used for the westbound travel time calculations showed that vehicle queuing occurs on both the north- and southbound off-ramps, but does not reach the I-5 mainline during typical AM and PM peak hour conditions (during non-event conditions at the Seattle Center).

4.3 Pedestrian Facilities

Sidewalks and signalized crosswalks are present in most portions of the study area. Two corridors have segments of missing sidewalks: Terry Avenue North and Valley Street. Terry Avenue North, between Mercer Street and Valley Street, has no sidewalks and a short portion of Terry Avenue south of Mercer Street does not have a sidewalk on the west side of the roadway. Valley Street, between Terry Avenue North and Westlake Avenue North, also does not have a sidewalk on the south side of the roadway.

Photo 4. Examples of Poor Sidewalk Conditions in the Area

Poor pedestrian conditions are defined as being non-compliant with the Americans with Disabilities Act (ADA), having rough surfaces or narrow sidewalk widths. Field observations were made to estimate the percentage of sidewalks characterized by one or more of the defined "poor" conditions. Exhibit 4-5 depicts the pedestrian facility locations and conditions. Although most blocks have sidewalks, the conditions are generally poor because of narrow sidewalk widths, no buffer, and cracked, uneven, and/or uprooted pavement. Ramps to accommodate wheelchairs are not provided at many intersections. Exhibit 4-5 also shows that signalized crosswalk locations within the study area are limited. Within the area, most crosswalk locations have faded striping and uneven surfaces caused by vehicle tracks.

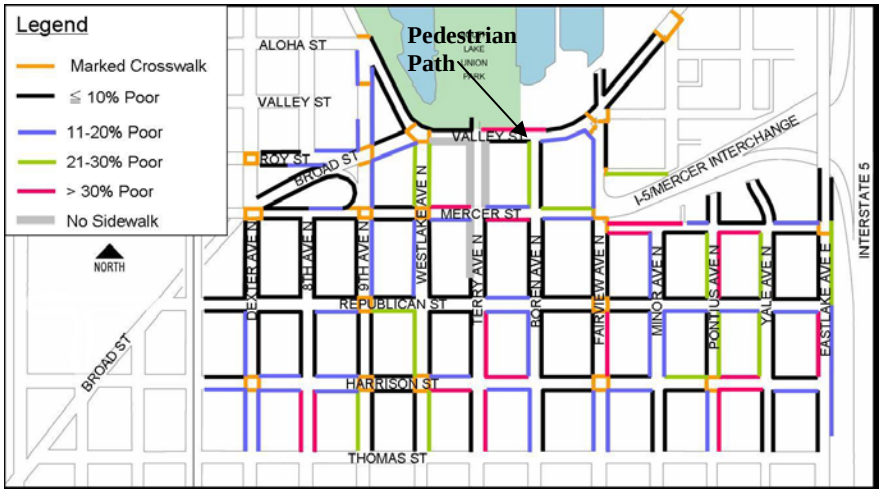


Exhibit 4-5. Existing Pedestrian Facilities

Exhibit 4-6. Path Conditions adjacent to Valley Street

Exhibit 4-7. Multi-Use Trail around Lake Union

A pedestrian path is also located around the south side of Lake Union from approximately Galer Street on the east to Halladay Street on the west (just east of the Aurora Bridge). Through the study area, the path is situated north of Valley Street (Exhibit 4-6), separated from traffic by a narrow shoulder and traffic curb. In the SLU area, the pavement conditions are poor, with cracks, patches, and uneven pavement that allow puddles to form (Exhibit 4-7). The eastern and western portions are in good condition.

4.4 Bicycle Facilities

As shown in Exhibit 4-8, only one roadway corridor includes bicycle facilities within the study area. Dexter Avenue North provides the only exclusive bicycle lanes. The limits of the lanes are from the Fremont Bridge to Denny Way.

The pedestrian path around the south side of Lake Union also allows bicycle use. The eastern limit of the multi-use path is located at Galer Street. The western limit of the path is located just east of the Aurora Bridge.

The South Lake Union Transportation Study identified the need for additional bicycle connectivity in the area.

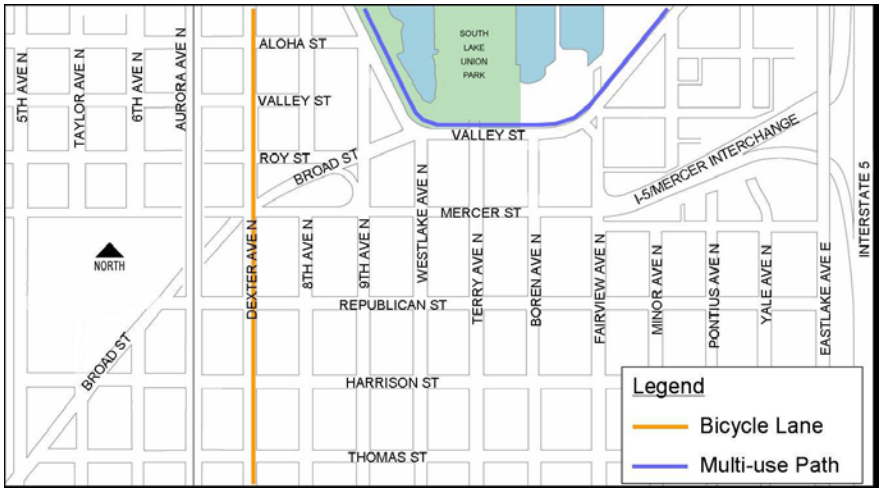


Exhibit 4-8. Existing Bicycle Routes

4.5 Public Transit

Transit is provided on each of the north/south arterial streets in the study area. King County Metro Transit buses service the Fairview Avenue North, Westlake Avenue North/Ninth Avenue North, Dexter Avenue North, Fifth Avenue North, and Aurora Avenue North corridors (Exhibit 4-9). Coverage in the east/west direction is sparse. Metro Route 74 provides the only local east-west service to the study area; it travels on Westlake Avenue North, and circulates to Mercer Street via Broad Street, Denny Way, and First Avenue. No east-west service is provided east of Westlake Avenue North. The current roadway constraints, including one-way streets and non-contiguous corridors, hinder provision of east-west service.

Exhibit 4-9. Existing Transit Routes

4.6 Truck Facilities

The study area serves commercial traffic to and from I-5 and major destinations including South Lake Union, Interbay, Ballard, Fremont, and downtown Seattle. The major truck routes to these areas use the Valley Street and Mercer Street couplet to and from Westlake Avenue North and Broad Street. While trucks are allowed on all arterial streets, primary truck routes are designated as Major Truck Streets, per the Seattle Comprehensive Plan. Aurora Avenue North, a City-classified Major Truck Street, also serves as a major regional truck route that traverses the study area limits. Exhibit 4-10 depicts the existing Major Truck Streets through the study area as designated in the Seattle Comprehensive Plan. Additionally, Mercer Street is identified in the 2005 City of Seattle Freight Plan as a Seaport Highway Connector between SR 99 and I-5.

Ninth Avenue North and Westlake Avenue North south of Mercer Street are also key routes for large truck access to the Denny Triangle and Convention Center areas. Although they are not classified as Major Truck Streets, they are arterial streets, and all arterial streets are designated truck streets.

Trucks carrying over-legal loads (with a permit) also use Mercer, Valley, and Broad streets and Westlake Avenue in this area. A 20-foot by 20-foot design envelope is required to accommodate such loads. In addition, Mercer Street is an alternative route for trucks with hazardous material that are restricted from the Battery Street Tunnel (SR 99).

The Washington State Department of Transportation (WSDOT) compiles the Washington State Freight and Goods Transportation System (FGTS). This system is used to classify state highways, county roads, and city streets according to the average annual gross truck tonnage they handle. The FGTS classifies roadways using five freight tonnage classifications, T-1 through T-5. Within the study area, SR 99, I-5, and Valley Street between Westlake and Fairview avenues are classified as T-1 streets. Westlake Avenue and Fairview Avenue between Valley Street and Yale Avenue North are classified as T-2 streets.

The maneuvers required for the westbound tractor-trailer trucks originating from the I-5 corridor are undesirable. The vehicles on the northbound I-5 off-ramp are required to weave through the southbound off-ramp vehicles to perform the right turn movement onto Fairview Avenue North. The trucks must then access the appropriate left-turn lane to position themselves correctly on Valley Street. Field observations have shown that many of the tractor-trailer trucks do not complete these turn maneuvers within their own lane. Encroachments into one or more of the adjacent lanes occur, creating safety and delay issues.

Washington State Freight and Goods Transportation System Roadway Classification

- T-1 roads: more than 10 million tons per year
- T-2 roads: 4 to 10 million tones per year
- T-3 roads: 300,000 to 4 million tons per year
- T-4 roads: 100,000 to 300,000 tones per year
- T-5 roads: at least 20,000 tons in 60 days.

Source: Freight and Goods Transportation System (FGTS) 2005 Update, WSDOT, December 2005

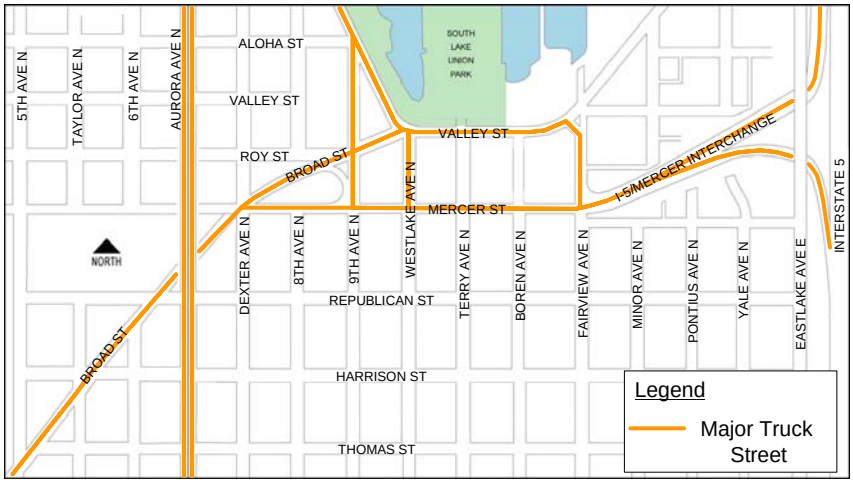


Exhibit 4-10. Existing Major Truck Streets (SDOT, April 2004)

A 16-hour truck count was performed for this project. During the count, over 200 tractor-trailer trucks used the Mercer Street off-ramp. In the opposite direction, more than 250 tractor-trailer trucks traveled onto I-5 on the Mercer on-ramp. On the local street system, approximately 50 tractor-trailer trucks headed north to Interbay on Westlake Avenue, and about 100 tractor-trailer trucks used Broad Street in the westbound direction. Heading eastbound on Mercer Street, there were slightly less than 160 tractor-trailer trucks at Ninth Avenue North.

4.7 Safety

The Seattle Department of Transportation (SDOT) provided records for accidents occurring within the Mercer Corridor study area between January 1, 2001, and December 31, 2003. WSDOT provided accident data for the freeway system (I-5 mainline and ramps to the Mercer Street interchange) for the same time frame. Current accident data are presented in Appendix TR-A. Exhibit TR-A-1 shows a 3-year accident history for the arterial streets in the study area, while Exhibit TR-A-2 shows a 3-year accident history for the freeway system.

A high accident location (HAL) is a section of state highway less than a mile long that has experienced a higher than average rate of severe accidents during the previous 2-year period.

A high accident corridor (HAC) is a section of state highway one or more miles long that has a higher than average number of severe accidents over a continuous period of time.

SDOT defines a high accident intersection as having 10 or more accidents per year if the intersection is signalized, and 5 or more if unsignalized. Exhibit 4-11 presents the list of seven high accident intersections within the Mercer Corridor study area over the 3-year period. The predominant accident type for all of the intersections listed in Exhibit 4-11 is angle accidents. These seven intersections are also identified in the South Lake Union Transportation Study as being high accident intersections, based on 2002 data only. Out of these seven intersections, four intersections had accidents that involved pedestrians and/or bicyclists. At Mercer Street and Westlake Avenue and Mercer Street and Terry Avenue intersections, a pedestrian and/or bicyclist was involved in two accidents. Two other intersections identified in the South Lake Union Transportation Study (Mercer Street/Fifth Avenue North and Harrison Street/Aurora Avenue

North) would not be considered high accident intersections when 3 years of data are averaged.

Exhibit 4-11. Mercer Corridor Study Area High Accident Intersections (Jan. 2001 to Dec. 2003)

Location	Traffic Control	Avg. Number of Accidents per Year
Mercer Street/Fairview Avenue (I-5 Ramp Terminal)	Signalized	17.0[a]
Valley Street/ Terry Avenue North	Unsignalized	7.0
Valley Street/ Boren Avenue North	Unsignalized	7.0
Mercer Street/ Westlake Avenue North	Signalized	11.7
Mercer Street/ Terry Avenue North	Unsignalized	8.7
Republican Street/ Ninth Avenue North	Unsignalized	5.7
Republican Street/ Westlake Avenue North	Unsignalized	5.0

[a] Accident records for both COS and WSDOT were reviewed at this intersection to ensure completeness.

Street segments between intersections within the Mercer Corridor study area were also analyzed to identify any segments with five or more accidents per year. Exhibit 4-12 presents a list of those street segments, with the predominant accident type for each location. Four of the six street segments identified in the study area are on Valley Street and Mercer Street. Additionally, three of these street segments had an accident that involved a pedestrian and/or bicyclist. The segments listed in Exhibit 4-12 on Valley Street, Mercer Street, and Broad Street experience heavy congestion and numerous lane changing, which explains the predominance of rear-end and side-swipe accidents.

Within the last three years, at least one accident involving a motorized vehicle and a pedestrian or bicyclist was reported at most study intersections. Along Mercer Street, pedestrian or bicyclist accidents occurred at Dexter, Westlake, Terry, Boren, and Fairview Avenue intersections. Along Valley Street, pedestrian or bicyclist accidents occurred at Westlake Avenue and Broad Street intersections. Within mid-blocks segments, pedestrian or bicycle accidents occurred along Mercer Street between Terry and Boren and Boren and Fairview avenues and along Fairview Avenue between Mercer Street and Valley Street. Accidents involving pedestrians and bicyclists could be attributed to few protected pedestrian crossing opportunities, narrow or missing sidewalks, narrow lanes, lack of delineated bicycle facilities, and high-volume vehicle turning conflicts. There were six freeway-related locations identified by WSDOT as being high accident locations (HALs) in the

study area. No high accident corridors (HACs) were identified. Three of those locations are I-5 ramps within the Mercer Street interchange (northbound off-ramp, southbound on-ramp, and southbound off-ramp), and one location is on the I-5 southbound mainline between mile posts 164.90 and 167.52 (Lakeview on-ramp to just north of the South Jackson Street undercrossing).

Exhibit 4-12. Mercer Corridor Study Area Street Segments with Five or More Accidents (Jan. 2001 To Dec. 2003)

Primary Street	Between	Avg. # Accidents/Year	Predominant Type
Westlake Avenue North	Ninth Avenue North & Valley Street	5.3	Side-Swipe
Valley Street	Westlake Avenue North & Terry Avenue North	8.7	Rear-End; Side-Swipe
Mercer Street	Fifth Avenue North & Taylor Avenue North	7.3	Side-Swipe
Mercer Street	Westlake Avenue North & Terry Avenue North	6.7	Side-Swipe; Rear-End
Mercer Street	Boren Avenue North & Fairview Avenue North	10.0	Rear-End; Side-Swipe
Broad Street	Fourth Avenue North & Fifth Avenue North	5.0	Rear-End

In addition to these locations, the I-5 ramp terminal intersection with Mercer Street/Fairview Avenue North experienced a high number of accidents during the 3-year period. The predominant accident type at this intersection was rear-end collisions, followed by angle and side-swipe collisions. These accidents are typical of highly congested areas with large volumes of weaving and merging movements.

The I-5 northbound off-ramp at Mercer Street experienced predominantly rear-end accidents, due to the heavy congestion on the ramp. One fatality accident occurred on this ramp during the 3-year study period. A pedestrian was struck and killed by a vehicle near the entrance to the off-ramp tunnel at night. This location qualifies as a HAL for 2006 based on the previous accident history for 2003 and 2004. The I-5 southbound off-ramp at Mercer Street experienced a high number of rear-end accidents.

The I-5 southbound on-ramp at Mercer Street experienced predominantly fixed object accidents involving vehicles losing control inside the tunnel and striking the tunnel wall/barriers. The majority of those types of accidents occurred at night time. One fatality accident occurred on this ramp during the 3-year study period. A vehicle traveling through the tunnel at nighttime lost control and struck the face of the barrier near the tunnel exit. The I-5 northbound on-ramp experienced a mixture of rear-

end, angle, sideswipe, and fixed-object accident types. The majority of these accidents occurred during the morning hours when the express lanes are closed.

The accident history on the I-5 mainline segments approaching the Mercer Street interchange was analyzed to determine how many collisions were related to vehicles queuing back to the mainline from the ramp terminal intersection at Mercer Street/Fairview Avenue North. The southbound approach to the Mercer Street off-ramp was the only influence area that exhibited a higher percentage of accidents in the lane leading to the interchange. Approximately 32 percent of accidents occurred in the exiting lane, while the remaining 4 mainline lanes experienced nearly 68 percent of accidents. The northbound approach to the interchange as well as the influence area of the on-ramps did not exhibit a disproportionate number of accidents between lanes.

Two fatality accidents occurred on the I-5 mainline during the analysis period. In the southbound direction the accident occurred between the Olive Way off-ramp and the Mercer Street off-ramp. In the northbound direction, the accident occurred between the Mercer Street on-ramp and the Yale Street on-ramp.

4.8 On-Street Parking

Existing on-street parking was inventoried as part of the South Lake Union On-Street Parking Plan, November 2005. The majority of the on-street parking within the study area is unrestricted. One-hour and two-hour time-restricted parking and loading zones are also present. Exhibit 4-13 depicts the on-street parking supply.

Exhibit 4-13. On-Street Parking

The Mercer and Valley Street corridors generally have no on-street parking. Within the proposed project limits there are only two segments that allow unrestricted parking: the north side of Mercer Street, between Terry Avenue North and Boren Avenue North, and the north side of Valley Street between Boren Avenue North and Fairview Avenue North.

The South Lake Union On-Street Parking Plan identified peak on-street parking occupancy during the midday. Approximately 75 percent of the stalls are utilized.

5. Environmental Consequences

5.1 Build Alternative

This section discusses the effects, both positive and negative, of construction and operation of the Build Alternative and the No Action Alternative on transportation elements in the study area. The Build Alternative options are described in Section 2. As stated earlier, only one general Build Alternative is analyzed in this report because the transportation impacts of the two options are identical. Impacts during construction, however, are outlined for both alternatives, as the construction phasing along Mercer Street differs between the options.

Exhibit 5-1 summarizes the background projects directly affecting the project area. These descriptions aid in understanding the area-wide improvements occurring concurrent with the Build Alternative.

Exhibit 5-1. Background Transportation Improvements

2010	2030	Project	Improvement
X	X	South Lake Union Streetcar	Provides streetcar operations between Westlake Center and Fairview/Yale Avenues with one-way streetcar operations along Westlake Avenue (SB) and Terry Avenue (NB) between Thomas and Valley streets. Terry Avenue will operate as a one-way northbound street between Thomas and Mercer streets. Westlake Avenue will be converted to two-way operation between Ninth Avenue (south of Denny Way) and Valley Street. Traffic signals will be constructed at Valley/Terry and Mercer/Terry intersections.
X	X	Ninth Avenue North Two-Way Conversion	Convert Ninth Avenue North to two-way operations south of Mercer Street.
	X	Alaskan Way Viaduct Replacement Project	Construct a highway tunnel along central waterfront with modified access to downtown from the south. Lowered Aurora, preferred solution,[a] includes grade separated crossings of Aurora Avenue (SR 99) at Mercer, Thomas, and Harrison streets. Right-turn on/off SR 99 access is provided at Roy Street both northbound and southbound, and a northbound off-ramp is provided at Republican Street.

[a]SR 99 Alaskan Way Viaduct & Seawall Replacement Project, PBQD communication, January 2006.

5.1.1 Effects During Construction

Effects during construction are considered short-term in comparison to the life-span of the completed project. Construction of the Build Alternative is expected to last approximately 2.5 years (Option 1) to 3.5 years (Option 2). It is expected that the construction effects would end

when construction is complete. Refer to Chapter 2 for the detailed descriptions of the two construction staging schedules.

Direct Effects

"Direct" effects are those effects that are caused by the project and occur at the same time and location. The expected construction activities would cause increases in noise and dust levels, detract from views and visual quality due to removal of earth and staging of construction equipment, and create glare from lighting if construction takes place at night. SDOT would comply with local policies and regulations regarding construction activities.

Vehicular and non-motorized access along all of the impacted corridors would be maintained during construction of the Build Alternative. Roadway lanes would be provided as discussed in Sections 2.5.1 and 2.5.2. Access to some businesses would be temporarily affected during various stages of construction.

Slight recirculation may occur through the study area and increase congestion due to travel lane and business access effects. Increased congestion and reduced roadway capacity may also lead to longer emergency vehicle response times through the area as well as general vehicular traffic and freight traffic delays. Existing truck routes would be maintained during the first two phases of construction. For Phase 3, the truck routes would be relocated to Mercer Street and Ninth/Westlake Avenues North corridors.

Pedestrian paths would be maintained to be ADA accessible, but may be more circuitous. Transit service may also be interrupted or require temporary relocation of stops.

On-street parking on Westlake Avenue North and Ninth Avenue North would be removed north of Republican Street. The on-street parking on the north side of Mercer Street between Terry Avenue North and Boren Avenue North would also be removed.

Build Option 2, widening of Mercer Street on both sides of the existing roadway, would have greater effects during construction than Option 1, widening only to the north. Construction Phase 1 would require an additional detour of traffic using both the north and south portions of the roadway while construction is performed within the center lanes. The Phase 1 construction for this option would require an additional 6 to 12 months, extending lane closures and vehicle/pedestrian impacts.

Indirect Effects

Indirect effects are those effects caused by the proposed action that are later in time or further removed in distance, but are still reasonably

foreseeable. Construction of the Build Alternative would have no indirect transportation effects.

Mitigation

To maximize capacity during construction, at least three travel lanes in the east- and westbound directions will remain open for most of the time including peak demand periods on Mercer Street. Improvements to Mercer Street would be completed prior to construction of improvements along Valley Street. Construction on Ninth Avenue North and Westlake Avenue North would not occur concurrently.

Driveway and cross-street access will be maintained throughout lane closure activities to minimize impacts to properties within the study area. The contractor will prepare a Traffic Management Plan (TMP) and coordinate with the City and individual property owners when temporary access restrictions or detours are required. To minimize congestion and emergency response impacts, lane closures will be scheduled outside of the peak travel demand periods, such as commute hours and special events at Seattle Center. Temporary signals will provide emergency vehicle pre-emption to minimize impacts to response times.

Lane widths will be a minimum of 11 feet through all construction zones, similar to existing conditions. In addition, a shoulder will be provided for all roadway segments with only one travel lane in each direction. This cross-section will allow vehicles to pull over for emergency vehicle access. It will also allow bicycle use adjacent to the travel lane.

All pedestrian paths through construction areas will be ADA accessible. Detours will be outlined in the contractor's TMP and detour signs will be posted in the project area. When pedestrians are redirected to travel along one of the closed travel lanes, a traffic barrier will separate them from vehicular traffic.

Public outreach will be performed to inform motorists of construction activities. This will be accomplished with informational signs, radio announcements, and website postings. Intelligent transportation system tools can also be deployed to maximize system use during construction. Currently, CCTV cameras are used along the corridor. Other strategies that could be used include video detection for vehicles and pedestrians, variable message signs, and advanced signal timing coordination.

Construction activities will be coordinated with other projects and services within the study area, such as the streetcar project and Metro Transit bus service, to avoid conflicts. Parking for construction workers will be developed as part of the contractor's Traffic Management Plan.

5.1.2 Effects During Operation

Direct Effects

The Mercer Improvements project would provide three through travel lanes for both east- and westbound travel on Mercer Street through the study area. By providing westbound access on Mercer, travel demand would be greatly reduced on Valley Street, allowing the roadway to be downsized to one travel lane in each direction. The two-way operations on Westlake and Ninth Avenue North would be extended north of Mercer Street to complete the conversion of the one-way couplet to two-way operations.

In general, the project would place a higher travel demand on the Mercer Street corridor with the additional westbound traffic from vehicles that currently use Valley Street. Operations and travel times for eastbound traffic would be slightly negatively affected; however, westbound travel would be more direct, thus improving the travel times in that direction.

Pedestrian safety and mobility would be improved within the study area. Pedestrian crossing times would be shortened along Valley Street for access to and from the South Lake Union Park. Continuous, ADA-compliant, wider sidewalks and ramps would be provided throughout Mercer and Valley streets and on the connecting north-south arterials. The pedestrian system would be developed and implemented in a uniform manner within the project construction period. Curb bulb-outs at most of the project intersections would reduce the pedestrian crossing distance and improve pedestrian visibility for right-turning traffic. The missing sidewalk links currently along Terry Avenue North would not be constructed as part of this improvement project. However, these links are expected to be completed by private developments to match the Mercer Corridor Improvements. Signalized intersections with crosswalks would also provide more convenient pedestrian crossings.

Bicycle safety and mobility would also be improved within the study area. An east-west bicycle route would be provided along Valley Street. The new east-west lanes would connect Fairview Avenue North to the existing bicycle lanes on Dexter Avenue North and the proposed bicycle lanes along Ninth Avenue North.

On-street parking would also be provided on both sides of Valley and Mercer Streets between Ninth and Fairview Avenue North. Additionally, on-street parking with peak period restrictions could be provided on Ninth and Westlake Avenues North from Mercer Street to the Ninth/Westlake Avenue North intersection. The only segments that would not include parking are the south side of Mercer Street between the short blocks of Boren and Fairview Avenues North and the north side of Mercer Street east of Ninth Avenue North. This on-street parking and planned landscaping supports adjacent businesses and provides a buffer for pedestrians from high volume traffic.

Emergency response times are expected to improve in the westbound direction as there are additional routes for travel and travel time estimates are expected to be shorter and less circuitous for this direction. In the eastbound direction, response times along Mercer Street are expected to be similar to No Action or slightly worse.

Along Valley Street, even with only one travel lane in each direction the response times may get slightly better as intersection LOS improves at key intersections and traffic is significantly reduced on this street. By providing a bike lane and parking in each direction, adequate space is provided for vehicles to pull over, allowing emergency vehicles access.

All new traffic signals would be equipped with emergency vehicle pre-emption to minimize impacts to response times.

By improving the circulation in the South Lake Union area, overall emergency response times should not be degraded. Providing emergency vehicles with route options would be a benefit during congested periods.

2010 Traffic Volumes

The greatest transportation effects of the proposed project would be on travel patterns along Valley Street and Mercer Street. Vehicles exiting I-5 would be allowed to traverse a direct westbound route on Mercer Street, as opposed to the current circuitous routing along Fairview, Valley, and Roy streets, which requires a right turn followed by an immediate left turn.

Valley Street would be de-emphasized from its current level and would promote a pedestrian- and bicycle-friendly atmosphere adjacent to the proposed South Lake Union Park and along the proposed SLU Streetcar route. One through travel lane would be provided in each direction, with widened sidewalks, bicycle lanes, and on-street parking.

In contrast, Mercer Street would accommodate the majority of the traffic flow associated with the I-5/Mercer Street interchange.

During Year 2010, Valley Street is projected to service approximately 3,300 vehicles during both the AM and PM peak hours under the No Action conditions. With the two-way Mercer Street operations, Valley Street demand would decrease to approximately 1,000 vehicles during the peak travel hours. This expected demand is mostly comprised of local traffic and vehicles traversing the south end of Lake Union.

The Mercer Street demand would increase significantly from 2,200 vehicles per hour (vph) to 4,800 vph during the AM peak hour and from 3,700 vph to 5,800 vph during the PM peak hour. The increase of traffic mainly consists of the shift of traffic from Valley to Mercer Street.

Screenline analyses indicate that the Build Alternative would generally create a higher overall vehicle demand (3 to 8 percent more) within the

study area than the No Action Alternative. The east (Fairview Avenue) screenline depicts a decrease in traffic volumes with the revised Mercer Street corridor. This is a result of a travel pattern change at Fairview Avenue North to the Mercer/Valley corridors, rather than a change in travel demand. In conjunction, the north screenline (Valley Street) reflects an increased travel demand. The north and south screenlines are also expected to increase in the Build condition with the conversion of Ninth and Westlake avenues to two-way operations and the completion of the grid network, which is expected to alter travel patterns in the area. Exhibit 5-2 summarizes the year 2010 No Action and Build Alternative screenline traffic volumes.

Exhibit 5-2. Year 2010 Screenline Comparison

Screenlines	AM Peak Hour			PM Peak Hour		
	2010 No Action	2010 Build	Difference	2010 No Action	2010 Build	Difference
East Screenline						
Eastbound	4,155	4,040	-115	6,620	6,415	-205
Westbound	4,940	4,840	-100	4,515	4,295	-220
West Screenline						
Eastbound	2,475	2,475	0	3,235	3,235	0
Westbound	2,705	2,795	90	3,110	3,195	85
North Screenline						
Northbound	2,315	2,555	240	3,040	3,365	325
Southbound	2,110	2,710	600	2,190	3,795	1605
South Screenline						
Northbound	1,350	1,390	40	3,025	3,090	65
Southbound	2,855	2,875	20	2,095	2,570	475
TOTAL	19,395	20,170	775 (3.8%)	23,830	25,995	2,165(8.3%)

2010 Operations

Exhibit 5-3 compares the Year 2010 AM peak-hour operations under No Action and Build conditions. (See also Exhibits TR-B-5 through TR-B-7 in Appendix TR-B for detailed intersection information on the intersection channelization and control, AM and PM peak-hour volumes, LOS, and intersection delay.) The intersection of Eighth Avenue North and Mercer Street was included in the year of opening analyses results to depict operations with the interim Broad Street connection.

During the AM peak hour, operations at two intersections along Valley Street improve from LOS E/F conditions to LOS D or better: Fairview Avenue North and Boren Avenue North. Improvements result from the decreased travel demand on Valley Street.

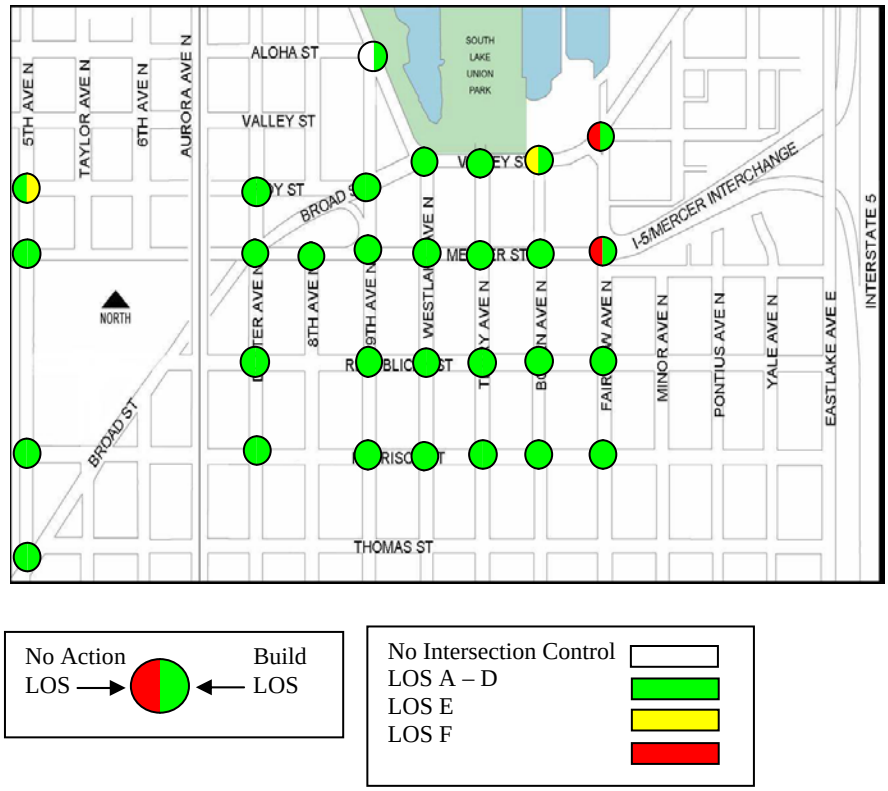


Exhibit 5-3. 2010 No Action and Build AM Peak Hour Intersection Operations

The I-5 Interchange/Mercer Street/Fairview Avenue North intersection also improves from LOS F in the No Action configuration to LOS D with two-way Mercer Street. This LOS improvement is created by the predominant off-ramp movement changing from a right-turn to a direct through movement. Overall traffic volumes are similar through the intersection, though fewer turn movements are projected with the two-way Mercer Street operations.

The intersection of Mercer Street with Fifth Avenue North, however, exhibited a slightly increased delay and is projected to operate near the LOS D/E threshold. The increased delay is a result of the traffic signal timing changes which optimize operations along the corridor.

The interim Eighth Avenue North/Mercer Street/Broad Street connection would operate well at LOS B levels. Additionally, the Ninth/Westlake Avenue North intersection is expected to operate at LOS C with the installation of a traffic signal.

Exhibit 5-4 (see also Exhibits TR-B-5 and TR-B-7) compares the Year 2010 PM peak hour operations under No Action and Build conditions.

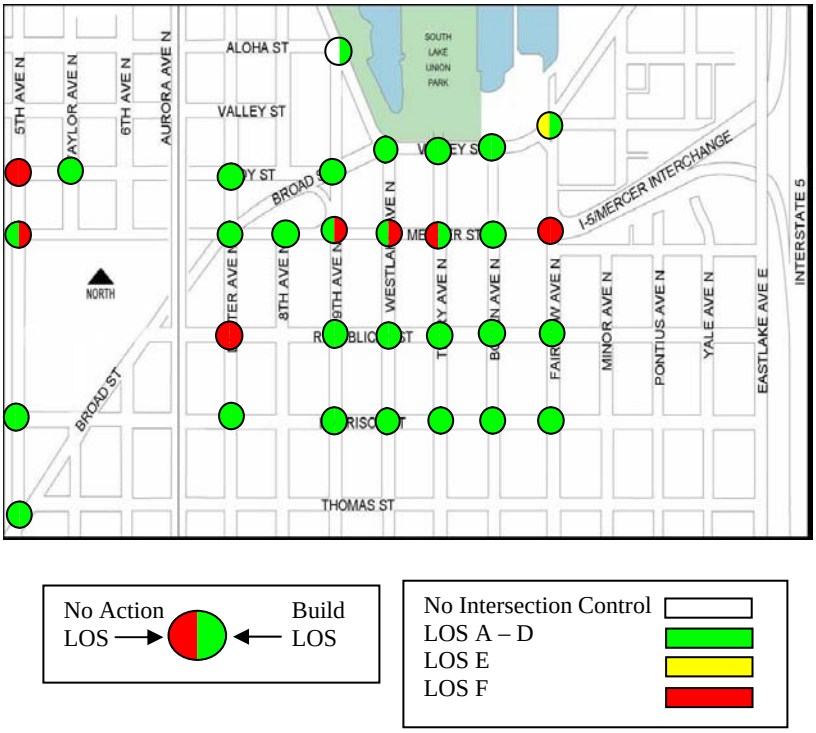


Exhibit 5-4. 2010 No Action and Build PM Peak Hour Intersection Operations

Generally, the traffic-signal-controlled intersections along Mercer Street are projected to operate at LOS E/F levels. Dexter Avenue North, Eighth Avenue North and Terry Avenue North are the exceptions, which would be maintained at LOS D or better conditions.

Operations at the Fairview Avenue North/Valley Street intersection are projected to improve as a result of the lower traffic demand on Valley Street. Even though the two intersections along Broad/Valley Streets at Ninth and Westlake Avenues do not operate at LOS E or F in the No Action condition, they are expected to see significant operating improvements with the de-emphasis of Valley Street and the removal of the Broad Street connection at Ninth Avenue as part of the Build condition.

The I-5 Interchange/Mercer Street/Fairview Avenue North intersection is expected to operate at LOS F levels in both No Action and Build conditions, but is expected to have lower delay in the Build condition. The Mercer Street intersections at Ninth and Westlake Avenues are expected to operate at LOS F conditions in the Build condition as the signal timing is modified to provide two-way operations in all approaches.

The Eighth Avenue North/Mercer Street/Broad Street connection would operate well (LOS C). Additionally, the Ninth/Westlake Avenue North intersection is expected to operate at LOS C with the installation of a

traffic signal. The alternate Broad Street connection at Ninth Avenue North was also analyzed. This configuration would result in high delays and LOS F conditions at the 5-legged intersection (Broad Street/Mercer Street/Ninth Avenue North) during both the AM and PM peak hours.

2030 Traffic Volumes

Year 2030 Build traffic volumes would be similar to Year 2010. Valley Street volumes during both the AM and PM peak hours of traffic would decrease by approximately two-thirds (2,000 vph), while Mercer Street would increase by approximately the same amount of vehicles.

Screenline analyses indicate that the Build Alternative would generally have a slightly higher travel demand through the study area (up to 2 percent overall).

As with the 2010 scenario, lower traffic volumes crossing the east (Fairview) screenline occur as a result of travel pattern changes to/from Fairview Avenue North. This change is also reflected in the north screenline (Valley Street), primarily in the southbound direction.

Exhibit 5-5 summarizes the year 2030 No Action and Build screenline traffic volumes.

Exhibit 5-5. Year 2030 Screenline Comparison

Screenlines	AM Peak Hour			PM Peak Hour		
	2030 No Action	2030 Build	Difference	2030 No Action	2030 Build	Difference
East Screenline						
Eastbound	4,835	4,765	-70	7,065	6,855	-210
Westbound	5,490	5,135	-355	5,280	4,940	-340
West Screenline						
Eastbound	2,865	2,865	0	3,555	3,515	-40
Westbound	3,385	3,395	10	3,275	3,210	-65
North Screenline						
Northbound	3,450	3,315	-135	4,460	4,635	175
Southbound	3,920	4,305	385	3,585	4,125	540
South Screenline						
Northbound	1,800	2,000	200	3,955	4,185	230
Southbound	3,495	3,385	-110	2,880	3,145	265
TOTAL	25,005	25,050	-45 (<1.0%)	28,935	29,530	595 (2.0%)

2030 Operations

Exhibit 5-6 compares the Year 2030 AM peak hour operations under No Action and Build conditions. (See also Exhibits TR-B-11 through TR-B-13.) The intersection of Sixth Avenue North and Mercer Street was included in the 2030 analyses to capture the effects of the Aurora Avenue North traffic using the Roy Street access. The reduced travel demand on Valley Street allows the operations at Valley Street and Westlake Avenue North to improve to LOS C.

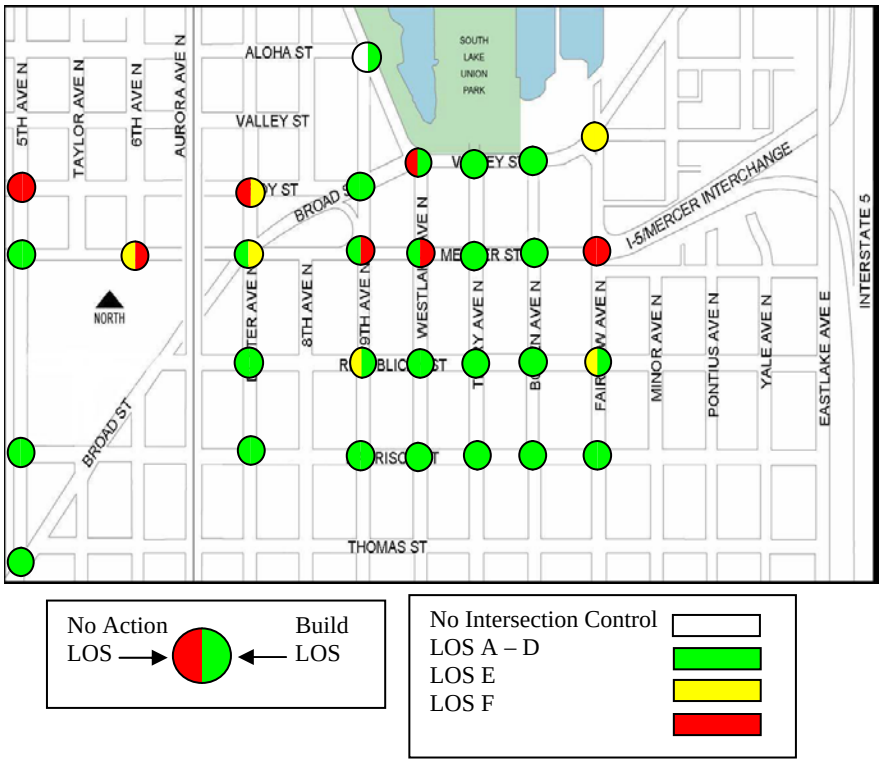


Exhibit 5-6. 2030 No Action and Build AM Peak Hour Intersection Operations

Traffic operations at four Mercer Street intersections are projected to operate at LOS F levels. Mercer Street at Westlake Avenue North and Ninth Avenue North intersections decline due to the additional traffic signal phases associated with the two-way traffic in addition to the streetcar signal phase (Westlake Avenue North intersection only). The Mercer Street and Sixth Avenue intersection also operates at LOS F due to increased traffic demands and traffic signal timing related to optimization of the corridor. The I-5 Interchange/Mercer Street/Fairview Avenue North intersection is expected to operate at LOS F levels in both No Action and Build conditions, but is expected to have significantly lower delay in the Build condition.

Intersections along Republican and Harrison streets are expected to either remain the same or improve operations as westbound demand is shifted from these arterials to the more direct route using Mercer Street from the I-5 off-ramps. The Republican Street intersections at Ninth and Fairview avenues are expected to improve from LOS E to LOS D and C, respectively, in the Build condition. Additionally, operations on Roy Street would improve at the Dexter Avenue intersection as regional demand is expected to shift to Mercer Street.

Exhibit 5-7 compares the Year 2030 PM peak-hour operations under No Action and Build conditions. (See also Exhibits TR-B-11 through TR-B-13.) Traffic operations throughout most of the study area would operate at similar levels to the No Action scenario. Mercer Street in both conditions

is expected to generally operate at LOS F conditions. The Mercer Street and Dexter Avenue intersection is expected to decline to LOS E conditions as traffic demands increase due to the two-way Mercer operations. Additional travel in the westbound direction is also expected to occur on Mercer Street, as it now provides a more direct route into the area. Valley and Roy streets, however, are expected to have improved operations in comparison to the No Action scenario. The reduced roadway and associated lower traffic demand allows the corridor to operate at LOS D or better, between Dexter and Boren Avenue North intersections.

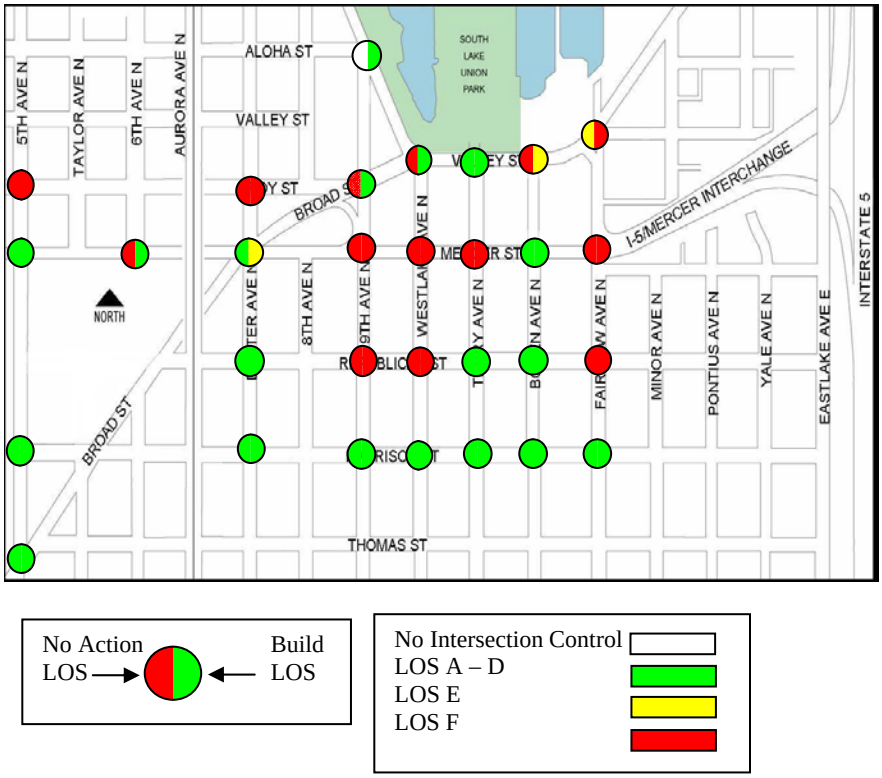


Exhibit 5-7. 2030 No Action and Build PM Peak Hour Intersection

Travel Time Analysis

Travel time estimates for year 2010 are shown in Exhibit 5-8. During the AM peak hour, significant westbound travel time savings are expected with the Build Alternative due to the less circuitous route. A savings of approximately 2.5 to 4 minutes is estimated for each westbound travel path. Eastbound AM travel times remain at the same level or increase slightly (less than 1 minute difference) due to the additional traffic control and signal phasing related to the two-way Mercer Street operations. During the PM peak hour, travel times between the Seattle Center and I-5 would remain similar to or increase slightly over the No Action conditions. Less than one minute of travel time savings are expected in both east- and westbound paths between Westlake Avenue North and I-5 (Paths 5 and 6). In the westbound direction, the direct through movement

from the I-5 off-ramp provides a travel time benefit. The proposed traffic signal at the Mercer Street and Fairview Avenue intersection would provide a greater percentage of westbound green time compared to the current combined signal operations at Mercer and Valley Streets. In the eastbound direction, the relocation of the Broad Street connection to Eighth Avenue reduces the number of conflicts in this direction. Travel times along the north-south Westlake and Ninth Avenue corridors remain similar to the No Action conditions during both peak periods.

Exhibit 5-8. 2010 Travel Time Comparison

Travel Route Paths	AM Peak Hour		PM Peak Hour	
	No Action (minutes)	Build (minutes)	No Action (minutes)	Build (minutes)
1 - WB - I-5 to (north) Seattle Center[a]	10.9	8.4	10.8	12.4
2 - EB – (north) Seattle Center to I-5	3.7	3.5	7.3	10.2
3 - WB - I-5 to (south) Seattle Center[a]	10.4	6.5	6.7	8.1
4 - EB – (south) Seattle Center to I-5	3.8	3.8	9.5	8.9
5 - WB - I-5 to Westlake[a]	8.4	5.1	6.6	6.1
6 - EB - Westlake to I-5	3.0	3.6	8.3	7.6
7 - NB - Westlake Avenue[b]	3.6	3.6	3.7	3.5
8 - SB – Westlake Avenue[b]	3.7	3.2	3.1	3.1
9 - NB – Ninth Avenue[b]	3.8	3.7	5.0	4.8
10 - SB - Ninth Avenue[b]	4.5	4.8	3.5	3.9

[a] Travel times from I-5 are a vehicle weighted average between the northbound and southbound off-ramps.
[b] Westlake Avenue and Ninth Avenue are proposed to be converted to two-way operations in the future.

Travel time estimates were also performed during the PM peak hour for the alternate Broad Street connection at Ninth Avenue North. Eastbound paths would incur travel time increases of up to 14 additional minutes with the 5-leg intersection at Mercer Street and Ninth Avenue North.

Providing on-street parking along the south side of Mercer Street is an option under consideration in the interim 2010 design. This parking would reduce the number of eastbound lanes from four to three between Ninth and Boren avenues. This option is expected to not change the AM peak-hour travel times, as the eastbound direction is the non-peak direction during that period. In the PM peak hour, the eastbound travel times (Paths 2, 4, and 6) would increase because the peak direction of travel is in as the eastbound direction and overall congestion is high. For instance, the travel time for Path 2 would increase from 10 to 18 minutes, compared to the no-parking/four-lane option. Paths 4 and 6 travel times would be expected to have a similar increase. All the other paths' travel times would remain similar.

Travel time estimates for year 2030 are shown in Exhibit 5-9. Travel patterns are similar to Year 2010 conditions. In the westbound direction, a savings of 2.5 to 5 minutes from the No Action condition is expected in the AM peak hour. In the eastbound direction, travel times are expected to be similar to or up to 4 additional minutes compared to the No Action

condition in the AM peak hour. Along the north-south corridors, travel times are similar in the AM peak hour.

Exhibit 5-9. 2030 Travel Time Comparison

Travel Route Paths	AM Peak Hour		PM Peak Hour	
	No Action (minutes)	Build (minutes)	No Action (minutes)	Build (minutes)
1 - WB - I-5 to (north) Seattle Center[a]	15.9	11.9	14.3	13.8
2 - EB – (north) Seattle Center to I-5	7.3	10.0	18.9	18.7
3 - WB - I-5 to (south) Seattle Center[a]	13.8	11.4	14.2	14.3
4 - EB – (south) Seattle Center to I-5	8.6	10.4	20.2	18.8
5 - WB - I-5 to Westlake[a]	11.3	6.4	14.2	9.9
6 - EB - Westlake to I-5	4.7	8.8	18.8	21.1
7 - NB - Westlake Avenue[b]	4.3	4.0	12.1	12.2
8 - SB – Westlake Avenue[b]	7.5	6.3	4.0	4.2
9 - NB – Ninth Avenue[b]	4.3	5.4	13.5	6.7
10 - SB - Ninth Avenue[b]	6.4	5.5	10.4	12.4

[a] Travel times from I-5 are a vehicle weighted average between the northbound and southbound off-ramps.

[b] Westlake Avenue and Ninth Avenue are proposed to be converted to two-way operations in the future.

In the PM peak hour, a savings up to 5 minutes is expected in the westbound direction. This is expected as the current circuitous route from I-5 to Valley/Broad Street is replaced with a more direct through movement along Mercer Street. In addition, the proposed traffic signal at the Mercer Street and Fairview Avenue intersection would provide a greater percentage of westbound green time compared to the current combined signal operations at Mercer and Valley Streets. In the eastbound direction, travel times are expected to be similar to the No Action condition. For instance, while the travel path from Westlake to I-5 gets slightly worse due to signal changes at Mercer Street and Ninth Avenue intersection, the travel path from south Seattle Center to I-5 gets better as vehicles shift their travel to arterials other than Mercer Street, thereby improving eastbound travel on Mercer Street. In the north-south travel paths, times are similar between No Action and Build except for Ninth Avenue northbound travel time path. This path in the No Action condition requires a circuitous maneuver (a right and left turn) at Mercer Street to transition to Westlake Avenue and continue heading northbound. In the Build condition, vehicles on Ninth Avenue heading north are able to cross Mercer Street and continue traveling on Ninth Avenue as a result of the extension of two-way traffic along the Ninth Avenue corridor, thereby reducing the demand on Westlake Avenue.

To further enhance the pedestrian connections across Mercer Street, there is an option to provide a protected pedestrian crossing at Boren Avenue. This signalized crossing would not accommodate any vehicular movements; therefore it would only be activated when pedestrians are present. The operational analysis for this option indicate the signalized crossing could either be provided as a one-stage or two-stage crossing

(where pedestrians are permitted to only cross half of Mercer Street at one time) with no significant impact to east-west traffic operations on Mercer Street. As this pedestrian crossing would likely be coordinated with an adjacent traffic signal, impacts to east-west operations would be minimized.

Overall, travel times in the east- and westbound directions are expected to remain similar in the AM peak period. In the PM peak period, westbound travel times are expected to increase by at most 1 minute, while in the eastbound direction travel times would be similar. If a two-stage pedestrian crossing is implemented, there would be no westbound travel time impact in the PM peak period. The queue impact along the I-5 off-ramp is expected to be minimal as the Boren Avenue pedestrian crossing could be coordinated with the north-south Fairview Avenue signal phase at Mercer Street, thereby minimizing the impact to the I-5 off-ramps. All the other paths' travel times would remain similar.

Freeway and ramp modeling (using Corsim software) was utilized for the westbound travel time calculations. Travel time (Exhibit 5-10) and estimated queue lengths for each of the northbound and southbound off-ramps were calculated for each analysis year. In year 2010, travel times increase by as much as 2 minutes in the northbound direction and increase slightly in the southbound direction. By year 2030, travel times are expected to more than double to 8 minutes in the northbound direction as it is very difficult for vehicles in the northbound off-ramp to merge into the southbound off-ramp lanes and turn right at Mercer Street and Fairview Avenue intersection.

Exhibit 5-10. 2010 and 2030 Freeway Travel Time Results

	AM Peak Hour				**PM Peak Hour**			
	No Action (minutes)		Build (minutes)		No Action (minutes)		Build (minutes)	
Condition	**NB**	**SB**	**NB**	**SB**	**NB**	**SB**	**NB**	**SB**
Existing	3.2	2.9	N/A	N/A	2.9	2.6	N/A	N/A
2010 – Year of Opening	5.3	4.1	3.2	3.0	3.6	2.2	3.9	3.2
2030 - Design Year	8.0	3.3	4.9	3.2	8.7	3.2	5.6	4.5

The Build Alternative provides a significant benefit to the northbound off-ramp as travel times are generally expected to improve by over two minutes in the 2010 AM peak hour. In the 2010 PM peak hour, the northbound travel time is expected to slightly decrease from No Action times. In the southbound off-ramp direction, the travel times are expected to improve by one minute in the AM peak hour, while decreasing slightly in the PM peak hour as vehicle conflicts with the northbound off-ramp create some additional delay. By 2030 travel time savings of over 3 minutes in both AM and PM peak hours is expected for the northbound off-ramp. For vehicles in the southbound off-ramp travel times are expected to remain similar or slightly increase (slightly more than a minute) by year 2030.

In addition to travel time results, the freeway analysis evaluated expected queue lengths from the northbound and southbound off-ramps. In the existing and year 2010 conditions, the vehicle queues on the off-ramp are not expected to reach I-5 mainline. Because of activities at Seattle Center, under certain conditions, vehicle queues extend past the I-5 off-ramps onto the mainline. By year 2030, the queue on the northbound off-ramp extends onto the mainline to the University Street on-ramp under the No Action conditions. The Build Alternative also is characterized by queues extending into the I-5 mainline, but the queue is expected to only extend past the Olive Street on-ramp. This improvement is expected as the Build alternative eliminates the predominant merging/weaving maneuver for vehicles from the northbound off-ramp. For all conditions, vehicle queues do not extend to the mainline lanes on the southbound off-ramp.

Appendix TR-C provides the Mercer Street/I-5 off-ramp and freeway results, including travel time calculations, average travel speeds, and expected queue lengths.

Pedestrian and Bicycle Facilities

Both pedestrian and bicycle safety and mobility within the study area would be enhanced by the project. The Mercer Corridor Improvements Project would reconstruct and repair pedestrian facilities within the study area north of Republican Street and east of Dexter Avenue North.

Sidewalks along Roy, Valley, and Mercer streets would be widened to accommodate the increased pedestrian demand associated with the expected higher density, mixed-use neighborhood. Sidewalks on the south side of Mercer would be widened to 16 feet to provide a 10-foot walkway and 6-foot safety buffer and planting area. The sidewalk on the north side of Mercer Street would be widened to 21 feet to allow for additional space along building frontages for window shopping and possible sidewalk cafés as well as the 6-foot safety buffer and planting strip. Along the south side of Mercer Street, on-street parking may be removed in the 2010 year of opening to provide additional eastbound vehicular capacity. If this is implemented there may be additional friction between pedestrians and vehicles, but would not be a degradation from no-action conditions. The sidewalk on the south side of Valley Street would also be widened to 16 feet, and a new 8-foot sidewalk would be constructed on the north side of the street. The Roy Street sidewalks would be constructed to be 10.5 feet wide.

The missing sidewalk links currently along Terry Avenue North would not be constructed as part of this improvement project. However, these links are expected to be completed by private developments to match the Mercer Corridor Improvements. Private developers would follow the Terry Avenue Street Design Concept Plan adopted in 2005, allowing for a homogeneous system.

The re-configured, two-lane Valley Street would significantly shorten the pedestrian crossing distance at all locations and provide new marked

pedestrian crosswalks at Fairview and Boren avenues. A new traffic signal is also proposed at the intersection of Ninth Avenue and Westlake Avenue, with crosswalks connecting directly to the South Lake Union Park pedestrian trails. New traffic signals and pedestrian crossings at Valley Street/Terry Street and Mercer Street/Terry Street would also be constructed as part of the South Lake Union Streetcar project, improving safety for pedestrians and providing additional linkages.

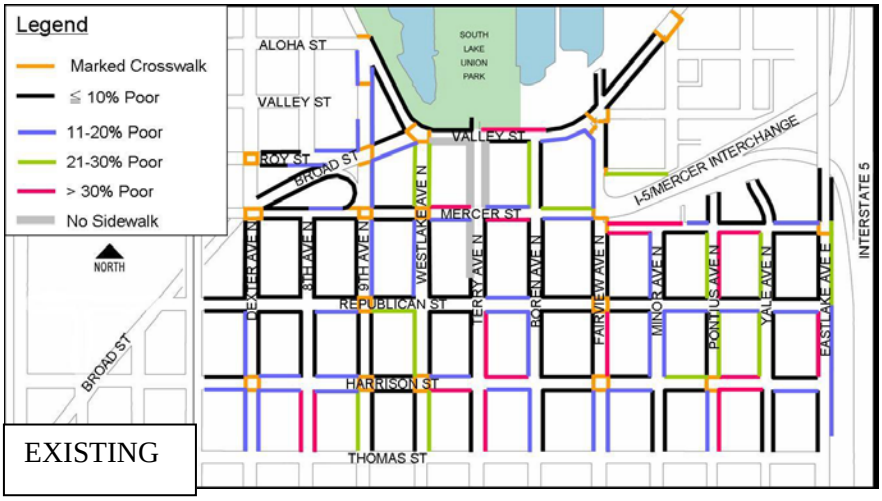
The truck route to/from Fremont and Ballard would use Ninth Avenue North between Mercer Street and Westlake Avenue North, thereby separating it from the pedestrian environment along Westlake Avenue and Valley Street. Intersection curb radii would be designed to accommodate a 75-foot design vehicle, resulting in longer pedestrian crossings at:

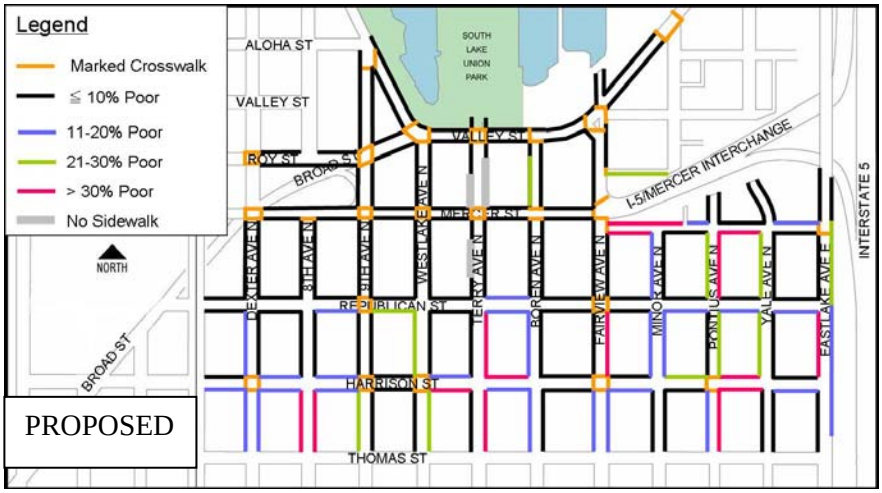
- Mercer Street at Fairview Avenue intersection – southwest, southeast and northeast corners
- Mercer Street at Ninth Avenue intersection – northeast corner

Smaller turn radii are proposed at most other intersections along Mercer, Valley, and Roy streets to reduce crossing distances and improve pedestrian visibility and safety. The *Preliminary Draft Basis of Design Report* (CH2M HILL, February 2006) provides the complete list of the proposed intersection curb radii.

Intersection bulb-outs would be provided at most of the crossings to shorten pedestrian crossing times and distances. To accommodate a 75-foot truck turning southbound from Ninth Avenue North to Mercer Street, a pedestrian bulb would not be constructed on Mercer Street at the southeast corner of the Ninth Avenue North intersection.

Improvements to the existing facilities along the north-south routes (Ninth, Westlake and Fairview avenues) would be made so that there are functional and continuous sidewalks from south of Mercer Street to the Ninth/Westlake Avenue North intersection. Improvements may include one or more of the following, depending on the specific deficiencies: repairing cracks, fixing uneven settlement of slabs, providing unobstructed paths, and/or conforming to ADA grade requirements. Exhibit 5-11 depicts the proposed pedestrian facilities that are part of this project in comparison to the existing pedestrian network.





Source: UDA (top) and Parsons Brinkerhoff (bottom), South Lake Union Transportation Study 2005

Exhibit 5-11. Existing and Proposed Pedestrian Facilities

Exclusive bicycle lanes would be striped along both directions of Valley Street and then on Roy Street between Dexter and Fairview avenues. The Valley Street and Roy Street bike lanes would provide an exclusive facility for east-west travel through the study area. The new lanes would also provide a direct connection between the multi-purpose trail around Lake Union and the bicycle lanes on Dexter and Ninth avenues. Ninth Avenue North would also be designed for bicycles, including bicycle lanes between Republican and Valley streets. This would connect to the proposed designated bicycle lanes on Ninth Avenue North, south of Republican Street (provided through a separate project). The additional signalized crosswalks on Valley and Mercer streets would also improve the ability for bicyclist to cross both streets.

Truck Facilities

Truck routes through the area would benefit by the Build Alternative primarily in the westbound direction. Travel would occur directly from the I-5 off-ramp onto Mercer Street, replacing the current three turning

movements required to go from I-5 off-ramps to Westlake Avenue North with one turn at the Mercer Street/Ninth Avenue intersection. Ninth Avenue North between Mercer Street and Westlake Avenue North would be designated a Major Truck Street. Mercer Street would remain a Major Truck Street, but the designation would apply to both directions. With this change, Valley Street, Fairview Avenue (north of Mercer Street), and Westlake Avenue North (between Mercer Street and Ninth Avenue North) would be reclassified, removing their designation as City of Seattle Major Truck Streets.

Proposed truck improvements include turning radii to accommodate a 75-foot design vehicle and no-parking zones near intersections with key right-turning truck movements along the proposed truck routes to/from I-5. Larger intersection radii would be provided at:

- Mercer Street at Fairview Avenue intersection – southwest, southeast, and northeast corners
- Mercer Street at Ninth Avenue intersection – northeast corner

A no-parking zone would be located on the south side of Mercer Street near Ninth Avenue to allow larger vehicles flexibility in turning from Ninth Avenue to Mercer Street. A new traffic signal would also be constructed at the Ninth Avenue/Westlake Avenue intersection, providing priority movement for the north-south truck and general traffic movements along the Ninth/Westlake Avenue corridor.

On-Street Parking

On-street parking would be increased with the Build Alternative. New on-street parking stalls would be provided on the south side of Valley Street between Fairview Avenue North and Westlake Avenue North. Parking

would also be provided on Mercer Street between Dexter Avenue North and Boren Avenue North. All elements of the proposed design were included in the traffic analysis including the effects—such as the "friction" caused by maneuvering vehicles—of on-street parking. Parking is included on Mercer Street to support future commercial development along the street. From the business-owners' perspective, on-street parking in front of the space (vs. side streets) is highly desired.

The existing parking on Ninth and Westlake avenues (between the Ninth Avenue North and Westlake Avenue North intersection and Mercer Street) would be removed during peak periods. Additionally, on-street parking on the north side of Roy Street would be removed, but parking would be added or maintained on the south side of Roy Street and Broad Street.

Consistent with other commercial areas of the city, the City plans to use pay stations to manage on-street parking in the South Lake Union area. This system is convenient and consistent with other Seattle commercial

districts, including downtown and would also be used for all on-street parking on Mercer and Valley streets.

Transit Service

No changes to transit service are proposed as part of this project. However, a two-way Mercer Street would improve the viability for transit in the study area by improving circulation and access in the corridor, and would provide the opportunity for additional east/west service. Also, north/south transit speed and reliability would likely improve because travel time savings are expected in those directions.

Safety

While the project creates a wider Mercer Street for pedestrians to cross, it reduces major motorized vehicle turn movements at the intersections of Fairview Avenue and Mercer Street and Fairview and Valley Street, and therefore reduces conflicts with pedestrian crossings. Traffic signals would be timed to allow pedestrians to cross the entire street in one phase, and the median would provide a safe refuge for any pedestrians that might leave the curb late or not make it across the full street width for other reasons.

The two-lane design of Valley Street would create safer conditions along the corridor and in the vicinity of the South Lake Union Park, SLU Streetcar station, and multi-purpose trail. Decreased traffic volumes and lower speeds would likely result in fewer accidents. Continuous sidewalks and more controlled crossings would improve pedestrian safety. Ninth Avenue North between Broad Street and Westlake Avenue North would be widened by approximately 15 feet to accommodate four traffic lanes. A new signal at the intersection of Ninth Avenue North and Westlake Avenue North would provide a new signal-controlled crossing for pedestrians.

Exclusive bike lanes on Valley Street and Ninth Avenue North (south of Mercer Street) would enhance the area's non-motorized safety and decrease conflicts between vehicles and bicycles along adjacent parallel routes.

The proposed intersection bulb-outs along Mercer and Valley streets would reduce pedestrian crossing distance, delineate on-street parking areas, and provide better pedestrian visibility for right-turning traffic. Two intersections would have curb radii to facilitate the movements of 75-foot trucks, resulting in longer crossing times for pedestrians.

Overall vehicle and pedestrian safety in the corridor is expected to improve with the proposed direct route to and from I-5 via Mercer Street. Elimination of the multiple weaving and turning maneuvers currently required to access westbound Valley Street from I-5 would reduce driver confusion and weaving movements. It would also reduce conflicts between high-volume turning movements and pedestrians. The queuing

caused by the required off-ramp merging/weaving maneuvers and Mercer/Valley Street signals contributes to accidents on the northbound off-ramp and immediate I-5 mainline area. With reduced queues on the northbound off-ramp, accidents, especially rear-end, should be reduced on the off-ramp and I-5 mainline. The potential for additional vehicle conflicts would be introduced to the Mercer corridor associated with two-way traffic. Head-on accidents, which are related to two-way traffic operations, would be minimized by the proposed center median and protected left-turn signal phasing, but side-swipe and rear-end accidents may increase with the addition of on-street parking. The number of accidents on Valley Street is expected to decrease with the reduced traffic volumes and cross-section, additional protected pedestrian crosswalks, and striped bike lanes.

The interim Broad Street connection at Eighth Avenue North and Mercer Street has geometric restrictions. The design speeds on Broad Street would be lowered at the approach to Mercer Street to account for these constraints. The alternate Ninth Avenue, 5-legged intersection connection does not have similar geometric constraints; however, safety may be affected by the congestion related to the operations of the intersection, pedestrian crossing restrictions or limitation, turn restrictions, and driver expectations with the introduction of an additional skewed approach.

Indirect Effects

Indirect effects are those effects caused by the proposed action that are later in time or further removed in distance, but are still reasonably foreseeable.

Annual average growth rates depict relatively low levels of traffic increases in comparison to the forecasted population and employment growth for both the Build and No Action scenarios. This can be partially attributed to peak-hour spreading, increased internal trips, mode shifts to higher occupancy vehicles and/or transit, and mode shifts to non-motorized modes. The Build Alternative would support these activities.

Pedestrian and bicycle mode share would likely increase due to the improved non-motorized facilities, including improvements to the sidewalk and crosswalk network, and provision of additional bicycle lanes within the study area.

Improvements to the east-west corridors may also provide opportunities for additional local transit service within the South Lake Union area. Republican and Harrison streets could accommodate the local service. The Mercer interchange and Mercer corridor may also be utilized as a transit service corridor to the Seattle Center and/or Downtown Seattle areas. However, transit service on Mercer Street is not proposed as part of this project.

Intelligent transportation system (ITS) elements and resources may allow motorists to adjust travel patterns with real-time data exchange of traffic

conditions along the corridor. Lastly, after the AWVRP is completed, motorists would be provided with alternative east-west travel routes across Aurora Avenue North at Harrison and Thomas streets. Providing drivers with multiple options to cross SR 99 would improve the reliability of the corridor and provide congestion relief, particularly during heavily traveled periods of time.

Mitigation

While slight impacts to travel times and intersection LOS are documented on some travel paths and some intersections, the overall transportation system is improved with this project. In 2010 the analysis shows some intersection impacts for the PM peak period and general improvements for the AM peak period. The 2010 PM peak period impacts are temporary as benefits are shown to occur by year 2030. Implementation of ITS elements will be further studied during the design phase of the Mercer Corridor Improvements Project. Technologies that could be implemented include: variable message signs, closed circuit TV, traffic sensors, traffic adaptive signal controllers, pedestrian countdown signal displays, and peak-hour directional lanes. SDOT will install positive guidance truck route signing at appropriate locations on the major truck streets in the study area. The ITS elements would improve utilization and efficiency of the network.

5.1.3 Cumulative Effects

The Mercer Corridor project may contribute to cumulative effects from past, present, or reasonably foreseeable future projects. In addition to the Mercer Corridor project, there are a number of currently planned transportation and commercial development projects that would potentially affect the study area's transportation system. Transportation projects include:

- Alaskan Way Viaduct Replacement Project
- South Lake Union Streetcar Project (including conversion of Westlake Avenue North to two-way traffic operations)
- Conversion of Ninth Avenue North from one-way to a two-way street

Other projects include:

- South Lake Union Park improvements
- University of Washington Medical Research Campus
- 2201 Westlake mixed use development
- Interurban Exchange mixed use development

Potential cumulative transportation impacts could occur as a result of two planned construction projects within the study area: the South Lake Union Streetcar and the Alaskan Way Viaduct Replacement project. The streetcar is proposed to be completed prior to the beginning of the Mercer Street Improvements Project. If the schedule is delayed, concurrent

construction through the Mercer Street intersections of Terry Avenue North and Westlake Avenue North could occur as well as along Valley Street. If concurrent construction is anticipated, detailed scheduling of lane closures and staging areas would be required. The Mercer Street improvements are projected to be completed prior to the Alaskan Way Viaduct Replacement construction. If concurrent construction is expected, physical impacts would only occur on the west side of the study area. Continuity of traffic access across Aurora Avenue during construction would require a major coordination effort.

Potential cumulative effects on the transportation system upon completion of the project involve changes in travel patterns. Vehicular and transit pattern changes may occur due to the strengthened grid network created by the aforementioned projects, including the two-way operations on Ninth Avenue North, Westlake Avenue North, and Mercer Street. The AWVRP also creates crossings of Aurora Avenue North at Thomas Street and Harrison Street, which are expected to relieve demand along the Mercer Street corridor.

5.2 No Action Alternative

Three major changes to the study area's transportation facilities would be constructed in the No Action Alternative. The South Lake Union Streetcar project would be constructed by 2010, which would offer a new transit facility in the study area. In conjunction with the streetcar project, Westlake Avenue North, south of Mercer, would be converted to two-way travel. As a separate project, Ninth Avenue North would also be converted to accommodate two-directional travel. The Alaskan Way Viaduct Replacement project is expected to be constructed by 2030. Within the project study area, this project would provide new crossings over Aurora Avenue and new ramps connecting to and from Aurora Avenue.

No Action conditions were analyzed for both the opening year 2010 and design year 2030. Planned projects within the study area were included in the No Action travel demand model to depict an accurate portrait of travel patterns during the study years. The assumed improvement projects are listed in Exhibit 5-12, and are consistent with the current PSRC model assumptions and Alaskan Way Viaduct Replacement plans.

Exhibit 5-12. No Action Transportation Improvements			
2010	**2030**	**Project**	**Improvement**
X	X	Seattle Monorail	Greenline Project from West Seattle to Ballard[a]
X	X	Sound Transit System Phase I	Link Light Rail – By 2010, service between Downtown and SeaTac with service between Northgate and Downtown by 2030, Sounder Commuter Rail and Express Bus
X	X	South Lake Union Streetcar	Provide streetcar operations between Westlake Center and Fairview/Yale Avenues with one-way streetcar operations along Westlake Avenue. (SB) and Terry Avenue. (NB). Terry Avenue will operate as a one-way northbound street between Thomas and Mercer streets. Westlake Avenue will be converted to two-way operation between Ninth Avenue (south of Denny Way) and Valley Street. Traffic signals will be constructed at Valley/Terry and Mercer/Terry intersections.
X	X	Ninth Avenue North Two-Way Conversion	Convert Ninth Avenue North to two-way operations by 2010 south of Mercer Street.
	X	SR 520 Bridge Replacement and HOV Project	2 general purpose lanes and 1 HOV lane in each direction (with reversible ramp to/from express lanes for HOV)
	X	SR 519 Phase I improvements	South Atlantic Street Improvements with Royal Brougham Way at-grade
	X	I-90 HOV	Reconfiguration option R-8A
	X	Colman Dock Expansion and Remote Holding Area S. Royal Brougham Way and east of Alaskan Way[b]	Expansion and replacement of the dock
	X	Alaskan Way Viaduct Replacement Project	Construct a highway tunnel along central waterfront with modified access to downtown from the south. Lowered Aurora, preferred solution,[c] includes grade separated crossings of Aurora Avenue (SR 99) at Mercer, Thomas, and Harrison streets. Right-turn on/off SR 99 access is provided at Roy Street and a northbound off-ramp is provided at Republican Street.
X	X	Transit Improvements	Metro's Six-year Transit Development Plan 2002-2007 plus 1% per year growth after 6 years
	X	I-405 Congestion Relief and Bus Rapid Transit Projects	Assume the implementation package which assumes an additional lane in each direction from SR 522 (Bothell) to I-5 (Tukwila)

[a] The Monorail project, no longer a funded project, had little traffic impact on the Mercer Corridor area.
[b] This project is considered a non-roadway improvement project.
[c] SR 99 Alaskan Way Viaduct & Seawall Replacement Project, PBQD communication, August 2005.
HOV = high-occupancy vehicle

One of the assumed No Action improvements with major impacts to the study area is the streetcar between Westlake Center and Fred Hutchinson Cancer Research Center. The streetcar will travel at grade along Westlake Avenue, Terry Avenue, Valley Street, and Fairview Avenue (Exhibit 5-13).

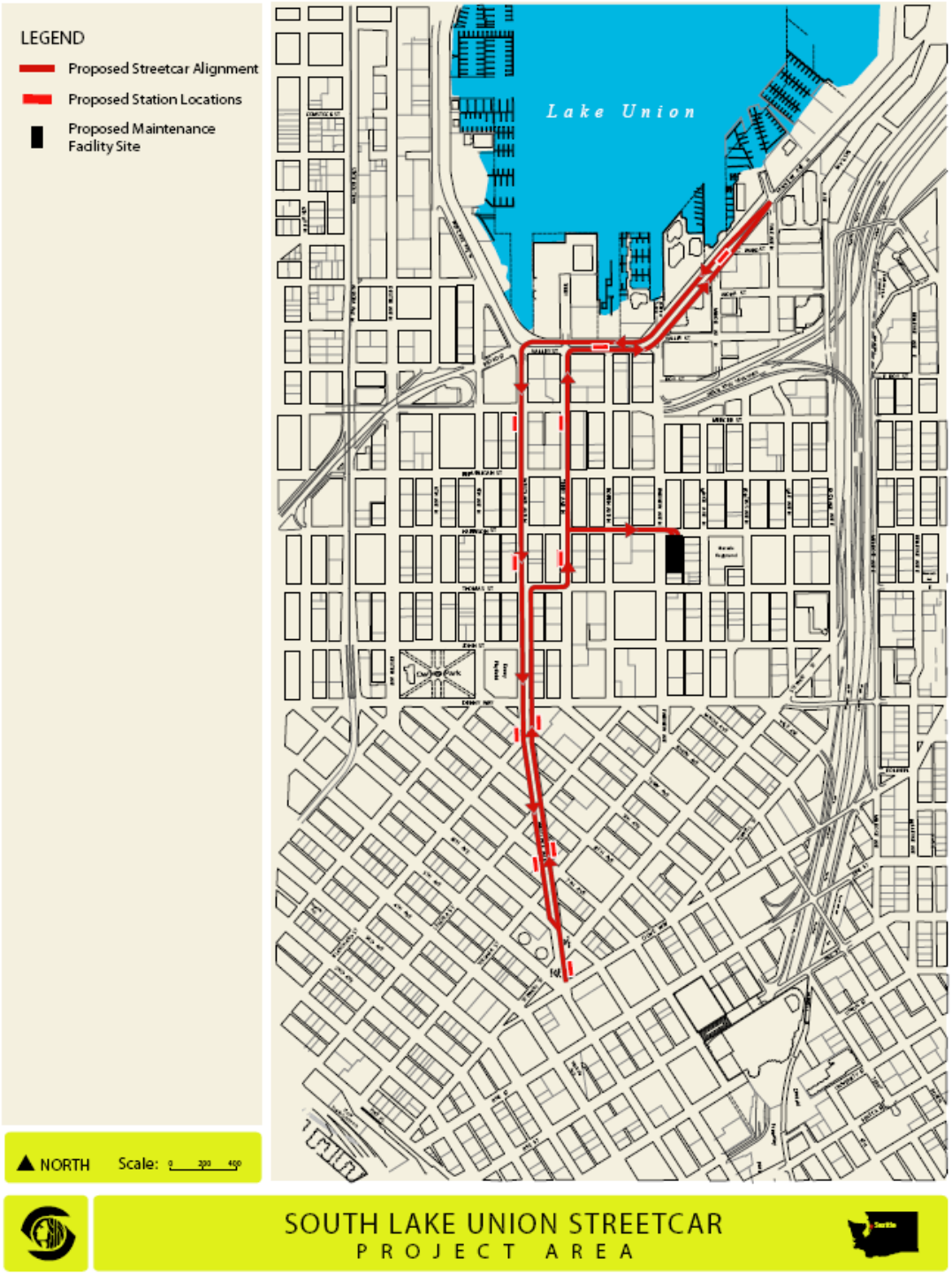


Exhibit 5-13. Streetcar Route

Westlake Avenue will be converted to two-way traffic operation south of Valley Street in conjunction with the streetcar operations, while Ninth Avenue will be converted as part of a separate City project. Portions of the route will be within mixed traffic and the streetcar will also have dedicated traffic signal phases, which will reduce vehicular capacity at some signalized intersections within the study area. The streetcar will, however, provide a direct connection between South Lake Union and the downtown bus/light rail tunnel and the monorail. Thus transit services are greatly enhanced by the new streetcar.

The second No Action assumption with major impacts to the study area is the Alaskan Way Viaduct Replacement project. This project is projected to be completed by the design year 2030. Traffic patterns will be affected as a result of crossing opportunities at Thomas Street, Harrison Street, and Mercer Street. Also Mercer Street between Fifth and Dexter avenues will be converted to two-way operation. The existing Broad Street underpass will be eliminated as a result of the new lowered profile of Aurora Avenue. Access to Aurora Avenue within the study area will be limited to right-on/right-off movements at Roy Street, with an additional northbound right-turn exit at Republican Street.

5.2.1 2010 Traffic Volumes

Although the year 2010 population and employment forecasts show a high level of growth, the AM and PM screenline analyses indicate fairly low annual growth rates at 1.3 and 1.6 percent, respectively. Exhibit 5-14 depicts the screenline volumes and annual average growth rates entering and exiting the study area boundaries.

Exhibit 5-14. Existing and 2010 No Action Screenline Comparison

Screenlines	AM Peak Hour			PM Peak Hour		
	2005 (vehicles)	2010 (vehicles)	Annual Growth Rate	2005 (vehicles)	2010 (vehicles)	Annual Growth Rate
East Screenline						
Eastbound	3,910	4,115	1.03%	6,180	6,620	1.39%
Westbound	4,735	4,940	0.85%	4,145	4,515	1.72%
West Screenline						
Eastbound	2,320	2,475	1.30%	3,080	3,235	0.99%
Westbound	2,655	2,705	0.37%	2,945	3,110	1.10%
North Screenline						
Northbound	2,030	2,315	2.66%	2,945	3,040	0.64%
Southbound	1,980	2,110	1.28%	1,960	2,190	2.24%
South Screenline						
Northbound	1,175	1,350	2.82%	2,670	3,025	2.53%
Southbound	2,640	2,855	1.58%	1,745	2,095	3.72%
TOTAL	21,445	22,865	1.29%	25,670	27,830	1.63%

The low screenline growth rates in comparison to the forecasted population and employment growth suggest several things are occurring: peak hour spreading, increased internal trips due to new mixed land uses, mode shifts to higher occupancy vehicles and/or transit, and mode shifts to non-motorized travel.

5.2.2 2010 Operations

The 2010 AM peak hour LOS operations in comparison with existing conditions are shown in Exhibit 5-15. (See also Exhibits TR-B-2 through TR-B-4.) Overall, operations within the study area would be slightly worse compared to 2005 conditions.

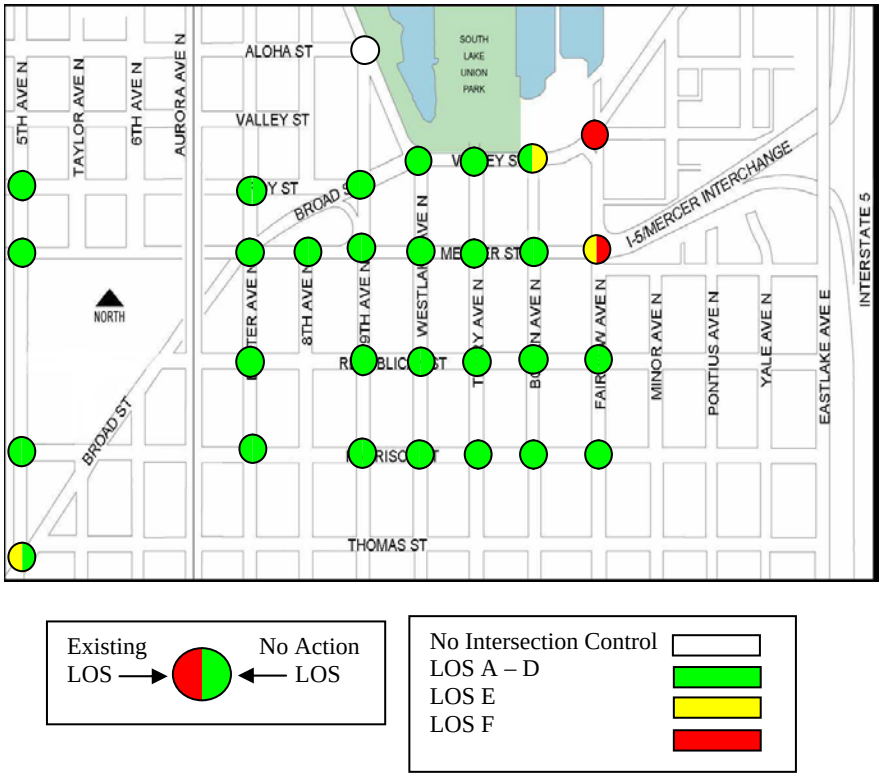


Exhibit 5-15. 2010 and Existing AM Peak Hour Intersection Operations

The stop-controlled leg of Boren Avenue North at Valley Street would exhibit a decline in LOS. This is a result of allowing a left-turn movement onto Valley Street. Left-turn movements incur higher delays than right-turns, as they need to yield to both directions of traffic on Valley Street. The Boren Street access is projected to operate at a LOS E.

The intersection of I-5/Mercer/Fairview would also decline to LOS F by the year 2010. The decline is a result of the increased traffic demand associated with the population and employment growth. Additional delay is also expected at intersections requiring an additional phase to

accommodate the SLU Streetcar; this includes the Valley Street intersections of Westlake Avenue North and Fairview Avenue North.

The 2010 PM peak-hour LOS operations in comparison with existing conditions are shown in Exhibit 5-16. (See also Exhibits TR-B-2 through TR-B-4.) Operations at the Valley Street/Terry Avenue North intersection improve as a result of the new traffic signal control installed with the streetcar project. Although the overall intersection delay improves, the east-west through-movements would experience additional delay created by the traffic signal. A new traffic signal at the Terry Avenue North and Mercer Street intersection, also installed to accommodate the streetcar crossing, will cause overall intersection operations to decline to LOS F. The decline is due to adding control delay to the Mercer Street traffic. Two other intersections along Mercer are projected to decline to LOS E due to the increase of background traffic: Fifth Avenue North and Ninth Avenue North. Likewise, the intersection of Dexter Avenue North/Republican Street will decline to LOS F by the Year 2010.

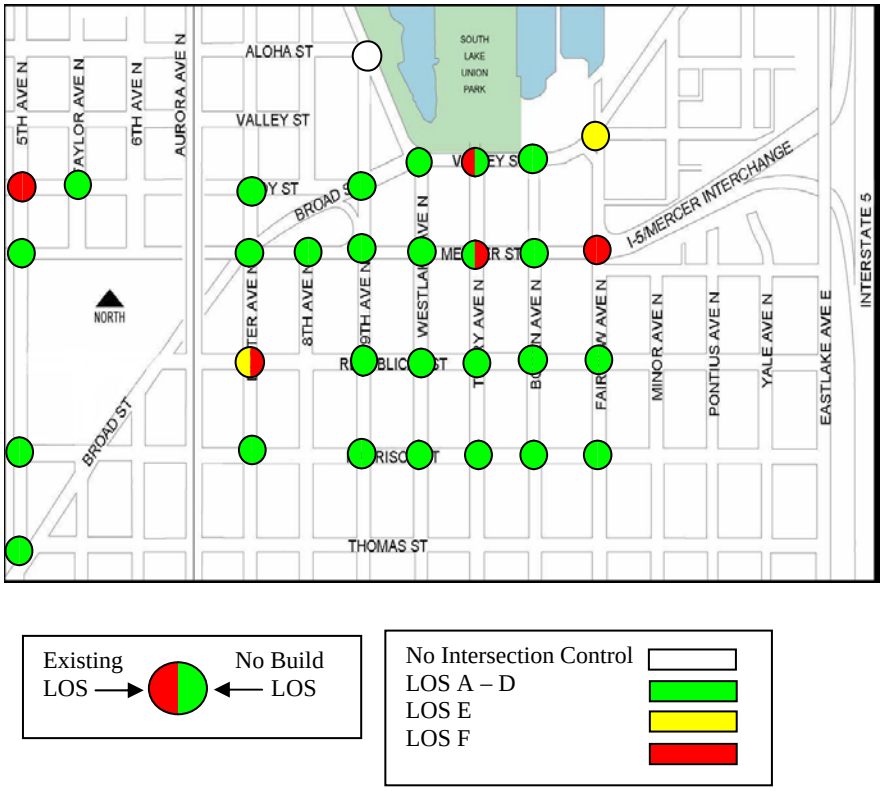


Exhibit 5-16. 2010 and Existing PM Peak Hour Intersection Operations

5.2.3 2030 Traffic Volumes

Annual average growth rates for 2030 as shown in Exhibit 5-17 continue to depict relatively low levels of traffic growth. An overall annual rate of less than 1.25 percent per year is forecasted for the area. The low screenline growth rates in comparison to the forecasted population and employment growth are attributed to peak-hour spreading, increased

internal trips due to new mixed land uses, mode shifts to higher occupancy vehicles and/or transit, and mode shifts to non-motorized travel.

5.2.4 2030 Operations

In 2030 operations throughout the study area would generally decline in comparison to existing conditions due to the projected population and employment growth within the SLU area, as well as increased through traffic.

The 2030 AM peak hour LOS operations in comparison with existing conditions are shown in Exhibit 5-18. (See also Exhibits TR-B8 through TR-B10.)

Exhibit 5-17. Existing and 2030 No Action Screenline Comparison

Screenlines	AM Peak Hour			PM Peak Hour		
	2005 (vehicles)	2030 (vehicles)	Annual Growth Rate	2005 (vehicles)	2030 (vehicles)	Annual Growth Rate
East Screenline						
Eastbound	3,910	4,835	0.85%	6,180	7,065	0.54%
Westbound	4,735	5,490	0.59%	4,145	5,280	0.97%
West Screenline						
Eastbound	2,320	2,865	0.85%	3,080	3,555	0.58%
Westbound	2,655	3,385	0.98%	2,945	3,275	0.43%
North Screenline						
Northbound	2,030	3,450	2.14%	2,940	4,460	1.68%
Southbound	1,980	3,920	2.77%	1,960	3,585	2.44%
South Screenline						
Northbound	1,175	1,800	1.72%	2,670	3,955	1.58%
Southbound	2,640	3,495	1.13%	1,745	2,880	2.02%
TOTAL	21,445	29,240	1.25%	25,665	34,055	1.14%

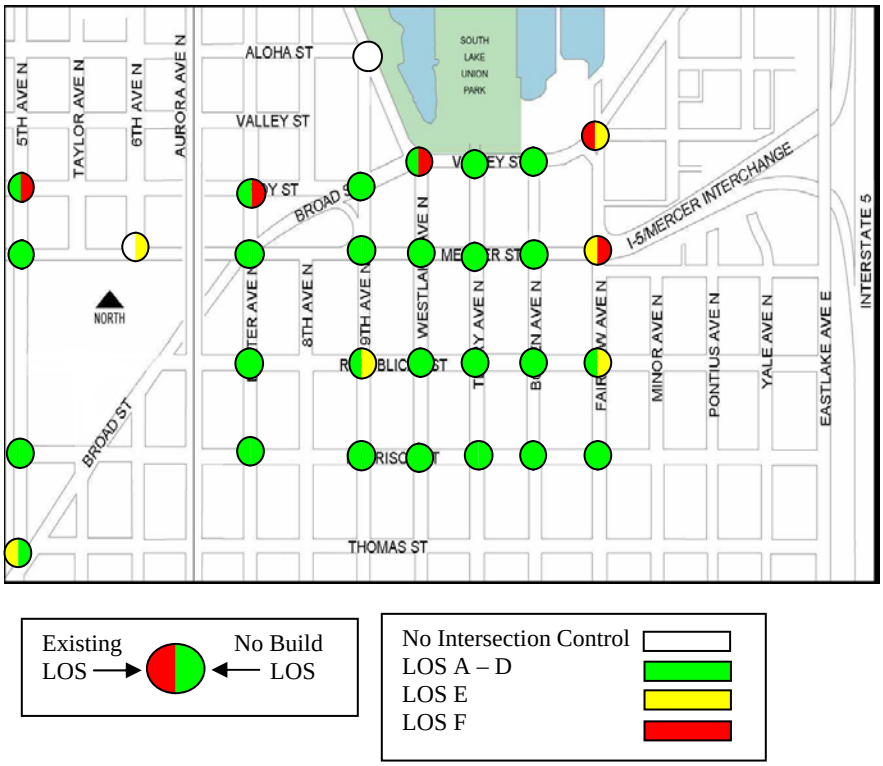


Exhibit 5-18. 2030 No Action and Existing AM Peak Hour Intersection Operations

During the AM peak hour, operations at intersections in the vicinity of the Aurora Avenue North access points at Roy Street/Dexter Avenue, Mercer Street/Sixth Avenue North, and Roy Street/Fifth Avenue North intersections would decline to LOS E/F operations. The intersection of Republican Street and Ninth Avenue North would also decline to LOS E. These intersections would experience an increase in volume over existing conditions due to the access routes and turn restrictions to and from Aurora Avenue North in addition to background traffic growth.

The Westlake Avenue North and Valley Street intersection would experience increased delays and would fall within the LOS F operational characteristics. The decline in level of service relates to the additional traffic signal phase required for the streetcar operations and expected growth in traffic volumes.

Operations at the Fairview intersections with Mercer Street and Republican Street would fall to LOS E/F by Year 2030. More vehicles would use these intersections due to the Republican Street connection to Aurora Avenue North in addition to the background traffic growth. With this shift of traffic, the Valley Street and Fairview intersection would improve slightly to LOS E conditions.

Other intersections within the study area mostly remain at similar LOS levels in comparison to existing operating conditions.

The 2030 PM peak hour LOS operations in comparison with existing conditions are shown in Exhibit 5-19. (See also Exhibits TR-B-8 through TR-B-10.). A majority of the intersections along Valley/Roy, Mercer, and Republican Streets are expected to operate at LOS E/F in the PM peak hour by year 2030.

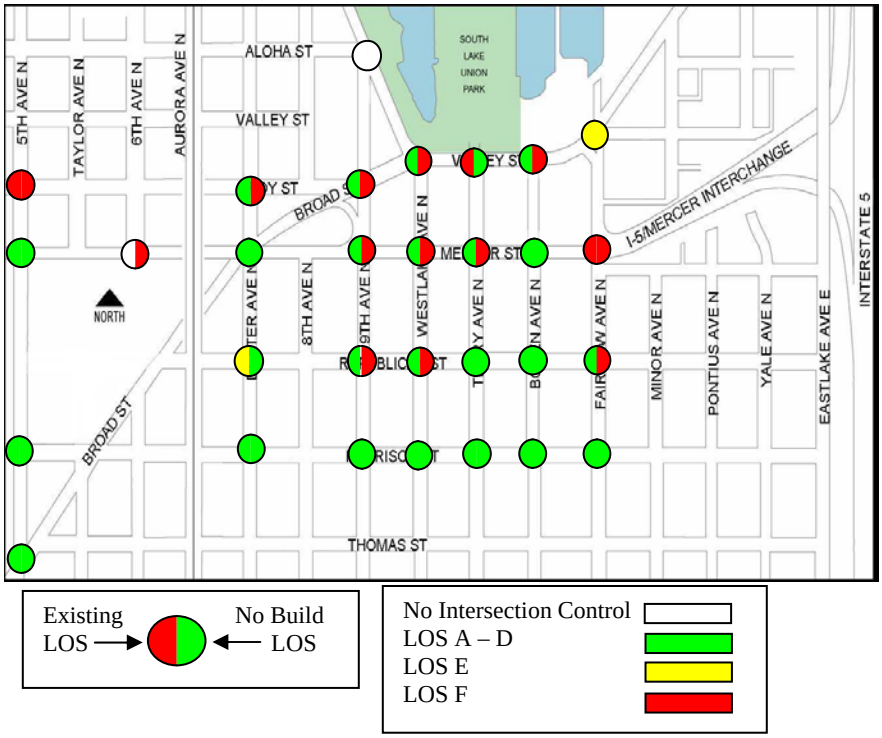


Exhibit 5-19. 2030 No Action and Existing PM Peak Hour Intersection Operations

The PM peak hour exhibits a similar pattern of declining operations along the Roy and Republican corridors as a result of the Aurora Avenue North access modifications. In addition, the Republican Street/Westlake Avenue North intersection would decline to LOS F during the PM peak hour. The Dexter Avenue North/Republican Street intersection would improve from LOS E to D. This is a result of the new traffic signal installed as part of the AWVRP. The current stop-controlled Republican Street approaches would incur less delay with the proposed traffic signal control.

Higher travel demand along the Mercer and Valley Street corridors would cause extensive delay at most of the study intersections along these roadways. The intersections with Westlake Avenue North and Ninth Avenue North are projected to experience the additional delay due to the higher travel demand coupled with the streetcar operations and revised traffic signal phasing. While the I-5 Ramp/Fairview intersection operates at LOS F in both existing and 2030 conditions, it is expected to experience a significant increase in vehicle delay by 2030 with the planned growth in the area.

5.2.5 Pedestrian and Bicycle Facilities

New pedestrian crossings will be constructed with the two new traffic signals as part of the South Lake Union Streetcar Project. These two signals along Terry Avenue at Valley and Mercer streets will provide some improved north-south pedestrian connectivity. No other improvements to the sidewalk condition or continuity are expected in this area.

Sidewalks would continue to be uneven and in disrepair and provide a poor pedestrian experience and do not link or provide amenities for current and planned transit connections such as the SLU streetcar. Pedestrian facilities would not be well defined or delineated creating safety issues for pedestrians. The lack of pedestrian and bicycle improvements in the study area would limit the system's ability to support any mode shift to transit and non-motorized modes.

Under the No Action Alternative, bicycle facilities are expected to remain fairly similar to existing conditions with the exception of bicycle lanes on Ninth Avenue, south of Mercer Street. These bike lanes would be provided as part of the Ninth Avenue conversion to two-way operations for this road segment. Some bicyclists may decide to not use Westlake or Terry avenues due to the streetcar tracks, but would have the option of using Ninth Avenue North. Overall, the bicycle facilities within the study area will continue to be limited.

5.2.6 Truck Facilities

No changes to the City of Seattle major truck streets are expected in the future. Truck traffic is expected to grow in this area with the expected increase in Ballard Interbay Northend Manufacturing and Industrial Center (BINMIC) operations and planned activities at Terminal 90 and 91. While truck volumes are expected to increase, they are expected to grow at a lower when compared to the general traffic growth within the South Lake Union area. Overall, with increased traffic congestion, truck travel times are expected to increase.

5.2.7 On-Street Parking

It is expected there would be no changes to the amount of on-street parking under the No Action Alternative.

In the future the City plans to use pay stations to manage on-street parking in the South Lake Union area. This system is convenient and consistent with other Seattle commercial districts, including downtown.

5.2.8 Transit Service

While the streetcar is included as part of the No Action condition, no other changes to transit service are expected in the future.

5.2.9 Safety

With an increase in the level of congestion, the number of accidents in the area is expected to increase. Although the total number of accidents increases, the accident rates are expected to be similar to current conditions as the proposed No Action transportation changes are not expected to create any new safety concerns or influence driver behaviors that would negatively effect safety.

6. Significant Unavoidable Adverse Effects

The purpose of the project is to improve local safety, access, and circulation within SLU for vehicles, bicycles, and pedestrians, and provide for more direct movement of traffic and freight through the corridor. This project would better accommodate anticipated urban density in the SLU area as well as anticipated regional and local traffic growth by improving the efficiency of the available grid network for all transportation modes.

During the opening year 2010, AM peak-hour travel times along Mercer Street are projected to improve with the direct east-west route along Mercer Street. Some PM peak-hour travel times, however, would increase slightly as a result of the project. The slightly longer 2010 PM peak-hour travel times are not considered significant in the context of overall travel times for traffic using this corridor.

The Mercer Street improvements would complement the travel patterns created by the revised Aurora Avenue North ramps and crossings, which will be completed by the design year 2030 as part of the Alaskan Way Viaduct and Replacement Project. Intersection operations and travel times would be similar to or better than No Action conditions during the design year. In both AM and PM peak hours, the Build condition would accrue a travel time savings along the more direct westbound route on Mercer Street. In the AM peak hour, the eastbound travel times would be slightly worse than in the No Action condition, but are not considered a significant impact as the Build Alternative's westbound travel times exhibit a greater savings, thereby creating a net benefit to the corridor during the morning peak hour. In the PM peak hour, eastbound travel times are expected to be similar between the Build and No Action conditions.

Although the levels of congestion in the Build and No Action scenarios are projected to be similar, the benefits to the area include a transportation system that removes barriers and improves local access and circulation for cars, trucks, pedestrians, and bicycles. It supports the City of Seattle's goals to encourage higher shares of pedestrian, bicycle, and transit modes for trips within, to, and through the South Lake Union urban center. Without this transportation infrastructure improvement, development would continue, but limited access, safety issues, and circuitous travel would continue.

7. References

Cambridge Systematics, Inc. December 2004. Draft Report, Seattle Travel Model Forecasts, 2030 Future Baseline.

CH2M HILL. 2006. *Preliminary Draft Basis of Design Report*. Prepared for Seattle Department of Transportation. February 2006.

Parsons Brinckerhoff Quade & Douglas, Inc. (PBQD). March 24, 2005. *South Lake Union Streetcar Project, Transportation Technical Report*. Prepared for SDOT.

PBQD. June 2004. *South Lake Union Transportation Study*. Prepared for SDOT.

Seattle Department of Transportation (SDOT). June 2005. *Freight Mobility Strategic Action Plan*.

Transportation Research Board. 2000. *Highway Capacity Manual*.

Washington State Department of Transportation (WSDOT). 2005. *Environmental Procedures Manual*. M31-11.

WSDOT. December 2005. *Freight and Goods Transportation System (FGTS) 2005 Update.*

Appendix TR-A
Accident Data

Exhibit A-1 - Local Arterial and Intersection Accident Statistics within Mercer Corridor study area

Three Year Accident History: January 1, 2001 through December 31, 2003

Intersection/Roadway Segment	Angle	Backing	Head On	Object Off Roadway	Object On Roadway	Overturn	Parked Vehicle	Pedalcyclist in Pedestrianway	Pedalcyclist in Trafficway	Pedestrian	Rear End	Side Swipe	*Side Swipe	Side Swipe Opposite	T-Bone	No Diagram	3-Year TOTAL
3RD AVE N AND MERCER ST - CITY SIGNAL	0	0	0	0	0	0	0	0	0	2	0	2	3	0	0	0	7
4TH AVE N AND BROAD ST - CITY SIGNAL	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	3
4TH AVE N AND MERCER ST - CITY SIGNAL	4	0	0	0	0	0	0	0	1	0	0	0	3	0	0	0	8
4TH AVE N BETWEEN REPUBLICAN ST AND MERCER ST	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
4TH AVE N AND ROY ST - CITY SIGNAL	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2
5TH AVE N AND BROAD ST - CITY SIGNAL	4	0	0	0	0	0	0	1	0	1	1	1	2	0	0	0	10
5TH AVE N AND HARRISON ST - CITY SIGNAL	5	0	0	0	0	0	0	0	0	1	3	0	0	0	0	0	9
5TH AVE N AND JOHN ST - CITY SIGNAL	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
5TH AVE N AND MERCER ST - CITY SIGNAL	19	0	0	0	0	0	0	0	0	2	1	4	2	0	0	0	28
5TH AVE N AND REPUBLICAN ST - CITY SIGNAL	6	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	7
5TH AVE N AND ROY ST - CITY SIGNAL	0	0	0	0	0	0	0	0	0	0	0	10	4	0	0	0	14
5TH AVE N BETWEEN BROAD ST AND HARRISON ST	1	0	0	1	1	0	1	0	0	0	4	0	0	0	0	1	9
5TH AVE N BETWEEN HARRISON ST AND REPUBLICAN ST	1	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	4
5TH AVE N BETWEEN JOHN ST AND BROAD ST	1	0	1	0	1	1	0	0	0	0	2	0	0	0	0	0	6
5TH AVE N BETWEEN MERCER ST AND ROY ST	0	1	0	0	0	0	0	0	0	0	4	3	0	0	0	0	8
5TH AVE N BETWEEN REPUBLICAN ST AND MERCER ST	2	1	0	0	1	0	0	0	0	0	4	0	0	0	0	0	8
6TH AVE N AND HARRISON ST - NO SIGNAL	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
6TH AVE N BETWEEN DEAD END AND ROY ST	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
6TH AVE N BETWEEN HARRISON ST AND REPUBLICAN ST	1	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	4
8TH AVE N AND HARRISON ST - NO SIGNAL	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
8TH AVE N AND REPUBLICAN ST - NO SIGNAL	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
8TH AVE N AND VALLEY ST - NO SIGNAL	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
8TH AVE N AND WESTLAKE S AVE N - NO SIGNAL	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
8TH AVE N BETWEEN REPUBLICAN ST AND MERCER ST	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
8TH AVE N BETWEEN ROY ST AND VALLEY ST	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2
9TH AVE N AND BROAD ST - CITY SIGNAL	16	0	0	0	0	0	0	0	0	0	0	1	5	0	0	1	23
9TH AVE N AND HARRISON ST - CITY SIGNAL	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
9TH AVE N AND MERCER ST - CITY SIGNAL	13	0	0	0	0	0	0	0	0	0	0	7	5	0	0	0	25
9TH AVE N AND REPUBLICAN ST - CITY SIGNAL	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
9TH AVE N AND REPUBLICAN ST - NO SIGNAL	15	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	17
9TH AVE N AND WESTLAKE AVE N - NO SIGNAL	2	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	5
9TH AVE N BETWEEN BROAD ST AND WESTLAKE AVE N	0	1	1	0	0	0	2	0	0	0	5	0	0	0	0	0	9
9TH AVE N BETWEEN HARRISON ST AND REPUBLICAN ST	2	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	4
9TH AVE N BETWEEN MERCER ST AND BROAD ST	0	0	0	1	1	0	0	0	0	0	6	0	0	0	0	0	8
9TH AVE N BETWEEN REPUBLICAN ST AND MERCER ST	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
AURORA AVE N AND HARRISON ST - NO SIGNAL	5	0	0	2	0	0	0	0	0	0	1	1	2	0	0	0	11
AURORA AVE N AND REPUBLICAN ST - NO SIGNAL	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3
AURORA AVE N AND ROY ST - NO SIGNAL	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	2
AURORA AVE N BETWEEN AURORA AV NB OFF RP AND AURORA AV SB OFF RP	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
AURORA AVE N BETWEEN AURORA AV SB OFF RP AND ROY ST	1	0	0	0	0	0	0	0	0	1	5	1	0	0	0	0	8
AURORA AVE N BETWEEN HARRISON ST AND REPUBLICAN ST	0	0	0	1	0	0	0	0	0	0	2	3	0	0	0	0	6
AURORA AVE N BETWEEN REPUBLICAN ST AND AURORA AV NB OFF RP	0	0	0	0	0	0	0	0	0	1	0	5	0	0	0	0	6
BOREN AVE N AND MERCER ST - NO SIGNAL	2	0	0	0	0	1	0	1	0	0	2	0	1	0	0	0	7
BOREN AVE N AND VALLEY ST - NO SIGNAL	14	0	1	0	0	0	0	0	0	0	1	0	5	0	0	0	21
BOREN AVE N BETWEEN HARRISON ST AND REPUBLICAN ST	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
BOREN AVE N BETWEEN MERCER ST AND VALLEY ST	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
BROAD ST AND BROAD ST EB OFF RP - NO SIGNAL	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2
BROAD ST AND HARRISON ST - NO SIGNAL	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
BROAD ST AND VALLEY ST - CITY SIGNAL	23	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	25
BROAD ST BETWEEN 4TH AVE N AND 5TH AVE N	0	1	0	0	1	0	0	0	0	1	10	2	0	0	0	0	15
BROAD ST BETWEEN 5TH AVE N AND TAYLOR AVE N	0	0	0	0	0	0	0	0	0	0	7	2	0	0	0	0	9
BROAD ST BETWEEN 9TH AVE N AND VALLEY ST	2	0	0	0	0	0	0	0	0	0	4	0	0	1	0	0	7

Exhibit A-1 - Local Arterial and Intersection Accident Statistics within Mercer Corridor study area

Three Year Accident History: January 1, 2001 through December 31, 2003

Intersection/Roadway Segment	Angle	Backing	Head On	Object Off Roadway	Object On Roadway	Overturn	Parked Vehicle	Pedalcyclist in Pedestrianway	Pedalcyclist in Trafficway	Pedestrian	Rear End	Side Swipe	*Side Swipe	Side Swipe Opposite	T-Bone	No Diagram	3-Year TOTAL
BROAD ST BETWEEN BROAD ST EB OFF RP AND 9TH AVE N	0	1	0	1	0	0	0	0	0	0	9	1	0	0	0	0	12
BROAD ST BETWEEN BROAD ST EB ON RP AND BROAD ST EB OFF RP	0	0	0	0	1	0	0	0	0	0	0	2	0	0	0	0	3
BROAD ST BETWEEN HARRISON ST AND BROAD ST EB ON RP	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	2
BROAD ST BETWEEN TAYLOR AVE N AND HARRISON ST	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	2
DEXTER AVE N AND HARRISON ST - CITY SIGNAL	4	0	0	0	0	0	0	0	4	0	0	1	0	0	0	0	9
DEXTER AVE N AND MERCER ST - CITY SIGNAL	8	0	0	0	2	0	0	0	1	1	1	2	3	0	0	0	18
DEXTER AVE N AND REPUBLICAN ST - NO SIGNAL	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
DEXTER AVE N AND ROY ST - CITY SIGNAL	3	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	5
DEXTER AVE N BETWEEN HARRISON ST AND REPUBLICAN ST	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	2
DEXTER AVE N BETWEEN MERCER ST AND BROAD ST	1	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	3
DEXTER AVE N BETWEEN REPUBLICAN ST AND MERCER ST	0	1	0	0	0	0	1	0	0	0	1	0	0	0	0	0	3
FAIRVIEW AVE N AND FAIRVIEW PL N - NO SIGNAL	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
FAIRVIEW AVE N AND HARRISON ST - CITY SIGNAL	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
FAIRVIEW AVE N AND I5 FAIRVIEW NB OF - NO SIGNAL	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
FAIRVIEW AVE N AND MERCER ST - CITY SIGNAL	8	0	0	0	0	1	0	0	0	1	1	6	3	0	0	0	20
FAIRVIEW AVE N AND REPUBLICAN ST - CITY SIGNAL	9	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	11
FAIRVIEW AVE N AND ROY ST - NO SIGNAL	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
FAIRVIEW AVE N AND VALLEY ST - CITY SIGNAL	5	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	10
FAIRVIEW AVE N BETWEEN FAIRVIEW PL N AND ALOHA ST	5	0	2	1	0	0	0	0	1	0	4	0	0	0	0	0	13
FAIRVIEW AVE N BETWEEN HARRISON ST AND REPUBLICAN ST	0	0	0	0	0	0	2	0	0	0	2	2	0	0	0	0	6
FAIRVIEW AVE N BETWEEN I5 FAIRVIEW NB OF AND ROY ST	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	4
FAIRVIEW AVE N BETWEEN MERCER ST AND I5 FAIRVIEW NB OF	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	3
FAIRVIEW AVE N BETWEEN REPUBLICAN ST AND MERCER ST	0	0	1	1	1	0	0	0	0	0	7	2	0	1	0	0	13
FAIRVIEW AVE N BETWEEN ROY ST AND VALLEY ST	1	0	1	0	0	0	0	0	0	0	4	2	0	0	0	0	8
FAIRVIEW AVE N BETWEEN VALLEY ST AND FAIRVIEW PL N	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
HARRISON ST AND MINOR AVE N - NO SIGNAL	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
HARRISON ST AND TERRY AVE N - NO SIGNAL	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
HARRISON ST AND WESTLAKE AVE N - CITY SIGNAL	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11
HARRISON ST BETWEEN 5TH AVE N AND TAYLOR AVE N	0	0	1	2	1	0	0	0	0	0	1	0	0	0	0	0	5
HARRISON ST BETWEEN 6TH AVE N AND AURORA AVE N	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	3
HARRISON ST BETWEEN AURORA AVE N AND DEXTER AVE N	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
HARRISON ST BETWEEN BOREN AVE N AND FAIRVIEW AVE N	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	2
HARRISON ST BETWEEN FAIRVIEW AVE N AND MINOR AVE N	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2
HARRISON ST BETWEEN WESTLAKE AVE N AND TERRY AVE N	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
JOHN ST AND TAYLOR AVE N - NO SIGNAL	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
JOHN ST BETWEEN 4TH AVE N AND 5TH AVE N	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	4
JOHN ST BETWEEN 5TH AVE N AND TAYLOR AVE N	0	1	0	0	3	0	0	0	0	0	0	0	0	0	0	0	4
MERCER ST AND TAYLOR AVE N - NO SIGNAL	3	0	0	0	0	0	0	0	0	1	0	1	5	0	0	0	10
MERCER ST AND TERRY AVE N - NO SIGNAL	13	0	0	0	0	0	0	0	1	1	1	2	6	0	1	1	26
MERCER ST AND WESTLAKE AVE N - CITY SIGNAL	23	0	0	0	0	0	0	1	1	0	2	2	6	0	0	0	35
MERCER ST BETWEEN 3RD AVE N AND 4TH AVE N	0	0	0	1	0	0	1	0	0	0	1	2	0	0	0	0	5
MERCER ST BETWEEN 4TH AVE N AND 5TH AVE N	0	0	0	0	0	0	0	0	0	0	5	3	0	0	0	0	8
MERCER ST BETWEEN 5TH AVE N AND TAYLOR AVE N	1	0	0	1	0	0	0	0	0	0	2	14	4	0	0	0	22
MERCER ST BETWEEN 8TH AVE N AND BROAD ST EB OFF RP	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
MERCER ST BETWEEN 9TH AVE N AND WESTLAKE AVE N	1	0	0	2	0	0	0	0	0	0	2	0	0	1	0	0	6
MERCER ST BETWEEN BOREN AVE N AND FAIRVIEW AVE N	3	1	0	0	1	0	0	1	0	0	15	9	0	0	0	0	30
MERCER ST BETWEEN BROAD ST EB OFF RP AND 9TH AVE N	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	4
MERCER ST BETWEEN DEXTER AVE N AND 8TH AVE N	0	0	0	0	0	0	0	0	0	0	3	0	0	1	0	0	4
MERCER ST BETWEEN FAIRVIEW AVE N AND MINOR AVE N	0	0	0	0	0	0	0	0	0	0	3	1	0	0	0	0	4
MERCER ST BETWEEN TAYLOR AVE N AND DEXTER AVE N	0	0	0	0	0	0	0	0	0	0	12	1	0	0	0	0	13
MERCER ST BETWEEN TERRY AVE N AND BOREN AVE N	0	0	0	1	0	0	0	1	0	0	3	5	4	0	0	0	14
MERCER ST BETWEEN WESTLAKE AVE N AND TERRY AVE N	0	0	0	0	0	0	0	0	0	0	6	10	3	0	1	0	20

Exhibit A-1 - Local Arterial and Intersection Accident Statistics within Mercer Corridor study area

Three Year Accident History: January 1, 2001 through December 31, 2003

Intersection/Roadway Segment	Angle	Backing	Head On	Object Off Roadway	Object On Roadway	Overturn	Parked Vehicle	Pedalcyclist in Pedestrianway	Pedalcyclist in Trafficway	Pedestrian	Rear End	Side Swipe	*Side Swipe	Side Swipe Opposite	T-Bone	No Diagram	3-Year TOTAL
MINOR AVE N AND REPUBLICAN ST - NO SIGNAL	3	0	0	0	0	0	1	0	0	1	0	1	0	0	0	0	6
REPUBLICAN ST AND TERRY AVE N - NO SIGNAL	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
REPUBLICAN ST AND WESTLAKE AVE N - CITY SIGNAL	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
REPUBLICAN ST AND WESTLAKE AVE N - NO SIGNAL	13	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	15
REPUBLICAN ST BETWEEN 4TH AVE N AND 5TH AVE N	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	2
REPUBLICAN ST BETWEEN 5TH AVE N AND DEAD END	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
REPUBLICAN ST BETWEEN 6TH AVE N AND AURORA AVE N	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
REPUBLICAN ST BETWEEN 8TH AVE N AND 9TH AVE N	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	2
REPUBLICAN ST BETWEEN 9TH AVE N AND WESTLAKE AVE N	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	3
REPUBLICAN ST BETWEEN AURORA AVE N AND DEXTER AVE N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
REPUBLICAN ST BETWEEN BOREN AVE N AND FAIRVIEW AVE N	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
REPUBLICAN ST BETWEEN FAIRVIEW AVE N AND MINOR AVE N	0	2	0	1	0	0	4	0	0	0	0	0	1	0	0	0	8
REPUBLICAN ST BETWEEN WESTLAKE AVE N AND TERRY AVE N	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	3
ROY ST AND TAYLOR AVE N - NO SIGNAL	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
ROY ST BETWEEN 4TH AVE N AND 5TH AVE N	0	0	0	0	0	0	1	0	0	0	1	3	0	0	0	0	5
ROY ST BETWEEN 6TH AVE N AND AURORA AVE N	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
ROY ST BETWEEN 8TH AVE N AND 9TH AVE N	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	3
ROY ST BETWEEN AURORA AVE N AND DEXTER AVE N	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
ROY ST BETWEEN TAYLOR AVE N AND 6TH AVE N	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	3
TAYLOR AVE N BETWEEN BROAD ST AND HARRISON ST	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
TAYLOR AVE N BETWEEN JOHN ST AND THOMAS ST	0	0	0	0	0	0	6	0	0	0	0	1	0	0	0	0	7
TAYLOR AVE N BETWEEN MERCER ST AND ROY ST	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	2
TAYLOR AVE N BETWEEN THOMAS ST AND BROAD ST	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2
TERRY AVE N AND VALLEY ST - NO SIGNAL	19	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	21
TERRY AVE N BETWEEN HARRISON ST AND REPUBLICAN ST	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
TERRY AVE N BETWEEN MERCER ST AND VALLEY ST	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
THOMAS ST BETWEEN 5TH AVE N AND TAYLOR AVE N	0	1	0	0	2	0	1	0	0	0	0	0	0	0	0	0	4
VALLEY ST BETWEEN BOREN AVE N AND FAIRVIEW AVE N	1	0	0	1	1	0	1	0	0	0	4	5	1	0	0	0	14
VALLEY ST BETWEEN BROAD ST AND TERRY AVE N	0	0	0	2	0	0	1	0	0	0	17	5	1	0	0	0	26
VALLEY ST BETWEEN TERRY AVE N AND BOREN AVE N (continued)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
WESTLAKE AVE N BETWEEN 9TH AVE N AND 8TH S AVE N	3	0	0	1	1	0	1	0	0	0	4	1	0	0	0	0	11
WESTLAKE AVE N BETWEEN HARRISON ST AND REPUBLICAN ST	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
WESTLAKE AVE N BETWEEN MERCER ST AND VALLEY ST	1	1	0	0	2	0	1	0	0	0	3	1	0	0	0	1	10
WESTLAKE AVE N BETWEEN REPUBLICAN ST AND MERCER ST	0	0	0	0	3	0	0	0	0	0	4	2	0	0	0	0	9
WESTLAKE AVE N BETWEEN VALLEY ST AND 9TH AVE N	1	0	1	0	1	0	1	0	0	1	3	5	2	1	0	0	16

Notes:

*Side Swipe - Accidents involve combination of same direction sideswipe and angle collision

Exhibit TR-A-2: Accident History for the Freeway System

WSDOT Transportation Data Office
January 1, 2001 to December 31, 2003

MARCH 18, 2005

Ms. Amy Elliott
CH2M Hill

Re: Collision Data

Dear Ms. Elliott:

In response to your request of March 17, we have prepared a history of reported collisions that occurred on State Route 5 (milepost 165.00 to 170.00) for the period of January 1, 2001 through December 31, 2003. For reference I've included the diagram data codes for decoding the "Diagram Analysis Data" column of the history, and a key for decoding the headings of the history. Also included per your request, the following is a listing of High Accident Locations (HALs) within the prescribed locations for the 2005-2007 biennium. There were no High Accident Corridors (HACs) or Pedestrian Accident Locations (PALs) for the 2005-2007 biennium.

HAL				
STATE ROUTE	RRT	RRQ	BEG SRMP	END SRMP
5			164.90	167.52
5	Q1	16606	0.00	0.40
5	S1	16640	0.02	0.62
5	P1	16642	0.00	0.48
5	R1	16716	0.00	0.54
5	S1	16898	0.00	0.39

Federal law 23 United States Code Section 409 governs use of the data you requested. Under this law, data maintained for purposes of evaluating potential highway safety enhancements:

> " . . . *shall not be subject to discovery* or admitted into evidence in a federal or state court proceeding *or considered for other purposes in any action for damages* arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data." [*Emphasis* added.]

The Washington State Department of Transportation (WSDOT) is releasing this data to you with the understanding that you will not use this data contrary to the restrictions in Section 409, which means you will not use this data in discovery or as evidence at trial in any action for damages against the WSDOT, the State of Washington, or any other jurisdiction involved in the locations mentioned in the data.

If you should attempt to use this data in an action for damages against WSDOT, the State of Washington, or any other jurisdiction involved in the locations mentioned in the data, these entities expressly reserve the right, under Section 409, to object to the use of the data, including any opinions drawn from the data.

If we may be of any further assistance, please contact Mr. Dan Davis, Collision Data and Analysis Business Supervisor, Collision Data and Analysis Branch at (360) 570-2451, or e-mail address davisd@wsdot.wa.gov.

Sincerely,

Brian Limotti
Collision Data and Analysis Assistant Branch Manager
Transportation Data Office
Strategic Planning & Programming Office

BL/DMD:kds

Enclosures

cc: Pat Foley, WSDOT Northwest Region

Ramp and Mainline Accident Summary (2000-2003) at Mercer Interchange

TABLE 1 - *INBOUND* ACCIDENTS AT MERCER INTERCHANGE

	Severity			Type of Accident						
	FAT	INJ	PDO	Rear-end	Angle	Sideswipe	Pedestrian	Fixed Object	Other	TOTAL
Mercer/Fairview Intersection*	0	13	23	19	9	11	1	1	10	51
Weave Area	0	3	8	10	0	0	0	0	1	11
Southbound Ramp	0	9	16	18	1	1	0	2	3	25
Northbound Ramp	1	11	22	26	1	0	1	6	0	34
Southbound Mainline Influence Area	0	19	32	41	1	3	0	4	2	51
Northbound Mainline Influence Area	0	9	23	21	0	2	0	9	0	32
Total*	1	64	124	135	12	17	2	22	16	196

*Summation of Severity will not equate due to limited city accident records at the intersection

TABLE 2 - *OUTBOUND* ACCIDENTS AT MERCER INTERCHANGE

	Severity			Type of Accident						
	FAT	INJ	PDO	Rear-end	Angle	Side swipe	Pedestrian	Fixed Object	Other	TOTAL
Weave Area	0	1	3	4	0	0	0	0	0	4
Southbound Ramp	1	13	28	9	0	3	0	29	1	42
Northbound Ramp	0	14	29	13*	9*	11*	0	9*	1	43
Southbound Mainline Influence Area (includes HOV Lane)	1	2	8	0	1	4	0	6	0	11
Northbound Mainline Influence Area	0	3	8	3	2	2	0	3	1	11
Total	2	33	76	29	12	20	0	47	3	111

*Majority of accidents occurring in the AM when express lanes are closed

NOTE: Influence areas are defined as the distance between the ramp merge/diverge point to the next interchange.

TABLE 3 - *INBOUND* MAINLINE INFLUENCE AREA SUMMARY

	Total	Percent		Total	Percent
Southbound I-5 Mainline Influence Area (MP 167.12 – 167.55)	51	32.2	Northbound I-5 Mainline Influence Area (MP 165.98 – 166.58)	32	16.4
I-5 Southbound Other (4 Lanes)	107	67.8	I-5 Northbound Other (4 Lanes)	163	83.6
Total	158	100.0	Total	195	100.0

TABLE 4 – *OUTBOUND* MAINLINE INFLUENCE AREA SUMMARY

	Total	Percent		Total	Percent
Southbound I-5 Mainline Influence Area (MP 166.15 – 166.58)	11	8.0	Northbound I-5 Mainline Influence Area (MP 167.07 – 167.43)	11	21.2
I-5 Southbound Other (4 Lanes)	127	92.0	I-5 Northbound Other (4 Lanes)	41	78.8
Total	138	100.0	Total	52	100.0

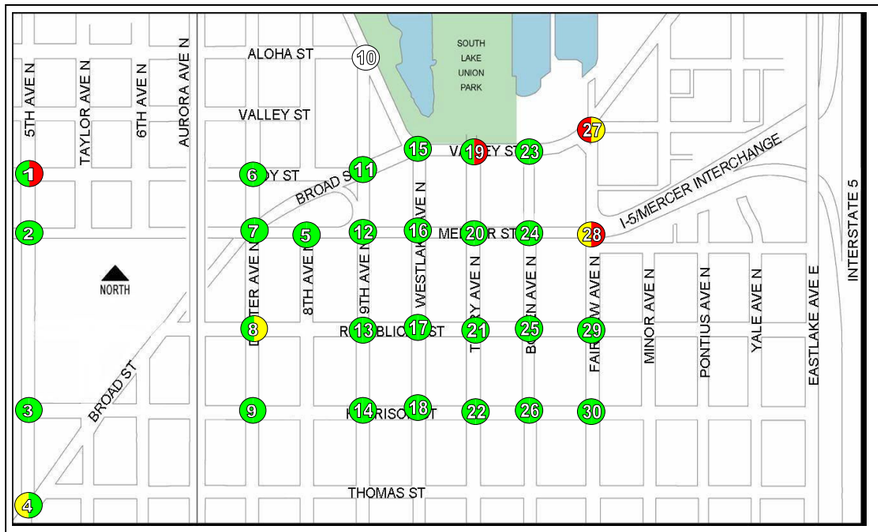
TABLE 5 - NORTHBOUND I-5 MAINLINE ACCIDENTS

	Severity			Type of Accident						
	FAT	INJ	PDO	Rear-end	Angle	Side swipe	Pedestrian	Fixed Object	Other	TOTAL
Olive Way Off Ramp to Mercer St Off Ramp (MP 165.98 – 166.58)	1	68	126	121	21	25	2	18	8	195
Mercer St Off Ramp to Mercer St On Ramp (MP 166.59 – 167.06	0	52	102	96	15	16	1	21	5	154
Mercer St On Ramp to Lakeview Off Ramp (MP 166.07 – 167.43)	0	23	29	27	6	7	0	10	2	52
Total	1	143	257	244	42	48	3	49	15	401

TABLE 6 - SOUTHBOUND I-5 MAINLINE ACCIDENTS

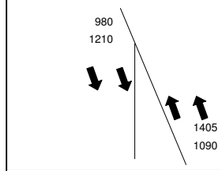
	Severity			Type of Accident						
	FAT	INJ	PDO	Rear-end	Angle	Side swipe	Pedestrian	Fixed Object	Other	TOTAL
Lakeview On Ramp to Mercer St Off Ramp (MP 167.12 – 167.55)	0	57	101	115	8	16	0	14	5	158
Mercer St Off Ramp to Denny Way Off Ramp (MP 166.61 – 167.11)	0	63	124	132	15	21	0	16	3	187
Denny Way Off Ramp to Mercer St On Ramp (MP 166.59 – 166.60)	0	2	1	2	0	0	0	0	1	3
Mercer St On Ramp to Yale On Ramp (MP 166.15 – 166.58)	1	44	93	90	13	22	0	10	3	138
Total	1	166	319	339	36	59	0	40	12	486

Appendix TR-B
Traffic Analysis Exhibits



10 Westlake Ave N & 9th Ave N

	Control	Delay (s)	LOS
Existing AM	N/A	N/A	N/A
Existing PM	N/A	N/A	N/A



LEGEND

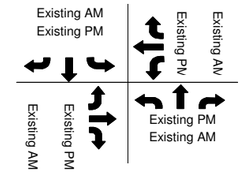
Turning Movement Direction

Existing AM LOS Existing PM LOS

- Intersection not applicable *
- LOS A - D
- LOS E
- LOS F

* Free movement intersection (LOS not applicable)

Peak Hour Turning Volumes/Channelization



NOTES

Intersection Number

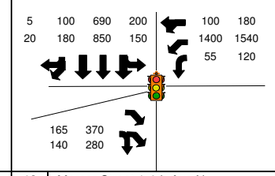
LOS: Level of Service
TWSC Two-way stop controlled intersection
AWSC All-way stop controlled intersection

\# In the non-peak direction, on-street parking is allowed therefore only one travel lane

NOTE: This analysis is based on the Synchro software package. For signalized intersections, results are reported based on Synchro methodology. For unsignalized intersections, results are reported for the worst minor street approach based on the Highway Capacity Manual.

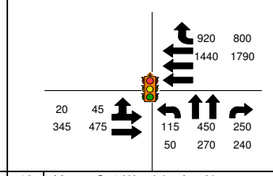
11 Broad St / Roy St & 9th Ave N

	Control	Delay (s)	LOS
Existing AM	Signal	29	C
Existing PM	Signal	39	D



15 Valley St & Westlake Ave N

	Control	Delay (s)	LOS
Existing AM	Signal	16	B
Existing PM	Signal	13	B

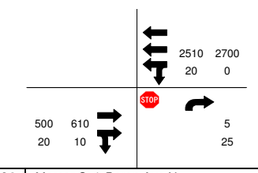


19 Valley St & Terry Ave N

	Control	Delay (s)	LOS
Existing AM	TWSC	21	C
Existing PM	TWSC	174	F

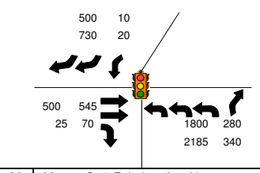
23 Valley St & Boren Ave N

	Control	Delay (s)	LOS
Existing AM	TWSC	11	B
Existing PM	TWSC	11	B



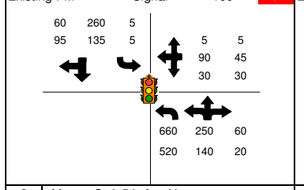
27 Valley St & Fairview Ave N

	Control	Delay (s)	LOS
Existing AM	Signal	110	F
Existing PM	Signal	77	E



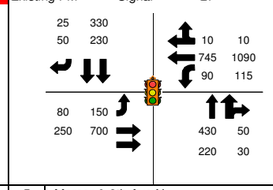
1 Roy St & 5th Ave N

	Control	Delay (s)	LOS
Existing AM	Signal	37	D
Existing PM	Signal	109	F



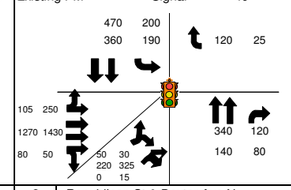
4 Broad St & 5th Ave N

	Control	Delay (s)	LOS
Existing AM	Signal	56	E
Existing PM	Signal	27	C



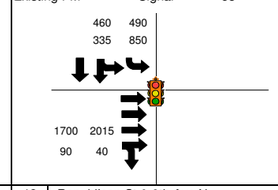
7 Mercer St, Dexter Ave N & Broad St

	Control	Delay (s)	LOS
Existing AM	Signal	40	D
Existing PM	Signal	49	D



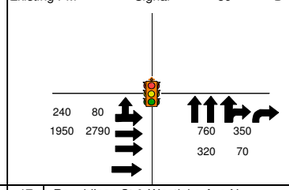
12 Mercer Street & 9th Ave N

	Control	Delay (s)	LOS
Existing AM	Signal	11	B
Existing PM	Signal	53	D



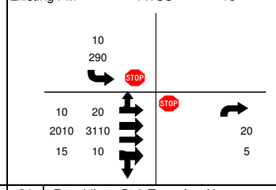
16 Mercer St & Westlake Ave N

	Control	Delay (s)	LOS
Existing AM	Signal	12	B
Existing PM	Signal	36	D



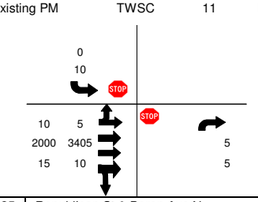
20 Mercer St & Terry Ave N

	Control	Delay (s)	LOS
Existing AM	TWSC	10	A
Existing PM	TWSC	16	C



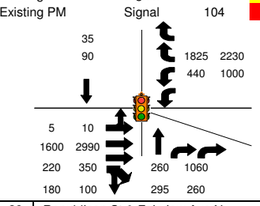
24 Mercer St & Boren Ave N

	Control	Delay (s)	LOS
Existing AM	TWSC	9	A
Existing PM	TWSC	11	B



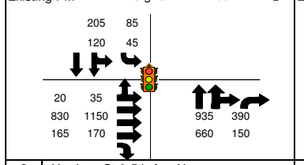
28 Mercer St & Fairview Ave N

	Control	Delay (s)	LOS
Existing AM	Signal	77	E
Existing PM	Signal	104	F



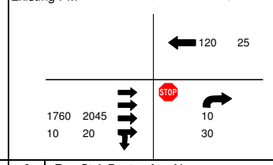
2 Mercer St & 5th Ave N

	Control	Delay (s)	LOS
Existing AM	Signal	28	C
Existing PM	Signal	53	D



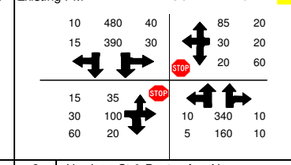
5 Mercer & 8th Ave N

	Control	Delay (s)	LOS
Existing AM	N/A	10	A
Existing PM	N/A	10	A



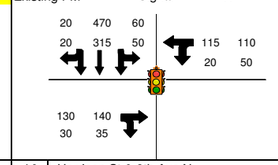
8 Republican St & Dexter Ave N

	Control	Delay (s)	LOS
Existing AM	TWSC	19	C
Existing PM	TWSC	40	E



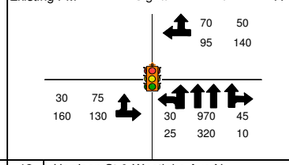
13 Republican St & 9th Ave N

	Control	Delay (s)	LOS
Existing AM	Signal	9	A
Existing PM	Signal	17	B



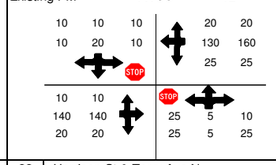
17 Republican St & Westlake Ave N

	Control	Delay (s)	LOS
Existing AM	Signal	21	C
Existing PM	Signal	8	A



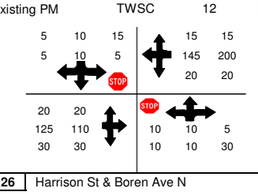
21 Republican St & Terry Ave N

	Control	Delay (s)	LOS
Existing AM	TWSC	12	B
Existing PM	TWSC	12	B



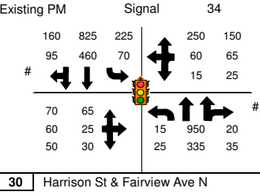
25 Republican St & Boren Ave N

	Control	Delay (s)	LOS
Existing AM	TWSC	14	B
Existing PM	TWSC	12	B



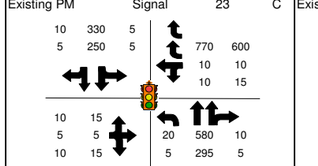
29 Republican St & Fairview Ave N

	Control	Delay (s)	LOS
Existing AM	Signal	20	B
Existing PM	Signal	34	C



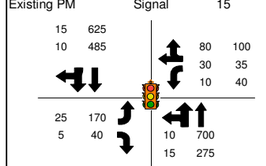
3 Harrison St & 5th Ave N

	Control	Delay (s)	LOS
Existing AM	Signal	19	B
Existing PM	Signal	23	C



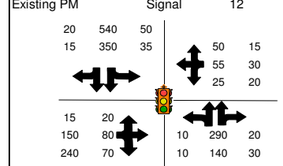
6 Roy St & Dexter Ave N

	Control	Delay (s)	LOS
Existing AM	Signal	7	A
Existing PM	Signal	15	B



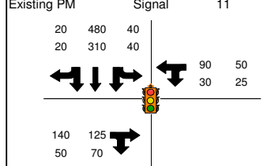
9 Harrison St & Dexter Ave N

	Control	Delay (s)	LOS
Existing AM	Signal	18	B
Existing PM	Signal	12	B



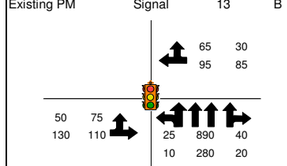
14 Harrison St & 9th Ave N

	Control	Delay (s)	LOS
Existing AM	Signal	7	A
Existing PM	Signal	11	B



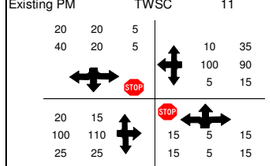
18 Harrison St & Westlake Ave N

	Control	Delay (s)	LOS
Existing AM	Signal	9	A
Existing PM	Signal	13	B



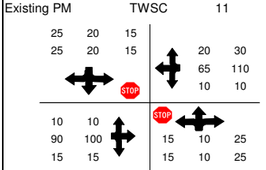
22 Harrison St & Terry Ave N

	Control	Delay (s)	LOS
Existing AM	TWSC	11	B
Existing PM	TWSC	11	B



26 Harrison St & Boren Ave N

	Control	Delay (s)	LOS
Existing AM	TWSC	11	B
Existing PM	TWSC	11	B



30 Harrison St & Fairview Ave N

	Control	Delay (s)	LOS
Existing AM	Signal	11	B
Existing PM	Signal	23	C

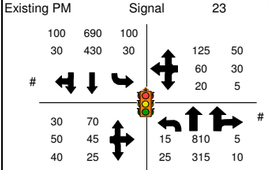
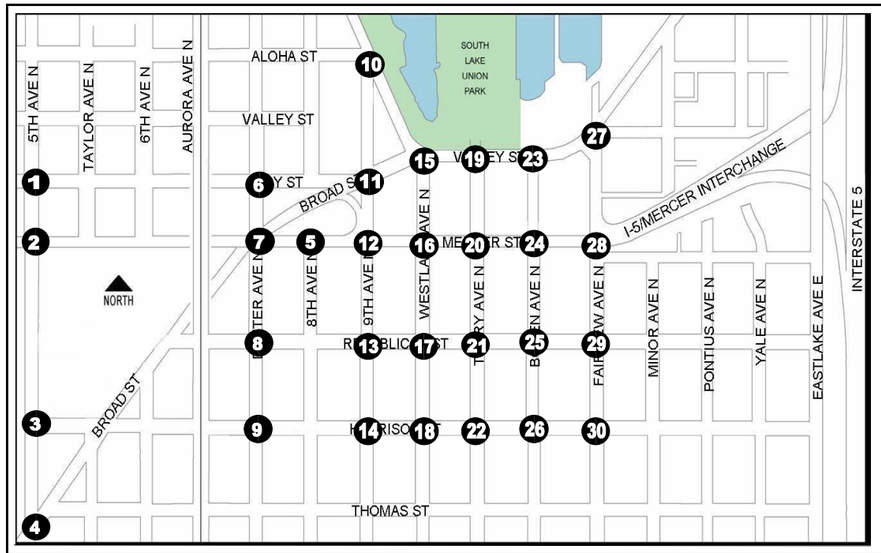
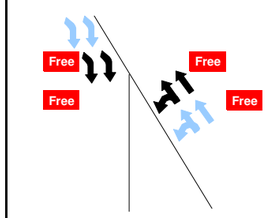


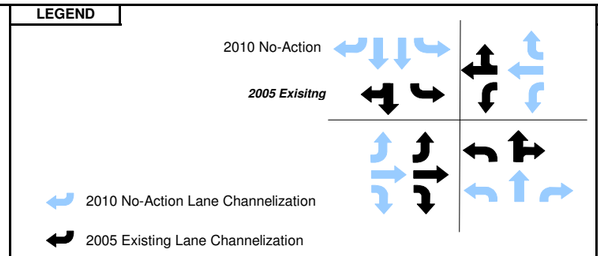
EXHIBIT TR-B1
Study Area Intersection Channelization/Volumes/LOS
2005 Existing AM and PM Peak Hour Conditions



10 Westlake Ave N & 9th Ave N



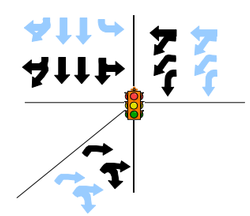
LEGEND



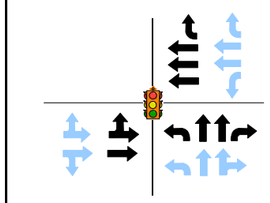
NOTES

- 8 Intersection Number
- STOP Stop-controlled Intersection/Approach
- STOP Stop-controlled Intersection/Approach added as part of Build
- Signalized Intersection
- Intersection is Signalized (as part of Build)
- Free Intersection has no control - all lanes are free
- # In the non-peak direction, on-street parking is allowed therefore only one travel lane

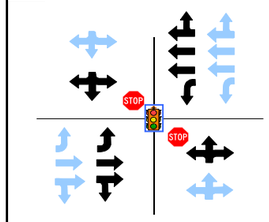
11 Broad St / Roy St & 9th Ave N



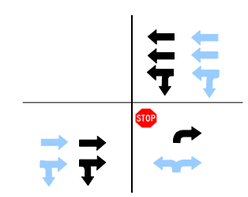
15 Valley St & Westlake Ave N



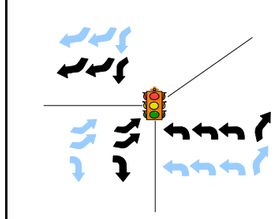
19 Valley St & Terry Ave N



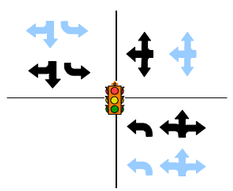
23 Valley St & Boren Ave N



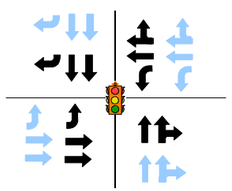
27 Valley St & Fairview Ave N



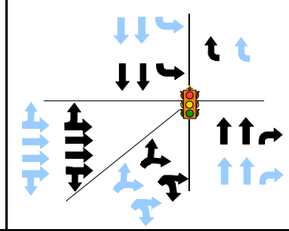
1 Roy St & 5th Ave N



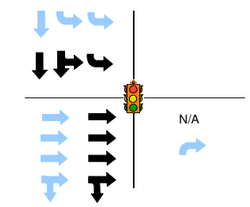
4 Broad St & 5th Ave N



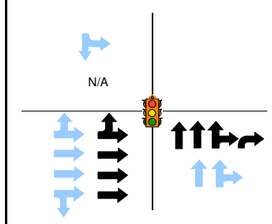
7 Mercer St, Dexter Ave N & Broad St



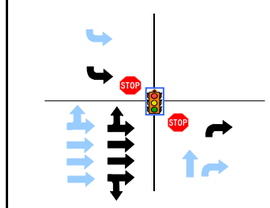
12 Mercer Street & 9th Ave N



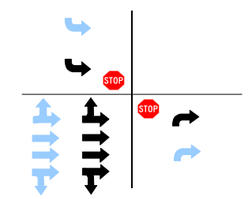
16 Mercer St & Westlake Ave N



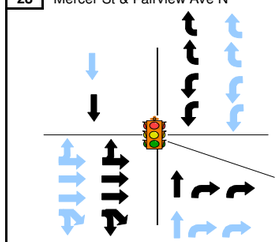
20 Mercer St & Terry Ave N



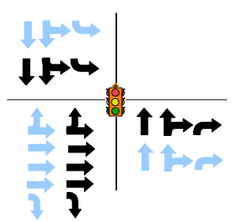
24 Mercer St & Boren Ave N



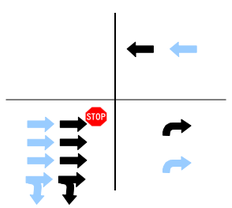
28 Mercer St & Fairview Ave N



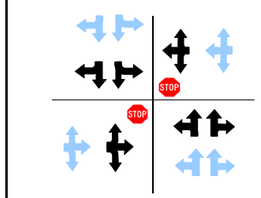
2 Mercer St & 5th Ave N



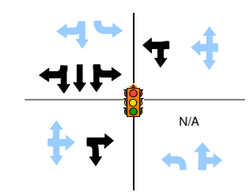
5 Mercer & 8th Ave N



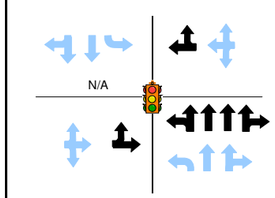
8 Republican St & Dexter Ave N



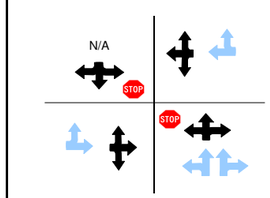
13 Republican St & 9th Ave N



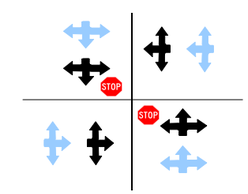
17 Republican St & Westlake Ave N



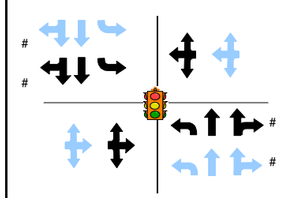
21 Republican St & Terry Ave N



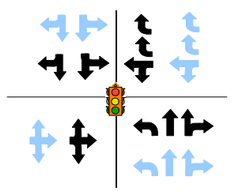
25 Republican St & Boren Ave N



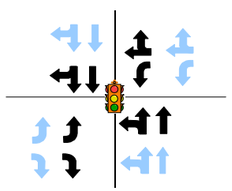
29 Republican St & Fairview Ave N



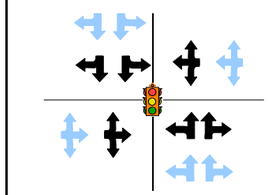
3 Harrison St & 5th Ave N



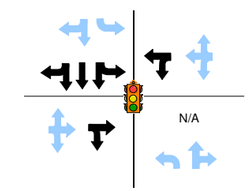
6 Roy St & Dexter Ave N



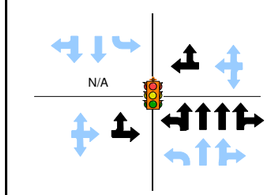
9 Harrison St & Dexter Ave N



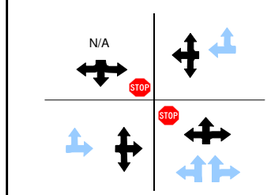
14 Harrison St & 9th Ave N



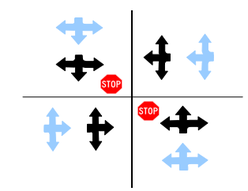
18 Harrison St & Westlake Ave N



22 Harrison St & Terry Ave N



26 Harrison St & Boren Ave N



30 Harrison St & Fairview Ave N

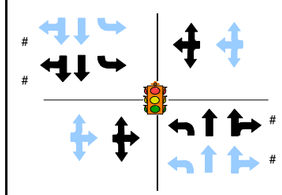
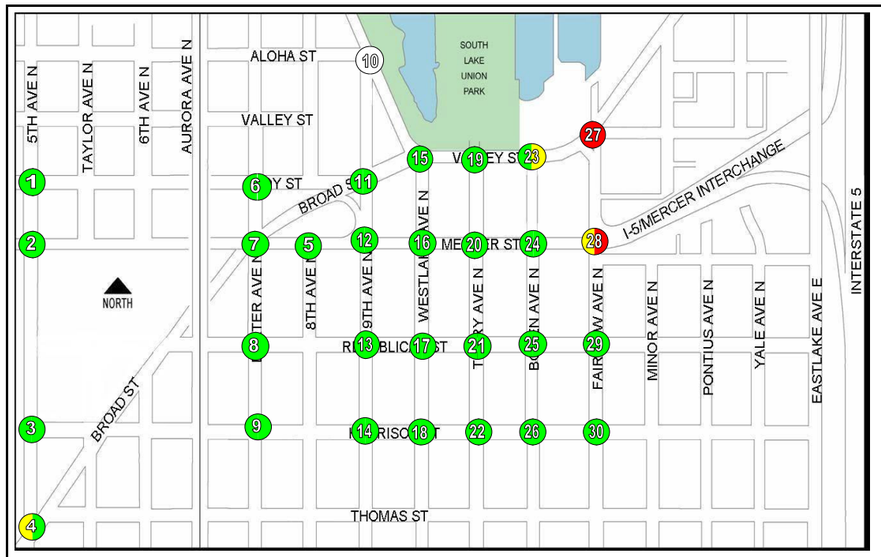
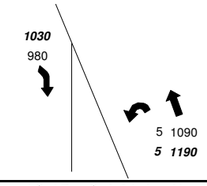


EXHIBIT TR-B2
Study Area Intersection Channelization
2005 Existing and 2010 No Action Conditions



10 Westlake Ave N & 9th Ave N

	Control	Delay (s)	LOS
No Action	N/A	N/A	N/A
Existing	N/A	N/A	N/A



LEGEND

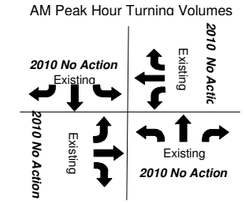
Turning Movement Direction

8 — 2005 Existing — 2010 No Action

Intersection not applicable *
LOS A - D
LOS E
LOS F

XXX Indicates that movement is not allowed
* Free movement intersection (LOS not applicable)

AM Peak Hour Turning Volumes



NOTES

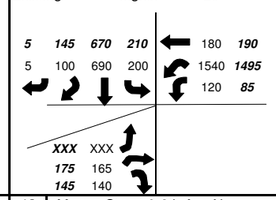
8 Intersection Number

LOS: Level of Service
TWSC Two-way stop controlled intersection
AWSC All-way stop controlled intersection

NOTE: This analysis is based on the Synchro software package. For signalized intersections, results are reported based on Synchro methodology. For unsignalized intersections, results are reported for the worst minor street approach based on the Highway Capacity Manual.

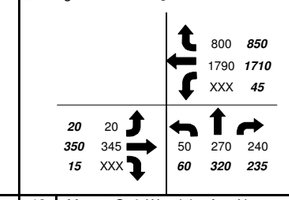
11 Broad St / Roy St & 9th Ave N

	Control	Delay (s)	LOS
No Action	Signal	21	C
Existing	Signal	29	C



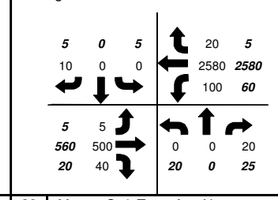
15 Valley St & Westlake Ave N

	Control	Delay (s)	LOS
No Action	Signal	50	D
Existing	Signal	16	B



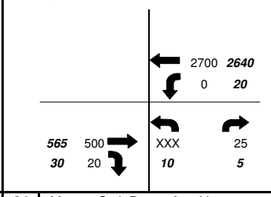
19 Valley St & Terry Ave N

	Control	Delay (s)	LOS
No Action	Signal	5	A
Existing	TWSC	21	C



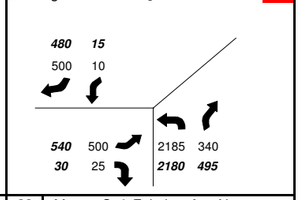
23 Valley St & Boren Ave N

	Control	Delay (s)	LOS
No Action	TWSC	39	E
Existing	TWSC	11	B



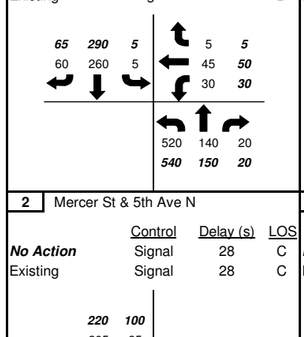
27 Valley St & Fairview Ave N

	Control	Delay (s)	LOS
No Action	Signal	113	F
Existing	Signal	110	F



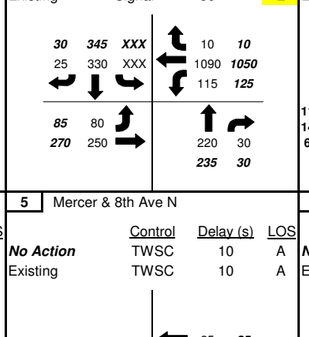
1 Roy St & 5th Ave N

	Control	Delay (s)	LOS
No Action	Signal	38	D
Existing	Signal	37	D



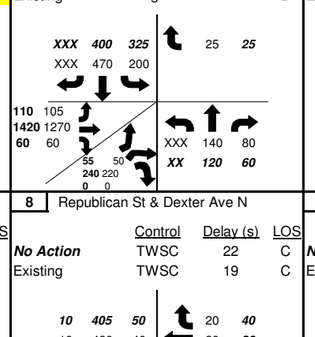
4 Broad St & 5th Ave N

	Control	Delay (s)	LOS
No Action	Signal	48	D
Existing	Signal	56	E



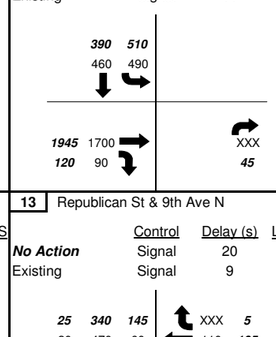
7 Mercer St, Dexter Ave N & Broad St

	Control	Delay (s)	LOS
No Action	Signal	40	D
Existing	Signal	40	D



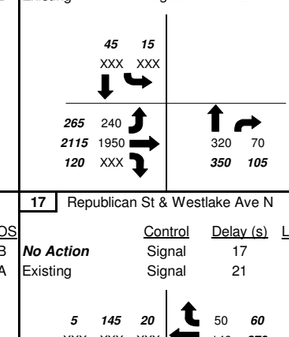
12 Mercer Street & 9th Ave N

	Control	Delay (s)	LOS
No Action	Signal	14	B
Existing	Signal	11	B



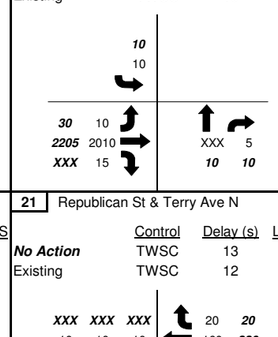
16 Mercer St & Westlake Ave N

	Control	Delay (s)	LOS
No Action	Signal	6	A
Existing	Signal	12	B



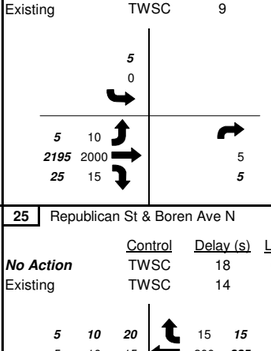
20 Mercer St & Terry Ave N

	Control	Delay (s)	LOS
No Action	Signal	7	A
Existing	TWSC	10	A



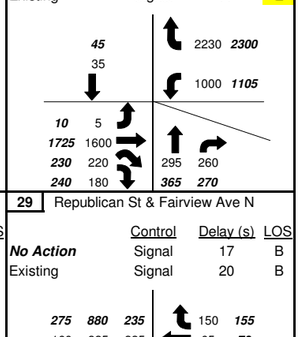
24 Mercer St & Boren Ave N

	Control	Delay (s)	LOS
No Action	TWSC	11	B
Existing	TWSC	9	A



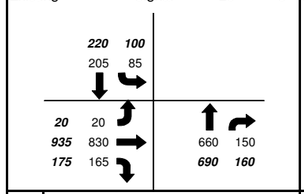
28 Mercer St & Fairview Ave N

	Control	Delay (s)	LOS
No Action	Signal	86	F
Existing	Signal	77	E



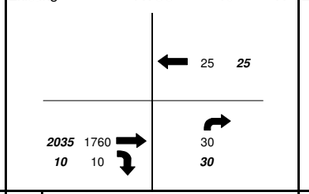
2 Mercer St & 5th Ave N

	Control	Delay (s)	LOS
No Action	Signal	28	C
Existing	Signal	28	C



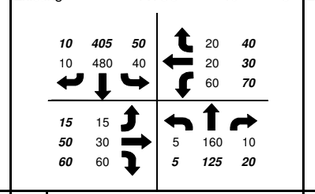
5 Mercer & 8th Ave N

	Control	Delay (s)	LOS
No Action	TWSC	10	A
Existing	TWSC	10	A



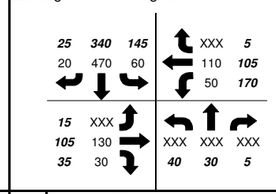
8 Republican St & Dexter Ave N

	Control	Delay (s)	LOS
No Action	TWSC	22	C
Existing	TWSC	19	C



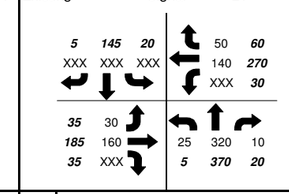
13 Republican St & 9th Ave N

	Control	Delay (s)	LOS
No Action	Signal	20	B
Existing	Signal	9	A



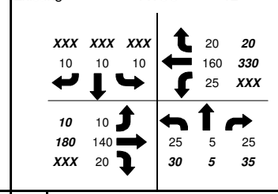
17 Republican St & Westlake Ave N

	Control	Delay (s)	LOS
No Action	Signal	17	B
Existing	Signal	21	C



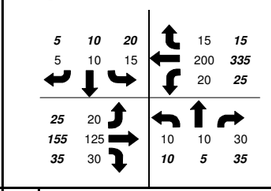
21 Republican St & Terry Ave N

	Control	Delay (s)	LOS
No Action	TWSC	13	B
Existing	TWSC	12	B



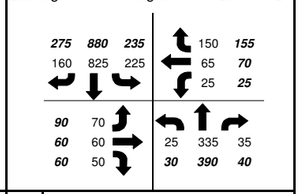
25 Republican St & Boren Ave N

	Control	Delay (s)	LOS
No Action	TWSC	18	C
Existing	TWSC	14	B



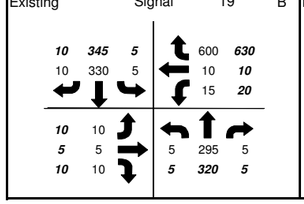
29 Republican St & Fairview Ave N

	Control	Delay (s)	LOS
No Action	Signal	17	B
Existing	Signal	20	B



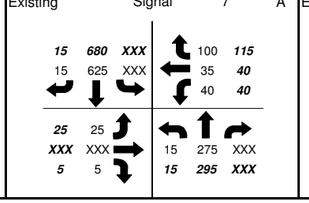
3 Harrison St & 5th Ave N

	Control	Delay (s)	LOS
No Action	Signal	18	B
Existing	Signal	19	B



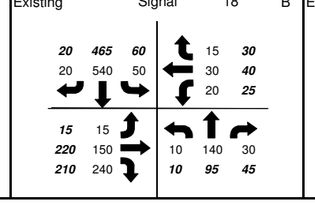
6 Roy St & Dexter Ave N

	Control	Delay (s)	LOS
No Action	Signal	7	A
Existing	Signal	7	A



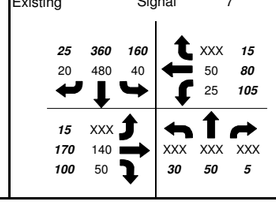
9 Harrison St & Dexter Ave N

	Control	Delay (s)	LOS
No Action	Signal	16	B
Existing	Signal	18	B



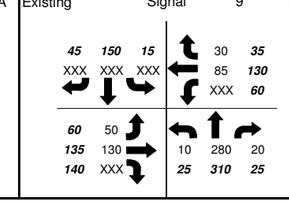
14 Harrison St & 9th Ave N

	Control	Delay (s)	LOS
No Action	Signal	22	C
Existing	Signal	7	A



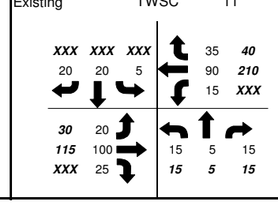
18 Harrison St & Westlake Ave N

	Control	Delay (s)	LOS
No Action	Signal	18	B
Existing	Signal	9	A



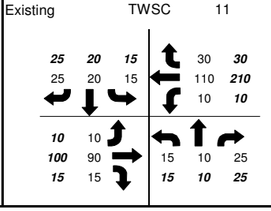
22 Harrison St & Terry Ave N

	Control	Delay (s)	LOS
No Action	TWSC	12	B
Existing	TWSC	11	B



26 Harrison St & Boren Ave N

	Control	Delay (s)	LOS
No Action	TWSC	13	B
Existing	TWSC	11	B



30 Harrison St & Fairview Ave N

	Control	Delay (s)	LOS
No Action	Signal	12	B
Existing	Signal	11	B

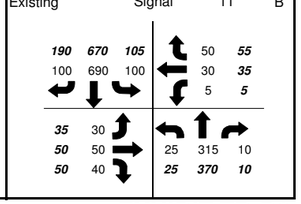
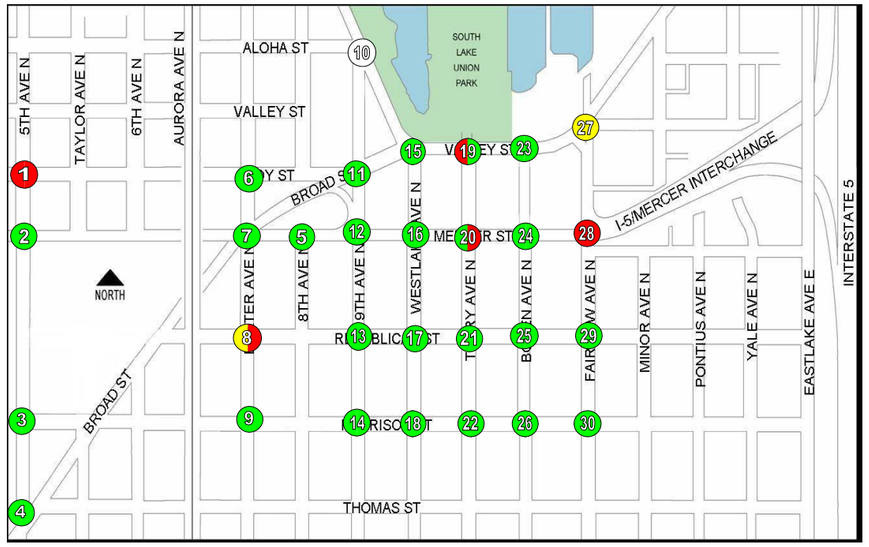
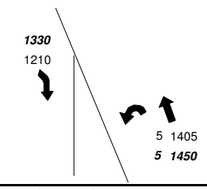


EXHIBIT TR-B3
Study Area Intersection Volumes and LOS
2005 Existing and 2010 No Action AM Peak Hour Conditions



10 Westlake Ave N & 9th Ave N

	Control	Delay (s)	LOS
No Action	N/A	N/A	N/A
Existing	N/A	N/A	N/A



LEGEND

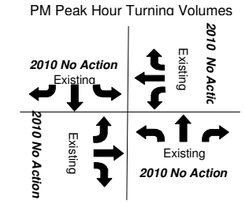
Turning Movement Direction

2005 Existing — 8 — 2010 No Action

Intersection not applicable *
LOS A - D
LOS E
LOS F

XXX Indicates that movement is not allowed
* Free movement intersection (LOS not applicable)

PM Peak Hour Turning Volumes



NOTES

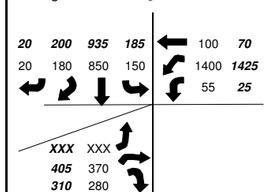
8 Intersection Number

LOS: Level of Service
TWSC Two-Way stop controlled intersection
AWSC All-way stop controlled intersection

NOTE: This analysis is based on the Synchro software package. For signalized intersections, results are reported based on Synchro methodology. For unsignalized intersections, results are reported for the worst minor street approach based on the Highway

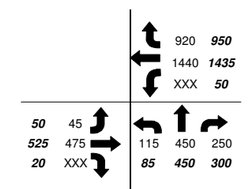
11 Broad St / Roy St & 9th Ave N

	Control	Delay (s)	LOS
No Action	Signal	30	C
Existing	Signal	39	D



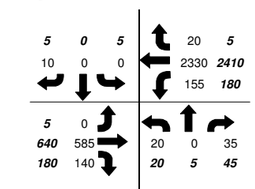
15 Valley St & Westlake Ave N

	Control	Delay (s)	LOS
No Action	Signal	45	D
Existing	Signal	13	B



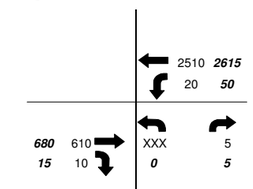
19 Valley St & Terry Ave N

	Control	Delay (s)	LOS
No Action	Signal	3	A
Existing	TWSC	174	F



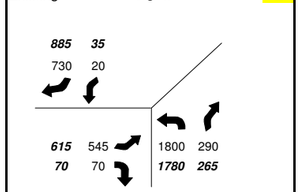
23 Valley St & Boren Ave N

	Control	Delay (s)	LOS
No Action	TWSC	11	B
Existing	TWSC	11	B



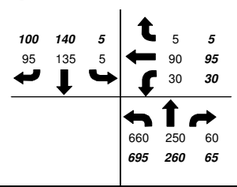
27 Valley St & Fairview Ave N

	Control	Delay (s)	LOS
No Action	Signal	64	E
Existing	Signal	77	E



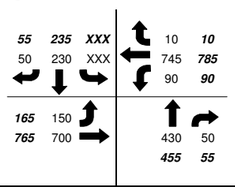
1 Roy St & 5th Ave N

	Control	Delay (s)	LOS
No Action	Signal	101	F
Existing	Signal	109	F



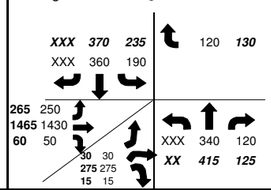
4 Broad St & 5th Ave N

	Control	Delay (s)	LOS
No Action	Signal	30	C
Existing	Signal	27	C



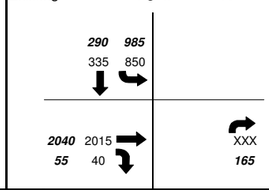
7 Mercer St, Dexter Ave N & Broad St

	Control	Delay (s)	LOS
No Action	Signal	42	D
Existing	Signal	49	D



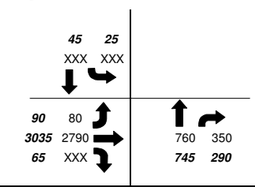
12 Mercer Street & 9th Ave N

	Control	Delay (s)	LOS
No Action	Signal	49	D
Existing	Signal	53	D



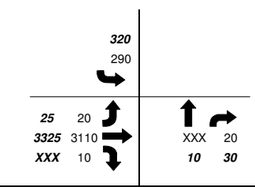
16 Mercer St & Westlake Ave N

	Control	Delay (s)	LOS
No Action	Signal	54	D
Existing	Signal	36	D



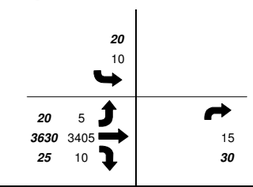
20 Mercer St & Terry Ave N

	Control	Delay (s)	LOS
No Action	Signal	89	F
Existing	TWSC	16	C



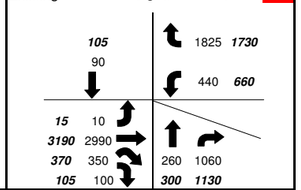
24 Mercer St & Boren Ave N

	Control	Delay (s)	LOS
No Action	TWSC	14	B
Existing	TWSC	11	B



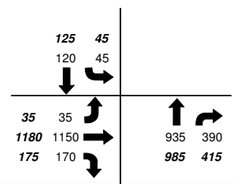
28 Mercer St & Fairview Ave N

	Control	Delay (s)	LOS
No Action	Signal	137	F
Existing	Signal	104	F



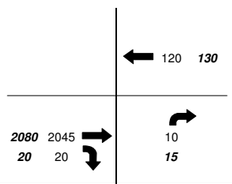
2 Mercer St & 5th Ave N

	Control	Delay (s)	LOS
No Action	Signal	49	D
Existing	Signal	53	D



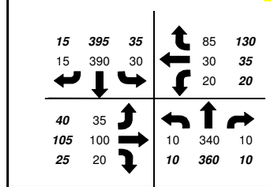
5 Mercer & 8th Ave N

	Control	Delay (s)	LOS
No Action	TWSC	10	A
Existing	TWSC	10	A



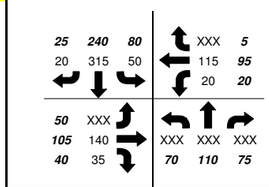
8 Republican St & Dexter Ave N

	Control	Delay (s)	LOS
No Action	TWSC	70	F
Existing	TWSC	40	E



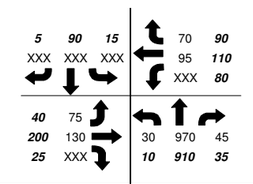
13 Republican St & 9th Ave N

	Control	Delay (s)	LOS
No Action	Signal	19	B
Existing	Signal	17	B



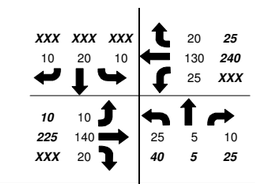
17 Republican St & Westlake Ave N

	Control	Delay (s)	LOS
No Action	Signal	18	B
Existing	Signal	8	A



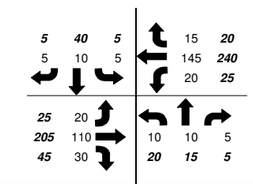
21 Republican St & Terry Ave N

	Control	Delay (s)	LOS
No Action	TWSC	14	B
Existing	TWSC	12	B



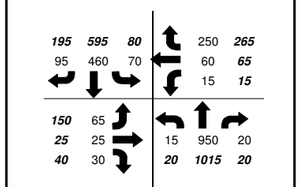
25 Republican St & Boren Ave N

	Control	Delay (s)	LOS
No Action	TWSC	18	C
Existing	TWSC	12	B



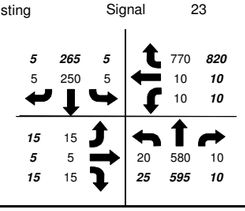
29 Republican St & Fairview Ave N

	Control	Delay (s)	LOS
No Action	Signal	40	D
Existing	Signal	34	C



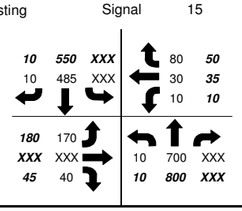
3 Harrison St & 5th Ave N

	Control	Delay (s)	LOS
No Action	Signal	21	C
Existing	Signal	23	C



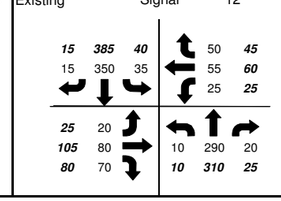
6 Roy St & Dexter Ave N

	Control	Delay (s)	LOS
No Action	Signal	12	B
Existing	Signal	15	B



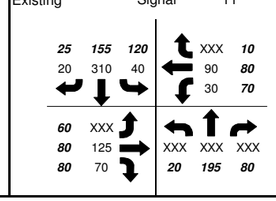
9 Harrison St & Dexter Ave N

	Control	Delay (s)	LOS
No Action	Signal	9	A
Existing	Signal	12	B



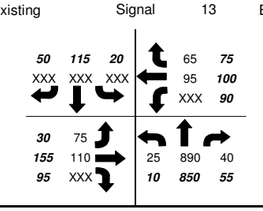
14 Harrison St & 9th Ave N

	Control	Delay (s)	LOS
No Action	Signal	21	C
Existing	Signal	11	B



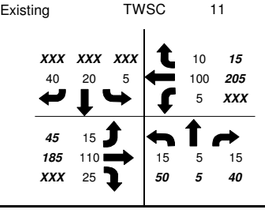
18 Harrison St & Westlake Ave N

	Control	Delay (s)	LOS
No Action	Signal	21	C
Existing	Signal	13	B



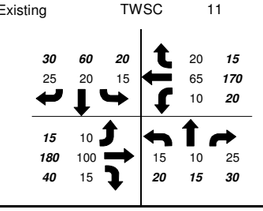
22 Harrison St & Terry Ave N

	Control	Delay (s)	LOS
No Action	TWSC	13	B
Existing	TWSC	11	B



26 Harrison St & Boren Ave N

	Control	Delay (s)	LOS
No Action	TWSC	16	C
Existing	TWSC	11	B



30 Harrison St & Fairview Ave N

	Control	Delay (s)	LOS
No Action	Signal	39	D
Existing	Signal	23	C

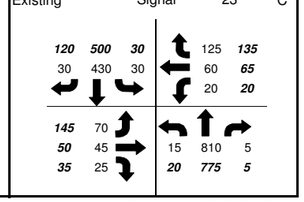
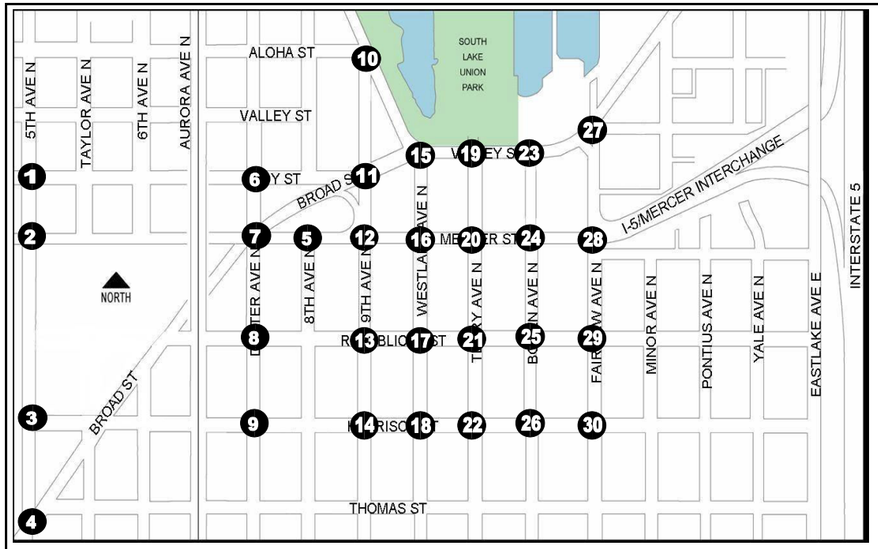
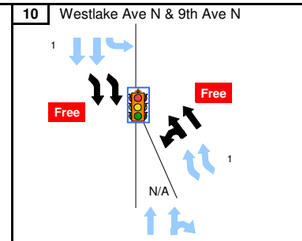


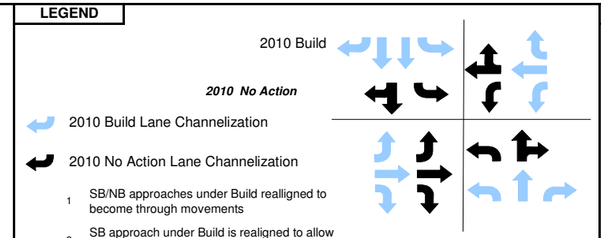
EXHIBIT TR-B4
Study Area Intersection Volumes and LOS
2005 Existing and 2010 No Action PM Peak Hour Conditions



10 Westlake Ave N & 9th Ave N



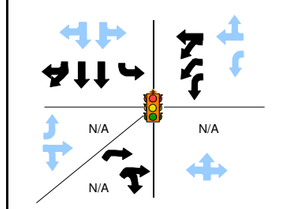
LEGEND



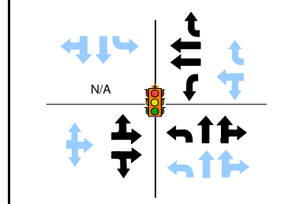
NOTES

- 8 Intersection Number
- STOP Stop-controlled Intersection/Approach
- STOP Stop-controlled Intersection/Approach added as part of Build
- Signalized Intersection
- Intersection is Signalized (as part of Build)
- Free Intersection has no control - all lanes are free
- # In the non-peak direction, on-street parking is allowed therefore only one travel lane

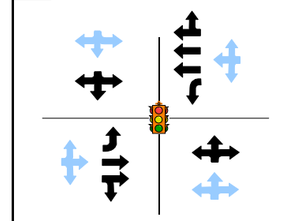
11 Broad St / Roy St & 9th Ave N



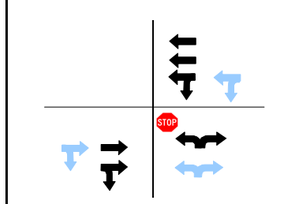
15 Valley St & Westlake Ave N



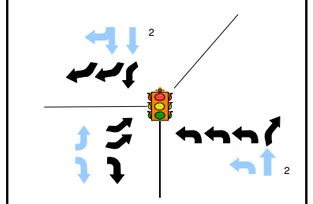
19 Valley St & Terry Ave N



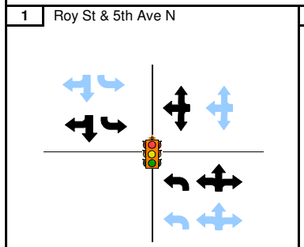
23 Valley St & Boren Ave N



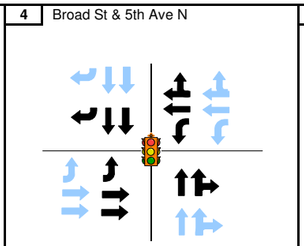
27 Valley St & Fairview Ave N



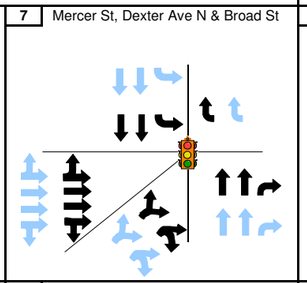
1 Roy St & 5th Ave N



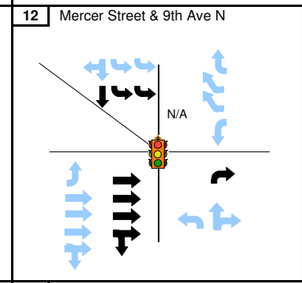
4 Broad St & 5th Ave N



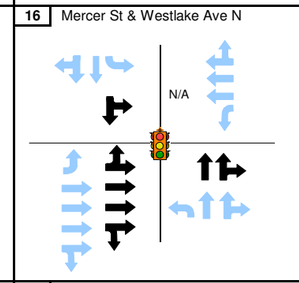
7 Mercer St, Dexter Ave N & Broad St



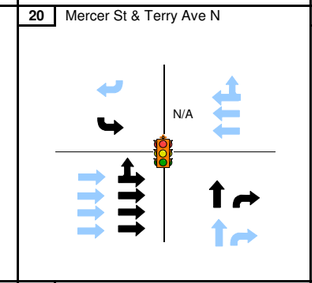
12 Mercer Street & 9th Ave N



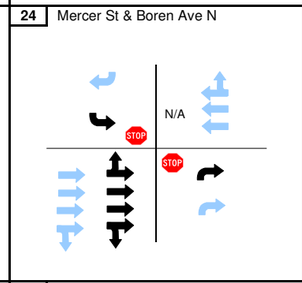
16 Mercer St & Westlake Ave N



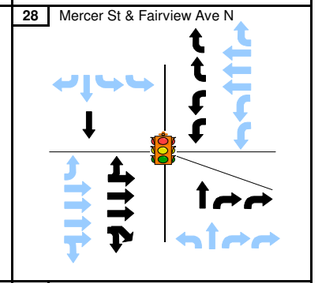
20 Mercer St & Terry Ave N



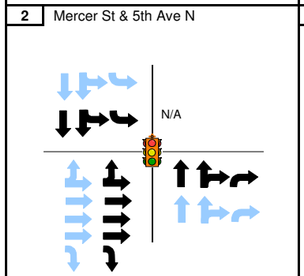
24 Mercer St & Boren Ave N



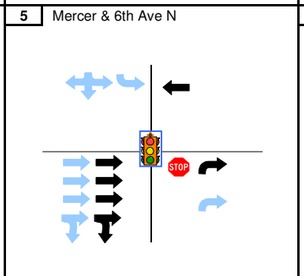
28 Mercer St & Fairview Ave N



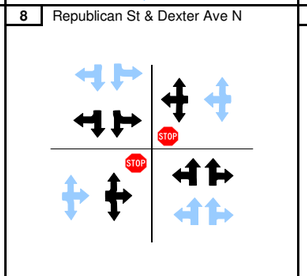
2 Mercer St & 5th Ave N



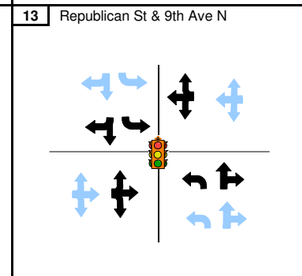
5 Mercer & 6th Ave N



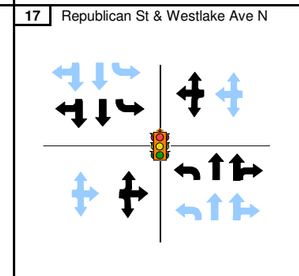
8 Republican St & Dexter Ave N



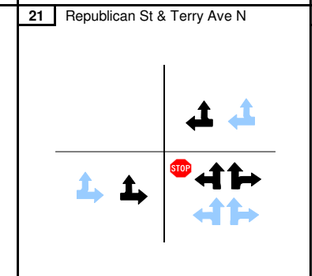
13 Republican St & 9th Ave N



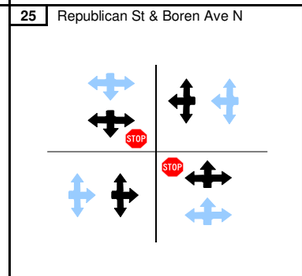
17 Republican St & Westlake Ave N



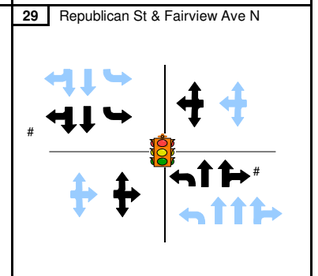
21 Republican St & Terry Ave N



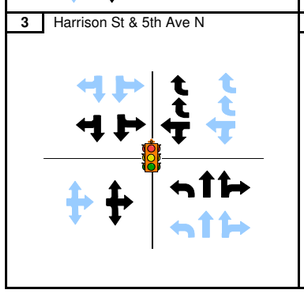
25 Republican St & Boren Ave N



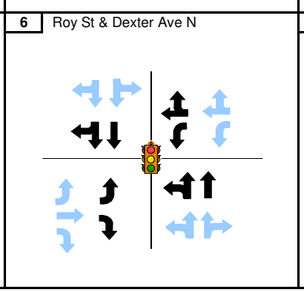
29 Republican St & Fairview Ave N



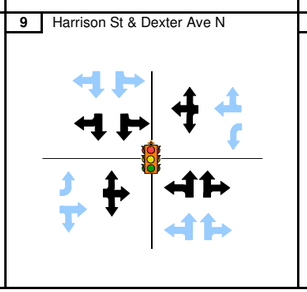
3 Harrison St & 5th Ave N



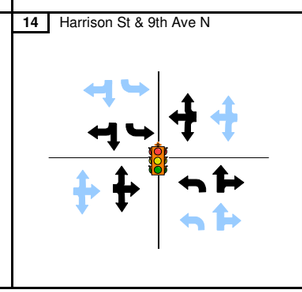
6 Roy St & Dexter Ave N



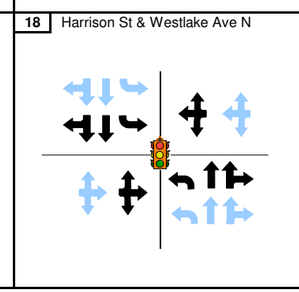
9 Harrison St & Dexter Ave N



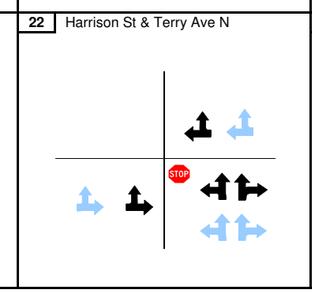
14 Harrison St & 9th Ave N



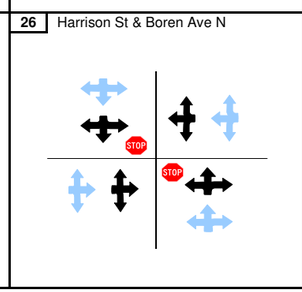
18 Harrison St & Westlake Ave N



22 Harrison St & Terry Ave N



26 Harrison St & Boren Ave N



30 Harrison St & Fairview Ave N

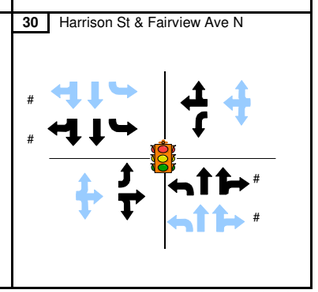
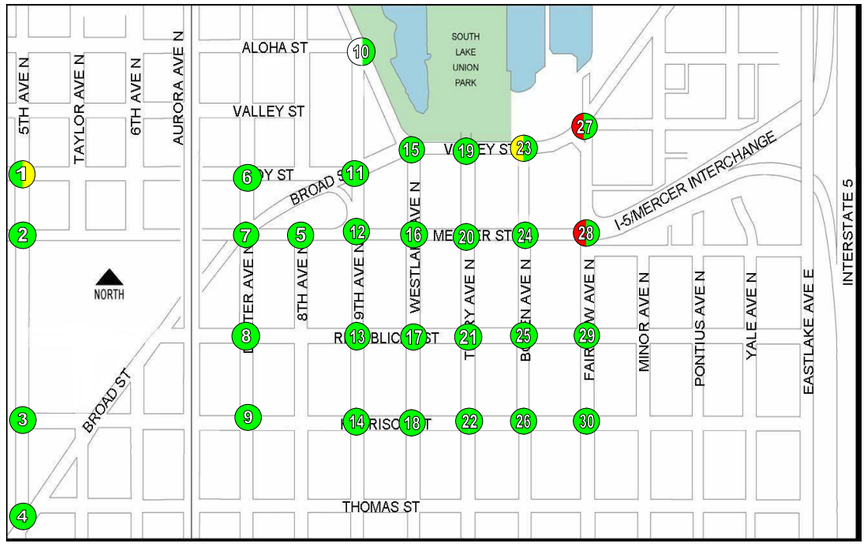
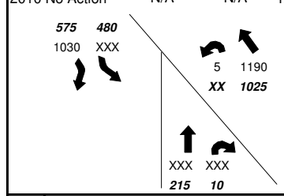


EXHIBIT TR-B5
Study Area Channelization
2010 No Action and 2010 Build Conditions



10 Westlake Ave N & 9th Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	24	C
2010 No Action	N/A	N/A	N/A



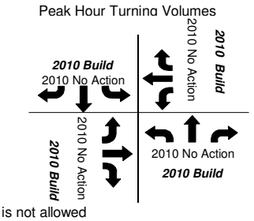
LEGEND

Turning Movement Direction

Intersection not applicable *
LOS A - D
LOS E
LOS F

XXX Indicates that movement is not allowed
* Free movement intersection (LOS not applicable)

Peak Hour Turning Volumes



NOTES

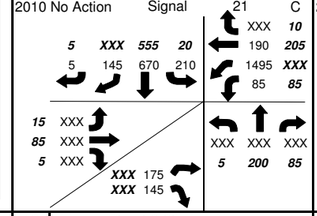
8 Intersection Number

LOS: Level of Service
TWSC Two-way stop controlled intersection
AWSC All-way stop controlled intersection

NOTE: This analysis is based on the Synchro software package. For signalized intersections, results are reported based on Synchro methodology. For unsignalized intersections, results are reported for the worst minor street approach based on the Highway Capacity Manual.

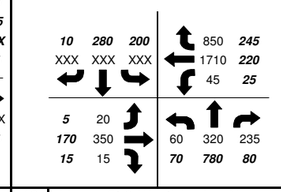
11 Broad St / Roy St & 9th Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	11	B
2010 No Action	Signal	21	C



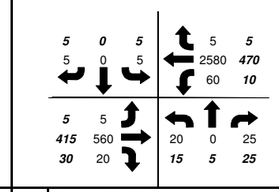
15 Valley St & Westlake Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	34	C
2010 No Action	Signal	50	D



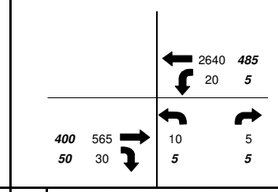
19 Valley St & Terry Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	6	A
2010 No Action	Signal	5	A



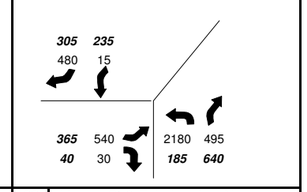
23 Valley St & Boren Ave N

	Control	Delay (s)	LOS
2010 Build	TWSC	16	C
2010 No Action	TWSC	39	E



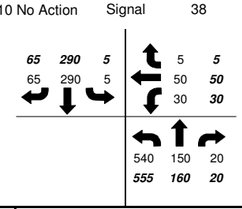
27 Valley St & Fairview Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	37	D
2010 No Action	Signal	113	F



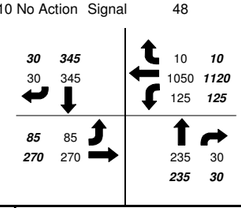
1 Roy St & 5th Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	56	E
2010 No Action	Signal	38	D



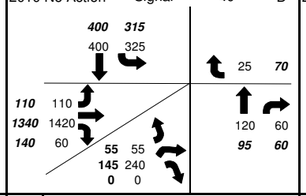
4 Broad St & 5th Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	26	C
2010 No Action	Signal	48	D



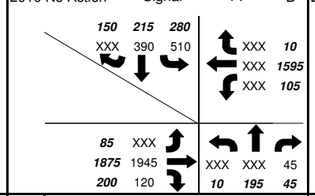
7 Mercer St, Dexter Ave N & Broad St

	Control	Delay (s)	LOS
2010 Build	Signal	36	D
2010 No Action	Signal	40	D



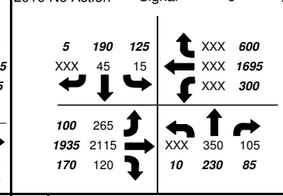
12 Mercer Street & 9th Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	31	C
2010 No Action	Signal	14	B



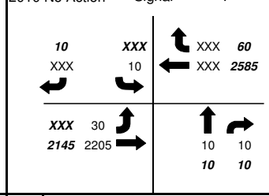
16 Mercer St & Westlake Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	20	B
2010 No Action	Signal	6	A



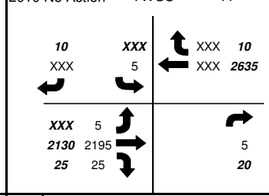
20 Mercer St & Terry Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	32	C
2010 No Action	Signal	7	A



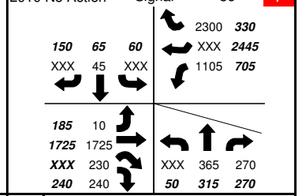
24 Mercer St & Boren Ave N

	Control	Delay (s)	LOS
2010 Build	TWSC	21	C
2010 No Action	TWSC	11	B



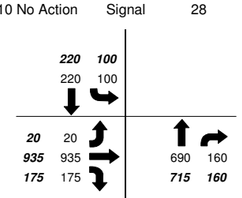
28 Mercer St & Fairview Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	48	D
2010 No Action	Signal	86	F



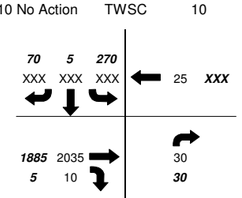
2 Mercer St & 5th Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	39	D
2010 No Action	Signal	28	C



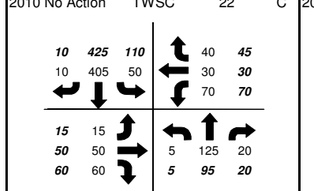
5 Mercer & 8th Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	19	B
2010 No Action	TWSC	10	A



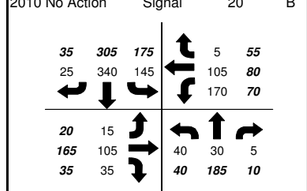
8 Republican St & Dexter Ave N

	Control	Delay (s)	LOS
2010 Build	TWSC	29	D
2010 No Action	TWSC	22	C



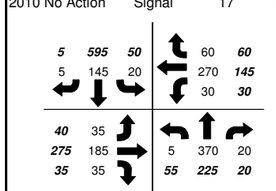
13 Republican St & 9th Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	26	C
2010 No Action	Signal	20	B



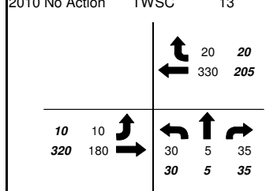
17 Republican St & Westlake Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	26	C
2010 No Action	Signal	17	B



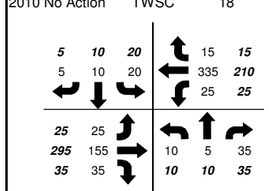
21 Republican St & Terry Ave N

	Control	Delay (s)	LOS
2010 Build	TWSC	14	B
2010 No Action	TWSC	13	B



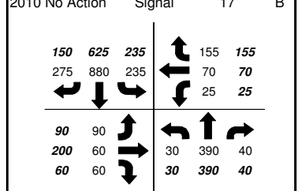
25 Republican St & Boren Ave N

	Control	Delay (s)	LOS
2010 Build	TWSC	20	C
2010 No Action	TWSC	18	C



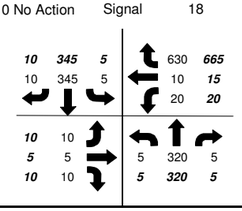
29 Republican St & Fairview Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	20	B
2010 No Action	Signal	17	B



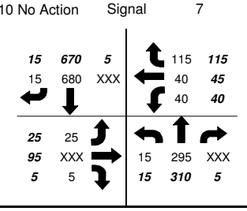
3 Harrison St & 5th Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	7	A
2010 No Action	Signal	18	B



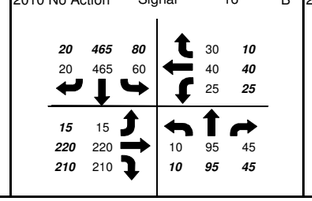
6 Roy St & Dexter Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	11	B
2010 No Action	Signal	7	A



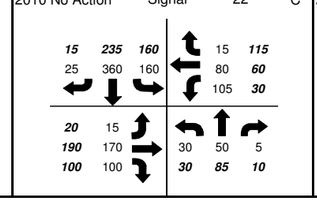
9 Harrison St & Dexter Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	23	C
2010 No Action	Signal	16	B



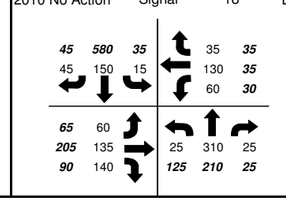
14 Harrison St & 9th Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	26	C
2010 No Action	Signal	22	C



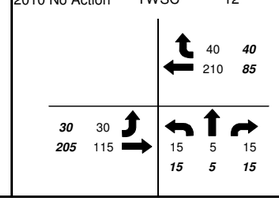
18 Harrison St & Westlake Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	19	B
2010 No Action	Signal	18	B



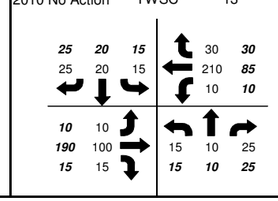
22 Harrison St & Terry Ave N

	Control	Delay (s)	LOS
2010 Build	TWSC	12	B
2010 No Action	TWSC	12	B



26 Harrison St & Boren Ave N

	Control	Delay (s)	LOS
2010 Build	TWSC	12	B
2010 No Action	TWSC	13	B



30 Harrison St & Fairview Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	12	B
2010 No Action	Signal	12	B

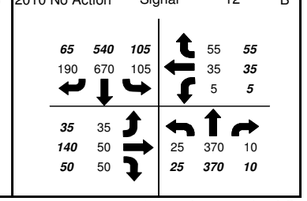
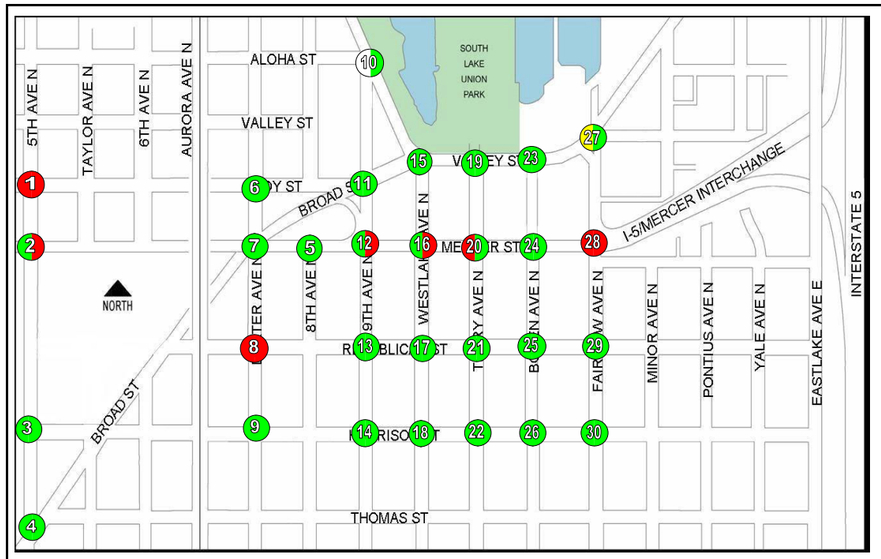
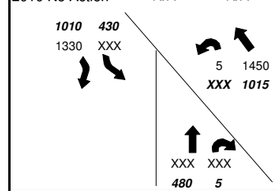


EXHIBIT TR-B6
Study Area Intersection Volumes and LOS
2010 No Action and Build AM Peak Hour Conditions

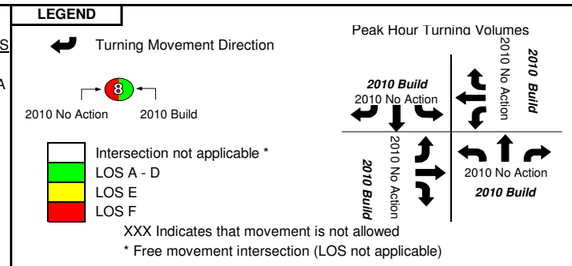


10 Westlake Ave N & 9th Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	32	C
2010 No Action	N/A	N/A	N/A



LEGEND



NOTES

Intersection Number

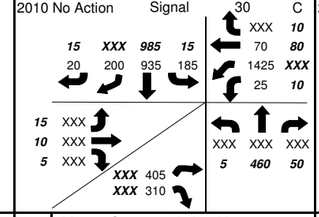
LOS: Level of Service
TWSC Two-way stop controlled intersection
AWSC All-way stop controlled intersection

NOTE: This analysis is based on the Synchro software package. For signalized intersections, results are reported based on Synchro methodology. For unsignalized intersections, results are reported for the worst minor street approach based on the Highway Capacity Manual.

* Free movement intersection (LOS not applicable)

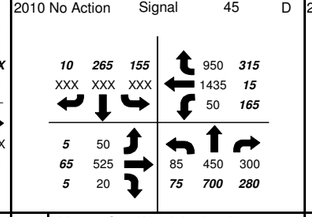
11 Broad St / Roy St & 9th Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	7	A
2010 No Action	Signal	30	C



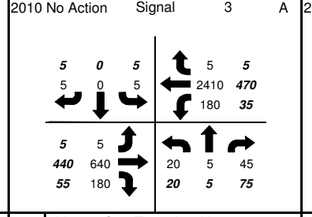
15 Valley St & Westlake Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	32	C
2010 No Action	Signal	45	D



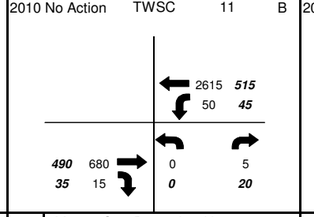
19 Valley St & Terry Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	8	A
2010 No Action	Signal	3	A



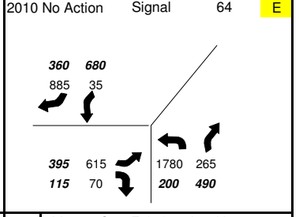
23 Valley St & Boren Ave N

	Control	Delay (s)	LOS
2010 Build	TWSC	13	B
2010 No Action	TWSC	11	B



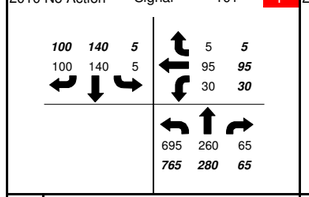
27 Valley St & Fairview Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	40	D
2010 No Action	Signal	64	E



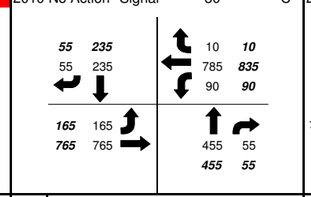
1 Roy St & 5th Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	123	F
2010 No Action	Signal	101	F



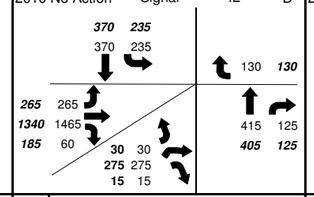
4 Broad St & 5th Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	25	C
2010 No Action	Signal	30	C



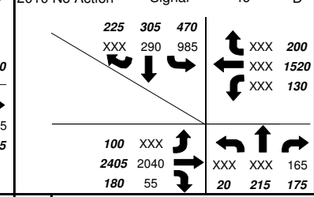
7 Mercer St, Dexter Ave N & Broad St

	Control	Delay (s)	LOS
2010 Build	Signal	37	D
2010 No Action	Signal	42	D



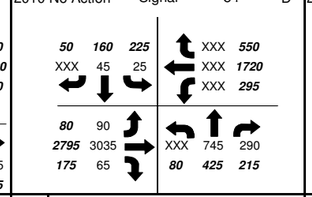
12 Mercer Street & 9th Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	103	F
2010 No Action	Signal	49	D



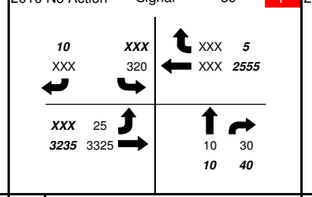
16 Mercer St & Westlake Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	94	F
2010 No Action	Signal	54	D



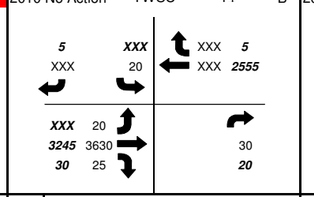
20 Mercer St & Terry Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	18	B
2010 No Action	Signal	89	F



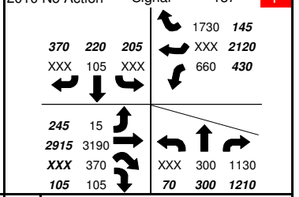
24 Mercer St & Boren Ave N

	Control	Delay (s)	LOS
2010 Build	TWSC	20	C
2010 No Action	TWSC	14	B



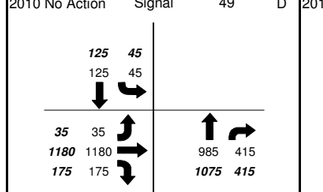
28 Mercer St & Fairview Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	95	F
2010 No Action	Signal	137	F



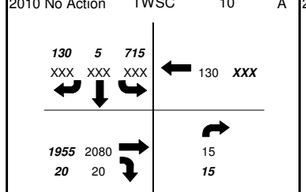
2 Mercer St & 5th Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	82	F
2010 No Action	Signal	49	D



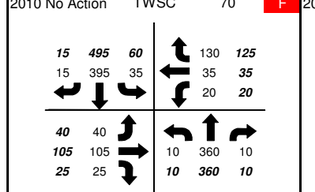
5 Mercer & 8th Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	26	C
2010 No Action	TWSC	10	A



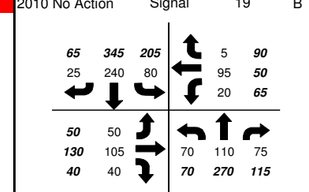
8 Republican St & Dexter Ave N

	Control	Delay (s)	LOS
2010 Build	TWSC	152	F
2010 No Action	TWSC	70	F



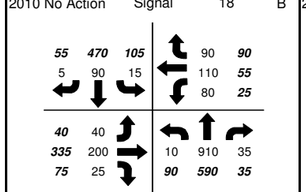
13 Republican St & 9th Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	25	C
2010 No Action	Signal	19	B



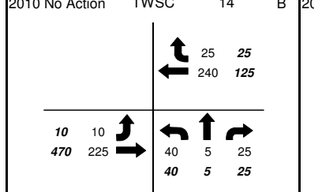
17 Republican St & Westlake Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	18	B
2010 No Action	Signal	18	B



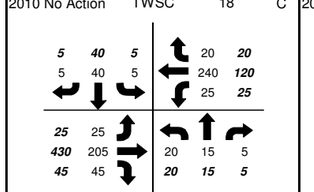
21 Republican St & Terry Ave N

	Control	Delay (s)	LOS
2010 Build	TWSC	18	C
2010 No Action	TWSC	14	B



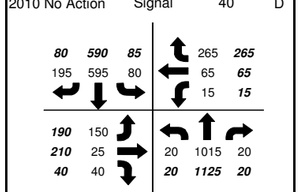
25 Republican St & Boren Ave N

	Control	Delay (s)	LOS
2010 Build	TWSC	24	C
2010 No Action	TWSC	18	C



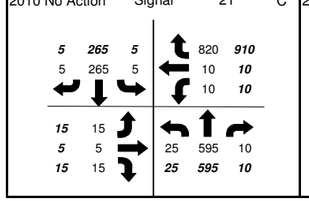
29 Republican St & Fairview Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	38	D
2010 No Action	Signal	40	D



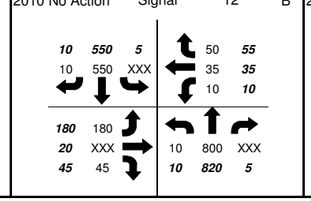
3 Harrison St & 5th Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	21	C
2010 No Action	Signal	21	C



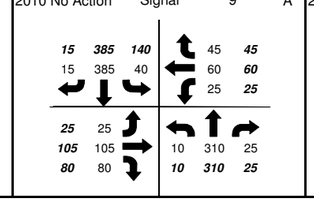
6 Roy St & Dexter Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	15	B
2010 No Action	Signal	12	B



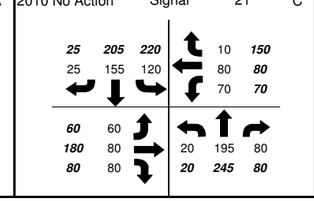
9 Harrison St & Dexter Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	8	A
2010 No Action	Signal	9	A



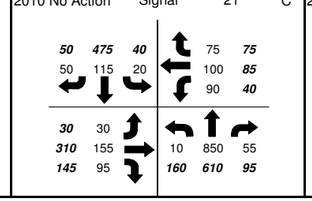
14 Harrison St & 9th Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	30	C
2010 No Action	Signal	21	C



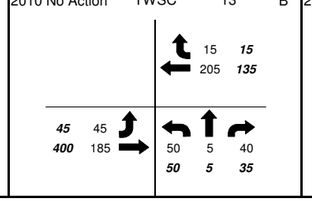
18 Harrison St & Westlake Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	26	C
2010 No Action	Signal	21	C



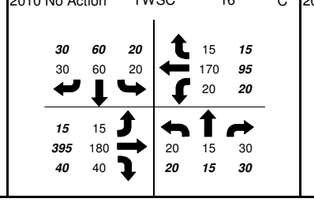
22 Harrison St & Terry Ave N

	Control	Delay (s)	LOS
2010 Build	TWSC	16	C
2010 No Action	TWSC	13	B



26 Harrison St & Boren Ave N

	Control	Delay (s)	LOS
2010 Build	TWSC	20	C
2010 No Action	TWSC	16	C



30 Harrison St & Fairview Ave N

	Control	Delay (s)	LOS
2010 Build	Signal	49	D
2010 No Action	Signal	39	D

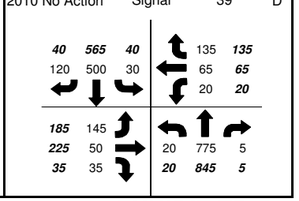


EXHIBIT TR-B7
Study Area Intersection Volumes and LOS
2010 No Action and Build PM Peak Hour Conditions

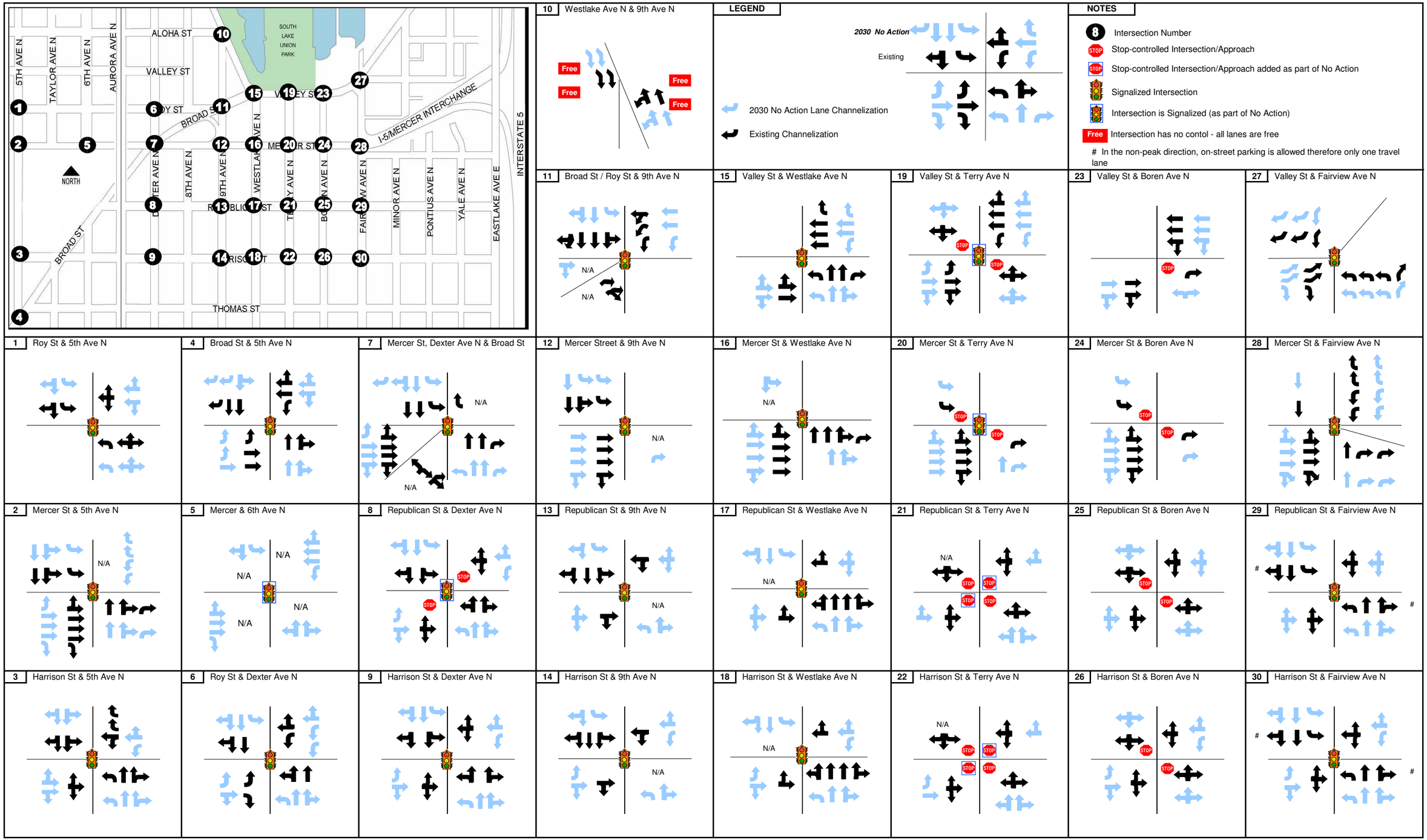
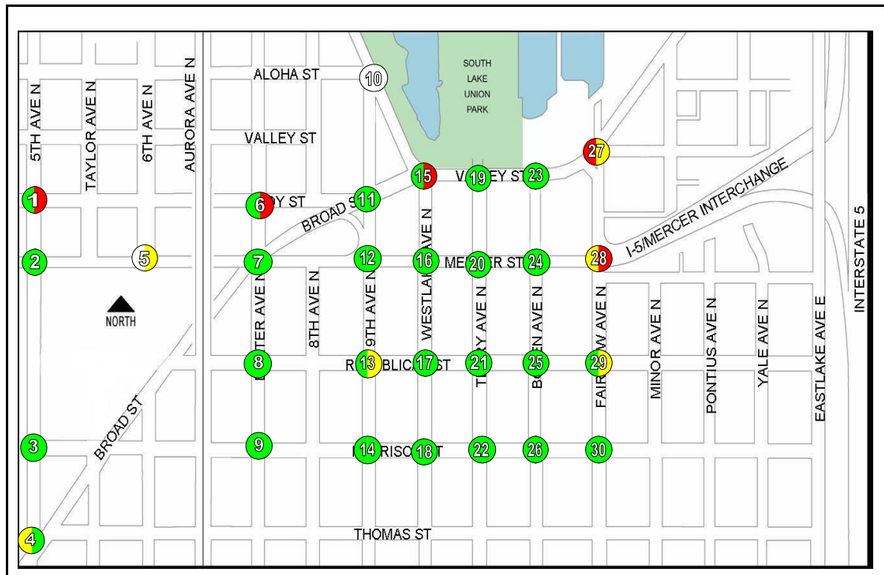
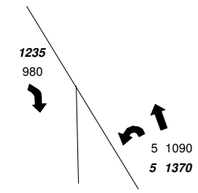


EXHIBIT TR-B8
Study Area Intersection Channelization
2005 Existing and 2030 No Action Conditions



10 Westlake Ave N & 9th Ave N

	Control	Delay (s)	LOS
No Action	N/A	N/A	N/A
Existing	N/A	N/A	N/A



LEGEND

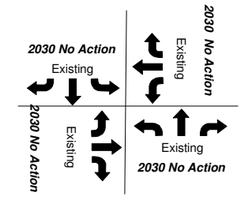
Turning Movement Direction

2005 Existing — 2030 No Action

Intersection not applicable *
LOS A - D
LOS E
LOS F

XXX Indicates that movement is not allowed
* Free movement intersection (LOS not applicable)

AM Peak Hour Turning Volumes



NOTES

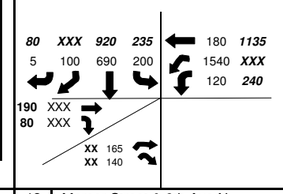
Intersection Number

LOS: Level of Service
TWSC Two-way stop controlled intersection
AWSC All-way stop controlled intersection

NOTE: This analysis is based on the Synchro software package. For signalized intersections, results are reported based on Synchro methodology. For unsignalized intersections, results are reported for the worst minor street approach based on the Highway Capacity Manual.

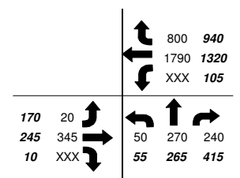
11 Broad St / Roy St & 9th Ave N

	Control	Delay (s)	LOS
No Action	Signal	35	C
Existing	Signal	29	C



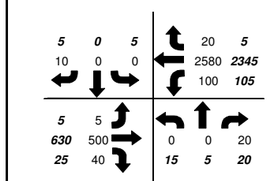
15 Valley St & Westlake Ave N

	Control	Delay (s)	LOS
No Action	Signal	83	F
Existing	Signal	16	B



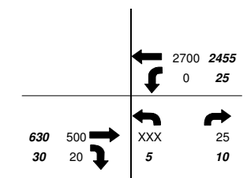
19 Valley St & Terry Ave N

	Control	Delay (s)	LOS
No Action	Signal	6	A
Existing	TWSC	21	C



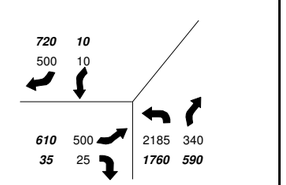
23 Valley St & Boren Ave N

	Control	Delay (s)	LOS
No Action	TWSC	25	D
Existing	TWSC	11	B



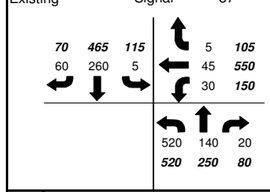
27 Valley St & Fairview Ave N

	Control	Delay (s)	LOS
No Action	Signal	79	E
Existing	Signal	110	F



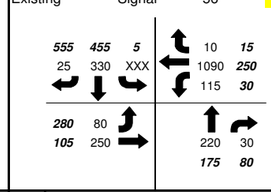
1 Roy St & 5th Ave N

	Control	Delay (s)	LOS
No Action	Signal	161	F
Existing	Signal	37	D



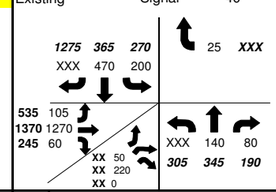
4 Broad St & 5th Ave N

	Control	Delay (s)	LOS
No Action	Signal	19	B
Existing	Signal	56	E



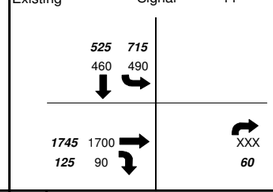
7 Mercer St, Dexter Ave N & Broad St

	Control	Delay (s)	LOS
No Action	Signal	32	C
Existing	Signal	40	D



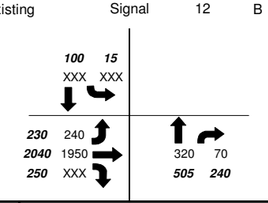
12 Mercer Street & 9th Ave N

	Control	Delay (s)	LOS
No Action	Signal	25	C
Existing	Signal	11	B



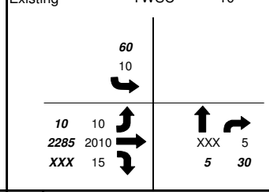
16 Mercer St & Westlake Ave N

	Control	Delay (s)	LOS
No Action	Signal	17	B
Existing	Signal	12	B



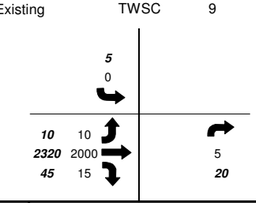
20 Mercer St & Terry Ave N

	Control	Delay (s)	LOS
No Action	Signal	7	A
Existing	TWSC	10	A



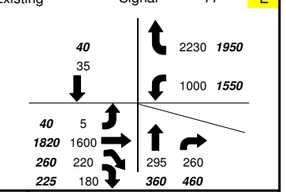
24 Mercer St & Boren Ave N

	Control	Delay (s)	LOS
No Action	TWSC	11	B
Existing	TWSC	9	A



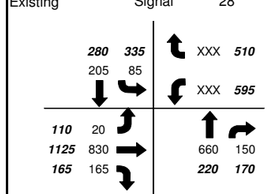
28 Mercer St & Fairview Ave N

	Control	Delay (s)	LOS
No Action	Signal	284	F
Existing	Signal	77	E



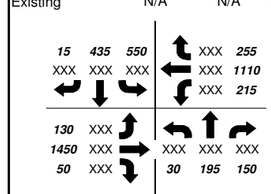
2 Mercer St & 5th Ave N

	Control	Delay (s)	LOS
No Action	Signal	30	C
Existing	Signal	28	C



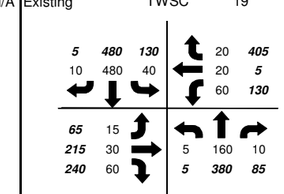
5 Mercer & 6th Ave N

	Control	Delay (s)	LOS
No Action	Signal	75	E
Existing	N/A	N/A	N/A



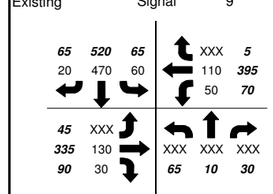
8 Republican St & Dexter Ave N

	Control	Delay (s)	LOS
No Action	Signal	14	B
Existing	TWSC	19	C



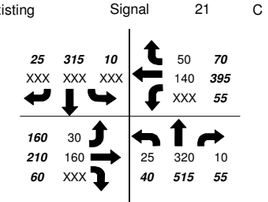
13 Republican St & 9th Ave N

	Control	Delay (s)	LOS
No Action	Signal	71	E
Existing	Signal	9	A



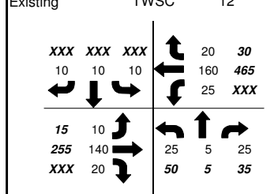
17 Republican St & Westlake Ave N

	Control	Delay (s)	LOS
No Action	Signal	28	C
Existing	Signal	21	C



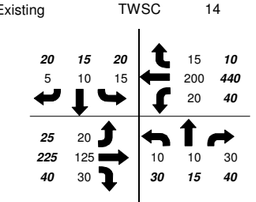
21 Republican St & Terry Ave N

	Control	Delay (s)	LOS
No Action	AWSC	16	C
Existing	TWSC	12	B



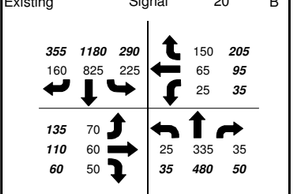
25 Republican St & Boren Ave N

	Control	Delay (s)	LOS
No Action	TWSC	24	C
Existing	TWSC	14	B



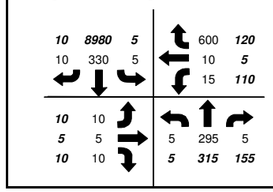
29 Republican St & Fairview Ave N

	Control	Delay (s)	LOS
No Action	Signal	74	E
Existing	Signal	20	B



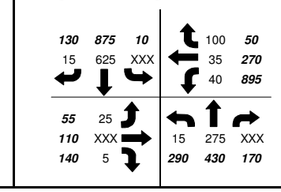
3 Harrison St & 5th Ave N

	Control	Delay (s)	LOS
No Action	Signal	7	A
Existing	Signal	19	B



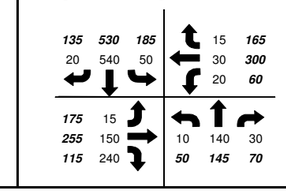
6 Roy St & Dexter Ave N

	Control	Delay (s)	LOS
No Action	Signal	103	F
Existing	Signal	7	A



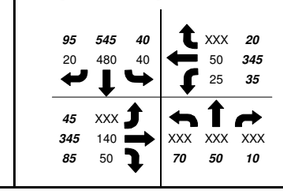
9 Harrison St & Dexter Ave N

	Control	Delay (s)	LOS
No Action	Signal	12	B
Existing	Signal	18	B



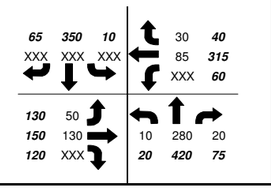
14 Harrison St & 9th Ave N

	Control	Delay (s)	LOS
No Action	Signal	50	D
Existing	Signal	7	A



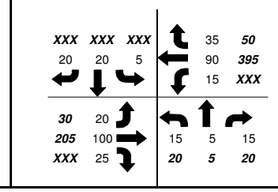
18 Harrison St & Westlake Ave N

	Control	Delay (s)	LOS
No Action	Signal	16	B
Existing	Signal	9	A



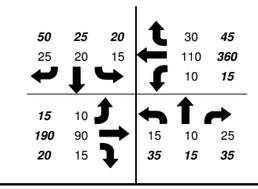
22 Harrison St & Terry Ave N

	Control	Delay (s)	LOS
No Action	AWSC	16	C
Existing	TWSC	11	B



26 Harrison St & Boren Ave N

	Control	Delay (s)	LOS
No Action	TWSC	19	C
Existing	TWSC	11	B



30 Harrison St & Fairview Ave N

	Control	Delay (s)	LOS
No Action	Signal	18	B
Existing	Signal	11	B

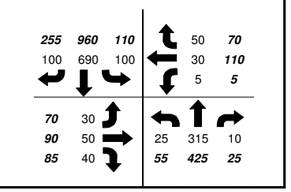
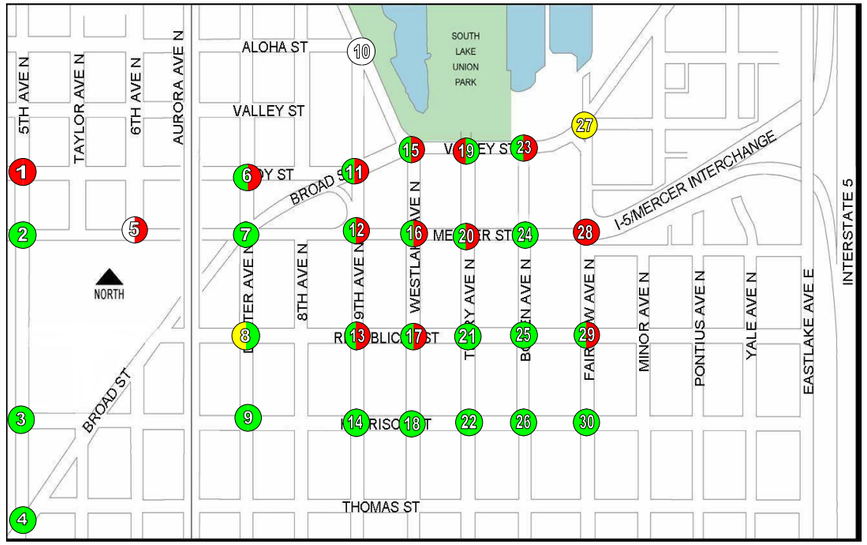
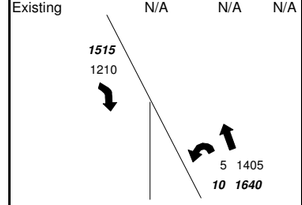


EXHIBIT TR-B9
Study Area Intersection Volumes and LOS
2005 Existing and 2030 No Action AM Peak Hour Conditions



10 Westlake Ave N & 9th Ave N

	Control	Delay (s)	LOS
No Action	N/A	N/A	N/A
Existing	N/A	N/A	N/A



LEGEND

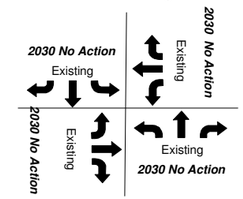
Turning Movement Direction

2005 Existing — 2030 No Action

Intersection not applicable *
LOS A - D
LOS E
LOS F

XXX Indicates that movement is not allowed
* Free movement intersection (LOS not applicable)

PM Peak Hour Turning Volumes



NOTES

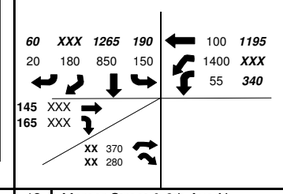
Intersection Number

LOS: Level of Service
TWSC Two-way stop controlled intersection
AWSC All-way stop controlled intersection

NOTE: This analysis is based on the Synchro software package. For signalized intersections, results are reported based on Synchro methodology. For unsignalized intersections, results are reported for the worst minor street approach based on the Highway Capacity Manual.

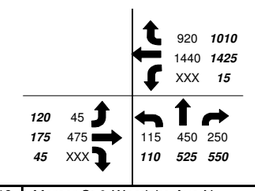
11 Broad St / Roy St & 9th Ave N

	Control	Delay (s)	LOS
No Action	Signal	136	F
Existing	Signal	39	D



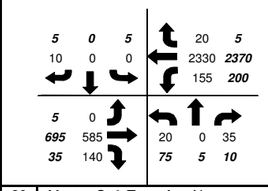
15 Valley St & Westlake Ave N

	Control	Delay (s)	LOS
No Action	Signal	190	F
Existing	Signal	13	B



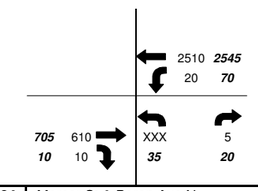
19 Valley St & Terry Ave N

	Control	Delay (s)	LOS
No Action	Signal	12	B
Existing	TWSC	174	F



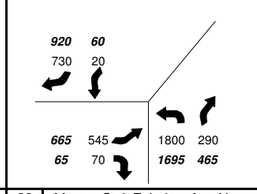
23 Valley St & Boren Ave N

	Control	Delay (s)	LOS
No Action	TWSC	130	F
Existing	TWSC	11	B



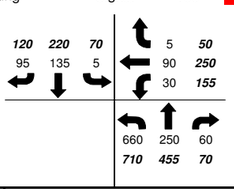
27 Valley St & Fairview Ave N

	Control	Delay (s)	LOS
No Action	Signal	71	E
Existing	Signal	77	E



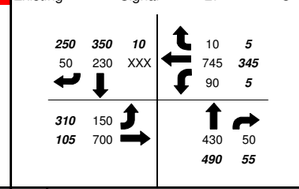
1 Roy St & 5th Ave N

	Control	Delay (s)	LOS
No Action	Signal	104	F
Existing	Signal	109	F



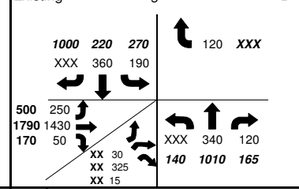
4 Broad St & 5th Ave N

	Control	Delay (s)	LOS
No Action	Signal	25	C
Existing	Signal	27	C



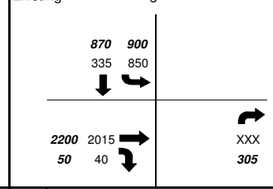
7 Mercer St, Dexter Ave N & Broad St

	Control	Delay (s)	LOS
No Action	Signal	45	D
Existing	Signal	49	D



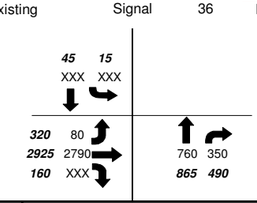
12 Mercer Street & 9th Ave N

	Control	Delay (s)	LOS
No Action	Signal	154	F
Existing	Signal	53	D



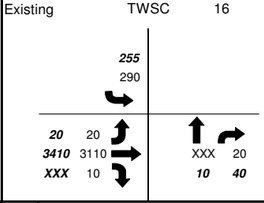
16 Mercer St & Westlake Ave N

	Control	Delay (s)	LOS
No Action	Signal	246	F
Existing	Signal	36	D



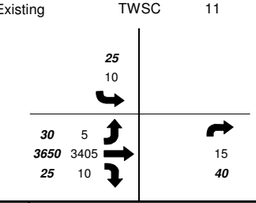
20 Mercer St & Terry Ave N

	Control	Delay (s)	LOS
No Action	Signal	117	F
Existing	TWSC	16	C



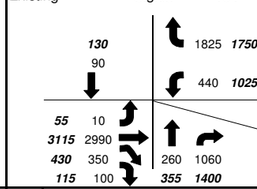
24 Mercer St & Boren Ave N

	Control	Delay (s)	LOS
No Action	TWSC	16	C
Existing	TWSC	11	B



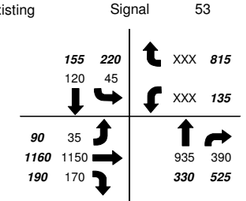
28 Mercer St & Fairview Ave N

	Control	Delay (s)	LOS
No Action	Signal	288	F
Existing	Signal	104	F



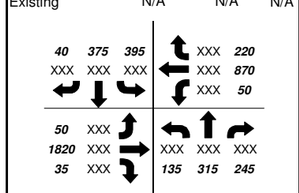
2 Mercer St & 5th Ave N

	Control	Delay (s)	LOS
No Action	Signal	23	C
Existing	Signal	53	D



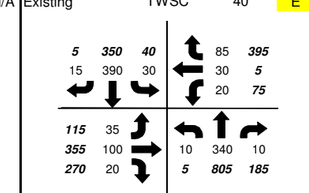
5 Mercer & 6th Ave N

	Control	Delay (s)	LOS
No Action	Signal	105	F
Existing	N/A	N/A	N/A



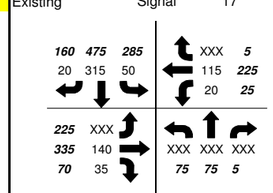
8 Republican St & Dexter Ave N

	Control	Delay (s)	LOS
No Action	Signal	40	D
Existing	TWSC	40	E



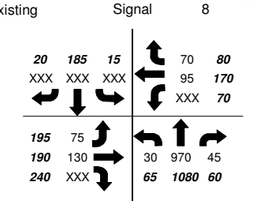
13 Republican St & 9th Ave N

	Control	Delay (s)	LOS
No Action	Signal	98	F
Existing	Signal	17	B



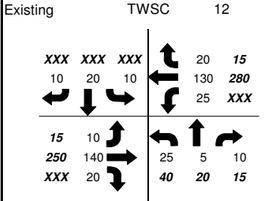
17 Republican St & Westlake Ave N

	Control	Delay (s)	LOS
No Action	Signal	121	F
Existing	Signal	8	A



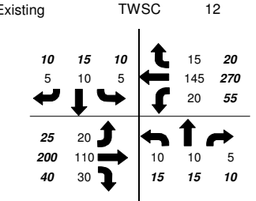
21 Republican St & Terry Ave N

	Control	Delay (s)	LOS
No Action	AWSC	10	B
Existing	TWSC	12	B



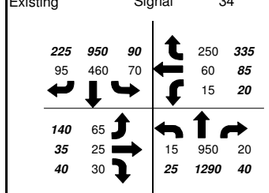
25 Republican St & Boren Ave N

	Control	Delay (s)	LOS
No Action	TWSC	18	C
Existing	TWSC	12	B



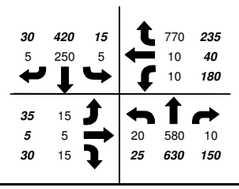
29 Republican St & Fairview Ave N

	Control	Delay (s)	LOS
No Action	Signal	80	F
Existing	Signal	34	C



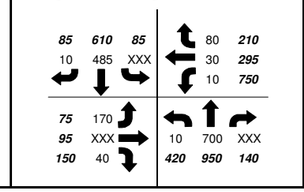
3 Harrison St & 5th Ave N

	Control	Delay (s)	LOS
No Action	Signal	8	A
Existing	Signal	23	C



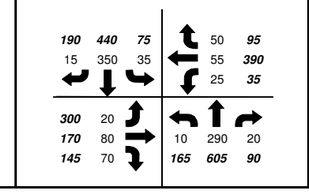
6 Roy St & Dexter Ave N

	Control	Delay (s)	LOS
No Action	Signal	101	F
Existing	Signal	15	B



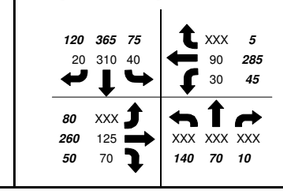
9 Harrison St & Dexter Ave N

	Control	Delay (s)	LOS
No Action	Signal	30	C
Existing	Signal	12	B



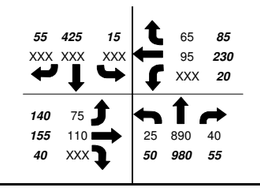
14 Harrison St & 9th Ave N

	Control	Delay (s)	LOS
No Action	Signal	22	C
Existing	Signal	11	B



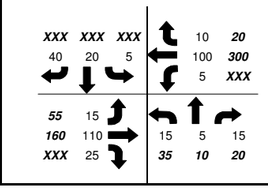
18 Harrison St & Westlake Ave N

	Control	Delay (s)	LOS
No Action	Signal	16	B
Existing	Signal	13	B



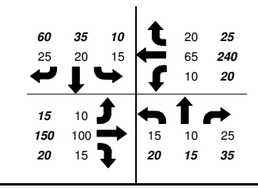
22 Harrison St & Terry Ave N

	Control	Delay (s)	LOS
No Action	AWSC	12	B
Existing	TWSC	11	B



26 Harrison St & Boren Ave N

	Control	Delay (s)	LOS
No Action	TWSC	15	B
Existing	TWSC	11	B



30 Harrison St & Fairview Ave N

	Control	Delay (s)	LOS
No Action	Signal	20	C
Existing	Signal	23	C

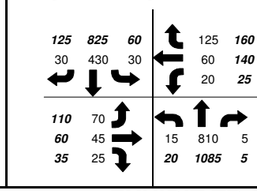
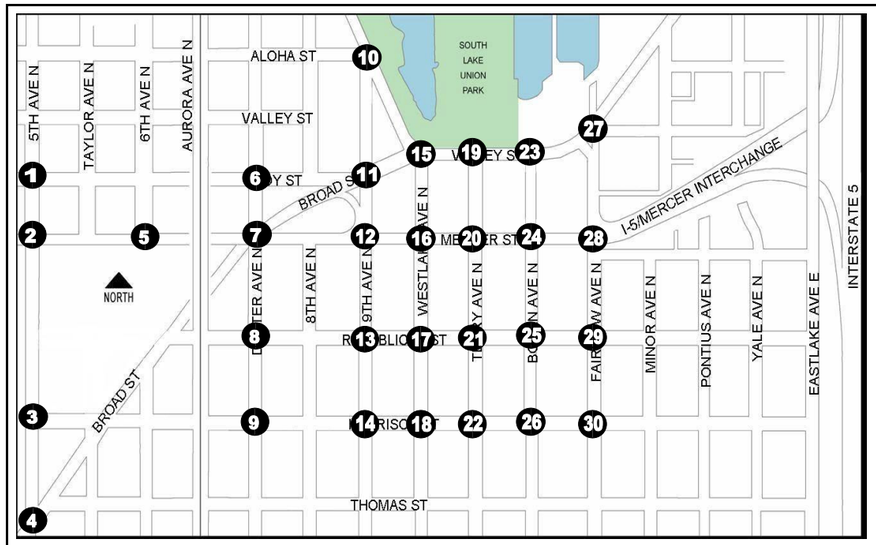
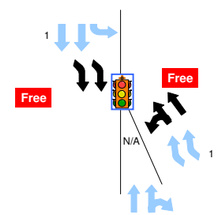


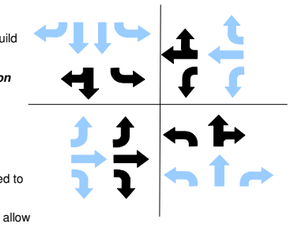
EXHIBIT TR-B10
Study Area Intersection Volumes and LOS
2005 Existing and 2030 No Action PM Peak Hour Conditions



10 Westlake Ave N & 9th Ave N



LEGEND

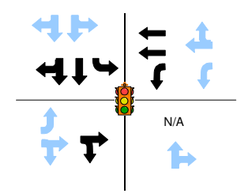


- 2030 Build Lane Channelization
- 2030 No Action Lane Channelization
- 1 SB/NB approaches under Build realligned to become through movements
- 2 SB approach under Build is realigned to allow SB through movements

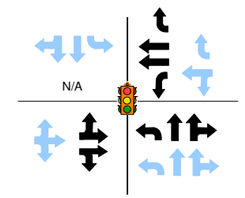
NOTES

- 8 Intersection Number
- STOP Stop-controlled Intersection/Approach
- STOP Stop-controlled Intersection/Approach added as part of Build
- Signalized Intersection
- Intersection is Signalized (as part of Build)
- Free Intersection has no control - all lanes are free

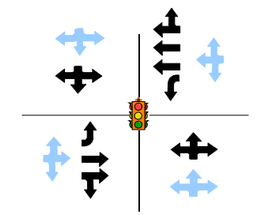
11 Broad St / Roy St & 9th Ave N



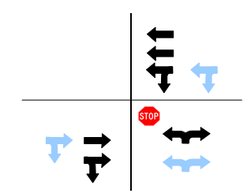
15 Valley St & Westlake Ave N



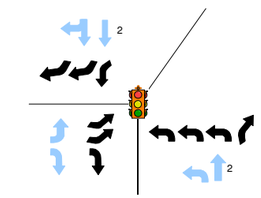
19 Valley St & Terry Ave N



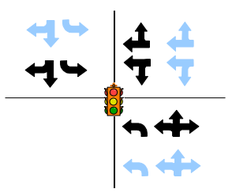
23 Valley St & Boren Ave N



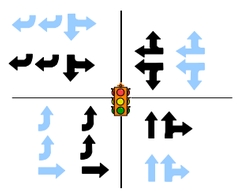
27 Valley St & Fairview Ave N



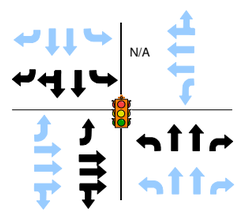
1 Roy St & 5th Ave N



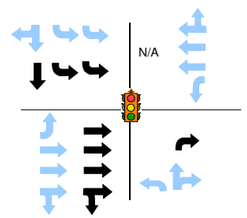
4 Broad St & 5th Ave N



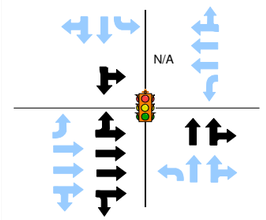
7 Mercer St, Dexter Ave N & Broad St



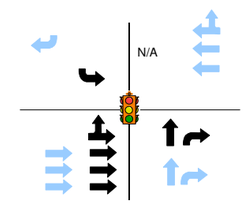
12 Mercer Street & 9th Ave N



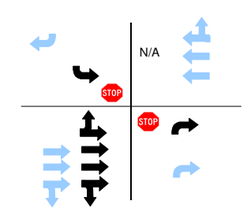
16 Mercer St & Westlake Ave N



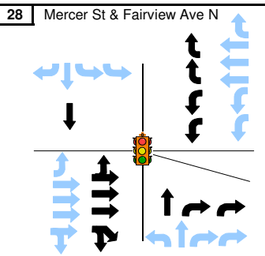
20 Mercer St & Terry Ave N



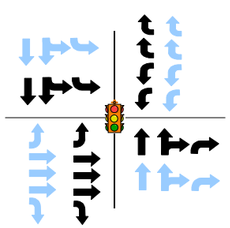
24 Mercer St & Boren Ave N



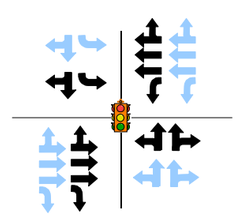
28 Mercer St & Fairview Ave N



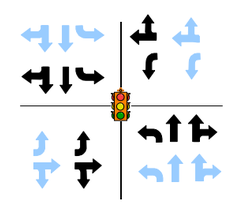
2 Mercer St & 5th Ave N



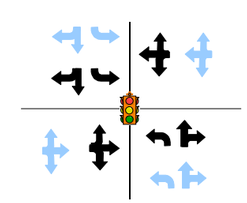
5 Mercer & 6th Ave N



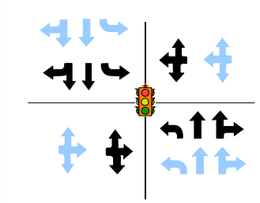
8 Republican St & Dexter Ave N



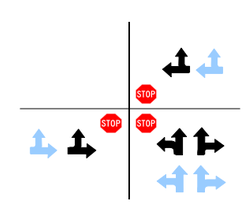
13 Republican St & 9th Ave N



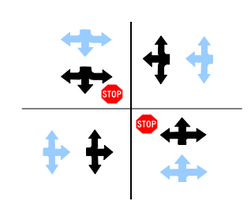
17 Republican St & Westlake Ave N



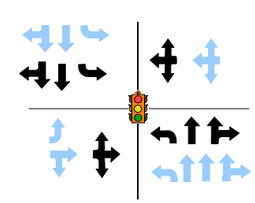
21 Republican St & Terry Ave N



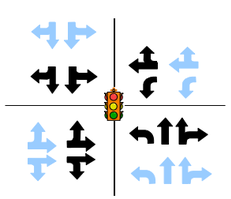
25 Republican St & Boren Ave N



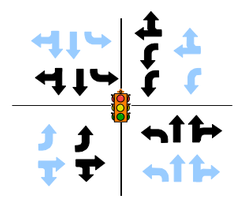
29 Republican St & Fairview Ave N



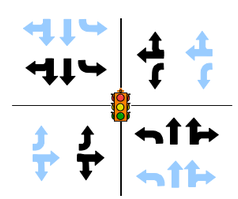
3 Harrison St & 5th Ave N



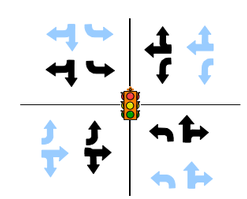
6 Roy St & Dexter Ave N



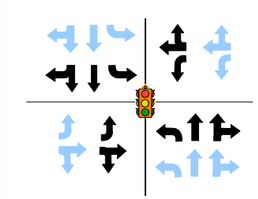
9 Harrison St & Dexter Ave N



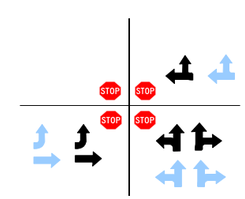
14 Harrison St & 9th Ave N



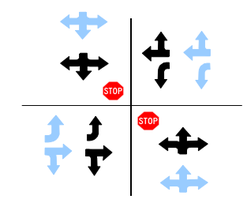
18 Harrison St & Westlake Ave N



22 Harrison St & Terry Ave N



26 Harrison St & Boren Ave N



30 Harrison St & Fairview Ave N

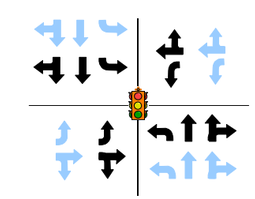
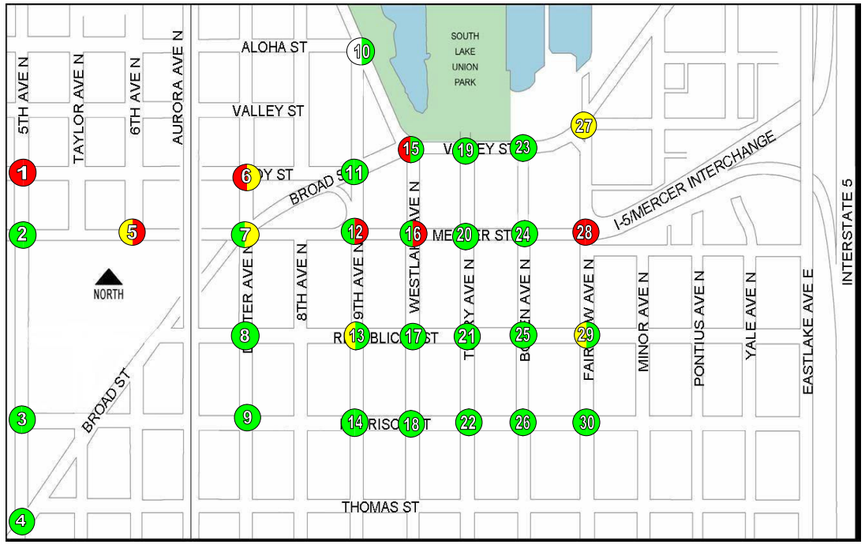
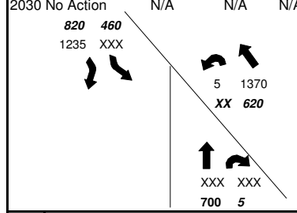


EXHIBIT TR-B11
Study Area Intersection Channelization
2030 No Action and Build Conditions



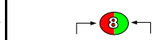
10 Westlake Ave N & 9th Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	21	C
2030 No Action	N/A	N/A	N/A



LEGEND

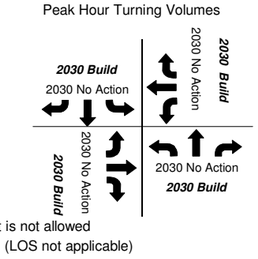
Turning Movement Direction



Intersection not applicable *
LOS A - D
LOS E
LOS F

XXX Indicates that movement is not allowed
* Free movement intersection (LOS not applicable)

Peak Hour Turning Volumes



NOTES

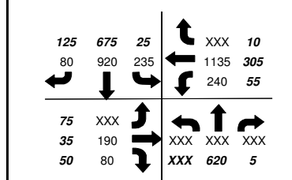
8 Intersection Number

LOS: Level of Service
TWSC Two-way stop controlled intersection
AWSC All-way stop controlled intersection

NOTE: This analysis is based on the Synchro software package. For signalized intersections, results are reported based on Synchro methodology. For unsignalized intersections, results are reported for the worst minor street approach based on the Highway Capacity Manual.

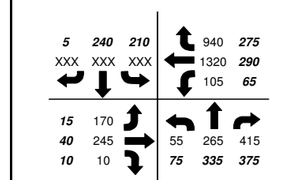
11 Broad St / Roy St & 9th Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	29	C
2030 No Action	Signal	35	C



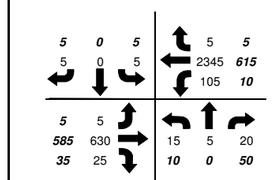
15 Valley St & Westlake Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	32	C
2030 No Action	Signal	83	F



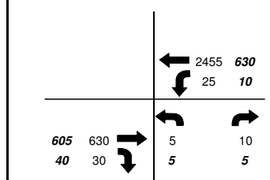
19 Valley St & Terry Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	11	B
2030 No Action	Signal	6	A



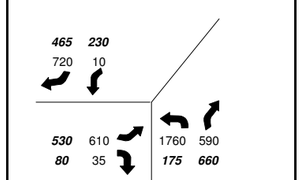
23 Valley St & Boren Ave N

	Control	Delay (s)	LOS
2030 Build	TWSC	25	D
2030 No Action	TWSC	25	D



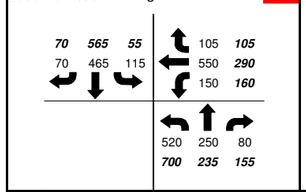
27 Valley St & Fairview Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	61	E
2030 No Action	Signal	79	E



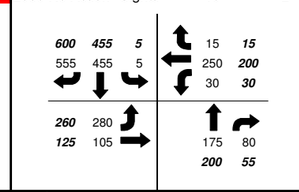
1 Roy St & 5th Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	244	F
2030 No Action	Signal	161	F



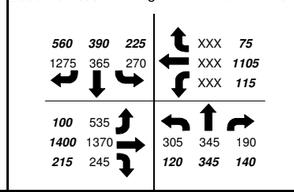
4 Broad St & 5th Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	25	C
2030 No Action	Signal	19	B



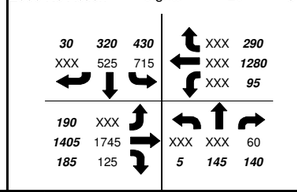
7 Mercer St, Dexter Ave N & Broad St

	Control	Delay (s)	LOS
2030 Build	Signal	59	E
2030 No Action	Signal	32	C



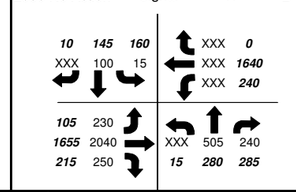
12 Mercer Street & 9th Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	96	F
2030 No Action	Signal	25	C



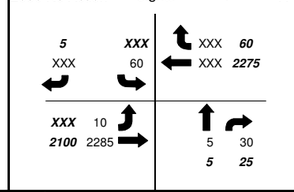
16 Mercer St & Westlake Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	95	F
2030 No Action	Signal	17	B



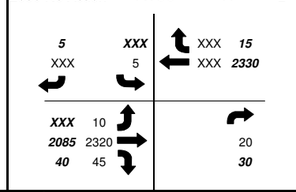
20 Mercer St & Terry Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	12	B
2030 No Action	Signal	7	A



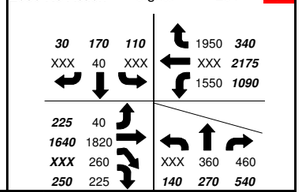
24 Mercer St & Boren Ave N

	Control	Delay (s)	LOS
2030 Build	TWSC	18	C
2030 No Action	TWSC	11	B



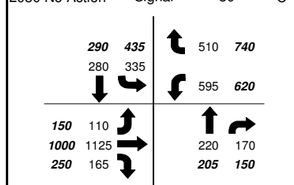
28 Mercer St & Fairview Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	131	F
2030 No Action	Signal	284	F



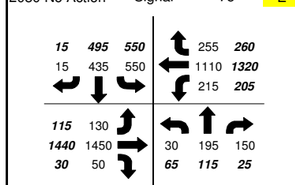
2 Mercer St & 5th Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	45	D
2030 No Action	Signal	30	C



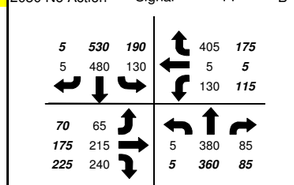
5 Mercer & 6th Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	94	F
2030 No Action	Signal	75	E



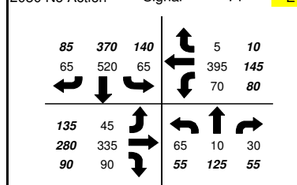
8 Republican St & Dexter Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	15	B
2030 No Action	Signal	14	B



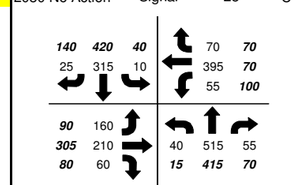
13 Republican St & 9th Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	41	D
2030 No Action	Signal	71	E



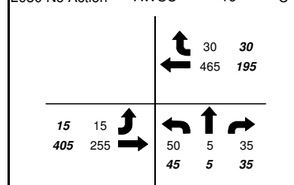
17 Republican St & Westlake Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	33	C
2030 No Action	Signal	28	C



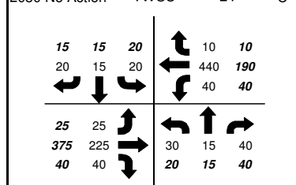
21 Republican St & Terry Ave N

	Control	Delay (s)	LOS
2030 Build	AWSC	13	B
2030 No Action	AWSC	16	C



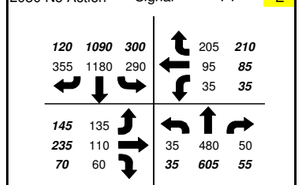
25 Republican St & Boren Ave N

	Control	Delay (s)	LOS
2030 Build	TWSC	21	C
2030 No Action	TWSC	24	C



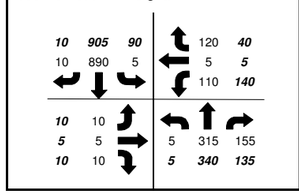
29 Republican St & Fairview Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	32	C
2030 No Action	Signal	74	E



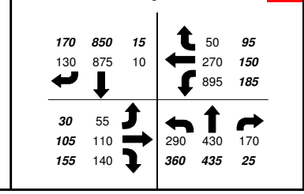
3 Harrison St & 5th Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	11	B
2030 No Action	Signal	7	A



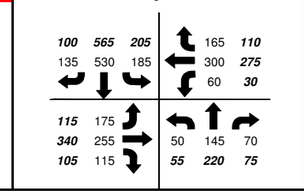
6 Roy St & Dexter Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	64	E
2030 No Action	Signal	103	F



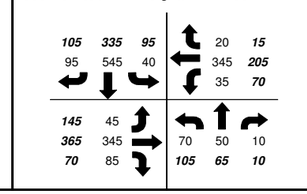
9 Harrison St & Dexter Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	16	B
2030 No Action	Signal	12	B



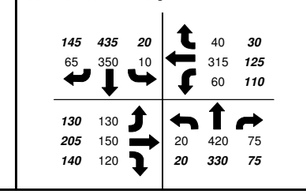
14 Harrison St & 9th Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	46	D
2030 No Action	Signal	50	D



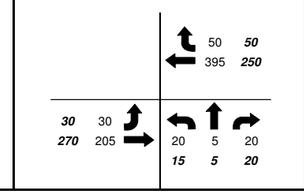
18 Harrison St & Westlake Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	15	B
2030 No Action	Signal	16	B



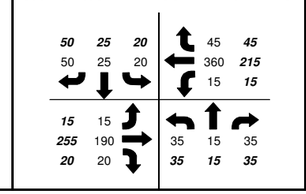
22 Harrison St & Terry Ave N

	Control	Delay (s)	LOS
2030 Build	AWSC	12	B
2030 No Action	AWSC	16	C



26 Harrison St & Boren Ave N

	Control	Delay (s)	LOS
2030 Build	TWSC	17	C
2030 No Action	TWSC	19	C



30 Harrison St & Fairview Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	13	B
2030 No Action	Signal	18	B

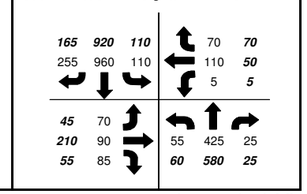
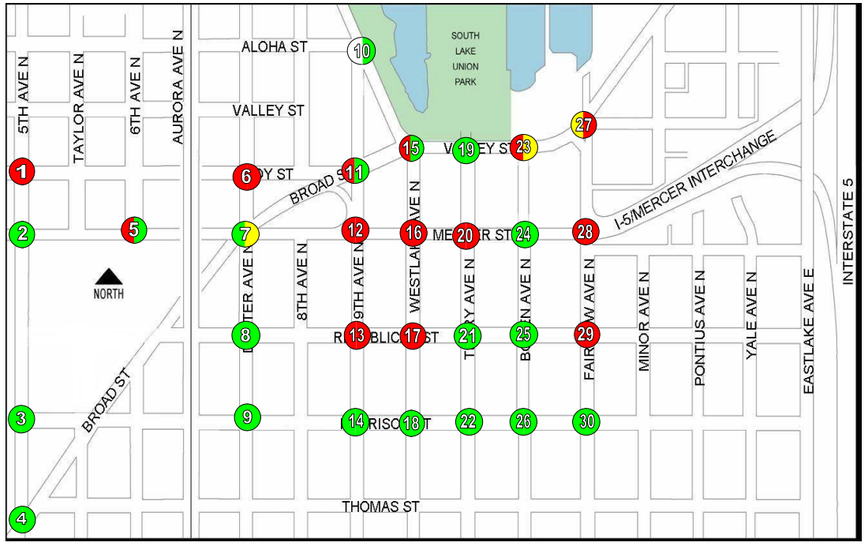
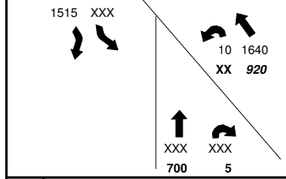


EXHIBIT TR-B12
Study Area Intersection Volumes and LOS
2030 No Action and Build AM Peak Hour Conditions



10 Westlake Ave N & 9th Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	21	C
2030 No Action	N/A	N/A	N/A

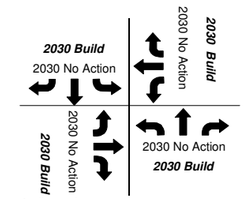


LEGEND

Turning Movement Direction

Intersection not applicable *
LOS A - D
LOS E
LOS F
XXX Indicates that movement is not allowed
* Free movement intersection (LOS not applicable)

Peak Hour Turning Volumes



NOTES

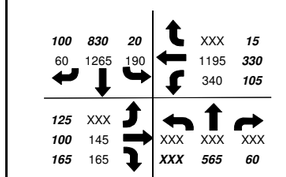
8 Intersection Number

LOS: Level of Service
TWSC Two-way stop controlled intersection
AWSC All-way stop controlled intersection

NOTE: This analysis is based on the Synchro software package. For signalized intersections, results are reported based on Synchro methodology. For unsignalized intersections, results are reported for the worst minor street approach based on the Highway Capacity Manual.

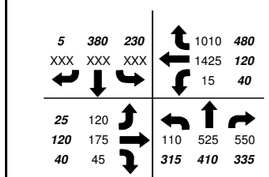
11 Broad St / Roy St & 9th Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	37	D
2030 No Action	Signal	136	F



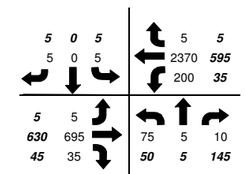
15 Valley St & Westlake Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	32	C
2030 No Action	Signal	190	F



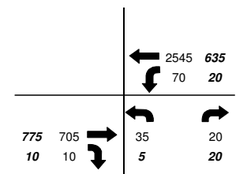
19 Valley St & Terry Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	31	C
2030 No Action	Signal	12	B



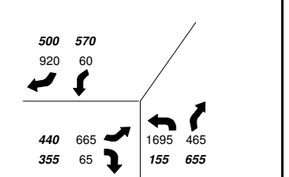
23 Valley St & Boren Ave N

	Control	Delay (s)	LOS
2030 Build	TWSC	41	E
2030 No Action	TWSC	130	F



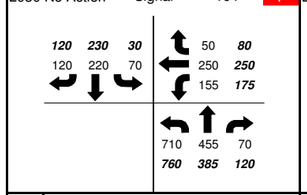
27 Valley St & Fairview Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	81	F
2030 No Action	Signal	71	E



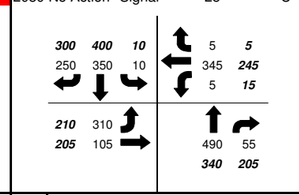
1 Roy St & 5th Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	137	F
2030 No Action	Signal	104	F



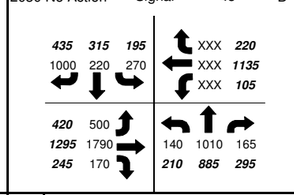
4 Broad St & 5th Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	19	B
2030 No Action	Signal	25	C



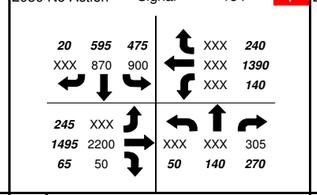
7 Mercer St, Dexter Ave N & Broad St

	Control	Delay (s)	LOS
2030 Build	Signal	79	E
2030 No Action	Signal	45	D



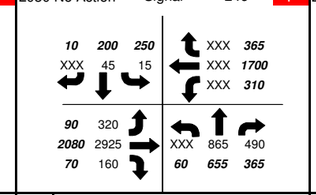
12 Mercer Street & 9th Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	182	F
2030 No Action	Signal	154	F



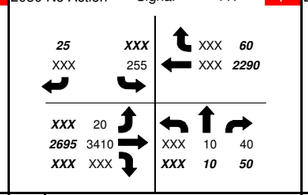
16 Mercer St & Westlake Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	214	F
2030 No Action	Signal	246	F



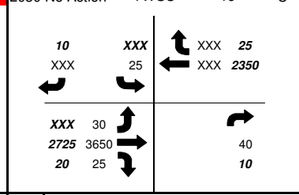
20 Mercer St & Terry Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	153	F
2030 No Action	Signal	117	F



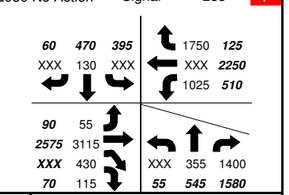
24 Mercer St & Boren Ave N

	Control	Delay (s)	LOS
2030 Build	TWSC	19	C
2030 No Action	TWSC	16	C



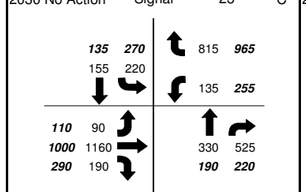
28 Mercer St & Fairview Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	229	F
2030 No Action	Signal	288	F



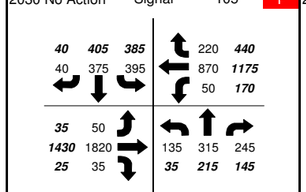
2 Mercer St & 5th Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	43	D
2030 No Action	Signal	23	C



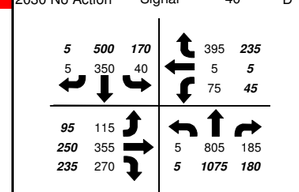
5 Mercer & 6th Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	46	D
2030 No Action	Signal	105	F



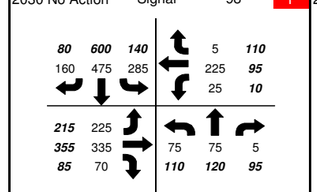
8 Republican St & Dexter Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	50	D
2030 No Action	Signal	40	D



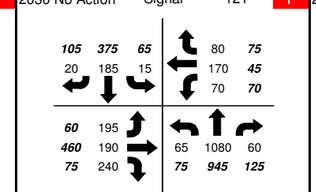
13 Republican St & 9th Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	130	F
2030 No Action	Signal	98	F



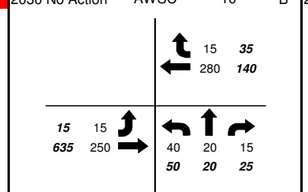
17 Republican St & Westlake Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	82	F
2030 No Action	Signal	121	F



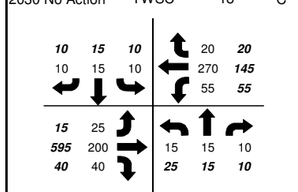
21 Republican St & Terry Ave N

	Control	Delay (s)	LOS
2030 Build	AWSC	28	D
2030 No Action	AWSC	10	B



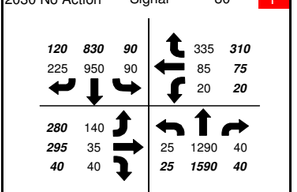
25 Republican St & Boren Ave N

	Control	Delay (s)	LOS
2030 Build	TWSC	30	D
2030 No Action	TWSC	18	C



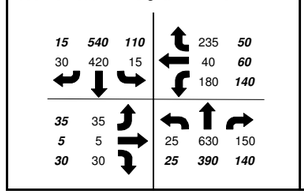
29 Republican St & Fairview Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	81	F
2030 No Action	Signal	80	F



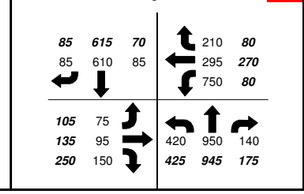
3 Harrison St & 5th Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	6	A
2030 No Action	Signal	8	A



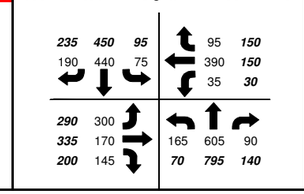
6 Roy St & Dexter Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	93	F
2030 No Action	Signal	101	F



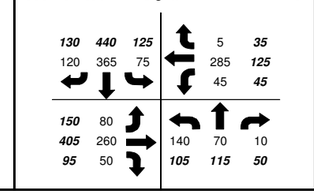
9 Harrison St & Dexter Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	31	C
2030 No Action	Signal	30	C



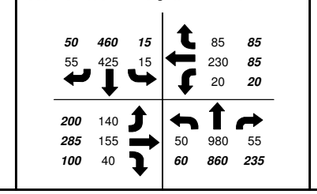
14 Harrison St & 9th Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	42	D
2030 No Action	Signal	22	C



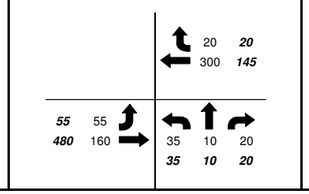
18 Harrison St & Westlake Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	19	B
2030 No Action	Signal	16	B



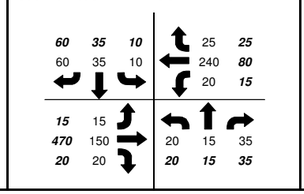
22 Harrison St & Terry Ave N

	Control	Delay (s)	LOS
2030 Build	AWSC	16	C
2030 No Action	AWSC	12	B



26 Harrison St & Boren Ave N

	Control	Delay (s)	LOS
2030 Build	TWSC	19	C
2030 No Action	TWSC	15	B



30 Harrison St & Fairview Ave N

	Control	Delay (s)	LOS
2030 Build	Signal	27	C
2030 No Action	Signal	20	C

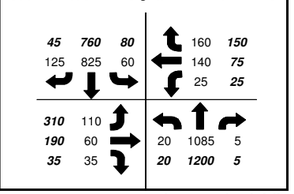


EXHIBIT TR-B13
Study Area Intersection Volumes and LOS
2030 No Action and Build PM Peak Hour Conditions

Appendix TR-C
I-5/Mercer Street Ramps and Freeway Travel Time Analysis

Travel Time (Seconds)

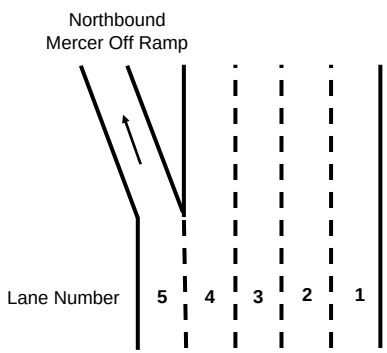
SCENARIO	from NB I-5 gore to ramp merge weave area			from SB I-5 gore to ramp merge weave area			from ramp merge weave point to Fairview/Mercer			Total Travel Time (from I-5 gore to Mercer/Fairview)	
	Move Time	Delay Time	Total Time	Move Time	Delay Time	Total Time	Move Time	Delay Time	Total Time	Northbound	Southbound
EXISTING											
2005 AM Existing	58.7	28.6	87.3	41.8	29.2	71.0	26.1	76.1	102.3	**189.6**	**173.3**
2005 PM Existing	57.5	7.3	64.7	41.2	7.2	48.4	26.2	80.5	106.6	**171.4**	**155.1**
2010											
2010 AM Baseline	58.8	152.5	211.3	42.0	100.3	142.3	30.4	74.5	105.0	**316.3**	**247.3**
2010 AM Preferred	54.9	34.1	88.9	47.8	28.5	76.3	27.4	78.0	105.4	**194.3**	**181.7**
2010 PM Baseline	57.7	68.9	126.6	38.1	5.1	43.3	22.7	65.0	87.8	**214.4**	**131.0**
2010 PM Preferred	54.8	60.1	114.9	48.1	26.3	74.4	27.3	88.8	116.1	**231.0**	**190.5**
2030											
2030 AM Baseline	59.1	311.3	370.4	42.3	48.8	91.1	30.9	75.7	106.6	**477.0**	**197.7**
2030 AM Preferred	55.3	126.4	181.7	48.0	24.4	72.4	27.6	89.1	116.7	**298.5**	**189.1**
2030 PM Baseline	58.8	336.0	394.8	42.3	25.5	67.8	30.8	94.1	124.9	**519.7**	**192.8**
2030 PM Preferred	55.2	125.6	180.8	48.5	64.3	112.8	27.4	128.8	156.2	**337.0**	**269.0**

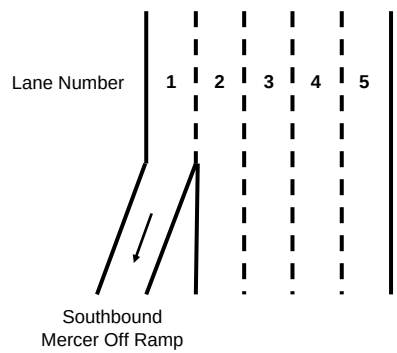
Average Travel Speeds (mph) on ramps

SCENARIO	Average Speed on NB Ramp (mph)	Average Speed on SB Ramp (mph)	Average Speed in merge area (mph)
EXISTING			
2005 AM Existing	20.1	23.8	4.8
2005 PM Existing	27.4	30.1	7.3
2010			
2010 AM Baseline	8.1	12.3	5.6
2010 AM Preferred	18.9	19.7	5.1
2010 PM Baseline	16.5	29.5	6.2
2010 PM Preferred	17.0	19.5	4.8
2030			
2030 AM Baseline	4.9	18.8	6.4
2030 AM Preferred	10.0	20.8	4.7
2030 PM Baseline	4.6	23.1	5.6
2030 PM Preferred	9.6	13.4	3.8

Average Travel Speeds (mph) on I-5 Mainline

SCENARIO	Average Speed on NB Mainline at Off Ramp (mph)					Average Speed on SB Mainline at Off Ramp (mph)				
	Lane 5	Lane 4	Lane 3	Lane 2	Lane 1	Lane 1	Lane 2	Lane 3	Lane 4	Lane 5
EXISTING										
2005 AM Existing	60.9	67.2	65.7	64.7	66.4	52.1	48.4	54.7	61.7	64.0
2005 PM Existing	61.2	66.3	62.9	49.3	59.7	51.9	49.7	56.5	63.8	65.3
2010										
2010 AM Baseline	30.7	43.6	50.5	46.6	54.7	26.3	26.2	37.5	48.9	54.4
2010 AM Preferred	58.8	60.0	58.2	51.0	56.5	51.6	39.0	50.8	61.9	65.0
2010 PM Baseline	59.0	63.0	65.3	61.6	64.1	53.3	50.6	59.1	65.6	65.2
2010 PM Preferred	31.7	37.6	36.8	25.2	37.9	35.4	35.3	45.4	57.5	61.3
2030 AM Baseline	5.6	12.3	19.3	19.7	40.6	12.8	17.8	27.4	33.4	36.7
2030 AM Preferred	15.9	24.3	27.4	19.0	32.9	22.7	20.6	30.3	36.9	40.6
2030 PM Baseline	5.5	12.4	18.8	15.4	33.7	17.8	21.0	29.3	33.7	36.5
2030 PM Preferred	13.9	18.3	19.7	10.0	22.5	13.9	23.3	31.2	34.1	36.9





Vehicles Served NORTHBOUND

SCENARIO	NB Mercer Off Ramp					NOTES
	Demand Volume	Served Volume	Served %	Unserved Volume	Unserved %	
EXISTING						
2005 AM Existing	1180	1193	100%	-13	0%	Queues do not back up onto I-5.
2005 PM Existing	1100	1064	97%	36	3%	Queues do not back up onto I-5.
2010						
2010 AM Baseline	1210	1110	92%	100	8%	Northbound queues back up beyond gore area onto I-5. Queue extends past Olive On-ramp.
2010 AM Preferred	1200	1146	95%	54	5%	Northbound queues back up onto ramp (but no spillback onto I-5 occurs).
2010 PM Baseline	1160	1054	91%	106	9%	Queues do not back up onto I-5.
2010 PM Preferred	1195	1130	95%	65	5%	Queues do not back up onto I-5.
2030						
2030 AM Baseline	1280	881	69%	399	31%	Northbound queues back up beyond gore area onto I-5. Queue extends past Olive On-ramp, to University On-ramp. Fewer vehicles served in Baseline than in Existing.
2030 AM Preferred	1290	1265	98%	25	2%	Northbound queues back up beyond gore area onto I-5. Queue extends past Olive On-ramp.
2030 PM Baseline	1210	788	65%	422	35%	Northbound queues back up beyond gore area onto I-5. Queue can extend to University On-ramp.
2030 PM Preferred	1255	1044	83%	211	17%	Queues do not back up onto I-5.

Vehicles Served SOUTHBOUND

SCENARIO	SB Mercer Off Ramp					NOTES
	Demand Volume	Served Volume	Served %	Unserved Volume	Unserved %	
EXISTING						
2005 AM Existing	2050	1851	90%	199	10%	Queues do not back up onto I-5. SB Express lane volumes are not fully served (only 83% served).
Mainline Ramp	945	932	99%	13	1%	
Express Lanes	1105	919	83%	186	17%	
2005 PM Existing	1165	1131	97%	34	3%	Queues do not back up onto I-5.
2010						
2010 AM Baseline	2195	1876	85%	319	15%	Queues do not back up onto I-5. SB Express lane volumes are not fully served (only 75% served).
Mainline Ramp	970	960	99%	10	1%	
Express Lanes	1225	917	75%	308	25%	
2010 AM Preferred	2280	2290	100%	-10	0%	Queues back up onto ramp just to gore (but no spillback onto I-5 occurs).
Mainline Ramp	1000	1014	100%	-14	0%	
Express Lanes	1280	1276	100%	4	0%	
2010 PM Baseline	1230	1037	84%	193	16%	Queues do not back up onto I-5.
2010 PM Preferred	1500	1411	94%	89	6%	Queues do not back up onto I-5.
2030						
2030 AM Baseline	2250	1971	88%	279	12%	Queues do not back up onto I-5. SB Express lane volumes are not fully served (only 86% served).
Mainline Ramp	945	845	89%	100	11%	
Express Lanes	1305	1126	86%	179	14%	
2030 AM Preferred	2315	2259	98%	56	2%	Queues do not back up onto I-5.
Mainline Ramp	975	920	94%	55	6%	
Express Lanes	1340	1339	100%	1	0%	
2030 PM Baseline	1580	1386	88%	194	12%	Queues do not back up onto I-5.
2030 PM Preferred	1680	1365	81%	315	19%	Queues do not back up onto I-5.

Addendum to the Transportation Discipline Report

Mercer Corridor Improvement Project - VISSIM Analysis for 2010 Year of Opening

PREPARED FOR: Angela Brady/SDOT
Eric Tweit/SDOT

PREPARED BY: Bill Love/CH2M HILL
Craig Grandstrom/CH2M HILL
Jeanne Acutanza/CH2M HILL

COPIES: Roger Mason/CH2M HILL

DATE: November 13, 2008

As identified in our project work breakdown structure, a VISSIM microsimulation analysis was completed for the year of opening to support design refinement and signal design and coordination. This technical memorandum describes the VISSIM analysis conducted for the Mercer Corridor Improvement Project for the 2010 year of opening. The VISSIM microsimulation software package was used to supplement the Synchro macroscopic traffic analysis previously documented in the November 2006 Transportation Discipline Report. This technical memorandum summarizes the benefits of VISSIM and describes the relationship to the original Synchro analysis. This memo also presents the results of the 2010 year of opening VISSIM analysis.

VISSIM Analysis Description

VISSIM is a very data-rich, in-depth analysis that provides many benefits for understanding traffic operations. It is labor-intensive to develop and therefore typically not used to compare alternatives at the environmental review phase. It is useful for analyzing the opening condition to inform final design decisions, however, especially with the slightly changed conditions with the streetcar. The advantages of VISSIM include the following:

- First, a microsimulation analysis is often used when more design details of the project are known as part of the design trade-offs and when elements such as signal timing plans and turn pockets need to be refined.
- Secondly, microsimulation (VISSIM) is better able to capture the effects of oversaturated conditions and queue spillback from adjacent intersections than macroscopic tools (Synchro). By contrast, macroscopic analysis tools assume that all projected demand volume will arrive at the intersection within the analysis period, despite any upstream or downstream bottlenecks that would potentially block the arrival of those vehicles. Currently, queue spillback occurs within the study area during the peak periods, and this trend is projected to continue in the future. This is especially important when considering the operations of the 6-Lane and 7-Lane build options in comparison to each other.

- Finally, VISSIM is able to realistically model the effects of the South Lake Union streetcar on the proposed arterial system. Currently, the streetcar preempts several signals along its route, which temporarily interrupts coordinated operation. Synchro is only partially able to model the effects of the streetcar by making oversimplified assumptions (such as streetcar arrival at every traffic cycle and no disturbance of coordination). For these reasons, a VISSIM analysis was used to help further refine the design and understand trade-offs between design details.

Methods and Assumptions

Study Area and Time Period

The study area for the Mercer VISSIM analysis includes 18 study intersections bounded by Valley Street to the north, Mercer Street to the south, 5th Avenue N to the west, and Fairview Avenue N to the east. The study area is represented in Figure 1 below. The study intersections and corresponding traffic controls are as follows:

1. Westlake Ave N/9th Ave N (one-way stop controlled)
2. 9th Ave N/Broad St (signalized)
3. Westlake Ave N/Valley St (signalized)
4. Terry Ave N/Valley St (two-way stop controlled)
5. Boren Ave N/Valley St (one-way stop controlled)
6. Fairview Ave N/Valley St (signalized)
7. 5th Ave N/Mercer St (signalized)
8. Dexter Ave N/Mercer St (signalized)
9. 8th Ave N/Mercer St (one-way stop controlled)
10. 9th Ave N/Mercer St (signalized)
11. Westlake Ave N/Mercer St (signalized)
12. Terry Ave N/Mercer St (two-way stop controlled)
13. Boren Ave N/Mercer St (two-way stop controlled)
14. Fairview Ave N/Mercer St/I-5 Ramps (signalized)
15. 5th Ave N/Republican St (signalized)
16. Fairview Ave N/Republican St (signalized)
17. 5th Ave N/Harrison St (signalized)
18. 5th Ave N/Broad St (signalized)

The ramps to and from I-5 were included in the VISSIM model, although I-5 mainline was not included.

Traffic operations were analyzed for the PM peak hour only, as this represents the worst case condition for traffic operations.

Traffic Volumes

Demand volumes for the VISSIM analysis are consistent with the Synchro analysis performed for the November 2006 Transportation Discipline Report.

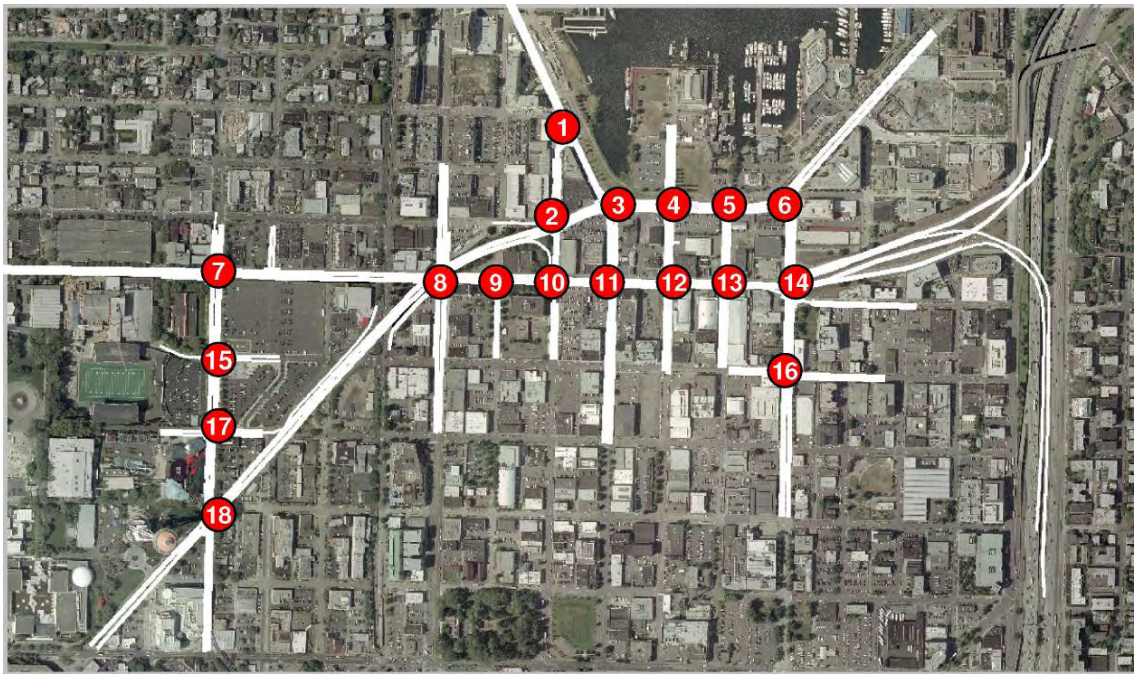


FIGURE 1
VISSIM Study Area

Methodology

The traffic operations analysis was conducted using a combination of Synchro and VISSIM software packages. Synchro (Version 7, Build 761) was used to determine the optimum cycle lengths, splits, and offsets for signalized intersections. Synchro is a macroscopic traffic model that produces measures of effectiveness (MOEs) consistent with the 2000 *Highway Capacity Manual* (HCM). A macroscopic traffic model analyzes intersections based on lane and movement groups, and will assume every vehicle in a lane group moves together.

VISSIM (Version 4.30, Build 05) is a microscopic, stochastic simulation model that models each vehicle as a separate entity with its own individual parameters and car-following logic. As a stochastic model, VISSIM accounts for the randomness of traffic and the mix of vehicle and driver types. VISSIM has no signal timing optimization features. However, VISSIM can simulate oversaturated conditions and queue spillback into adjacent intersections. VISSIM uses random numbers to determine when new vehicles enter a network and to choose vehicle paths through a network. This approach can cause unique network performance results; therefore, ten different simulation runs are performed and the results are averaged.

Synchro was used primarily to develop existing traffic signal cycle lengths, splits, and offsets. For 2005 Existing conditions, actual signal timing parameters were obtained from SDOT and input to the Synchro model. VISSIM was used for the operational analysis of the existing conditions and to measure volume throughput, delay, queues, and travel time. Documentation of the VISSIM calibration for the existing conditions is presented in a separate technical memorandum.

A table of parameters for the VISSIM analysis for each of the conditions modeled is presented in Table 1.

TABLE 1
VISSIM Arterial Operations Parameters/Assumptions

Parameter	2010 No Build (Full Preemption)	2010 No-Build (Partial Preemption)	2010 Build (6- and 7-Lane)
Driver Behavior: Car Following	Wiedemann 74 - Add. part of safety distance = 2.40 (default = 2.00) - Multiplicative part of safety distance = 3.30 (default = 3.00) Note: Parameters were changed to make saturation flow rate = 1900 vphg	Same as 2010 No Build	Same as 2010 No Build
Traffic Composition	From 2010 No Build Synchro File	From 2010 No Build Synchro File	From 2010 Build Synchro File
Conflicting Pedestrians Per Hour	From 2010 No Build Synchro File	From 2010 No Build Synchro File	From 2010 Build Synchro File
Parking Maneuvers Per Hour	From 2010 No Build Synchro File	From 2010 No Build Synchro File	From 2010 Build Synchro File
Bus Blockages	No bus routes modeled	Same as 2010 No Build	Same as 2010 No Build
Streetcar Headway	15 minute headways	Same as 2010 No Build	Same as 2010 No Build
Streetcar Signal Operations	Assume Streetcar preempt at following: Terry/Mercer NB Fairview/Valley EB and WB Terry/Valley WB Westlake/Valley WB Assume Streetcar travels with vehicle phase at following: Terry/Valley NB Westlake/Mercer SB	Assume Streetcar preempt at following: Fairview/Valley EB and WB Assumes Streetcar travels with vehicle phase at all other affected intersections.	Assume Streetcar travels with vehicle phase at all affected intersections.
Intersection signal phasing and coordination	From 2010 No Build Synchro File	From 2010 No Build Synchro File	From 2010 Build Synchro File
Intersection signal timing optimization limits	Between 90-150 seconds	Same as 2010 No Build	Same as 2010 No Build
# of Random Seed Runs	10 runs	Same as 2010 No Build	Same as 2010 No Build

Partial Preemption assumes streetcar signal preemption at Fairview and Valley intersection only

2010 Year of Opening Analysis

There are four conditions that were analyzed during the 2010 Year of Opening:

- **2010 No Build with Current (Full) Streetcar Preemption –** Assumes the 2005 street network, but with the conversion from one-way to two-way operation of Westlake Avenue N and 9th Avenue N from Valley Street to Denny Way. Other transportation improvements include the Seattle streetcar with 15-minute headways, signalization of the Terry Avenue N/Valley Street and Terry Avenue N/Mercer Street intersections, as well as signal preemption for the streetcar at all signals along the streetcar route within the study area, except for Mercer Street at Westlake Avenue N. Modification of the 5th Avenue N/Harrison Street intersection to include a pedestrian crosswalk on the north leg is also assumed.
- **2010 No Build with Partial Streetcar Preemption** - Assumed streetcar preemption occurs only at the intersection of Valley Street at Fairview Avenue.
- **2010 Build 6-Lane –** Assumes the Mercer Corridor improvements, with three lanes in each direction and a fourth eastbound lane in the block between Boren and Fairview avenues.
- **2010 Build 7-Lane –** Assumes the same improvements as the 2010 Build 6-Lane option, with the exception of eastbound Mercer Street between 9th Avenue N and Boren Avenue N, which would remove the parking lane creating a fourth travel lane.

Streetcar and other operational details for the above conditions are included in Table 1.

The volume throughput and travel time results of each condition will be discussed and compared in further detail below.

Volume Throughput

A screenline comparison of throughput volume as estimated by the VISSIM model was analyzed. The screenlines are shown in Figure 2 and the results are presented in Table 2. VISSIM throughput volume by intersection for the 2010 No Build (Full Preemption), 2010 No Build (Partial Preemption), 2010 Build 6-Lane, and 2010 Build 7-Lane conditions are contained in Appendices A, B, C, and D, respectively. It should be noted that travel demand forecasts within the Mercer Corridor study area are generally predicted to increase in the 2010 Build condition compared to the 2010 No Build condition. This would indicate a desired shift from other nearby corridors to the South Lake Union corridor.

The screenline volume results are mixed between the 2010 No Build Full Preemption and the 2010 Build 6-Lane conditions. The 2010 Build 6-Lane condition has the same or higher vehicle throughput than the 2010 No Build Full Preemption condition at the South and East screenlines, while slightly lower vehicle throughput at the North and West screenlines. Overall, the 2010 Build 6-Lane condition vehicle throughput is similar to the 2010 No Build Full Preemption condition.

Both 2010 Build conditions increase the vehicle throughput at the I-5 Mercer Street off-ramp compared to both 2010 No Build conditions. Overall, the 2010 Build 7-Lane condition has the highest vehicle throughput of the four conditions analyzed.

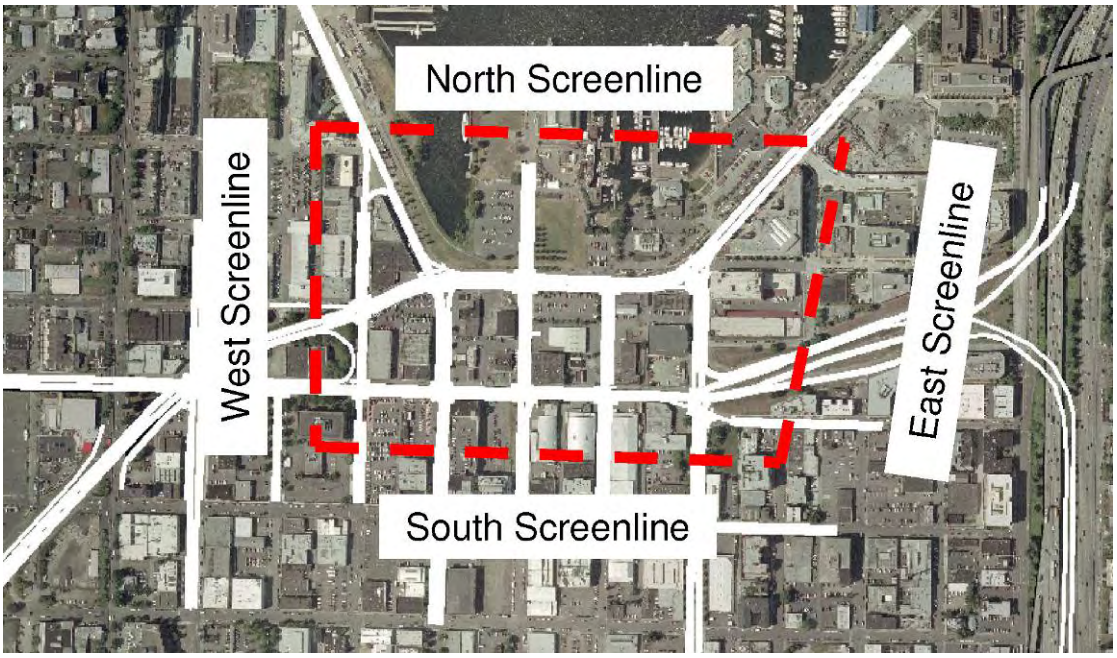


FIGURE 2
2010 Volume Screenlines

TABLE 2
2010 PM Peak Hour VISSIM Screenline Throughput Volume Comparison

Cordon	Direction	2010 No Build Current (Full) Preemption	2010 No Build Partial Preemption	2010 Build 6-Lane	2010 Build 7-Lane
North Screenline	NB	2,040	2,170	1,880	1,980
	SB	2,000	1,860	1,820	1,810
South Screenline	NB	2,250	2,490	2,080	2,170
	SB	1,160	1,130	1,460	1,520
West Screenline	EB	2,220	2,450	2,090	2,400
	WB	1,560	1,570	1,560	1,590
East Screenline	EB	3,530	3,680	3,360	3,640
	WB	2,160	2,150	2,350	2,430
Screenline Total		16,920	17,500	16,600	17,540

Notes: All volumes reported above are hourly throughput volumes measured from VISSIM.

Travel Time Results

Travel time routes were compared between 2010 No Build and Build conditions. The east-west travel time routes that were analyzed between the north side of the Seattle Center and I-5 are shown in Figure 3, while the travel time routes between the south side of the Seattle Center and I-5 are shown in Figure 4. These figures illustrate the differences in travel paths between the 2010 No Build and Build conditions, with a more direct path for westbound travel in the Build condition compared to the No Build condition. In addition to those routes, eastbound and westbound travel time routes were also analyzed between I-5 and Westlake Avenue N to the north. Travel time routes were also analyzed along Westlake Avenue N (northbound) and 9th Avenue N (southbound), respectively, between Republican Street and 8th Avenue N.

Travel time results for the east-west routes are presented in Table 3. In both eastbound routes analyzed between I-5 and the Seattle Center, the 7-Lane Build option would result in improved travel times by up to 2.3 minutes and 5.6 minutes compared to the Partial Preemption No Build and Full Preemption No Build scenarios, respectively. Travel times for the path to the north on Westlake would fluctuate by up to 1 minute longer under the 7-Lane Build option compared to either No Build scenario. Travel times for the 6-Lane Build option would increase by 0.5 to 1.5 minutes compared to the No Build Partial Preemption scenario for the six east-west paths.

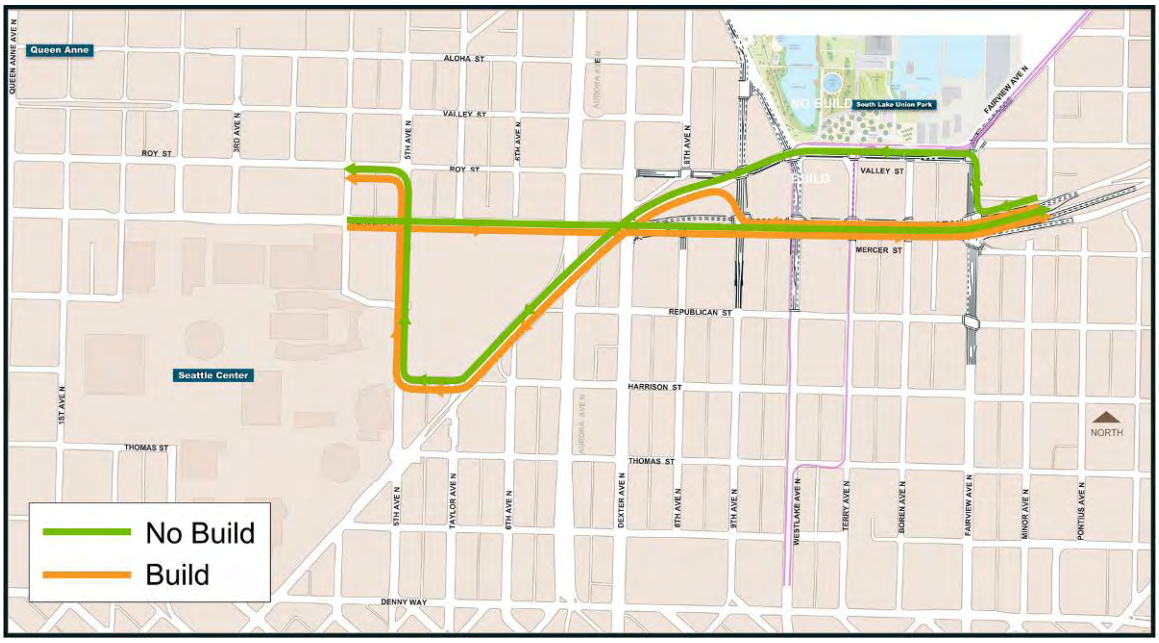


FIGURE 3
Travel Time Routes Between I-5 and the North Side of the Seattle Center

FIGURE 4
Travel Time Routes Between I-5 and the South Side of the Seattle Center

TABLE 3
Updated 2010 PM Peak Travel Time (in minutes) Comparison

Travel Route Paths	No Build Current (Full) Streetcar Preemption[a]	No Build Partial Streetcar Preemption[b]	Two-way (7-lane) Mercer[c]	Two-way (6-lane) Mercer[d]
WB - I-5 to Northside Seattle Center	7.8	7.2	7.3	8.5
EB – Northside Seattle Center to I-5	12.0	8.7	6.4	9.1
WB - I-5 to Southside Seattle Center	6.9	6.4	6.7	7.8
EB – Southside Seattle Center to I-5	12.0	9.5	8.4	10.5
WB - I-5 to Westlake	5.2	5.1	6.0	6.8
EB - Westlake to I-5	6.1	7.3	6.7	8.5
NB - Westlake Avenue	3.7	2.9	3.6	2.7
SB - Ninth Avenue	3.6	4.6	3.7	4.9

[a] Streetcar signal preemption at four intersections (Fairview/Valley, Valley/Terry, Valley/Westlake, Mercer/Terry).

[b] Streetcar signal preemption at Fairview and Valley intersection only.

[c] With four eastbound travel lanes on Mercer Street from Ninth Avenue to Fairview Avenue. No streetcar signal preemption.

[d] With on-street parking and three eastbound travel lanes on Mercer Street from Ninth Avenue to Boren Avenue and four travel lanes on Mercer Street from Boren Avenue to Fairview Avenue. No streetcar signal preemption.

The streetcar could potentially experience longer travel time under both Build conditions compared to the No Build condition due to a change in priority for the signal operations of the streetcar in the Build condition. Under the No Build Current (Full) Preemption condition, the streetcar was assumed to operate with preemption priority at most of the traffic signals along the streetcar route, which minimizes delay for the streetcar but temporarily disrupts signal coordination for vehicles. Under the Build condition, the traffic signals would be programmed to accommodate the streetcar with a separate phase that allows the traffic signal to remain in coordination for vehicles. The streetcar could experience some additional delay while it waits for its phase to occur; however, other vehicles within the study area would benefit by maintaining signal coordination. Preemption could be added at some or all of the Valley Street intersections to improve travel times for the streetcar.

A comparison between the original Synchro analysis and the supplemental VISSIM analysis for the 2010 east-west travel time results is presented in Table 4. The largest difference between the Synchro and VISSIM analysis is in the 2010 Build 6-Lane condition for both eastbound routes. This is attributable to the difference in macroscopic and microscopic methodologies as described earlier in this technical memorandum. A block-by-block examination of the eastbound route between the north side of the Seattle Center and I-5 indicates the travel time for Synchro is shorter than VISSIM between 4th Avenue N and Dexter Avenue N (3.5 minutes in Synchro compared to 6.7 minutes in VISSIM). Travel time for Synchro is longer than VISSIM between the 8th Avenue N/Broad Street and Fairview Avenue N intersections along Mercer Street (14.5 minutes in Synchro compared to 1.6 minutes in VISSIM). For comparison, the VISSIM travel time is 10.3 minutes between 4th Avenue N and 9th Avenue N and 1.7 minutes between 9th Avenue N and Fairview Avenue N in the No Build scenario. In both cases, this is due to congestion in VISSIM in the western portion of the corridor. Once the vehicles have traveled past the bottleneck, traffic flows better toward Fairview Avenue N and travel times are shorter than the Synchro estimates.

TABLE 4
Year 2010 Synchro-VISSIM Travel Time Comparison

Route	2010 No Build Full Preemption			2010 Build 6-Lane			2010 Build 7-Lane		
	Synchro	VISSIM	Key Differences	Synchro	VISSIM	Key Differences	Synchro	VISSIM	Key Differences
1 - WB (I-5 to NSC)	9.6	7.8	* 5th/Republican to 5th/Roy (3.9 in Synchro vs 0.7 in VISSIM)	8.6	8.5	* No significant difference	9.5	7.3	* Terry to 9th (2.8 min in Synchro vs 1.5 min in VISSIM)
2 - EB (NSC to I-5)	7.3	12.0	* 4th to 9th (2.0 in Synchro vs 10.3 in VISSIM) * 9th to Fairview (5.3 in Synchro vs 1.7 in VISSIM)	18.0	9.1	* 4th to Dexter (3.5 min in Synchro vs 6.7 min in VISSIM) * 8th/Broad to Fairview (14.5 min in Synchro vs 1.6 min in VISSIM)	10.2	6.4	* 4th to Dexter (2.9 min in Synchro vs 4.2 min in VISSIM) * 8th/Broad to Fairview (6.8 min in Synchro vs 1.5 min in VISSIM)
3 - WB (I-5 to SSC)	7.6	6.9	* No significant difference	7.5	7.8	* No significant difference	8.1	6.7	* Terry to 9th (2.8 min in Synchro vs 1.5 min in VISSIM)
4 - EB (SSC to I-5)	9.3	12.0	* 4th to 9th (1.9 in Synchro vs 8.4 in VISSIM) * 9th to Fairview (7.4 in Synchro vs 3.6 in VISSIM)	15.7	10.5	* 4th to 8th/Broad (1.5 min in Synchro vs 7.8 min in VISSIM) * 8th/Broad to Fairview (14.2 min in Synchro vs 2.7 min in VISSIM)	8.6	8.4	* 4th to 8th/Broad (1.4 min in Synchro vs 6.0 min in VISSIM) * 8th/Broad to Fairview (7.2 min in Synchro vs 2.4 min in VISSIM)

Notes:
Travel times are in minutes.
WB = westbound
NSC = north side of Seattle Center
EB = eastbound
SSC = south side of Seattle Center

Appendix A
2010 No-Build (Full Preemption) - VISSIM Throughput Results by Intersection

Mercer Corridor

2010 No Build PM Peak - Full Streetcar Preemption - VISSIM Summary

Int #	Int Name	Traffic Control	Appr	Mvmt	VISSIM Volume
1	Westlake / 9th	TWSC	NB	LT	4
2	Roy / 9th / Broad	Signal	NEB	TH	326
				RT	216
			SB	LT	156
				TH	823
				RT	171
				RT2	18
			SWB	LT	26
				TH	1313
				RT	61
3	Westlake / Valley	Signal	NB	LT	67
				TH	398
				RT	259
			EB	LT	38
				TH	365
				RT	103
			WB	LT	50
				TH	1339
				RT	885
4	Terry / Valley	Signal	NB	LT	20
				TH	4
				RT	13
			EB	LT	0
				TH	555
				RT	62
			SB	LT	3
				TH	0
				RT	5
			WB	LT	189
				TH	2239
				RT	3
5	Boren / Valley	TWSC	NB	RT	2
			WB	LT	28
6	Fairview / Valley	Signal	NB	LT	1641
				RT	203
			NEB	TH	518
				RT	59
			SWB	LT	26
				TH	802
7	5th / Mercer	Signal	NB	TH	889
				RT	398
			EB	LT	37
				TH	992
				RT	169
			SB	LT	40
				TH	120
8	Dexter / Mercer	Signal	NB	TH	397
				RT	121
			EB	LT	200
				TH	1083
				RT	49
			SB	LT	234
				TH	376
			WB	RT	88
			NEB	LT	20
				RT	188
				RT2	10
9	8th / Mercer	TWSC	NB	RT	15
10	9th / Mercer	Signal	NB	TH	3
				RT	162
			EB	LT	2
				TH	1545
				RT	46
			SB	LT	821
				TH	263
11	Westlake / Mercer	Signal	NB	TH	630
				RT	251
			EB	LT	74
				TH	2438
				RT	53
			SB	LT	99
				TH	53
12	Terry / Mercer	Signal	NB	TH	8
				RT	24
			EB	LT	16
				TH	2780
			SB	LT	201
13	Boren /	TWSC	NB	RT	21

Mercer Corridor

2010 No Build PM Peak - Full Streetcar Preemption - VISSIM Summary

Int #	Int Name	Traffic Control	Appr	Mvmt	VISSIM Volume
14	Fairview / Mercer	Signal	NB	TH	220
				RT	928
				RT2	0
			EB	LT	12
				TH	2602
				RT	294
				RT2	83
			SB	TH	85
			WB	LT	573
				RT	1584
15	5th / Republican	Signal	NB	LT	44
				TH	1258
				RT	21
			SB	LT	9
				TH	250
				RT	34
			WB	LT	28
				TH	0
				RT	46
16	Fairview / Republican	Signal	NB	LT	18
				TH	973
				RT	18
			EB	LT	65
				TH	10
				RT	18
			SB	LT	62
				TH	557
				RT	161
			WB	LT	8
				TH	36
				RT	127
17	5th / Harrison	Signal	NB	LT	23
				TH	551
				RT	11
			EB	LT	15
				TH	4
				RT	16
			SB	LT	5
				TH	265
				RT	5
			WB	LT	0
				TH	10
				RT	733
18	5th / Broad	Signal	NB	TH	440
				RT	84
			NEB	LT	154
				TH	705
			SB	TH	229
				RT	54
			SWB	LT	71
				TH	711
				RT	0

Appendix B
2010 No-Build (Partial Preemption) - VISSIM Throughput Results by Intersection

Mercer Corridor

2010 No Build PM Peak - Streetcar Preemption at Valley/Fairview Only - VISSIM Summary

Int #	Int Name	Traffic Control	Appr	Mvmt	VISSIM Volume
1	Westlake / 9th	TWSC	NB	LT	4
2	Roy / 9th / Broad	Signal	NEB	TH	381
				RT	262
			SB	LT	133
				TH	687
				RT	143
				RT2	15
			SWB	LT	27
				TH	1347
				RT	62
3	Westlake / Valley	Signal	NB	LT	75
				TH	447
				RT	290
			EB	LT	44
				TH	369
				RT	120
			WB	LT	51
				TH	1361
				RT	894
4	Terry / Valley	Signal	NB	LT	19
				TH	4
				RT	16
			EB	LT	0
				TH	584
				RT	72
			SB	LT	3
				TH	0
				RT	5
			WB	LT	193
				TH	2257
				RT	3
5	Boren / Valley	TWSC	NB	RT	2
			WB	LT	30
6	Fairview / Valley	Signal	NB	LT	1628
				RT	227
			NEB	TH	558
				RT	51
			SWB	LT	29
				TH	854
7	5th / Mercer	Signal	NB	TH	896
				RT	399
			EB	LT	41
				TH	1087
				RT	177
			SB	LT	41
				TH	120
8	Dexter / Mercer	Signal	NB	TH	397
				RT	121
			EB	LT	227
				TH	1213
				RT	51
			SB	LT	213
				TH	369
			WB	RT	106
			NEB	LT	20
				RT	189
				RT2	10
9	8th / Mercer	TWSC	NB	RT	15
10	9th / Mercer	Signal	NB	TH	3
				RT	161
			EB	LT	3
				TH	1655
				RT	48
			SB	LT	767
				TH	230
11	Westlake / Mercer	Signal	NB	TH	716
				RT	287
			EB	LT	82
				TH	2466
				RT	58
			SB	LT	113
				TH	54
12	Terry / Mercer	Signal	NB	TH	8
				RT	24
			EB	LT	18
				TH	2849
			SB	LT	221
13	Boren /	TWSC	NB	RT	21

Mercer Corridor

2010 No Build PM Peak - Streetcar Preemption at Valley/Fairview Only - VISSIM Summary

Int #	Int Name	Traffic Control	Appr	Mvmt	VISSIM Volume
14	Fairview / Mercer	Signal	NB	TH	251
				RT	1019
				RT2	0
			EB	LT	14
				TH	2662
				RT	302
				RT2	87
			SB	TH	78
			WB	LT	571
				RT	1573
15	5th / Republican	Signal	NB	LT	44
				TH	1266
				RT	21
			SB	LT	9
				TH	257
				RT	35
			WB	LT	28
				TH	0
				RT	46
16	Fairview / Republican	Signal	NB	LT	15
				TH	863
				RT	15
			EB	LT	145
				TH	22
				RT	39
			SB	LT	62
				TH	556
				RT	161
			WB	LT	14
				TH	59
				RT	251
17	5th / Harrison	Signal	NB	LT	24
				TH	561
				RT	11
			EB	LT	15
				TH	4
				RT	16
			SB	LT	5
				TH	272
				RT	5
			WB	LT	0
				TH	9
				RT	734
18	5th / Broad	Signal	NB	TH	443
				RT	85
			NEB	LT	161
				TH	748
			SB	TH	234
				RT	56
			SWB	LT	72
				TH	717
				RT	0

Appendix C
2010 Build 3-Lane - VISSIM Throughput Results by Intersection

Mercer Corridor

2010 Build 3-Lane PM Peak - VISSIM Summary

Int #	Int Name	Traffic Control	Appr	Mvmt	VISSIM Volume
1	Westlake / 9th	Signal	NB	TH	406
				RT	7
			SB	LT	455
				TH	694
			WB	RT	783
2	Roy / 9th / Broad	Signal	NB	LT	2
				TH	406
				RT	53
			EB	LT	10
				TH	11
				RT	4
			SB	LT	10
				TH	672
				RT	10
			WB	LT	3
				TH	79
				RT	6
3	Westlake / Valley	Signal	NB	LT	72
				TH	540
				RT	306
			EB	LT	5
				TH	57
				RT	7
			SB	LT	110
				TH	332
				RT	9
			WB	LT	110
				TH	8
				RT	238
4	Terry / Valley	Signal	NB	LT	22
				RT	81
			EB	TH	431
				RT	34
			SB	LT	22
				TH	0
				RT	12
			WB	LT	22
				TH	322
5	Boren / Valley	TWSC	NB	RT	17
			WB	LT	68
6	Fairview / Valley	Signal	NB	LT	154
				TH	283
			EB	LT	410
				RT	82
			SB	TH	411
				RT	260
7	5th / Mercer	Signal	NB	TH	919
				RT	407
			EB	LT	28
				TH	1091
				RT	158
			SB	LT	41
				TH	119
8	Dexter / Mercer	Signal	NB	TH	335
				RT	97
			EB	LT	232
				TH	1049
				RT	173
			SB	LT	32
				TH	192
			WB	RT	106
			NEB	LT	25
				RT	246
				RT2	13
9	8th / Mercer	Signal	NB	LT	4
				RT	16
			EB	TH	1456
				RT	13
			SB	LT	533
				TH	4
				RT	99
10	9th / Mercer	Signal	NB	LT	6
				TH	76
				RT	66
			EB	LT	114
				TH	1875
				RT	73
			SB	LT	374
				TH	123
				RT	183
			WB	LT	114
				TH	1281
				RT	263

Mercer Corridor

2010 Build 3-Lane PM Peak - VISSIM Summary

Int #	Int Name	Traffic Control	Appr	Mvmt	VISSIM Volume
11	Westlake / Mercer	Signal	NB	LT	69
				TH	408
				RT	157
			EB	LT	96
				TH	2187
				RT	61
			SB	LT	178
				TH	240
				RT	33
			WB	LT	158
				TH	1549
				RT	406
12	Terry / Mercer	Signal	NB	TH	10
				RT	75
			EB	TH	2540
			SB	LT	0
				RT	7
			WB	TH	2118
				RT	6
13	Boren / Mercer	Signal	NB	RT	16
			EB	TH	2594
				RT	18
			SB	RT	48
			WB	TH	2086
				RT	3
14	Fairview / Mercer	Signal	NB	LT	48
				TH	215
				RT	931
			EB	LT	92
				TH	2285
				RT	127
				RT2	75
			SB	LT	143
				TH	151
				RT	210
			WB	LT	451
				TH	1778
				RT	121
15	5th / Republican	Signal	NB	LT	39
				TH	1276
				RT	20
			SB	LT	9
				TH	241
				RT	32
			WB	LT	28
				TH	0
				RT	46
16	Fairview / Republican	Signal	NB	LT	15
				TH	964
				RT	16
			EB	LT	59
				TH	49
				RT	15
			SB	LT	61
				TH	526
				RT	95
			WB	LT	12
				TH	49
				RT	180
17	5th / Harrison	Signal	NB	LT	24
				TH	566
				RT	11
			EB	LT	14
				TH	4
				RT	16
			SB	LT	5
				TH	261
				RT	5
			WB	LT	0
				TH	7
				RT	759
18	5th / Broad	Signal	NB	TH	441
				RT	86
			NEB	LT	156
				TH	717
			SB	TH	223
				RT	53
			SWB	LT	67
				TH	705
				RT	0

Appendix D
2010 Build 4-Lane - VISSIM Throughput Results by Intersection

Mercer Corridor

2010 Build 4-Lane PM Peak VISSIM Summary

Int #	Int Name	Traffic Control	Appr	Mvmt	VISSIM Volume
1	Westlake / 9th	Signal	NB	TH	457
				RT	6
			SB	LT	470
				TH	701
			WB	RT	793
2	Roy / 9th / Broad	Signal	NB	LT	3
				TH	459
				RT	73
			EB	LT	10
				TH	11
				RT	4
			SB	LT	11
				TH	686
				RT	10
			WB	LT	3
				TH	77
				RT	5
3	Westlake / Valley	Signal	NB	LT	70
				TH	553
				RT	308
			EB	LT	5
				TH	76
				RT	7
			SB	LT	111
				TH	346
				RT	10
			WB	LT	105
				TH	7
				RT	237
4	Terry / Valley	Signal	NB	LT	22
				RT	82
			EB	TH	453
				RT	35
			SB	LT	22
				TH	0
				RT	13
			WB	LT	21
				TH	314
5	Boren / Valley	TWSC	NB	RT	17
			WB	LT	63
6	Fairview / Valley	Signal	NB	LT	152
				TH	302
			EB	LT	430
				RT	85
			SB	TH	390
				RT	246
7	5th / Mercer	Signal	NB	TH	936
				RT	411
			EB	LT	29
				TH	1158
				RT	171
			SB	LT	41
				TH	119
8	Dexter / Mercer	Signal	NB	TH	389
				RT	118
			EB	LT	242
				TH	1218
				RT	195
			SB	LT	134
				TH	315
			WB	RT	113
			NEB	LT	27
				RT	267
				RT2	14
9	8th / Mercer	Signal	NB	LT	4
				RT	17
			EB	TH	1746
				RT	15
			SB	LT	572
				TH	4
				RT	108
10	9th / Mercer	Signal	NB	LT	11
				TH	129
				RT	112
			EB	LT	130
				TH	2160
				RT	86
			SB	LT	382
				TH	123
				RT	184
			WB	LT	117
				TH	1303
				RT	269

Mercer Corridor

2010 Build 4-Lane PM Peak VISSIM Summary

Int #	Int Name	Traffic Control	Appr	Mvmt	VISSIM Volume
11	Westlake / Mercer	Signal	NB	LT	68
				TH	395
				RT	149
			EB	LT	113
				TH	2501
				RT	74
			SB	LT	188
				TH	244
				RT	31
			WB	LT	158
				TH	1586
				RT	417
12	Terry / Mercer	Signal	NB	TH	10
				RT	75
			EB	TH	2868
			SB	LT	0
				RT	7
			WB	TH	2172
				RT	6
13	Boren / Mercer	Signal	NB	RT	16
			EB	TH	2920
				RT	19
			SB	RT	43
			WB	TH	2157
				RT	3
14	Fairview / Mercer	Signal	NB	LT	49
				TH	221
				RT	935
			EB	LT	105
				TH	2566
				RT	144
				RT2	86
			SB	LT	138
				TH	146
				RT	203
			WB	LT	466
				TH	1835
				RT	124
15	5th / Republican	Signal	NB	LT	39
				TH	1293
				RT	20
			SB	LT	9
				TH	251
				RT	34
			WB	LT	28
				TH	0
				RT	46
16	Fairview / Republican	Signal	NB	LT	14
				TH	948
				RT	16
			EB	LT	65
				TH	53
				RT	17
			SB	LT	66
				TH	542
				RT	98
			WB	LT	12
				TH	52
				RT	198
17	5th / Harrison	Signal	NB	LT	24
				TH	570
				RT	11
			EB	LT	14
				TH	4
				RT	16
			SB	LT	5
				TH	271
				RT	5
			WB	LT	0
				TH	8
				RT	773
18	5th / Broad	Signal	NB	TH	441
				RT	86
			NEB	LT	159
				TH	737
			SB	TH	231
				RT	55
			SWB	LT	70
				TH	713
				RT	0