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EUGENE CITY COUNCIL AGENDA

April 16, 2014

12:00 PM **CITY COUNCIL WORK SESSION**
Harris Hall
125 East 8th Avenue
Eugene, Oregon 97401

Meeting of April 16, 2014;
Her Honor Mayor Kitty Piercy Presiding

Councilors

George Brown, President	Pat Farr, Vice President
Mike Clark	George Poling
Chris Pryor	Claire Syrett
Betty Taylor	Alan Zelenka

CITY COUNCIL WORK SESSION
Harris Hall

12:00 p.m. A. WORK SESSION:
South Willamette Street Improvement Plan

**time approximate*

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EUGENE CITY COUNCIL
AGENDA ITEM SUMMARY

Work Session: South Willamette Street Improvement Plan

Meeting Date: April 16, 2014
Department: Public Works
www.eugene-or.gov

Agenda Item Number: A
Staff Contact: Chris Henry
Contact Telephone Number: 541-682-8472

ISSUE STATEMENT
The Eugene City Council will receive a presentation from staff and consultants about the Draft South Willamette Street Improvement Plan, an economic study, and details of a test reconfiguration. The South Willamette Street Improvement Plan will develop a complete street design for an active transportation corridor (providing for walking, biking, transit, driving, and business access) that can be adopted and advanced as a capital improvement project for construction.

The project team will share details of community involvement, the range of street design alternatives resulting from that engagement, and the consultant team recommendation. Consultants will also share the results of a separate economic study. The council will have an opportunity to ask questions about the street design alternatives, the consultant team recommendation, discuss community issues, provide feedback, and discuss their role in the process leading to a public hearing and decision.

BACKGROUND
Purpose:
The South Willamette Street Improvement Plan is exploring options for people to safely walk, bike, take the bus, or drive in an eight-block study area of Willamette Street from 24th Avenue to 32nd Avenue. The City and Oregon Department of Transportation (ODOT) have contracted with a consultant team of transportation engineers and urban design planners led by DKS Associates (with assistance from OTAK), which includes Cogito, locally-based public involvement specialists.

The goal of this study is to help South Willamette Street become a vibrant urban corridor accessible by bicycle, foot, car, and bus. Today, Willamette Street is heavily used to reach many popular destinations, yet it is uninviting to people walking, biking, riding transit, and driving. For years, many residents and business owners have shared complaints about the poor conditions on Willamette Street for walking and biking and the need to do something about it.

The plan aims to support existing businesses and the commercial district’s vitality; create a balanced multi-modal transportation system; further City planning efforts to identify compact growth and redevelopment opportunities; and foster a well-informed and involved community supportive of the plan.

The results of this project will serve as the street design portion of the South Willamette Concept Plan. The South Willamette Concept Plan is a pilot of the area planning process, an important strategy to accommodate growth through Envision Eugene. The Concept Plan creates a long-term vision and identifies tools for realizing that vision in the South Willamette area. One important goal of the Concept Plan is to create a neighborhood where services for residents are available within a "20-minute" walk, and that the street functions for a variety of users. The timing of the South Willamette Street Improvement Plan is good because it melds with the South Willamette Concept Plan, and needed pavement preservation work recently identified in the 2012 Bond Measure to Fix Streets and Fund Bicycle and Pedestrian Projects.

Public Process:
In August of 2012, the project team began by talking with stakeholders in small groups, including property and business owners, bicycle, pedestrian and transit advocates, and neighborhood leaders from Friendly, Crest, South Eugene, and Amazon neighborhood associations. Based on knowledge gained in September, two robust focus groups were organized (one based on business; and another based on users of cars, walking, bus, and bike) to hear more about people's concerns, preferences and flexibilities towards identified corridor issues. In October, traffic count data was collected (when University of Oregon (UO) and Lane Community College (LCC) campuses were active) and an Existing Conditions Report was prepared. In November, over 150 participants attended the first community forum where they heard the results of recent traffic studies, explored alternatives, and the project team listened to community priorities for future improvements.

A second community forum was held in February 2013 to evaluate the alternatives that were prepared in response to earlier community conversations. Following the February community forum, the project team narrowed the number of alternatives down to three and performed more detailed transportation analysis.

The third, and final, community forum was held in June 2013. Participants were asked to help rank and refine the street design alternatives following a presentation of transportation analysis and group discussion. An online survey was also available to hear the preferences of those who were not able to attend the community forum.

Staff has provided updates on the process to the Eugene City Council on January 28, 2013, and again on June 19, 2013. Staff has also met with the Eugene Planning Commission twice, on November 4, 2013, and again on April 7, 2014, to discuss the South Willamette Street Improvement Plan and Economic Study respectively.

Consultant Project Team Recommendation:
On October 2, 2013, an executive summary of the Draft South Willamette Street Improvement Plan and consultant project team recommendation was shared in two meetings with stakeholder groups. The consultant team will provide details of the street design alternatives in their

presentation.
The Eugene City Manager has endorsed a triple-bottom-line approach to sustainability and analysis for City projects and programs providing for consideration of people, the planet, and prosperity (or equity, environment, and economy). In development of the Draft Eugene Transportation System Plan (Draft TSP), the Transportation Community Resource Group (TCRG) extensively vetted a sustainability rating system based on a triple-bottom-line analysis. The South Willamette Street Improvement Plan adapted the TCRG sustainability work to develop screening criteria for qualitative assessment of the roadway alternatives. The results of the sustainability screening are included in the Draft South Willamette Street Improvement Plan and helped to inform the consultant project team recommendation.

In weighing all the considerations identified in the Draft South Willamette Street Improvement Plan, the community feedback and technical analysis, **the consultant project team finds that Alternative #3 (three lanes with bike lanes) represents the best solution for South Willamette Street.**

Economic Study:
Following the October 2013 stakeholder meetings, concerns were raised by some business and property owners about the economic effects of a potential street reconfiguration. In response to those economic concerns, staff collaborated with business and property owner representatives to develop an Economic Study of the potential economic effects of changes to the street configuration on area businesses and properties. A local economic consulting firm, ECONorthwest, conducted a review of literature and case studies of street reconfigurations to assess their economic effects. Staff believes that the public process surrounding the South Willamette Street Improvement Plan development is strengthened by including an economic analysis in collaboration with those that are potentially affected by changes to the street. ECONorthwest staff will present the findings of their research.

Test Street Reconfiguration:
Scope:
At the June 2013 work session, the City Council asked that staff return with information about the scope of a test street reconfiguration. The information provided here is detailed in order to describe the elements of a test and the potential options for monitoring and reporting back with information about the performance of the street. In preparing the scope of a test reconfiguration, staff considered the importance of the test replicating, as best as reasonably possible, the final conditions that would be experienced with a reconfigured street. Therefore, the scope of the test includes right-of-way acquisition and widening in the vicinity of the Woodfield Station driveway on Willamette to construct a permanent traffic signal and additional widening near 24th Avenue to allow for connecting the exiting bikeway systems and a center turn-lane for automobiles. In addition to the transportation improvements, it would be valuable to monitor the street to gather information and report back about the transportation system, economics, and public opinion.

The scope considers implementing a test of Alternative 3 (three lanes with bike lanes) from 24th Avenue through 29th Avenue. As previously mentioned, a test would include right-of-way acquisition, widening, and construction of a traffic signal and turn lane at the Woodfield Station driveway on Willamette Street. Driveways on the east side of the street within the newly signalized intersection would need to be closed. Additional widening of the roadway north of 24th Avenue would also be necessary. What is not included in the scope of a test is a new roadway pavement surface, drainage repairs, or widened and improved sidewalks.

It is important to note that the purpose of a test would be primarily to provide the community with the experience of three (instead of the current four) travel lanes on Willamette Street. There will be opportunity to measure the effects on the transportation system, economy, and public opinion. However, there are limitations of the test (not improving the road surface, drainage, or sidewalks) that may not necessarily lead to increased biking and walking during the test period. Therefore, the opportunities with a test are to confirm the transportation analysis of the South Willamette Street Improvement Plan, determine if there are any unintended consequences, and provide a real experience of a street reconfiguration for people driving cars.

Schedule:
The duration of a test street reconfiguration will likely require two years from initiation to completion and reporting. Time will be needed in advance of a test to establish baseline economic data and to complete the construction of improvements. Following construction, an additional three months is needed as a period to allow the community to develop familiarity with the new street configuration and a normalization and adjustment of transportation patterns to occur. Following the adjustment period, a test reconfiguration would be in effect for one year (12 months) during which time data would be gathered about the transportation system, economics, and public opinion. Following the test period, there will be time needed to analyze and report on the findings of the test.

Budget:
The combined cost to construct and monitor a test reconfiguration of street design Alternative #3 (three lanes with bike lanes) is $920K. The cost of constructing the test improvements alone is estimated at $760K (plus costs to monitor the transportation system, economics, and public opinion).

Additional effort and expense would be required to monitor the street to gather information and report back about the transportation system, economics, and public opinion. Information gathered about the transportation system could include: crashes (number and severity), vehicle speed, travel time through the corridor, traffic volume on Willamette Street and neighboring streets, observation of use of the street by people riding bicycles and walking (noting that the roadway and sidewalk surfaces are not improved), intersection operations, and emergency response times in the corridor. An economic study could attempt to collect data about business revenue along the corridor during the test. A public opinion survey could evaluate community acceptance of a test following its completion (and possibly midway through the test). The cost to gather information about the test and report back is estimated at $160K ($50K transportation, $50K economics, $60K public opinion).

Much of the expense of a test would include elements that are common to all the alternatives and could remain as permanent improvements. What follows is a comparison of project cost estimates for the alternatives to the cost of a test reconfiguration of the street.

Cost to implement alternatives:
Alternative 1 (four lanes and signal): $4.6M (includes $2.1M Pavement Bond)
Alternative 3 (three lanes with bike lanes and signal): $4.85M (includes $2.1M Pavement Bond)
Alternative 5 (three lanes with wide sidewalks and signal): $5.6M (includes $2.1M Pavement Bond)

Cost to implement test of Alternative 3:
$920K total = $760K construction + $160K monitoring ($50K transportation, $50K economy, $60K public opinion)

Incremental cost of test of Alternative 3:
Compared to Alternative 1: $214K total = $54K construction + $160K monitoring
Compared to Alternative 3: $173K total = $13K construction + $160K monitoring
Compared to Alternative 5: $173K total = $13K construction + $160K monitoring

The cost to revert back to four travel lanes is $13K.

Coordination with Envision Eugene:
As previously stated, the results of the South Willamette Street Improvement Plan will serve as the street design portion of the South Willamette Concept Plan, a pilot of the area planning process for Envision Eugene. The Concept Plan includes a long-term vision for redevelopment of the streetside character of Willamette Street that is compatible with the South Willamette Street Improvement Plan alternatives. Staff will be working with the Eugene Planning Commission, as part of the Concept Plan implementation, to develop a systematic approach in the Eugene Code to address how accesses along the street are managed over time. Those discussions are anticipated to be coming soon to the Eugene Planning Commission followed by Eugene City Council adoption at a later date.

Resources:
The South Willamette Street Improvement Plan is being managed by the City of Eugene and is funded with a grant from the Transportation and Growth Management program of the Oregon Department of Transportation.

More details of the project and public involvement process are available at: http://www.eugene-or.gov/SWillametteStreet

RELATED CITY POLICIES
During their deliberations, the Eugene City Council will have an opportunity to consider the policy context surrounding the South Willamette Street Improvement Plan. The council may choose to affirm existing policies, balance potential conflicts between policies, approve potential changes to existing policies or enact new policies.

TransPlan (2002)

System-Wide Policy #4: Neighborhood Livability
Support transportation strategies that enhance neighborhood livability.

Roadway Policy #1: Mobility and Safety for all Modes
Address the mobility and safety needs of motorists, transit users, bicyclists, pedestrians, and the needs of emergency vehicles when planning and constructing roadway system improvements.

Roadway Policy #2: Motor Vehicle Level of Service
1. *Use motor vehicle level of service standards to maintain acceptable and reliable performance on the roadway system.*
2. *Acceptable and reliable performance is defined by the following levels of service under peak hour traffic conditions: Level of Service E within Eugene's Central Area Transportation Study (CATS) area, and Level of Service D elsewhere.*

Roadway Policy #4: Access Management
Manage the roadway system to preserve safety and operational efficiency by adopting regulations to manage access to roadways and applying these regulations to decisions related to approving new or modified access to the roadway system.

Bicycle Policy #1: Bikeway System and Support Facilities
Construct and improve the region's bikeway system and provide bicycle system support facilities for both new development and redevelopment/expansion.

Bicycle Policy #2: Bikeways on Arterials and Collectors
Require bikeways along new and reconstructed arterial and major collector streets.

Bicycle Policy #4: Implementation of Priority Bikeway Miles
Give funding priority (ideally within the first three to five years after adoption of TransPlan subject to available funding) to stand-alone bikeway projects that are included in the definition of "Priority Bikeway Miles" and that increase the use of alternative modes.

Pedestrian Policy #1: Pedestrian Environment
Provide for a pedestrian environment that is well integrated with adjacent land uses and is designed to enhance the safety, comfort, and convenience of walking.

Goods Movement Policy #1: Freight Efficiency
Support reasonable and reliable travel times for freight/goods movement in the Eugene-Springfield region.

Finance Policy #5: Short-Term Project Priorities
Consider and include among short-term project priorities, those facilities and improvements that support mixed-use, pedestrian-friendly nodal development and increased use of alternative modes.

Priority Bikeway System Project #296 – Striped bike lanes, Willamette Street from 18th Avenue to 32nd Avenue (unprogrammed).

Eugene Pedestrian Bicycle Master Plan (2012)

Policy 1.1: *Make bicycling and walking more attractive than driving for trips of two miles or less.*

Policy 1.2: *Increase pedestrian and bicycle connectivity between existing residential neighborhoods and nearby commercial areas, parks, and schools.*

Policy 1.5: *Construct high-quality pedestrian and bicycle infrastructure to provide safer, more appealing and well-connected facilities.*

Policy 1.6: *Build pedestrian and bicycle facilities on new roadways, and retrofit older roadways to complete the pedestrian and bicycle system, using routes and facility designs identified in this plan.*

Policy 1.7: *Construct bikeways along new and reconstructed arterial and major collector streets.*

Policy 2.1: *Continually improve bicycling and walking comfort and safety through design, operations and maintenance including development of "low stress" bikeways to attract new cyclists.*

Policy 3.6: *Improve the quality of the pedestrian environment by including facilities such as planter strips and street trees in the design or reconstruction of streets and consider preservation of existing trees whenever practicable.*

20-Minute Neighborhoods Program: *Development of a 20-Minute Neighborhoods Program is considered a key implementation step of the Climate and Energy Action Plan. 20-minute neighborhoods are places where people can easily walk or bike to key destinations such as grocery stores, other retail establishments, parks and schools. Coordination between implementation of the Pedestrian and Bicycle Master Plan and the 20 -Minute Neighborhoods Program will be critical to the success of both. The 20-Minute Neighborhoods Program should be one factor that is considered when determining project funding priorities.*

Bike Lane Project #31 – Willamette Street from 17th Avenue to 32nd Avenue.

Bike Boulevard Project #397 – Portland Alley from West 24th Avenue to West 27th Avenue.

Bike Boulevard Project #458 – East 29th Place/Pearl Street/East 28th Avenue/High Street/East 27th Avenue from Amazon Parkway to Willamette Street.

Envision Eugene (2012)

Seven Pillars of Envision Eugene (partial list)

- *Provide ample economic opportunities for all community members*
- *Plan for climate change and energy uncertainty*
- *Promote compact urban development and efficient transportation options*
- *Protect, repair, and enhance neighborhood livability*
- *Provide for adaptable, flexible, and collaborative implementation*

COUNCIL OPTIONS
This is an informational work session. No action is required at this time; however, options will be provided at the time of City Council deliberations and action scheduled following the May 19, 2014, public hearing.

CITY MANAGER'S RECOMMENDATION
No recommendation at this time. This item is scheduled for a May 19, 2014, public hearing. Following the City's receipt of all testimony, the City Manager will make a recommendation to be included in the council packet scheduled for action at a future date.

SUGGESTED MOTION
None.

ATTACHMENTS
A. South Willamette Street Improvement Plan Executive Summary October 2013
B. DRAFT South Willamette Street Improvement Plan October 2013
C. South Willamette Street Improvement Plan Appendix October 2013 – view at www.eugene-or.gov/SWillametteStreet
D. ECONorthwest Economic Literature Review February 2014

FOR MORE INFORMATION
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Project Webpage: http://www.eugene-or.gov/SWillametteStreet

Executive Summary

INTRODUCTION

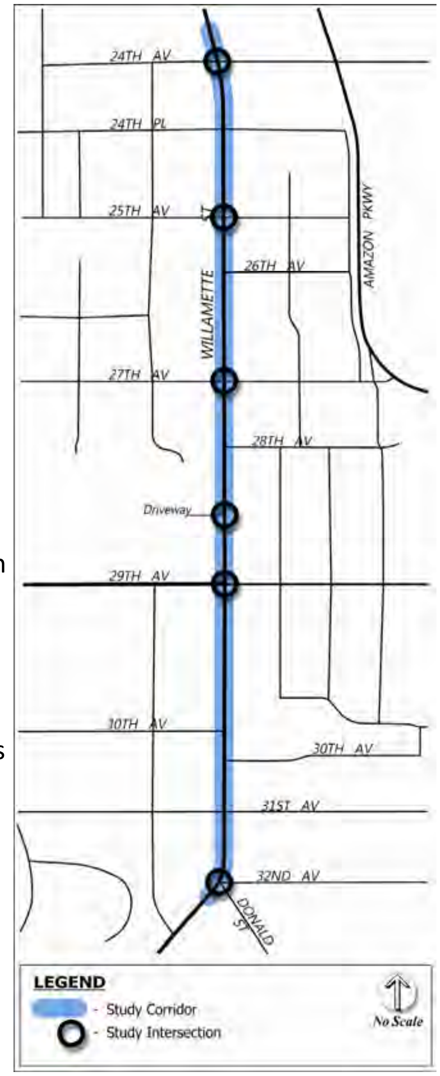
The South Willamette Street Improvement Plan ("Plan") identifies options for people to easily and safely walk, bike, take transit, or drive in an eight-block section of South Willamette Street located between 24th Avenue and 32nd Avenue in Eugene, Oregon.

The goal of the Plan is to help South Willamette Street become a vibrant urban corridor accessible by bicycle, foot, car, and bus. The Plan aims to support the area's businesses, encourage the district's vitality, create balanced multi-modal transportation system, and foster well-informed community support for the project.

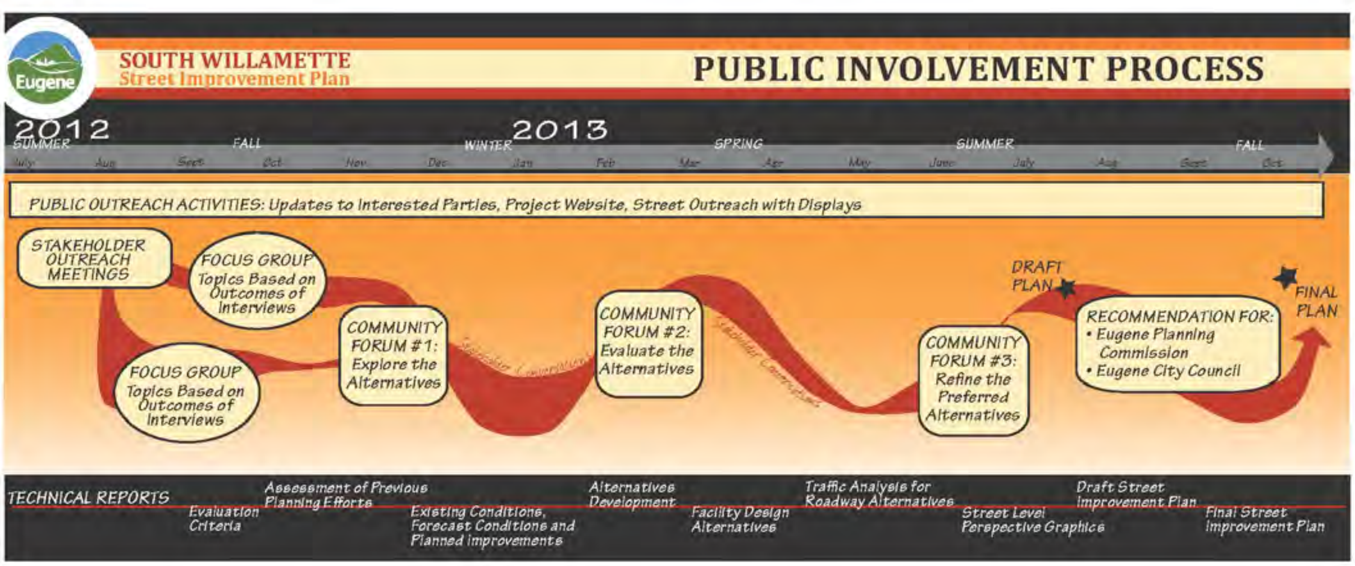
The Plan was developed through a collaborative process among various public agencies, key stakeholders and community members. The regional context was considered through a review of previous planning efforts for the area and the plan was developed in coordination with the Draft South Willamette Concept Plan ("Draft Concept Plan"). A broad level of public involvement was vital to the Plan development.

Throughout this project, the project team took time to understand multiple points of view, obtain fresh ideas and resource materials, and encourage participation from the community. The project team received public input through letters, phone calls, emails, and in-person at stakeholder outreach meetings and focus groups. Three community forums were held at key stages of the project and regular meetings were held with decision makers including City of Eugene Planning Commission and work sessions with the Eugene City Council.

In weighing all the considerations identified in this Plan, the community feedback and technical analysis, the consultant project team finds that **Alternative 3 (3-lanes with bike lanes) represents the best solution for South Willamette Street.**



Project Study Corridor



EXISTING CONDITIONS

Existing transportation facilities and travel conditions on South Willamette Street were evaluated to establish a baseline for assessing potential design alternatives and improvements to the corridor.

Existing Transportation Facilities

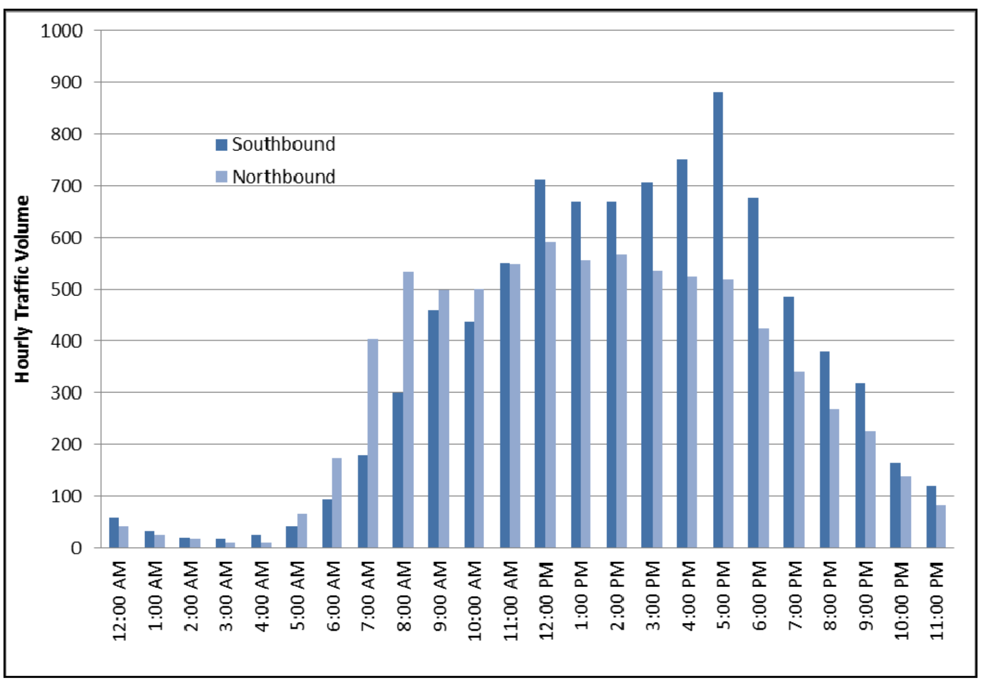
The existing transportation facilities vary within the study area between 24th Avenue and 32nd Avenue. The facilities are summarized below:

- **Roadway configuration:** includes a 4-lane section north of 29th Avenue, a 5-lane section near the 29th Avenue intersection, and a 3-lane section south of 29th Avenue.
- **Right-of-way:** width ranges from approximately 60 to 75 feet, with the widest section near the 29th Avenue intersection.
- **Number of driveways:** over 70 on the 0.8 mile corridor of Willamette Street.
- **Sidewalks:** present on both sides of Willamette Street for the full length of the study corridor, varying in width from approximately 5 feet to 9 feet. Most of the sidewalks in the study area are located curbside, with utility poles and other objects creating obstacles that impact accessibility.
- **Marked pedestrian crossings:** located at the five signalized intersections (at 24th Avenue, 25th Avenue, 27th Avenue, 29th Avenue, and 32nd Avenue).
- **Bike lanes:** exist approximately 250' south of 29th Avenue and continue south through 32nd Avenue. There are currently no bicycle facilities to the north of 29th Avenue.
- **Transit**: service consists of two bus routes operated by Lane Transit District through the corridor, with several bus stops located along Willamette Street.
- **Posted speed limit:** 25 mph

Existing Travel Conditions

A wide variety of measures were used to evaluate existing travel conditions including traffic patterns, collision data, intersection operations and quality of travel for active modes and transit.

Traffic volumes vary by time of day and follow a typical directional pattern. The peak morning flow is heavier toward the downtown business district (northbound) and the peak afternoon traffic primarily moves away from downtown (southbound). Travel time on the corridor depends on the traffic volume and resulting delays that may occur.

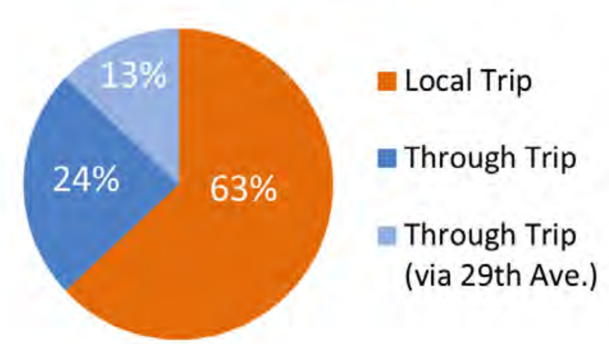


24-Hour Traffic Volumes (Willamette Street south of 27th Ave.)

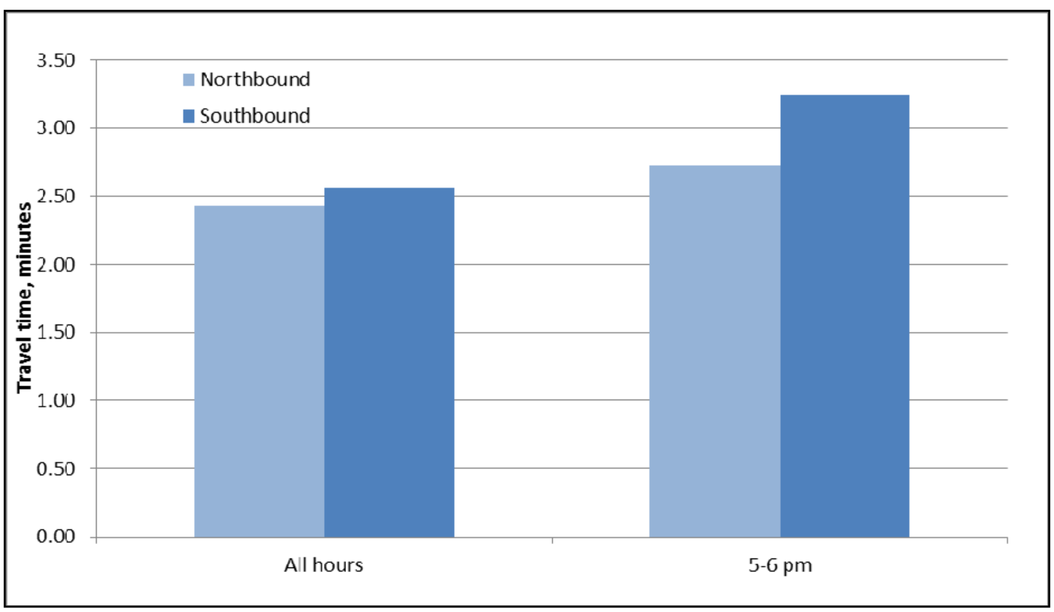
Auto, pedestrian, bicycle and transit operations along Willamette Street were evaluated using multi-modal level of service (MMLOS) methodologies that measure user comfort along roadway segments. Motor vehicle traffic operations at study intersections were evaluated for a.m. and p.m. peak hours based on turn movement traffic counts.

Travel Conditions Highlights:

- **16,500** daily traffic volume.
- **2.5** minutes daily average for end-to-end travel time on the corridor, increasing to approximately three minutes during the p.m. peak hour.
- More than **15%** of motor vehicles travel over 30 mph, exceeding the posted speed limit (25 mph) by 5 mph or more.
- **5.2** collisions per million vehicle-miles traveled is nearly double the statewide average (2.9) for urban city minor arterial streets.
- **100%** of study intersections meet the City of Eugene minimum operational performance standard (LOS D).
- **2%** of traffic is heavy vehicles.
- **63%** of Willamette Street travelers are "local" traffic - making a stop on Willamette Street or turning onto a local street. The remaining 37% are "through" travelers – those who do not stop and go directly north/ south on Willamette Street between 24th Avenue and 32nd Avenue (24%), or make a turn at 29th Avenue (13%).



Traveler Characteristics on Willamette Street (between 24th Ave. and 32nd Ave.)

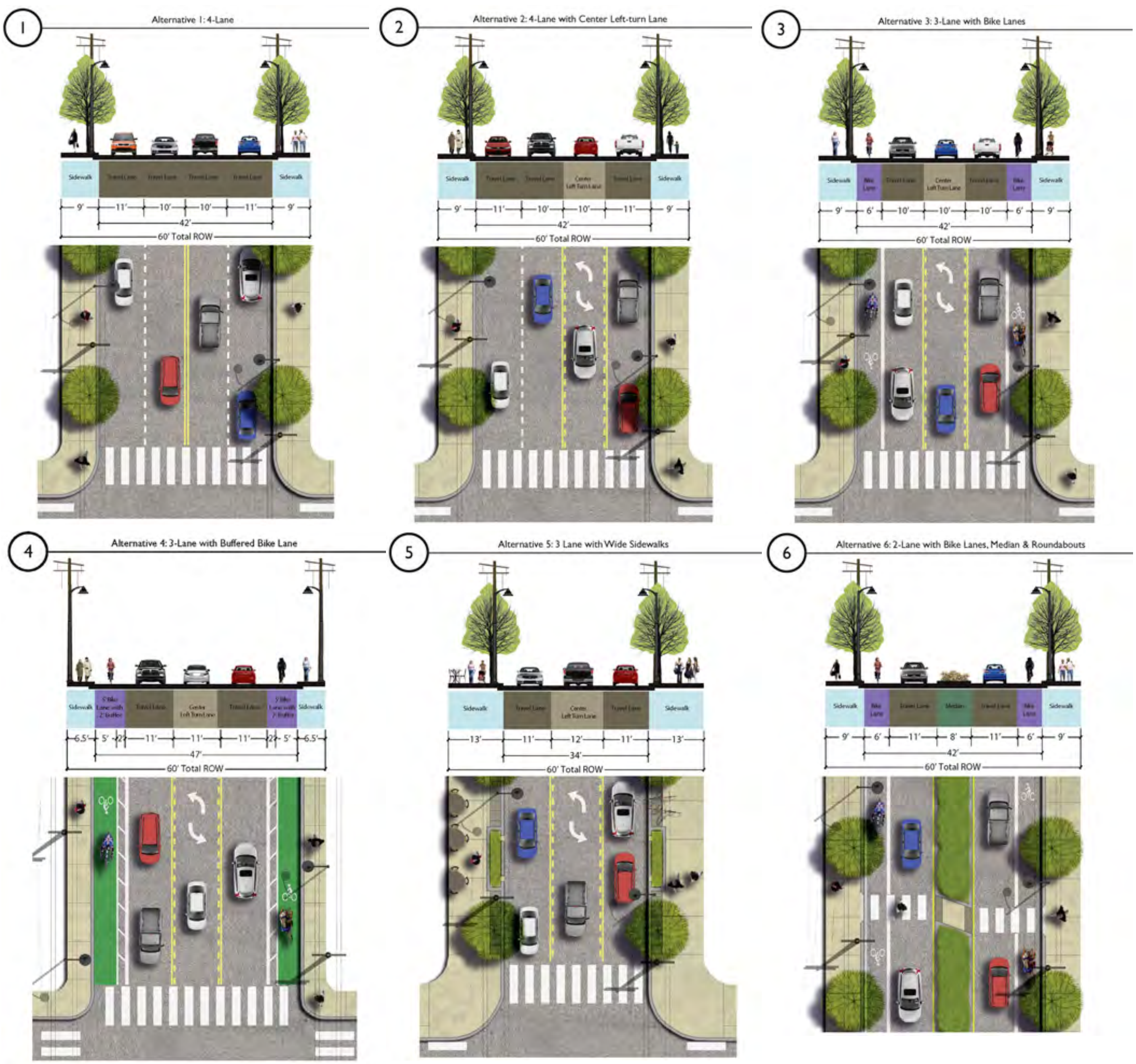


Average Travel Times (Willamette Street, between 24th Ave. and 32nd Ave.)

Alternative Concepts

Six conceptual roadway alternatives were proposed for consideration for the South Willamette Street Improvement Plan. The proposed alternatives were identified to support a long-term corridor vision, but also to facilitate development of a design plan that can be adopted and implemented in the short-term. The existing right-of-way was maintained in all alternatives to minimize cost.

The alternatives defined cross-section concepts that reflect a variety of community benefits and trade-offs for the corridor. Community Forum #1 (Explore The Alternatives), held in November of 2012, was critical in developing the range of options that were considered to meet community needs. Community Forum #2 (Evaluate the Alternatives), held in February of 2013, provided an opportunity to receive community feedback on which of the six proposed alternatives should be advanced.



Conceptual Alternatives (Tier 1)

Screening Evaluation

The six alternative concepts were refined to three based on both a technical review (Tier 1 screening) and public input received from the community and stakeholders. The Eugene City Manager has endorsed a triple-bottom-line approach to sustainability and analysis for City projects and programs providing for consideration of people, the planet, and prosperity (or equity, environment, and economy). In development of the Draft Eugene Transportation System Plan (Draft TSP), the Transportation Community Resource Group (TCRG) extensively vetted a sustainability rating system based on a triple-bottom-line analysis. The South Willamette Street Improvement Plan adapted the TCRG sustainability work to develop the Tier 1 screening criteria for qualitative assessment of the roadway alternatives.

The table to the right provides the assessment results, which show that Alternatives 3, 5, and 6 scored highest in the evaluation, though no alternative was clearly superior in all ways. In addition, based on public outreach, Alternative 3, 4, and 5 received the strongest community support.

Although the 4-lane alternatives (Alternative 1 and 2) scored the lowest on the evaluation criteria and received the least favorable public feedback, overall public input indicated the need for further analysis and discussion before reductions to motor vehicle capacity should be further considered. Therefore, the following three alternatives were selected for further refinement and more detailed analysis:

- 4-lane (Alternative 1)
- 3-lane with bike lanes (Alternative 3)
- 3-lane with wide sidewalks (Alternative 5)

Evaluation Criteria Scoring of Alternatives

Alternative		#1 4-Lane	#2 4-Lane with Center Left-turn Lane	#3 3-Lane with Bike Lanes	#4 3-Lane with Buffered Bike Lanes	#5 3-Lane with Wide Sidewalks	#6 2-Lane with Bike Lanes, Median & Roundabouts
Access & Mobility	Reliability (For All Modes)	0	0	0	0	0	0
	Neighborhood Connectivity	0	0	1	1	0	1
	Motor Vehicle Travel Time	0	0	-1	-1	-1	-1
	Active Mode Travel Time	0	0	1	1	0	1
Safety & Health	Safety	0	0	1	1	1	1
	Security	0	0	1	1	1	1
	Emergency Response	0	0	-1	-1	-1	-1
Social Equity	Equity	0	0	1	1	1	1
	Economic Access	0	0	1	1	1	1
Economic Benefit	Freight Mobility	0	0	-1	-1	-1	-1
	Walkable/Bikeable Business District	0	0	1	1	1	1
	Business Vitality	0	1	0	0	0	-1
Cost Effective-ness	Fundability	1	0	0	-1	-1	-1
	Asset Management	1	1	1	1	1	1
	Project Benefits	1	1	1	1	1	1
Climate & Energy	Reduce Vehicle Miles Traveled	0	0	0	0	0	0
	Pedestrian Facilities	0	0	0	-1	1	0
	Bicycle Facilities	0	0	1	1	0	1
	Transit Facilities	0	0	0	0	1	0
Ecological Function	Stormwater Design	0	0	0	0	0	0
	Landscape Design	0	0	0	0	0	0
Community Context	Community Vision and Land Use	0	0	0	-1	1	0
	Transportation Planning Compatibility	0	0	0	0	0	0
TOTAL		3	3	7	4	6	5

Alternatives Refinement

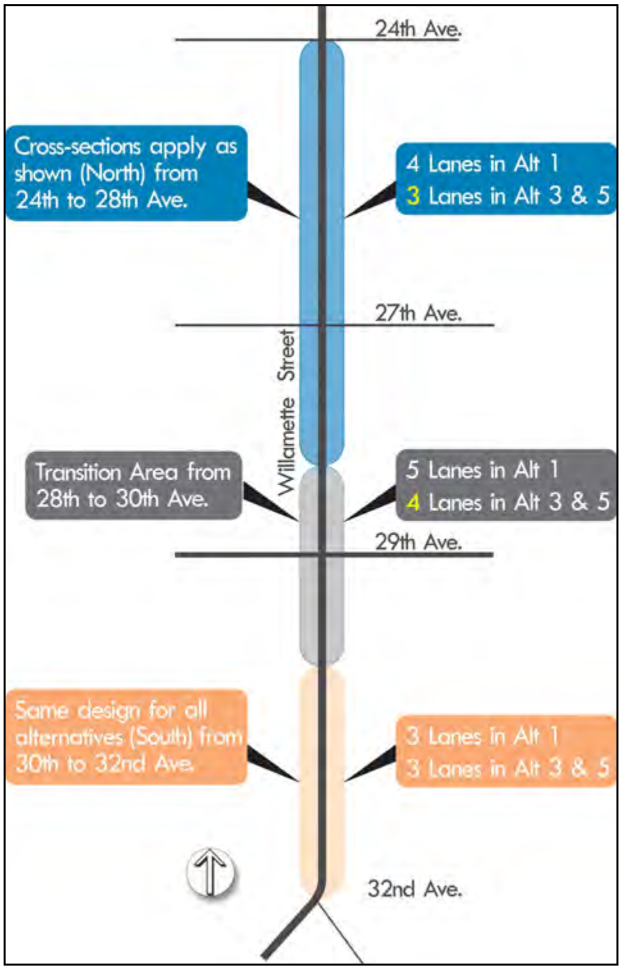
Additional roadway design details and options for corridor implementation were developed for each of the three alternative concepts advanced. These refinements included segment cross sections, intersection configurations, bicycle and pedestrian connections to the corridor, and other design considerations. Cost estimates were also prepared for each alternative.

In addition, some planned improvements are desired throughout the corridor and will be assumed for each alternative. These improvements include new pavement, improved drainage, wider sidewalks, and enhancements to pedestrian and bicycle access around Willamette Streets. Other improvements may vary depending on the location and alternative configuration.

Potential Changes by Segment

The alternative cross section concepts previously illustrated apply on the north segment of Willamette Street, from 24th Avenue to near 28th Avenue. In the south segment of the study corridor, no differences are proposed for any alternative. Around 29th Avenue, a "transition area" will provide continuity between the corridor segments to the north and south, while best meeting the corridor's identified needs and objectives.

Illustration of Conceptual Alternatives (Tier 2)



Potential Cross-Section Changes by Segment

Potential Changes at Intersections

Woodfield Station Driveway Intersection: It is recommended that a traffic signal at this intersection be considered as a design option in all alternatives. A traffic signal would provide better access for turning vehicles and an additional pedestrian crossing opportunity. Driveway modifications would likely be necessary on the east side of Willamette Street, across from the Woodfield Station Driveway.

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Conceptual Lane Configurations at Woodfield Station and 29th Ave. Intersections

Other Potential Refinements

- **Roundabouts** can improve traffic flow and safety when they are installed and are less expensive to operate and maintain compared to traffic signals. However, heavy vehicle operators may be opposed to roundabouts and significant property acquisition costs may be necessary to provide the right-of-way needed to construct appropriately-sized roundabouts. Traffic analysis results indicate that single lane roundabouts may not comfortably accommodate peak hour traffic demand at several intersections. Roundabouts are not explicitly included in the facility design of any alternative but may be considered further as potential design refinements.
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crashes and increased capacity along the corridor. Managing access points along the corridor requires finding an appropriate balance between safety, mobility, and access. Preliminary consideration of access management strategies for the corridor indicates that recommended strategies will not be significantly different for any alternative compared to another.

- **Bus Pullouts** would remove stopped vehicles from travel lanes, but would likely require right-of-way acquisition and buses in the pullouts would need to merge back into the traffic stream. No bus pullouts are recommended for the corridor given the frequency of bus uses (five per hour south of 29th Avenue and two per hour north of 29th Avenue), right-of-way impacts, transit agency preference, and increased delay for merging.

- **Enhanced Bicycle Connections** could be provided with potential bicycle facility improvements nearby, connecting to, and crossing Willamette Street. These improvements may be combined with bike lanes on Willamette Street or considered independently. The bicycle improvements proposed for consideration include treatments for nearby bike routes and crossing improvements at the 24th Avenue and 29th Place intersections.

- **Enhanced Pedestrian Crossings** could support the wider sidewalks included in each alternative by improving opportunities to cross along Willamette Street. A variety of design treatments can be implemented to enhance the pedestrian crossings, including mid-block crossings, median pedestrian crossing refuges, leading pedestrian intervals, and modified pavement surfaces. The traffic signal proposed at the Woodfield Station Driveway and the bicycle crossing improvement proposed at 29th Place would also provide new pedestrian crossings along the largest existing gaps between signalized crossings.

- **On-Street Parking** would likely have a very favorable benefit to the pedestrian environment, however, given the constrained right-of-way and community priorities, on-street parking is not considered in any of the three design alternatives. On-street parking may be reconsidered as part of long-term enhancements to the corridor.

Alternative Cost Estimates

Planning-level cost estimates were developed for each alternative, with the facility designs specified in this memorandum. All costs shown are planning-level estimates in 2013 dollars and are subject to change. The most significant difference between alternative costs are due to reconstruction of sidewalks. The planning-level estimated costs for utility relocation ($2.6 Million) are not included in the estimates shown below.

Planning-Level Cost Estimates
(Million Dollars, in 2013 Dollars)

Alternative	Pavement Project	24th to 29th Ave	29th to 32nd Ave	Total
1	$2.1	$1.7	$0.3	**$4.1**
3	$2.1	$1.8	$0.3	**$4.2**
5	$2.1	$2.4	$0.3	**$4.8**

Pavement Project – City of Eugene project is planned to include paving, ADA accessibility, and stormwater improvements from 24th to 29th Avenue
24th to 29th Avenue – Additional costs vary by alternative
29th to 32nd Avenue – Additional costs same for all alternatives
*All costs are planning-level estimates subject to change

STREETSCAPE DESIGN OPTIONS

The elements of a unified streetscape that should be considered in conjunction with the roadway facility design alternatives include sidewalk space, utilities, and stormwater treatment. The design concepts are intended to balance comfort, safety, and appeal for all users and may be incorporated into all plan alternatives to varying degrees.

- **Sidewalk Widening** will provide a more comfortable pedestrian environment that is accessible to more users and offers support for the success of future businesses as the area redevelops. Wider sidewalks may provide opportunities for landscaping, vegetation, storm water/drainage elements (e.g., bioswales), café seating, overhead signing, decorative lighting, bike parking, etc. It is assumed that sidewalks will be widened to construct the maximum allowable width within the existing right-of-way in each of the alternatives. Wider sidewalks, extending beyond the existing right-of-way, may be constructed incrementally as properties redevelop.
- **Utility Relocation** to underground would improve the sidewalk environment by removing some barriers to pedestrian access and increase the available sidewalk space. Utilities (poles, hydrants, pedestals, etc.) currently located along the sidewalks result in an inconsistent and obstructed pedestrian environment.
- **Green Streets** are facilities that treat and manage stormwater within the right-of-way. Those facilities create an ecological function for our streets, in addition to the traditional mobility and access functions. Examples of green street facilities include flow-through planters, basins, sidewalk silva cells, filterras, and permeable paving. The choice of techniques will be affected by the width of the sidewalk corridor in a preferred alternative and will require detailed engineering analysis and consistency with existing City of Eugene stormwater standards.

The summary matrix below shows how easily some of the typical amenities of a streetscape can be accommodated within the sidewalk corridors depicted in the alternatives.

Willamette Street Amenities Matrix

	Alt. 1	Alt. 3	Alt. 5
Bus Stop Amenities			
Enhanced Bus Shelters	Constrained	Constrained	Comfortably Accommodated
Sidewalk Character			
Wide Sidewalks (10' or greater)	Constrained	Constrained	Comfortably Accommodated
Paved furnishing zone	Comfortably Accommodated	Comfortably Accommodated	Comfortably Accommodated
Planter strip	Comfortably Accommodated	Comfortably Accommodated	Comfortably Accommodated
Outdoor seating/retail focus	Constrained	Constrained	Comfortably Accommodated
Textured Crosswalk	Comfortably Accommodated	Comfortably Accommodated	Comfortably Accommodated
Sidewalk Furnishings			
Bike Racks	Constrained	Constrained	Comfortably Accommodated
Benches	Constrained	Constrained	Comfortably Accommodated
Trash receptacles	Comfortably Accommodated	Comfortably Accommodated	Comfortably Accommodated
Lighting			
Pedestrian scale (18' tall or shorter)	Comfortably Accommodated	Comfortably Accommodated	Comfortably Accommodated
Landscaping			
Deciduous tree canopy	Constrained	Constrained	Comfortably Accommodated
Street corner planting	Constrained	Constrained	Comfortably Accommodated
Landscaped tree wells	Comfortably Accommodated	Comfortably Accommodated	Comfortably Accommodated
Stormwater facilities	Constrained	Constrained	Comfortably Accommodated

Key: Comfortably Accommodated (filled circle); Constrained (circled X)

Streetscape Design Amenities Matrix

TRANSPORTATION IMPACTS

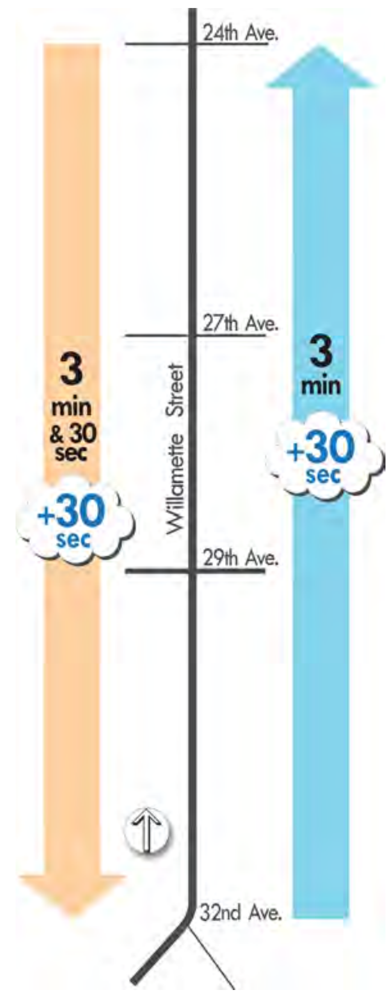
Traffic analysis comparisons of the three alternatives advanced for the South Willamette Street Improvement Plan were performed for the year 2018. Results include estimates of intersection operations, delay, vehicle queuing, travel time, neighborhood traffic shift and multi-modal system performance for bicyclists, pedestrians and transit.

Travel volume forecasts for 2018 were developed using growth identified in the regional travel demand model developed by the Lane Council of Governments (LCOG). More delay is anticipated in 2018 as a result of expected growth in motor vehicle traffic volumes. Alternatives 3 and 5 are considered to be approximately equivalent for motor vehicle operations.

Transportation Impacts Summary for Alternatives 3 and 5 (as compared to Alternative 1)

- More motor vehicle delay is anticipated due to the reduction of travel lanes for motor vehicles.
- Traffic speeds will likely be reduced for through-moving vehicles, as a passing lane will be unavailable in some locations.
- Average travel times between 24th Avenue and 32nd Avenue are expected to increase by 30 seconds during the 2018 p.m. peak hour.
- Travel time reliability through the corridor may decrease.
- Intersection operations at Willamette Street and 29th Avenue may fall below the adopted minimum performance standard (LOS D) during the a.m. and p.m. peak (reaching LOS E). All other intersections operate within the performance standards for all time periods evaluated for 2018.
- Vehicle queues at the locations where motor vehicle lanes are reduced for through travel may expect to see queues approximately double in length.
- Up to 500 vehicles per day (3% of daily traffic) may reroute to other roadways, with approximately two-thirds of the traffic shifting east to Hilyard Street and/or Amazon Parkway.
- Bicyclist and pedestrian comfort (MMLOS) would improve significantly in Alternatives 3 and 5, respectively.

Case studies in Seattle and Vancouver, WA as well as Orlando, FL demonstrated successful examples of previous corridor conversions from four vehicle lanes



Change in Estimated Average Travel Times (2018 p.m. peak hour) for Alternatives 3 & 5

to three. The corridors were generally similar to Willamette Street, with before/after comparisons indicating that vehicle speeds were reduced, the number of crashes was reduced, and pedestrian and bicycle access was improved. No significant problems were identified for motor vehicle traffic operations.

CONCLUSIONS

The public involvement process has identified a variety of needs and preferences for the range of users who travel, live, work, and shop on South Willamette Street. Each proposed alternative provides relative positive and negative impacts that may be perceived differently by individuals. Within the limited right-of-way available in the developed mixed-use Willamette Street corridor, trade-offs must be carefully considered. Ultimately the alternative selected should reflect a balanced approach that best meets the transportation needs of the users of Willamette Street and best reflects the goals and objectives of the community.

In weighing all the considerations identified in this Plan, the community feedback and technical analysis, the consultant project team finds that **Alternative 3 (3-lanes with bike lanes) represents the best solution for South Willamette Street.** Alternative 3 ranked highest in the screening evaluation, based on criteria reflecting community values adapted from a sustainability process vetted by the Transportation Community Resource Group in development of the Draft Eugene Transportation System Plan. These make clear that considerations of safety, health, energy, equity, economic vitality, and access are at least as important to the Eugene community as mobility.

Alternative 3 was also the most favorably ranked configuration based on responses received at the Community Forum #3 (Refine the Alternatives),

DRAFT TRANSPORTATION GOALS

Eugene's Draft Transportation System Plan (TSP) identifies four goals describing the desires of the community with regards to its transportation system:

- **Goal 1:** Create an integrated multimodal transportation system that is safe and efficient; supports local land use and economic development plans; reduces reliance on single occupancy automobiles; and enhances community livability.
- **Goal 2:** Advance regional sustainability by providing a transportation system that improves economic vitality, environmental health, social equity, and well-being.
- **Goal 3:** Strengthen community resilience to changes in climate, increases in fossil fuel prices, and economic fluctuations through adaptations to the transportation networks.
- **Goal 4:** Distribute the benefits and impacts of transportation decisions fairly and address the transportation needs and safety of all users, including youth, the elderly, people with disabilities, and people of all races, ethnicities and incomes.

The Draft TSP also identifies objectives that are grouped into the eight Sustainable Transportation Access Rating System (STARS) categories:

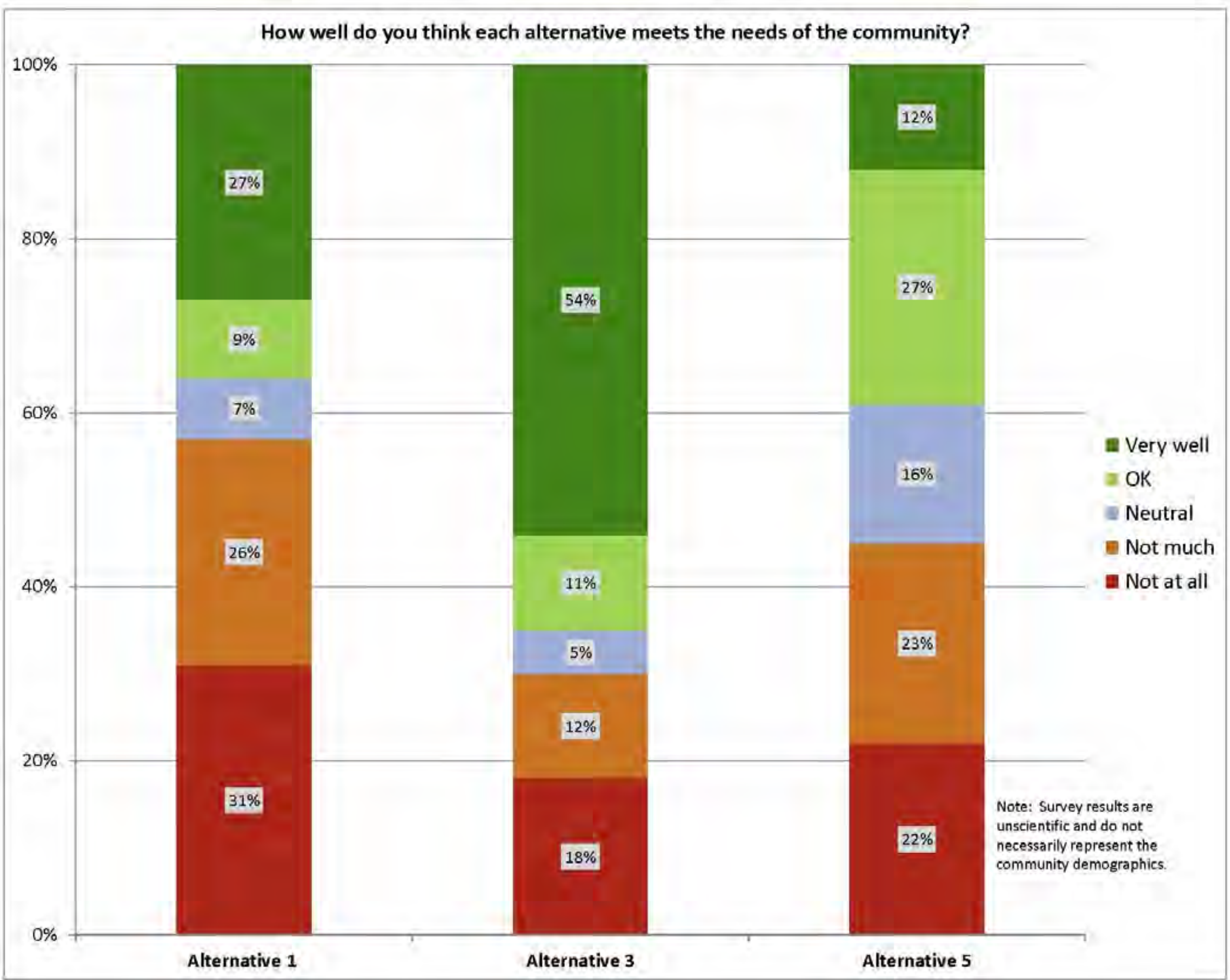
- Safety and Health
- Social Equity
- Access and Mobility for All Modes
- Community Context
- Economic Benefit
- Cost Effectiveness
- Climate and Energy
- Ecological Function

The Draft TSP goals and objectives cover a wide range of community needs and provided the foundation for evaluating the improvement alternatives identified in the South Willamette Street Improvement Plan.

held in June 2013, and via online survey. These outreach efforts indicated a clear preference from participants and respondents for improved access and safety.

Potential motor vehicle impacts include peak hour travel time increases that most respondents considered to be acceptable. The transportation analysis findings for Alternative 3 also identify potential benefits such as reduced speeding, improved safety, and more comfortable left-turn movements. With the refinements recommended, most notably keeping two through travel lanes southbound at 29th Avenue, a considerable effort has been made to minimize the potential negative impacts to motor vehicle mobility.

Alternative 3 enhances pedestrian and bicyclist comfort and safety, drawing people to the corridor who previously avoided it. Because the majority of Willamette Street travelers are turning at driveways or local streets, not simply passing through the corridor as quickly as possible, the potential benefits of improved safety and ease of access may also outweigh concerns about travel time. Reviews of roadway conversions in similar circumstances show the potential for implementation of Alternative 3 to result in successful outcomes across all methods of travel.



Online Public Survey Response

Prepared for

City of Eugene

ODOT

Eugene

SOUTH WILLAMETTE
Street Improvement Plan

October 2013

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Acknowledgements

The South Willamette Street Improvement Plan was a collaborative process among various public agencies, key stakeholders and the community. Input, assistance, and outreach by the following people helped make the Improvement Plan possible:

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City of Springfield
Kristi Krueger

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Contents

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Executive Summary

INTRODUCTION

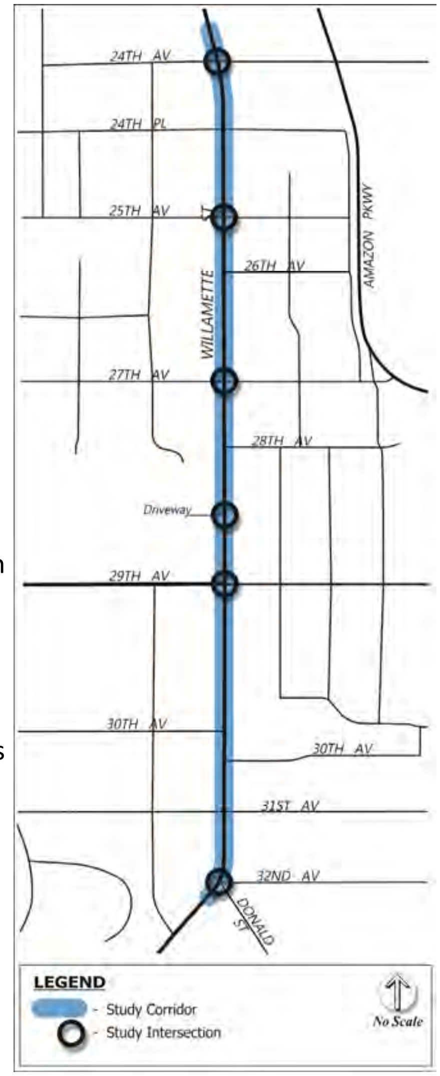
The South Willamette Street Improvement Plan ("Plan") identifies options for people to easily and safely walk, bike, take transit, or drive in an eight-block section of South Willamette Street located between 24th Avenue and 32nd Avenue in Eugene, Oregon.

The goal of the Plan is to help South Willamette Street become a vibrant urban corridor accessible by bicycle, foot, car, and bus. The Plan aims to support the area's businesses, encourage the district's vitality, create a balanced multi-modal transportation system, and foster well-informed community support for the project.

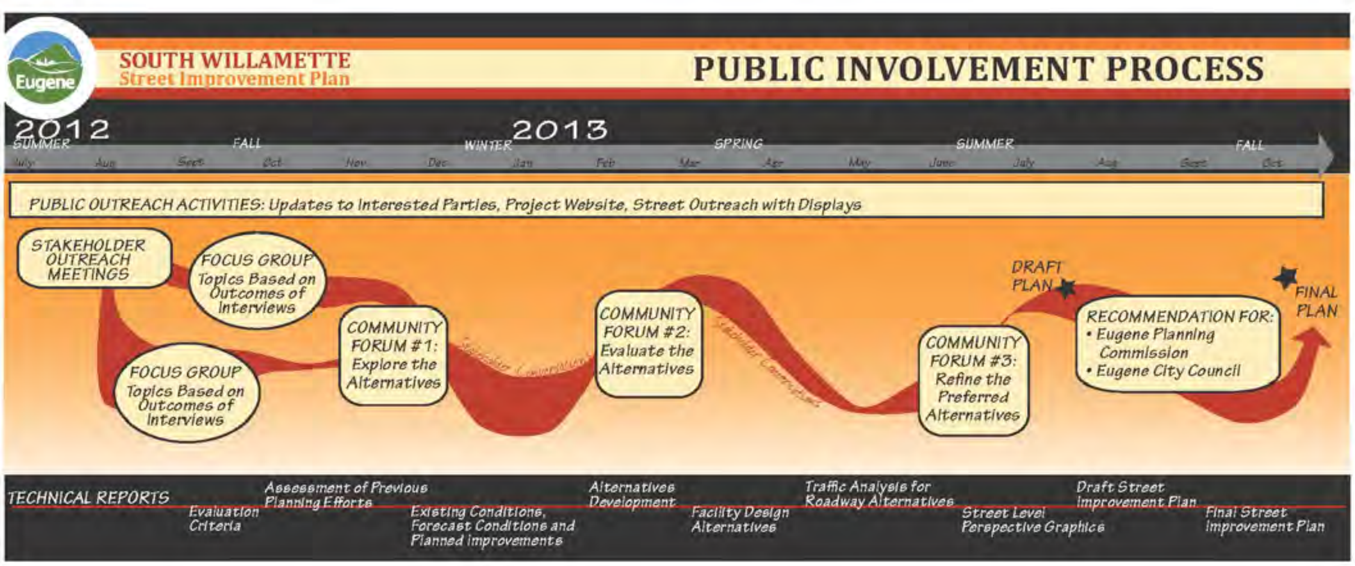
The Plan was developed through a collaborative process among various public agencies, key stakeholders and community members. The regional context was considered through a review of previous planning efforts for the area and the plan was developed in coordination with the Draft South Willamette Concept Plan ("Draft Concept Plan"). A broad level of public involvement was vital to the Plan development.

Throughout this project, the project team took time to understand multiple points of view, obtain fresh ideas and resource materials, and encourage participation from the community. The project team received public input through letters, phone calls, emails, and in-person at stakeholder outreach meetings and focus groups. Three community forums were held at key stages of the project and regular meetings were held with decision makers including City of Eugene Planning Commission and work sessions with the Eugene City Council.

In weighing all the considerations identified in this Plan, the community feedback and technical analysis, the consultant project team finds that **Alternative 3 (3-lanes with bike lanes) represents the best solution for South Willamette Street.**



Project Study Corridor



EXISTING CONDITIONS

Existing transportation facilities and travel conditions on South Willamette Street were evaluated to establish a baseline for assessing potential design alternatives and improvements to the corridor.

Existing Transportation Facilities

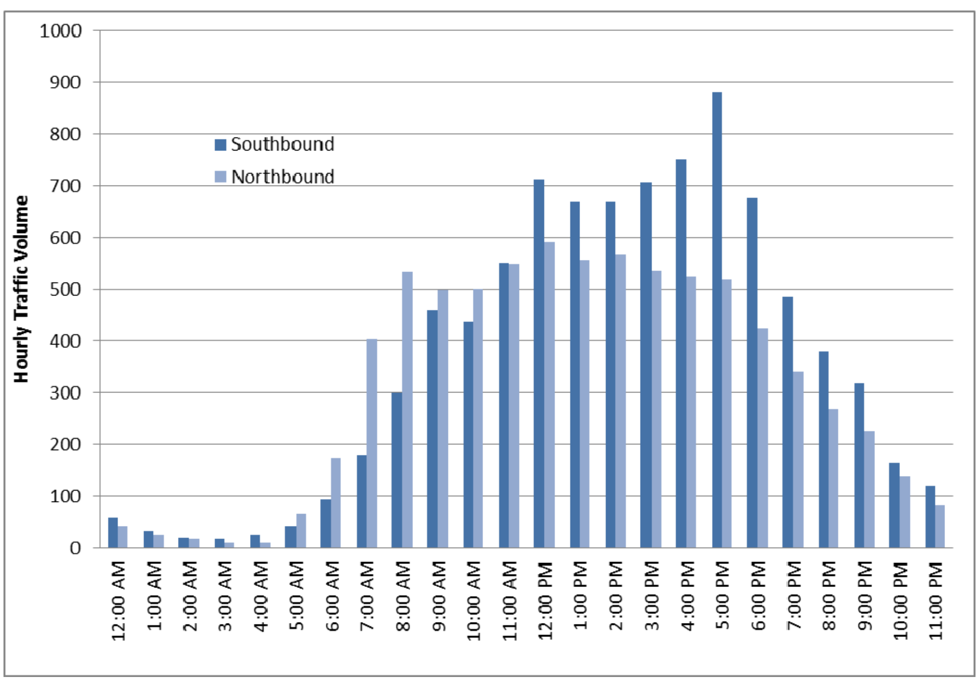
The existing transportation facilities vary within the study area between 24th Avenue and 32nd Avenue. The facilities are summarized below:

- **Roadway configuration:** includes a 4-lane section north of 29th Avenue, a 5-lane section near the 29th Avenue intersection, and a 3-lane section south of 29th Avenue.
- **Right-of-way:** width ranges from approximately 60 to 75 feet, with the widest section near the 29th Avenue intersection.
- **Number of driveways:** over 70 on the 0.8 mile corridor of Willamette Street.
- **Sidewalks:** present on both sides of Willamette Street for the full length of the study corridor, varying in width from approximately 5 feet to 9 feet. Most of the sidewalks in the study area are located curbside, with utility poles and other objects creating obstacles that impact accessibility.
- **Marked pedestrian crossings:** located at the five signalized intersections (at 24th Avenue, 25th Avenue, 27th Avenue, 29th Avenue, and 32nd Avenue).
- **Bike lanes:** exist approximately 250' south of 29th Avenue and continue south through 32nd Avenue. There are currently no bicycle facilities to the north of 29th Avenue.
- **Transit**: service consists of two bus routes operated by Lane Transit District through the corridor, with several bus stops located along Willamette Street.
- **Posted speed limit:** 25 mph

Existing Travel Conditions

A wide variety of measures were used to evaluate existing travel conditions including traffic patterns, collision data, intersection operations and quality of travel for active modes and transit.

Traffic volumes vary by time of day and follow a typical directional pattern. The peak morning flow is heavier toward the downtown business district (northbound) and the peak afternoon traffic primarily moves away from downtown (southbound). Travel time on the corridor depends on the traffic volume and resulting delays that may occur.

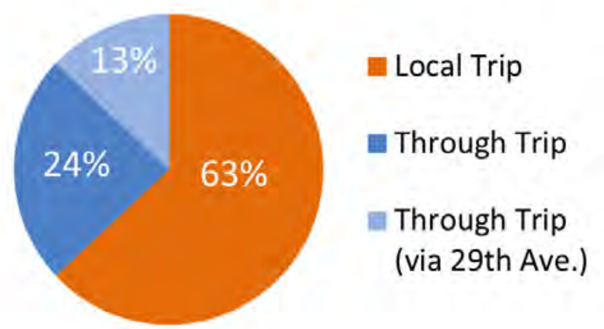


24-Hour Traffic Volumes (Willamette Street south of 27th Ave.)

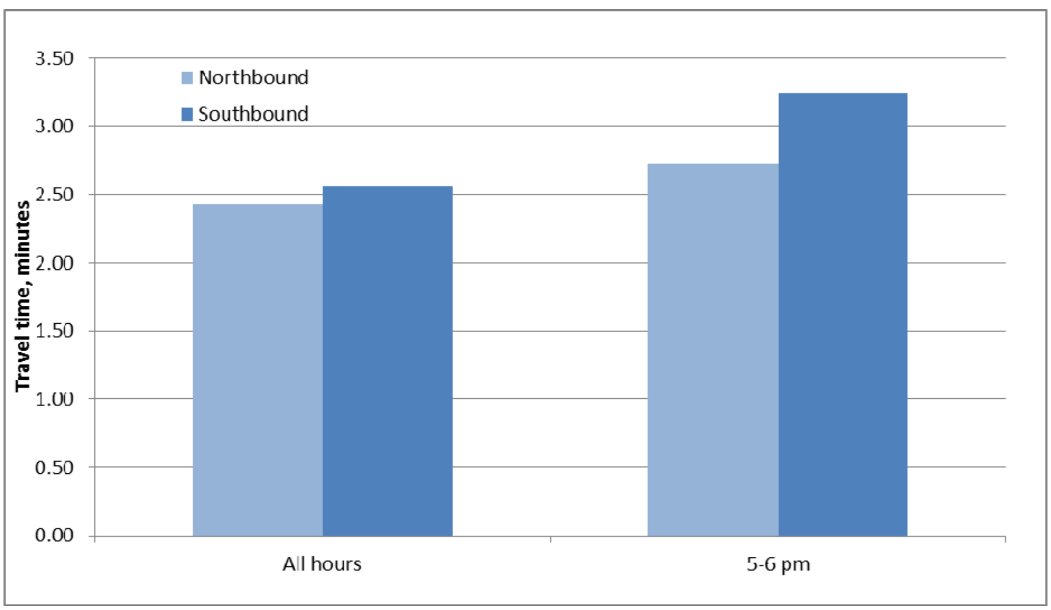
Auto, pedestrian, bicycle and transit operations along Willamette Street were evaluated using multi-modal level of service (MMLOS) methodologies that measure user comfort along roadway segments. Motor vehicle traffic operations at study intersections were evaluated for a.m. and p.m. peak hours based on turn movement traffic counts.

Travel Conditions Highlights:

- **16,500** daily traffic volume.
- **2.5** minutes daily average for end-to-end travel time on the corridor, increasing to approximately three minutes during the p.m. peak hour.
- More than **15%** of motor vehicles travel over 30 mph, exceeding the posted speed limit (25 mph) by 5 mph or more.
- **5.2** collisions per million vehicle-miles traveled is nearly double the statewide average (2.9) for urban city minor arterial streets.
- **100%** of study intersections meet the City of Eugene minimum operational performance standard (LOS D).
- **2%** of traffic is heavy vehicles.
- **63%** of Willamette Street travelers are "local" traffic - making a stop on Willamette Street or turning onto a local street. The remaining 37% are "through" travelers – those who do not stop and go directly north/south on Willamette Street between 24th Avenue and 32nd Avenue (24%), or make a turn at 29th Avenue (13%).



Traveler Characteristics on Willamette Street (between 24th Ave. and 32nd Ave.)

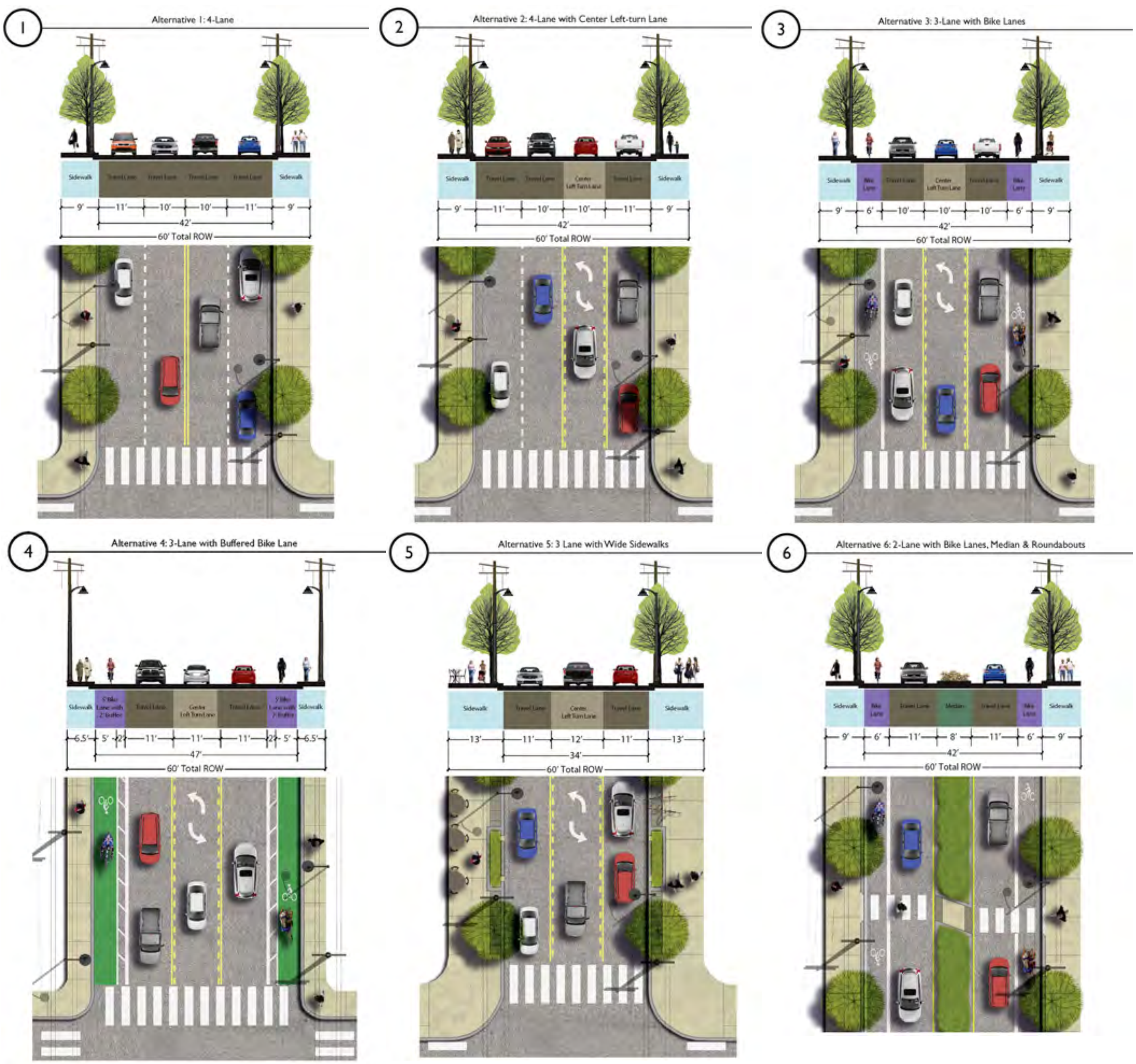


Average Travel Times (Willamette Street, between 24th Ave. and 32nd Ave.)

Alternative Concepts

Six conceptual roadway alternatives were proposed for consideration for the South Willamette Street Improvement Plan. The proposed alternatives were identified to support a long-term corridor vision, but also to facilitate development of a design plan that can be adopted and implemented in the short-term. The existing right-of-way was maintained in all alternatives to minimize cost.

The alternatives defined cross-section concepts that reflect a variety of community benefits and trade-offs for the corridor. Community Forum #1 (Explore The Alternatives), held in November of 2012, was critical in developing the range of options that were considered to meet community needs. Community Forum #2 (Evaluate the Alternatives), held in February of 2013, provided an opportunity to receive community feedback on which of the six proposed alternatives should be advanced.



Conceptual Alternatives (Tier 1)

Screening Evaluation

The six alternative concepts were refined to three based on both a technical review (Tier 1 screening) and public input received from the community and stakeholders. The Eugene City Manager has endorsed a triple-bottom-line approach to sustainability and analysis for City projects and programs providing for consideration of people, the planet, and prosperity (or equity, environment, and economy). In development of the Draft Eugene Transportation System Plan (Draft TSP), the Transportation Community Resource Group (TCRG) extensively vetted a sustainability rating system based on a triple-bottom-line analysis. The South Willamette Street Improvement Plan adapted the TCRG sustainability work to develop the Tier 1 screening criteria for qualitative assessment of the roadway alternatives.

The table to the right provides the assessment results, which show that Alternatives 3, 5, and 6 scored highest in the evaluation, though no alternative was clearly superior in all ways. In addition, based on public outreach, Alternative 3, 4, and 5 received the strongest community support.

Although the 4-lane alternatives (Alternative 1 and 2) scored the lowest on the evaluation criteria and received the least favorable public feedback, overall public input indicated the need for further analysis and discussion before reductions to motor vehicle capacity should be further considered. Therefore, the following three alternatives were selected for further refinement and more detailed analysis:

- 4-lane (Alternative 1)
- 3-lane with bike lanes (Alternative 3)
- 3-lane with wide sidewalks (Alternative 5)

Evaluation Criteria Scoring of Alternatives

Alternative		#1 4-Lane	#2 4-Lane with Center Left-turn Lane	#3 3-Lane with Bike Lanes	#4 3-Lane with Buffered Bike Lanes	#5 3-Lane with Wide Sidewalks	#6 2-Lane with Bike Lanes, Median & Roundabouts
Access & Mobility	Reliability (For All Modes)	0	0	0	0	0	0
	Neighborhood Connectivity	0	0	1	1	0	1
	Motor Vehicle Travel Time	0	0	-1	-1	-1	-1
	Active Mode Travel Time	0	0	1	1	0	1
Safety & Health	Safety	0	0	1	1	1	1
	Security	0	0	1	1	1	1
	Emergency Response	0	0	-1	-1	-1	-1
Social Equity	Equity	0	0	1	1	1	1
	Economic Access	0	0	1	1	1	1
Economic Benefit	Freight Mobility	0	0	-1	-1	-1	-1
	Walkable/Bikeable Business District	0	0	1	1	1	1
	Business Vitality	0	1	0	0	0	-1
Cost Effective-ness	Fundability	1	0	0	-1	-1	-1
	Asset Management	1	1	1	1	1	1
	Project Benefits	1	1	1	1	1	1
Climate & Energy	Reduce Vehicle Miles Traveled	0	0	0	0	0	0
	Pedestrian Facilities	0	0	0	-1	1	0
	Bicycle Facilities	0	0	1	1	0	1
	Transit Facilities	0	0	0	0	1	0
Ecological Function	Stormwater Design	0	0	0	0	0	0
	Landscape Design	0	0	0	0	0	0
Community Context	Community Vision and Land Use	0	0	0	-1	1	0
	Transportation Planning Compatibility	0	0	0	0	0	0
TOTAL		3	3	7	4	6	5

Alternatives Refinement

Additional roadway design details and options for corridor implementation were developed for each of the three alternative concepts advanced. These refinements included segment cross sections, intersection configurations, bicycle and pedestrian connections to the corridor, and other design considerations. Cost estimates were also prepared for each alternative.

In addition, some planned improvements are desired throughout the corridor and will be assumed for each alternative. These improvements include new pavement, improved drainage, wider sidewalks, and enhancements to pedestrian and bicycle access around Willamette Streets. Other improvements may vary depending on the location and alternative configuration.

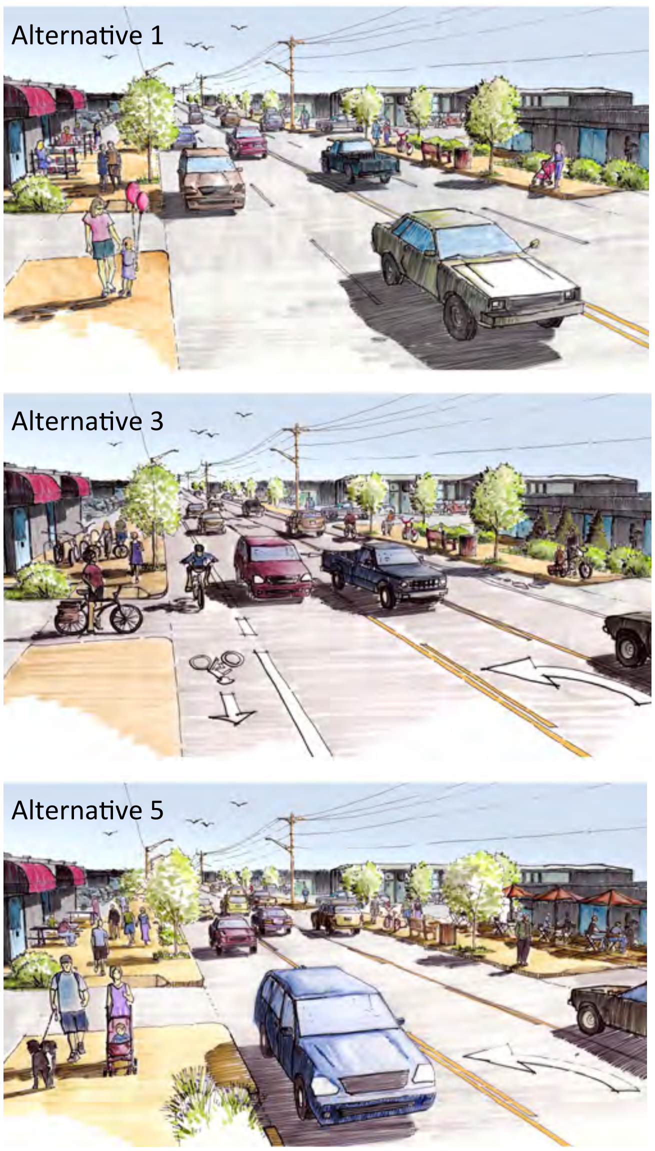
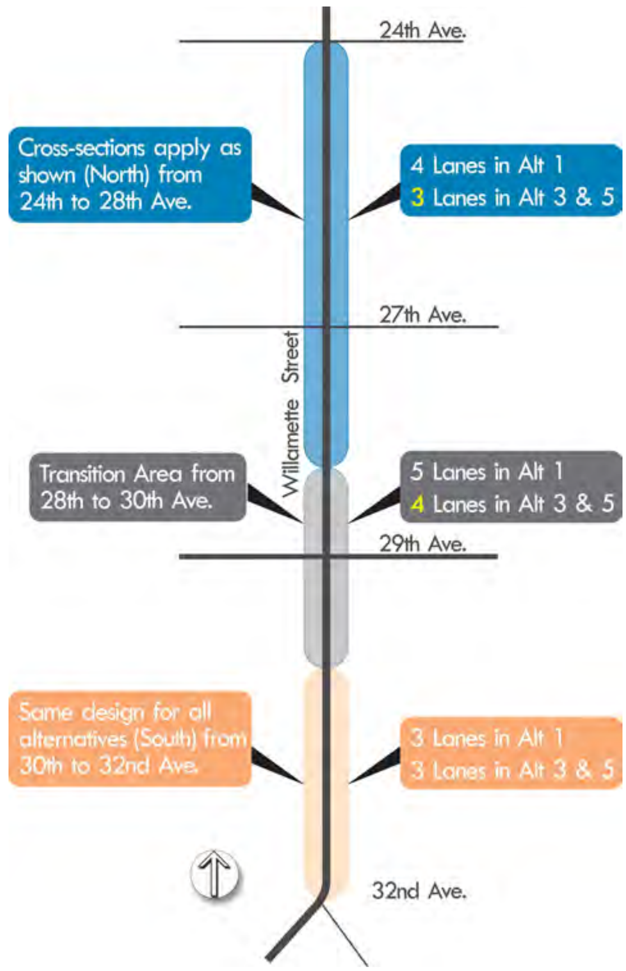


Illustration of Conceptual Alternatives (Tier 2)

Potential Changes by Segment

The alternative cross section concepts previously illustrated apply on the north segment of Willamette Street, from 24th Avenue to near 28th Avenue. In the south segment of the study corridor, no differences are proposed for any alternative. Around 29th Avenue, a “transition area” will provide continuity between the corridor segments to the north and south, while best meeting the corridor’s identified needs and objectives.



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Alternative Cost Estimates

Planning-level cost estimates were developed for each alternative, with the facility designs specified in this memorandum. All costs shown are planning-level estimates in 2013 dollars and are subject to change. The most significant difference between alternative costs are due to reconstruction of sidewalks. The planning-level estimated costs for utility relocation ($2.6 Million) are not included in the estimates shown below.

Planning-Level Cost Estimates (Million Dollars, in 2013 Dollars)

Alternative	Pavement Project	24th to 29th Ave	29th to 32nd Ave	Total
1	$2.1	$1.7	$0.3	**$4.1**
3	$2.1	$1.8	$0.3	**$4.2**
5	$2.1	$2.4	$0.3	**$4.8**

Pavement Project – City of Eugene project is planned to include paving, ADA accessibility, and stormwater improvements from 24th to 29th Avenue
24th to 29th Avenue – Additional costs vary by alternative
29th to 32nd Avenue – Additional costs same for all alternatives
*All costs are planning-level estimates subject to change

STREETSCAPE DESIGN OPTIONS

The elements of a unified streetscape that should be considered in conjunction with the roadway facility design alternatives include sidewalk space, utilities, and stormwater treatment. The design concepts are intended to balance comfort, safety, and appeal for all users and may be incorporated into all plan alternatives to varying degrees.

- **Sidewalk Widening** will provide a more comfortable pedestrian environment that is accessible to more users and offers support for the success of future businesses as the area redevelops. Wider sidewalks may provide opportunities for landscaping, vegetation, storm water/drainage elements (e.g., bioswales), café seating, overhead signing, decorative lighting, bike parking, etc. It is assumed that sidewalks will be widened to construct the maximum allowable width within the existing right-of-way in each of the alternatives. Wider sidewalks, extending beyond the existing right-of-way, may be constructed incrementally as properties redevelop.
- **Utility Relocation** to underground would improve the sidewalk environment by removing some barriers to pedestrian access and increase the available sidewalk space. Utilities (poles, hydrants, pedestals, etc.) currently located along the sidewalks result in an inconsistent and obstructed pedestrian environment.
- **Green Streets** are facilities that treat and manage stormwater within the right-of-way. Those facilities create an ecological function for our streets, in addition to the traditional mobility and access functions. Examples of green street facilities include flow-through planters, basins, sidewalk silva cells, filterras, and permeable paving. The choice of techniques will be affected by the width of the sidewalk corridor in a preferred alternative and will require detailed engineering analysis and consistency with existing City of Eugene stormwater standards.

The summary matrix below shows how easily some of the typical amenities of a streetscape can be accommodated within the sidewalk corridors depicted in the alternatives.

Willamette Street Amenities Matrix

	Alt. 1	Alt. 3	Alt. 5
Bus Stop Amenities			
Enhanced Bus Shelters	⊗	⊗	●
Sidewalk Character			
Wide Sidewalks (10' or greater)	⊗	⊗	●
Paved furnishing zone	●	●	●
Planter strip	●	●	●
Outdoor seating/retail focus	⊗	⊗	●
Textured Crosswalk	●	●	●
Sidewalk Furnishings			
Bike Racks	⊗	⊗	●
Benches	⊗	⊗	●
Trash receptacles	●	●	●
Lighting			
Pedestrian scale (18' tall or shorter)	●	●	●
Landscaping			
Deciduous tree canopy	⊗	⊗	●
Street corner planting	⊗	⊗	●
Landscaped tree wells	●	●	●
Stormwater facilities	⊗	⊗	●

Key	
Comfortably Accommodated	●
Constrained	⊗

Streetscape Design Amenities Matrix

TRANSPORTATION IMPACTS

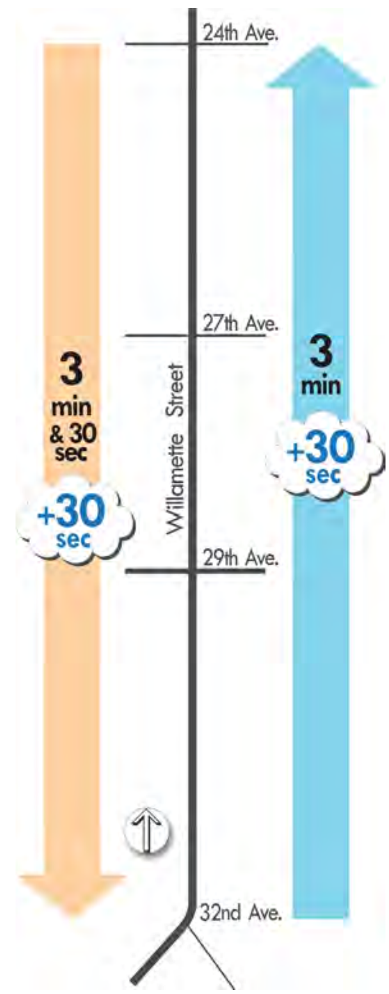
Traffic analysis comparisons of the three alternatives advanced for the South Willamette Street Improvement Plan were performed for the year 2018. Results include estimates of intersection operations, delay, vehicle queuing, travel time, neighborhood traffic shift and multi-modal system performance for bicyclists, pedestrians and transit.

Travel volume forecasts for 2018 were developed using growth identified in the regional travel demand model developed by the Lane Council of Governments (LCOG). More delay is anticipated in 2018 as a result of expected growth in motor vehicle traffic volumes. Alternatives 3 and 5 are considered to be approximately equivalent for motor vehicle operations.

Transportation Impacts Summary for Alternatives 3 and 5 (as compared to Alternative 1)

- More motor vehicle delay is anticipated due to the reduction of travel lanes for motor vehicles.
- Traffic speeds will likely be reduced for through-moving vehicles, as a passing lane will be unavailable in some locations.
- Average travel times between 24th Avenue and 32nd Avenue are expected to increase by 30 seconds during the 2018 p.m. peak hour.
- Travel time reliability through the corridor may decrease.
- Intersection operations at Willamette Street and 29th Avenue may fall below the adopted minimum performance standard (LOS D) during the a.m. and p.m. peak (reaching LOS E). All other intersections operate within the performance standards for all time periods evaluated for 2018.
- Vehicle queues at the locations where motor vehicle lanes are reduced for through travel may expect to see queues approximately double in length.
- Up to 500 vehicles per day (3% of daily traffic) may reroute to other roadways, with approximately two-thirds of the traffic shifting east to Hilyard Street and/or Amazon Parkway.
- Bicyclist and pedestrian comfort (MMLOS) would improve significantly in Alternatives 3 and 5, respectively.

Case studies in Seattle and Vancouver, WA as well as Orlando, FL demonstrated successful examples of previous corridor conversions from four vehicle lanes



Change in Estimated Average Travel Times (2018 p.m. peak hour) for Alternatives 3 & 5

to three. The corridors were generally similar to Willamette Street, with before/after comparisons indicating that vehicle speeds were reduced, the number of crashes was reduced, and pedestrian and bicycle access was improved. No significant problems were identified for motor vehicle traffic operations.

CONCLUSIONS

The public involvement process has identified a variety of needs and preferences for the range of users who travel, live, work, and shop on South Willamette Street. Each proposed alternative provides relative positive and negative impacts that may be perceived differently by individuals. Within the limited right-of-way available in the developed mixed-use Willamette Street corridor, trade-offs must be carefully considered. Ultimately the alternative selected should reflect a balanced approach that best meets the transportation needs of the users of Willamette Street and best reflects the goals and objectives of the community.

In weighing all the considerations identified in this Plan, the community feedback and technical analysis, the consultant project team finds that **Alternative 3 (3-lanes with bike lanes) represents the best solution for South Willamette Street.** Alternative 3 ranked highest in the screening evaluation, based on criteria reflecting community values adapted from a sustainability process vetted by the Transportation Community Resource Group in development of the Draft Eugene Transportation System Plan. These make clear that considerations of safety, health, energy, equity, economic vitality, and access are at least as important to the Eugene community as mobility.

Alternative 3 was also the most favorably ranked configuration based on responses received at the Community Forum #3 (Refine the Alternatives),

DRAFT TRANSPORTATION GOALS

Eugene's Draft Transportation System Plan (TSP) identifies four goals describing the desires of the community with regards to its transportation system:

- **Goal 1:** Create an integrated multimodal transportation system that is safe and efficient; supports local land use and economic development plans; reduces reliance on single occupancy automobiles; and enhances community livability.
- **Goal 2:** Advance regional sustainability by providing a transportation system that improves economic vitality, environmental health, social equity, and well-being.
- **Goal 3:** Strengthen community resilience to changes in climate, increases in fossil fuel prices, and economic fluctuations through adaptations to the transportation networks.
- **Goal 4:** Distribute the benefits and impacts of transportation decisions fairly and address the transportation needs and safety of all users, including youth, the elderly, people with disabilities, and people of all races, ethnicities and incomes.

The Draft TSP also identifies objectives that are grouped into the eight Sustainable Transportation Access Rating System (STARS) categories:

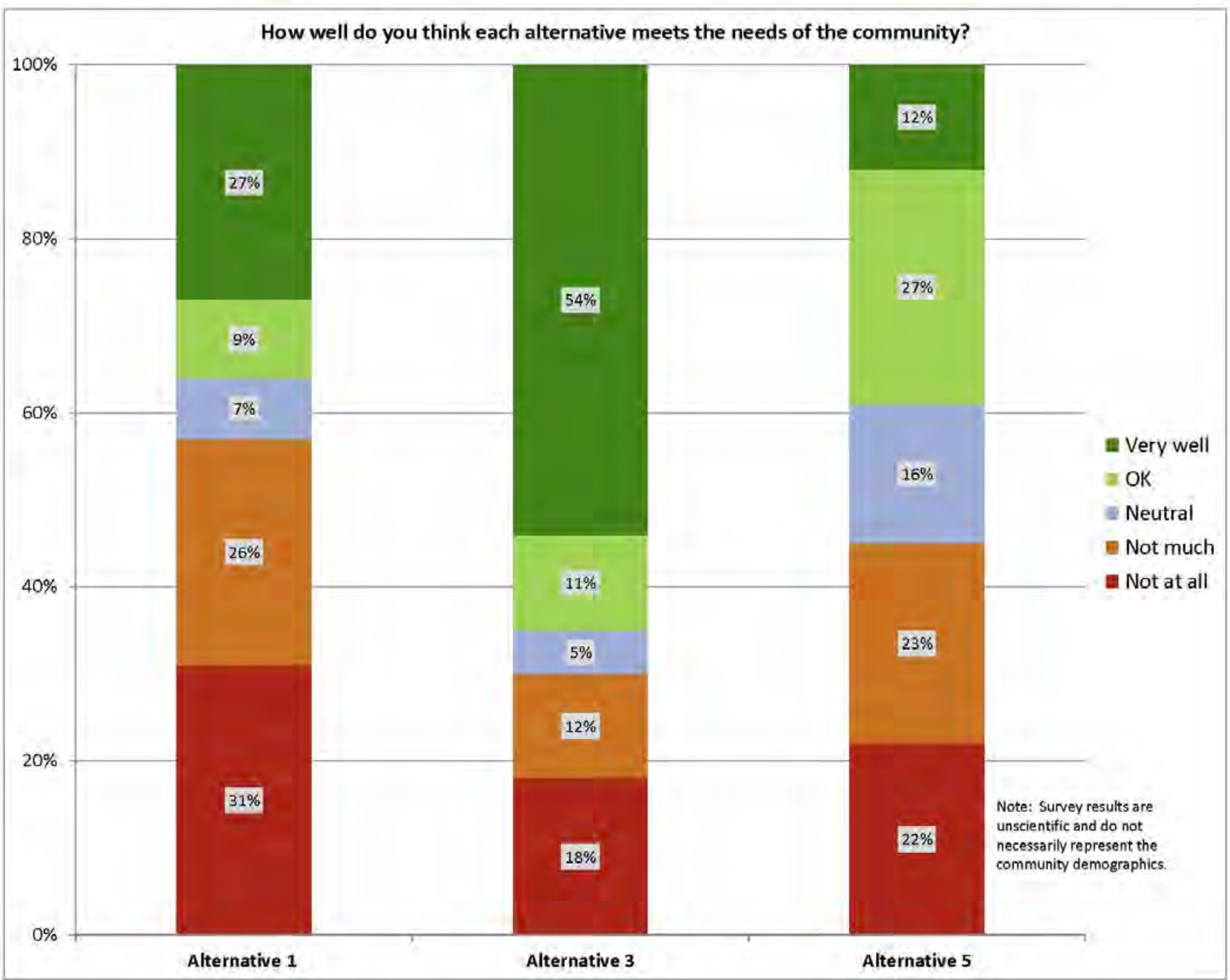
- Safety and Health
- Social Equity
- Access and Mobility for All Modes
- Community Context
- Economic Benefit
- Cost Effectiveness
- Climate and Energy
- Ecological Function

The Draft TSP goals and objectives cover a wide range of community needs and provided the foundation for evaluating the improvement alternatives identified in the South Willamette Street Improvement Plan.

held in June 2013, and via online survey. These outreach efforts indicated a clear preference from participants and respondents for improved access and safety.

Potential motor vehicle impacts include peak hour travel time increases that most respondents considered to be acceptable. The transportation analysis findings for Alternative 3 also identify potential benefits such as reduced speeding, improved safety, and more comfortable left-turn movements. With the refinements recommended, most notably keeping two through travel lanes southbound at 29th Avenue, a considerable effort has been made to minimize the potential negative impacts to motor vehicle mobility.

Alternative 3 enhances pedestrian and bicyclist comfort and safety, drawing people to the corridor who previously avoided it. Because the majority of Willamette Street travelers are turning at driveways or local streets, not simply passing through the corridor as quickly as possible, the potential benefits of improved safety and ease of access may also outweigh concerns about travel time. Reviews of roadway conversions in similar circumstances show the potential for implementation of Alternative 3 to result in successful outcomes across all methods of travel.



Online Public Survey Response

1. Introduction

View of Willamette Street looking south.

The South Willamette Street Improvement Plan ("Plan") identifies options for people to easily and safely walk, bike, take transit, or drive in an eight-block section of South Willamette Street located between 24th Avenue and 32nd Avenue in Eugene, Oregon. South Willamette Street is an important corridor that functions as a commercial destination and as a key route for connecting residents of southern Eugene to the rest of the city. The goal of the Plan is to help South Willamette Street become a vibrant urban corridor accessible by bicycle, foot, car, and bus. The Plan aims to support the area's businesses, encourage the district's vitality, create a balanced multimodal transportation system, and foster well-informed community support for the project.

Six conceptual roadway alternatives were identified and considered for the Tier 1 screening evaluation. The alternative facility designs reflect a variety of community benefits and trade-offs for the corridor. The six alternative concepts were refined to three based on direction from City of Eugene staff after receiving community input and feedback from the project Technical Advisory Committee on the results of the Tier 1 Screening. The three alternative configurations advanced to the Tier 2 screening phase were a 4-lane (Alternative 1), 3-lane with bike lanes (Alternative 3), and 3-lane with wide sidewalks (Alternative 5.) The Tier 2 screening provides a more detailed description and rigorous analysis of the facility design needed to progress toward a selected corridor design.

This Plan identifies the study corridor, provides a summary of the existing transportation facilities, and summarizes the existing travel conditions for all users. The Plan describes the development and analysis of alternatives and discusses benefits and tradeoffs associated with each alternative. Transportation analysis for a future 2018 horizon year is included to inform decision -makers and the community on how South Willamette Street will function after a preferred design is selected and built.

Study Corridor

The study corridor is a 0.8 mile segment of Willamette Street between 24^{th} Avenue and 32^{nd} Avenue. This section of Willamette Street is a minor arterial that carries approximately 16,500 vehicles per day[1] and has five signalized and several unsignalized intersections. All five signalized intersections and one unsignalized intersection (as listed below) were analyzed as part of this Plan. These intersections are also shown in Figure 1.

- Willamette Street/24^{th} Avenue
- Willamette Street/25^{th} Avenue
- Willamette Street/27^{th} Avenue
- Willamette Street/Woodfield Station Driveway (unsignalized)
- Willamette Street/29^{th} Avenue
- Willamette Street/32^{nd} Avenue

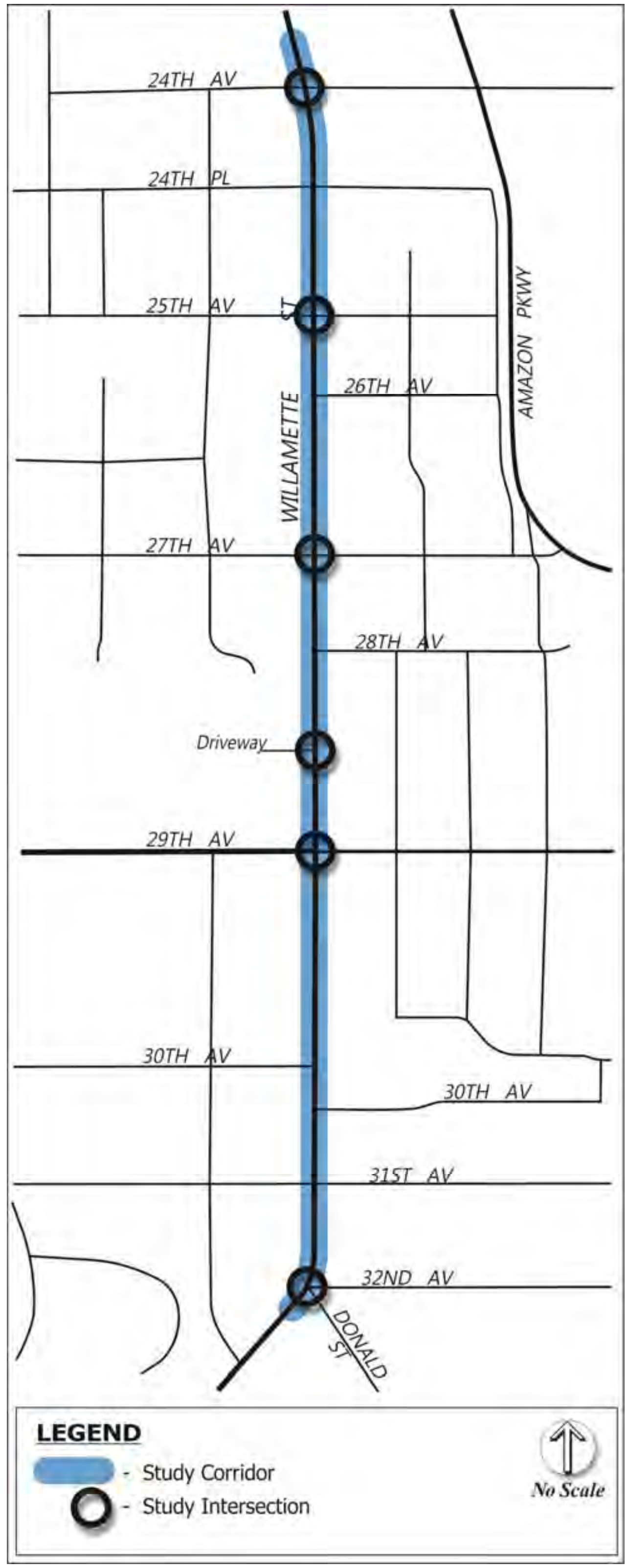


Figure 1: Study Corridor

Background and Context

This section describes how South Willamette Street fits into the regional context based on review of previous planning efforts for the area. Key elements from the plans are highlighted below that reflect a range of considerations and objectives for South Willamette Street. Key facility design standards are also summarized.

The following documents have been reviewed and included in the summary:

- South Willamette Area Draft Concept Plan
- Eugene Arterial and Collector Street Plan (ACSP)
- TransPlan: The Eugene-Springfield Transportation System Plan
- Eugene Pedestrian and Bicycle Master Plan
- Walkable Community Workshops
- Willamette Street Traffic Analysis Report

South Willamette Area Draft Concept Plan

The South Willamette Draft Concept Plan ("Draft Concept Plan") provides high-level guidance and vision on how development in the area should progress. The Draft Concept Plan concentrates on residential and shopping areas surrounding Willamette Street between 24th Avenue and 32nd Avenue, from Portland Street to the west to Amazon Parkway to the east. The Draft Concept Plan is focused on promoting business success in an urban district while supporting walking, biking, and driving.

A key concept identified in the Draft Concept Plan is developing the "Heart of the Walkable Business District," which is characterized by a "Safe, Attractive Pedestrian Experience for Business, Shopping and Entertainment." The portion of Willamette Street extending from 24th Place to 27th Avenue is identified as part of this district along with other nearby roadways.

The Draft Concept Plan identifies the potential for a pedestrian walkway across Willamette Street located between 27th Avenue and 29th Avenue. It also identifies gateways into the district located at the Willamette Street intersections at 23rd Avenue and 31st Avenue. The Draft Concept Plan also recommends the establishment of shared parking facilities to support the commercial district.

Eugene Arterial and Collector Street Plan (ACSP)

The primary purpose of the Eugene ACSP (adopted 1999) is to provide an updated street classification map and the appropriate street design standards and guidelines. The ACSP includes priorities to help guide decision making related to street improvements. Table 1 provides a summary of the priorities for improvement or regulation relevant to Willamette Street (minor arterial).

As shown, the highest priorities are identified to be regulating access, adding sidewalks and bike lanes, and upgrading urban standards. Regarding access management, the ACSP goes on to say "attempts should be made, wherever possible, to consolidate multiple driveways on arterial streets into a single access point." The City has also adopted access management standards within the Eugene Code (EC 7.408) that are intended to:

Table 1: Priority of Improvement or Regulation for Minor Arterials

Improvement Type	Priority
Regulate Access	High
Traffic Calming	Medium
Adding Sidewalks	High
Adding Bike Lanes	High
Upgrade Urban Standards	High
Major Corridor Improvements	Medium
New Street Mileage	Low

- Balance the need for a safe and efficient roadway system against the need to provide ingress and egress to developed land adjacent to the street.
- Reduce conflict points in the transportation system by managing the number, spacing, location and design of access connections.
- Preserve intersection influence areas to allow drivers to focus on traffic operational tasks, weaving, speed changes, traffic signal indications, etc.
- Reduce interference with through movement, caused by slower vehicles exiting, entering or turning across the roadway, by providing turning lanes or tapers and restricting certain movements.

The Eugene Code also provides direction on access spacing standards that are dependent upon the roadway classification and influence to adjacent intersections.

TransPlan: The Eugene-Springfield Transportation System Plan

TransPlan, the Eugene-Springfield Transportation System Plan,[2] identifies Willamette Street as a minor arterial. The Eugene Arterial and Collector Street Plan (ACSP) identifies the following standards that apply to minor arterials:

- Right-of-way (ROW) widths from 65' to 100'
- Minimum 11' travel lanes
- Continuous sidewalks on both sides of street and set back from curb.
- Minimum sidewalk widths of 10' for curbside sidewalks, and 5' for setback sidewalks
- Bicycle lanes should be striped 6' (standard) or 5' (in constrained situations) and free from drainage grates and utility covers

TransPlan also specifies a minimum performance of Level of Service (LOS) "D" for signalized intersections. In addition, TransPlan identifies a project on Willamette Street to stripe bike lanes (Project 296).

Eugene Pedestrian and Bicycle Master Plan

The Eugene Pedestrian and Bicycle Master Plan (PBMP) identifies existing conditions and needed improvements to bicycle and pedestrian facilities. The current roadway configuration on Willamette Street does not include bike lanes.

The desired improvement along the Willamette Street corridor is to provide wider sidewalks and 6' bike lanes (5' minimum), resulting in standard width pedestrian/bicycle facilities. However, this would require significant road widening, potential impacts to properties and structures, and high potential cost.

The recommended reconfiguration between 24th Avenue and 32nd Avenue was to meet design standards, as follows:

- From 32nd Avenue to approaching the 29th Avenue intersection the width would be 65' including three 11' lanes (1 northbound, 2 southbound), two 6' bike lanes, and 10' sidewalks on each side.
- Approaching 29th Avenue from the south and leaving 29th Avenue north the roadway would be 87' including five 11' lanes (1 Center left-turn lane each direction), 6' bike lanes, and 10' sidewalks.
- Leaving 29th Avenue to 24th Avenue the width would be 76' including four 11' lanes, 6' bike lanes, and 10' sidewalks.

Walkable Community Workshops

In 2004, a series of interactive workshops were held with community members to identify and propose solutions to concerns about walkability.[4] One workshop focused on Willamette Street between 24th Avenue and 29th Avenue and the surrounding neighborhood. Four small groups discussed potential solutions after walking around the area. Many ideas were documented and a few identified by multiple groups are summarized here:

- Convert Willamette Street from its existing four-lane configuration to a three-lane configuration with a Center left-turn lane, bike lanes, and pedestrian refuge medians.
- Create bus pullouts at all stops to prevent buses from blocking traffic.
- Reduce the number of curb cuts and driveways wherever possible.
- Make pedestrian crossing of Willamette Street easier with refuge medians at key locations.
- Add landscaped medians for improved aesthetics.
- Move utilities underground or to alleyways for improved aesthetics and pedestrian circulation.

The summary report contains many additional ideas generated by the small groups. It also identified improved access management and a comprehensive look at traffic circulation in a broader area around

Willamette Street as necessary steps to be taken before enhancements can be implemented.

Willamette Street Traffic Analysis

A traffic analysis(5) was conducted in 2001 to evaluate alternative designs for the section of Willamette Street between 24th and 29th Avenues. It was directed at improving pedestrian access while maintaining traffic capacity and safety.

The recommended alternative involved re-striping Willamette Street to a three-lane section with a center left-turn lane, bicycle lanes, and pedestrian refuges at strategic points. The analysis also evaluated a variable three/four-lane section with pedestrian refuges, as well as traffic signal options (full signal vs. mid-block pedestrian signal) at the Willamette Street/25th Avenue intersection. A full traffic signal was added at the 25th Avenue intersection as a result of the analysis.

Public Process

The South Willamette Street Improvement Plan was a collaborative process among various public agencies, key stakeholders and the community. A broad level of public involvement was vital to the Plan development. Public input was received through letters, phone calls, emails, and in-person at stakeholder outreach meetings and focus groups. The Plan's public involvement guiding principles and goals are summarized in the call-out box at right.

Throughout this project, the project team took time to understand multiple points of view, obtain fresh ideas and resource materials, and encourage participation from the community. Project staff conversed informally with members of the community, conducted individual interviews, and hosted small focus group meetings with key stakeholders representing business and property owners, local residents, and corridor users for all modes. Regular meetings were held with decision makers including the City of Eugene Planning Commission and work sessions with the Eugene City Council.

At key stages, project staff also held three public workshops (or community forums) that gave residents an opportunity to learn about the study and contribute their concerns on how Willamette Street might be improved. The three community forums included the following:

- #1 Community Forum: Explore the Alternatives (November 2012)
- #2 Community Forum: Evaluate the Alternatives (February 2013)
- #3 Community Forum: Refine the Preferred Alternative (June 2013)

Public Involvement Guiding Principles and Goals

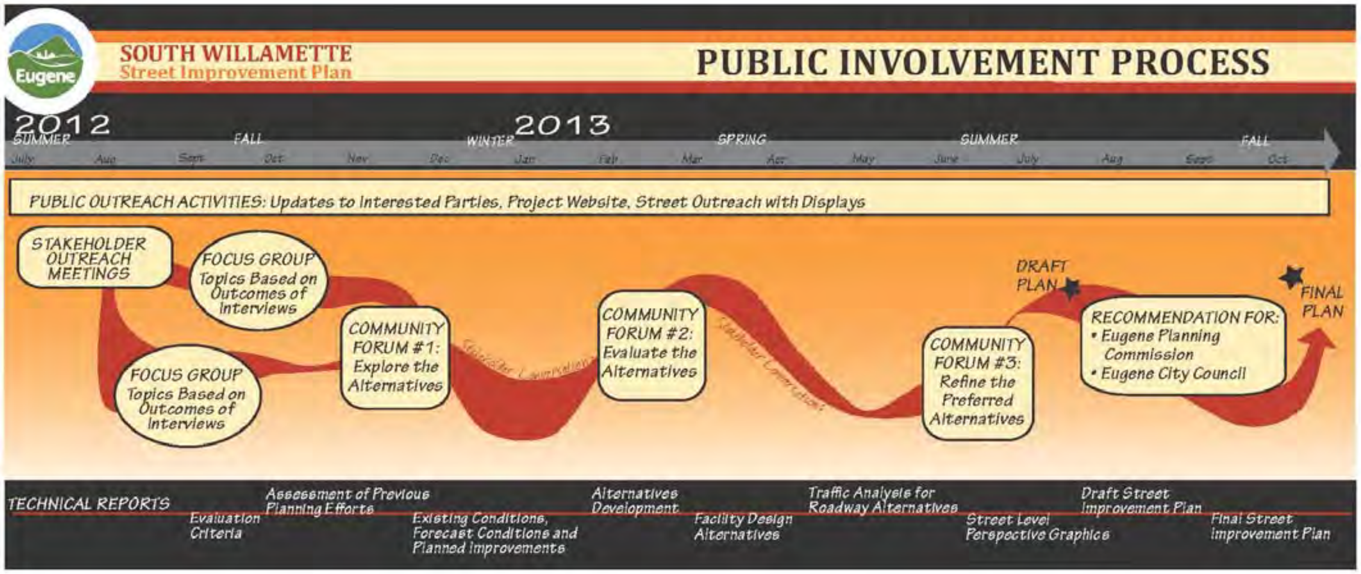
The South Willamette Street Improvement Plan included significant public involvement based on the following guiding principles and goals:

Guiding Principles

- Respect the intelligence of the public
- Seek out and facilitate the involvement of those potentially affected
- Identify issues and concerns early and throughout the process
- Widely disseminate complete information in a timely manner
- Include the public's contribution in decisions
- Report how input was considered & reasons for decisions in each phase
- Encourage open and honest communication

Public Involvement Goals

- Broad participation
- Timely, authentic & useful public input
- Thoughtful responses to individual comments, concerns, questions
- Public information on city policies, such as the 20-minute neighborhood



Additional details related to the community forums are provided in call-out boxes on pages 18, 32, and 67-69 to provide context for the decisions made throughout the alternatives screening process.

Community interest in the project was very high. The interested parties list exceeded 1,000. Total attendance at the public meetings exceeded 1,000. Over 600 surveys were completed and over 300 public comment emails were submitted to the city.

Evaluation Criteria

A variety of evaluation criteria were established to assess the potential of alternatives to best meet the transportation needs of the users of Willamette Street. The Eugene City Manager has endorsed a triple-bottom -line approach to sustainability and analysis for City projects and programs providing for consideration of people, the planet, and prosperity (or equity, environment, and economy).

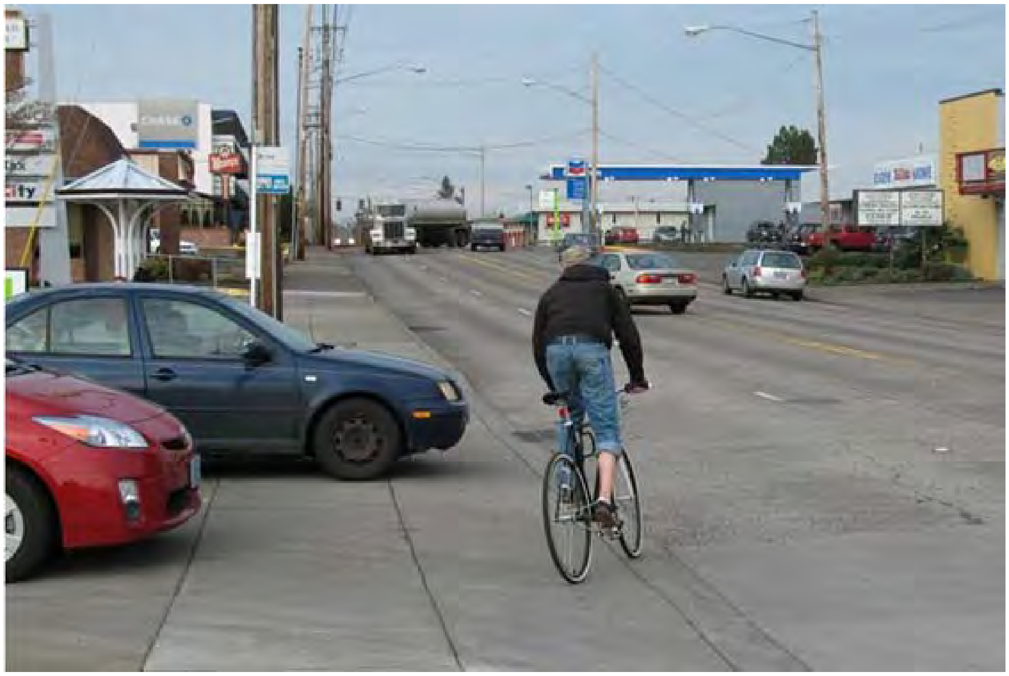
In development of the Draft Eugene Transportation System Plan (Draft TSP), the Transportation Community Resource Group (TCRG) extensively vetted a sustainability rating system based on a triple-bottom-line analysis. The South Willamette Street Improvement Plan adapted the TCRG sustainability work to develop the Tier 1 screening criteria for qualitative assessment of the roadway alternatives.

The TCRG work has been incorporated into Draft TSP goals, which provide broad statements that describe the desires of the Eugene community. The Draft TSP identifies a list of objectives which are divided into eight goal categories:

- Access and Mobility (for all modes)
- Safety and Health
- Social Equity
- Economic Benefit
- Cost Effectiveness
- Climate and Energy
- Ecological Function
- Community Context

Under these eight goal categories, 23 individual evaluation criteria were developed for the South Willamette Street Improvement Plan. The criteria reflect community values adapted from a sustainability process vetted by the TCRG, with refinements made based on a review of planning documents more specific to the project area, including the South Willamette Draft Concept Plan. The evaluation criteria are detailed in Technical Memorandum #1 (South Willamette Street Improvement Plan – Evaluation Criteria).

2. Existing Conditions



South Willamette Street is a multimodal corridor with a mixture of facilities to serve automobile, bicycle, pedestrian, transit, and freight users. The challenge of providing mobility and accessibility to all users is managing the various conflicts that arise, such as bikes and automobiles at driveways (foreground) and turning trucks blocking travel lanes (background).

Existing conditions were evaluated for South Willamette Street. This section documents the existing transportation facilities, adjacent land uses, and corridor travel conditions.

Existing Transportation Facilities

Key characteristics of the corridor's transportation facilities are documented for the roadway network, bicycle and pedestrian facilities, and transit facilities.

Roadway Network

The transportation characteristics of Willamette Street north and south of 29th Avenue are summarized in Table 2 and include approximate street width, number of travel lanes, posted speeds, and the presence of sidewalks and/or bike lanes. The functional classification of Willamette Street (Minor Arterial) specifies the purpose of the roadway and defines the applicable cross-section and access spacing standards.

At the north end of the study corridor, 24th Avenue provides an important connection to the east and provides a high number of vehicle connections to and from Willamette Street. Near the center of the study area, 29th Avenue is a minor arterial that carries approximately 12,000 to 15,700 vehicles [6] per day. The remaining cross streets primarily provide local access to businesses and residential areas.

The roadway configuration for Willamette Street within the study area can be separated into three segments. From 24th Avenue to near 29th Avenue, Willamette

Table 2: Roadway Characteristics

Roadway	Street Width	Travel Lanes	Posted Speed	Sidewalks	Bike Lanes
Willamette St (North of 29th Ave)	42 feet	4 lanes (2 SB, 2 NB)	25 mph	Yes	No
Willamette St (South of 29th Ave)	41 feet	3 lanes (2 SB, 1 NB)	25 mph	Yes	Yes

Figure 2a: 4-Lane Cross Section (North of 29th Avenue)

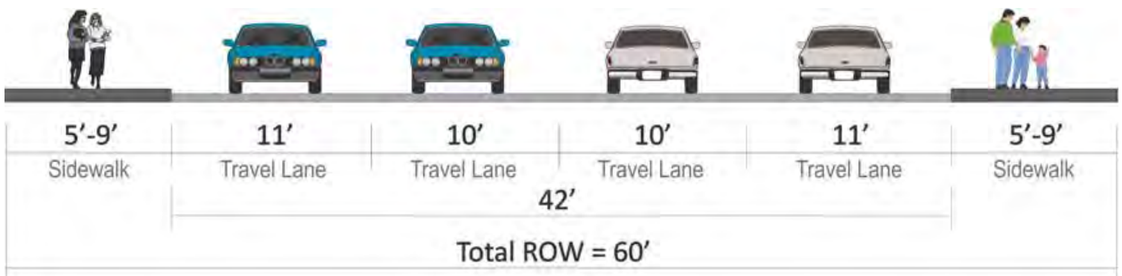


Figure 2b: 5-Lane Cross Section (at 29th Avenue)

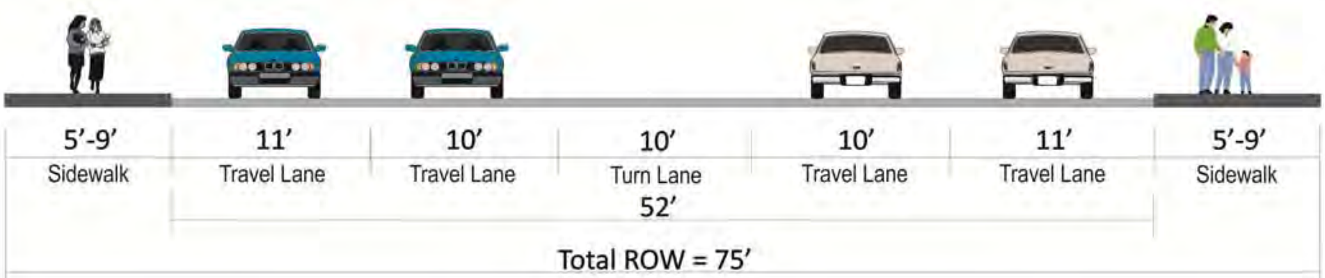
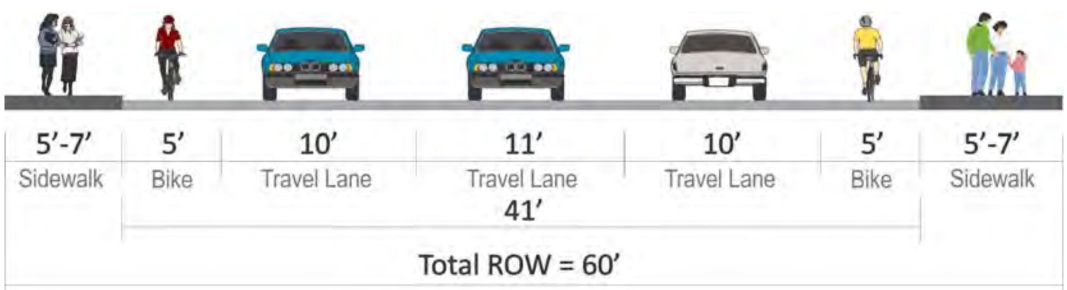


Figure 2c: 3-Lane Cross Section (South of 29th Avenue)



Street has a 60 foot right-of-way consisting of four travel lanes and no dedicated bike lanes (shown in Figure 2a). There is a short segment near 29th Avenue where a "transition zone" exists, with the right-of-way widening to 75 feet. This segment has five travel lanes to accommodate left-turn lanes at the 29th Avenue intersection, and no dedicated bike lanes (shown in Figure 2b).

Roughly 500 feet south of 29th Avenue, the right-of-way returns to approximately 60 feet, with three travel lanes (two southbound and one northbound) and bike lanes available in both directions south of 29th Place. Figures 2a, 2b, and 2c illustrate the existing cross-sections for the three segments of Willamette Street.

Bicycle and Pedestrian Facilities

Sidewalks are present on both sides of Willamette Street for the full length of the study corridor varying in width from approximately 5 feet to 9 feet. Most of the study area has curbside sidewalks with the exception of small sections of landscaping near the north and south limits of the study area. Utility poles and other objects create obstacles and impact accessibility. There are marked pedestrian crossings at the five signalized intersections. No other marked crosswalks currently exist within the study area.

Bike lanes exist from approximately 250' south of 29th Avenue and continue south through 32nd Avenue. There are currently no bicycle facilities to the north of 29th Avenue. Bike lanes are present on the cross streets of 24th Avenue and 29th Avenue; however the lack of bike lanes on Willamette Street hinders connectivity to these facilities. Portland Street (one block to the west) and Oak Street (one block to the east) provide potential alternate bike routes to Willamette Street but these roadways include connectivity gaps in the network.

Obstacles on the sidewalk—such as utility poles, fire hydrants, and driveway slopes—impact the accessibility and travel experience for pedestrians and bicyclists.

Figure 3: Existing Bicycle Facilities

Figure 4: Existing Pedestrian Facilities

Figure 3 shows the location of existing bike lanes, while Figure 4 shows existing sidewalks. Both figures show paths, which can be used by both bicyclists and pedestrians.

Driveways and Access Points

There are over 70 driveways on the 0.8 mile corridor of Willamette Street. The Arterial and Collector Street Plan (ACSP) indicates that for a typical minor arterial, emphasis should be given to mobility rather than accessibility and that access regulation is of high priority for roadways with this classification. However, the commercial nature of Willamette Street encourages a balanced approach to maintaining access and supporting mobility.

Transit Facilities

Lane Transit District (LTD) provides public transit service to the Eugene-Springfield areas. The following two routes provide service to the study area.

- Route 24 (Donald) – Route 24 runs both directions over the length of the study corridor. On weekdays, it operates from roughly 6:15 am to 11:00 pm with 30-minute headways (2 buses per hour). After 7:00 pm, it operates with one-hour headways. On Saturdays, this route operates very similar to weekdays, and on Sundays it operates on one-hour headways from 8:00 am to 8:00 pm.
- Route 73 (UO/Willamette) – Route 73 runs both directions on Willamette Street from 29th Avenue to 40th Avenue. At 29th Avenue, the route heads east to Hilyard Street. On weekdays, this route operates from about 7:00 am to 7:00 pm with headways ranging from 20 minutes to two hours, and there is no service on weekends.

Bus shelters at key transit stops along the South Willamette Street corridor provide a more comfortable waiting experience for riders.

Figure 5 shows the locations of marked bus stops located within the study area as well as the available transit routes through the study corridor.

Figure 5: Transit Stops and Routes

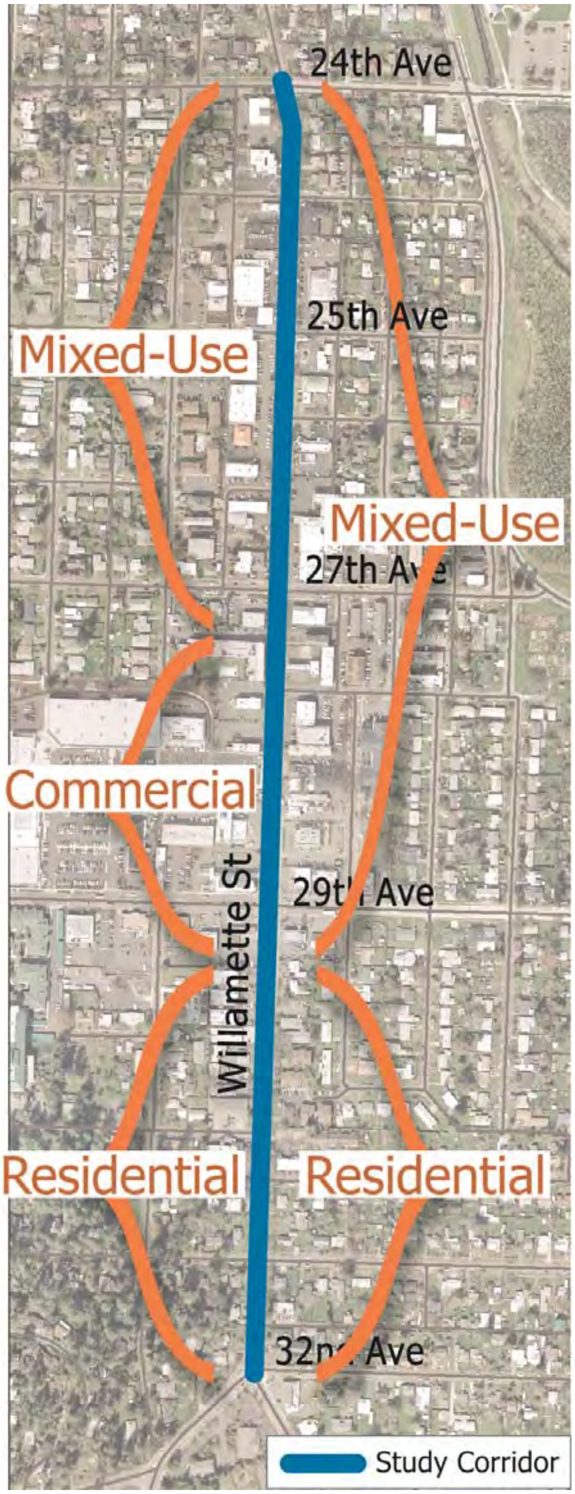


Figure 6: Adjacent Land Use

Adjacent Land Uses

Figure 6 identifies the land uses adjacent to the study corridor. From 24th Avenue to 29th Avenue, the adjacent land use is a combination of a few single family homes, apartment buildings, and retail stores. Woodfield Station is located between 28th Avenue and 29th Avenue on the west side of Willamette Street. Adjacent land use south of 29th Avenue consists mostly of apartment buildings and single family residential units.

Travel Conditions

Existing travel conditions were also evaluated for the South Willamette Street corridor. A wide variety of information and measures are presented including traveler characteristics, traffic patterns (i.e., volume, speed, and classification), travel times, intersection operations, multimodal operations (i.e., for active modes and transit), and collision history.

Traveler Characteristics

Data collected on Willamette Street between 24th Avenue and 32nd Avenue(7) indicate that the majority of traffic on Willamette Street has a local origin or destination. As shown in Figure 7, approximately 63% of trips either begin, end, or stop on Willamette Street or use local streets for access. Approximately one quarter (24%) of Willamette Street traffic is traveling through from one end of the corridor to the other (between 24th Avenue and 32nd Avenue) without stopping or turning onto another street. Another 13% are traveling through the corridor using 29th Avenue to connect to or from Willamette Street, without making a local stop.

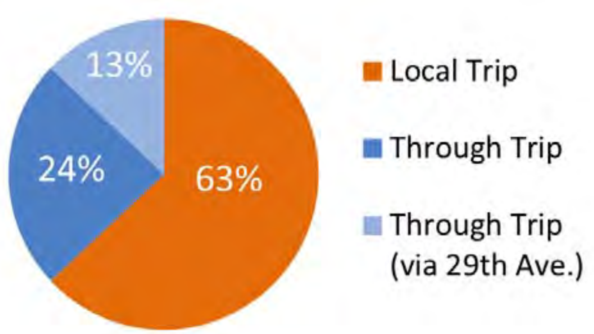


Figure 7: Traveler Characteristics on Willamette Street (24th Ave to 32nd Ave)

Traffic Patterns (Volumes, Speed, and Classification)

Table 3 presents traffic data collected south of the Willamette Street/27th Avenue intersection[8] including volume, speed, and heavy vehicle percentages[9]. As shown, the daily traffic volume is approximately 16,400 along the study corridor. The 85th percentile speeds (meaning 85% of vehicles travel at this speed or slower) along Willamette Street are approximately 5 mph higher than the posted speed of 25 mph and the heavy vehicle percentages are around 2%.

To further understand the use of this roadway over the course of a 24-hour period, Figure 8 shows vehicle movements throughout the day. This graph shows that the highest northbound traffic volume occurs during the lunch hour and the highest southbound volumes occur during the p.m. peak hours. The northbound direction is used more heavily during the a.m. hours and the southbound direction tends to have higher volumes during the p.m. hours. This directional traffic pattern is typical for commuting trips, with the a.m. flow towards the downtown business district and the p.m. traffic moving away from the downtown core.

Table 3: Willamette Street ADT, Speed, and Classification

Characteristic	Northbound	Southbound	Total
Average Daily Traffic	7,610 (47%)	8,750 (53%)	16,360
85th Percentile Speed	31.7 mph	29.8 mph	30.7 mph
Heavy Vehicle Percentage	2%	2%	2%

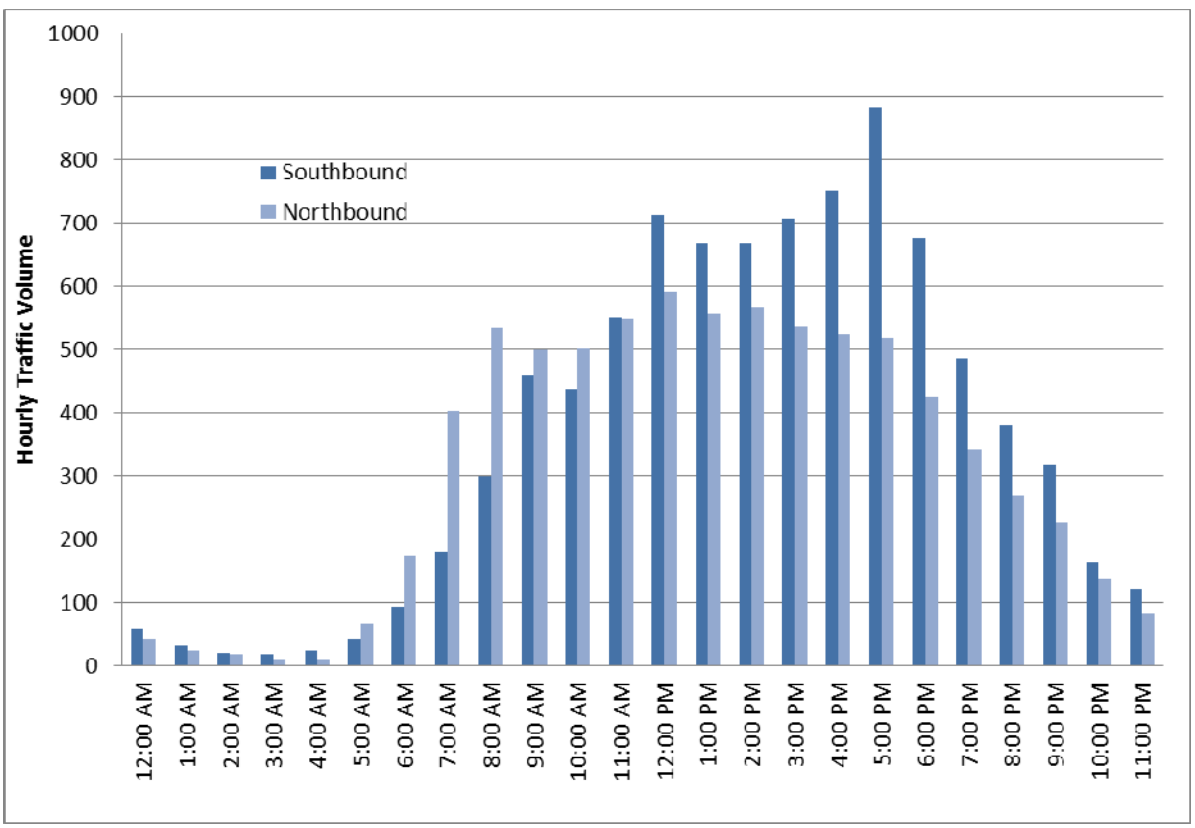


Figure 8: 24-Hour Bi-Directional Volume (Willamette Street south of 27th Avenue)

Travel Times

Data collected on Willamette Street between 24th Avenue and 32nd Avenue[10] indicates that travel times vary by time of day. The length of time needed to travel from one end of the study corridor to the other depends on the traffic volume and resulting delay that may occur. The study corridor is approximately three quarter miles in length.

Figure 9 shows the average travel times collected for all hours of the day compared to the p.m. peak hour, by direction. It takes approximately two and a half minutes (150 seconds) to travel through the corridor, on average over all hours of the day. The travel time is approximately equivalent for southbound and northbound travel. However, during the p.m. peak hour, when traffic volumes are highest, the travel time increases by approximately 20 seconds in the northbound direction and 40 seconds in the southbound direction.

Intersection Operations

The City of Eugene specifies a minimum performance of level of service (LOS) "D" at signalized and unsignalized intersections. An exception exists to the City's mobility standard within the Central Area Transportation Study Area (primarily downtown and near the University of Oregon), where the City allows LOS "E" for signalized intersection operations. However, this does not currently apply to the study corridor.

The existing traffic operations at the study intersections were determined for the a.m. and p.m. peak hours based on turn movement volumes collected during the a.m. (7:00 a.m. to 10:00 a.m.) and the p.m. (4:00 p.m. to 7:00 p.m.) peak periods.[11] All of the study intersections currently meet operating standards. The Willamette Street/29th Avenue intersection experiences the greatest delay. The estimated average delay, level of service (LOS), and volume to capacity (v/c) ratio of each study intersection were determined, as shown in Table 4. Traffic volumes and operations analysis are detailed in Technical Memorandum #2. The intersection traffic counts also included bicycle and pedestrian volumes at each intersection.

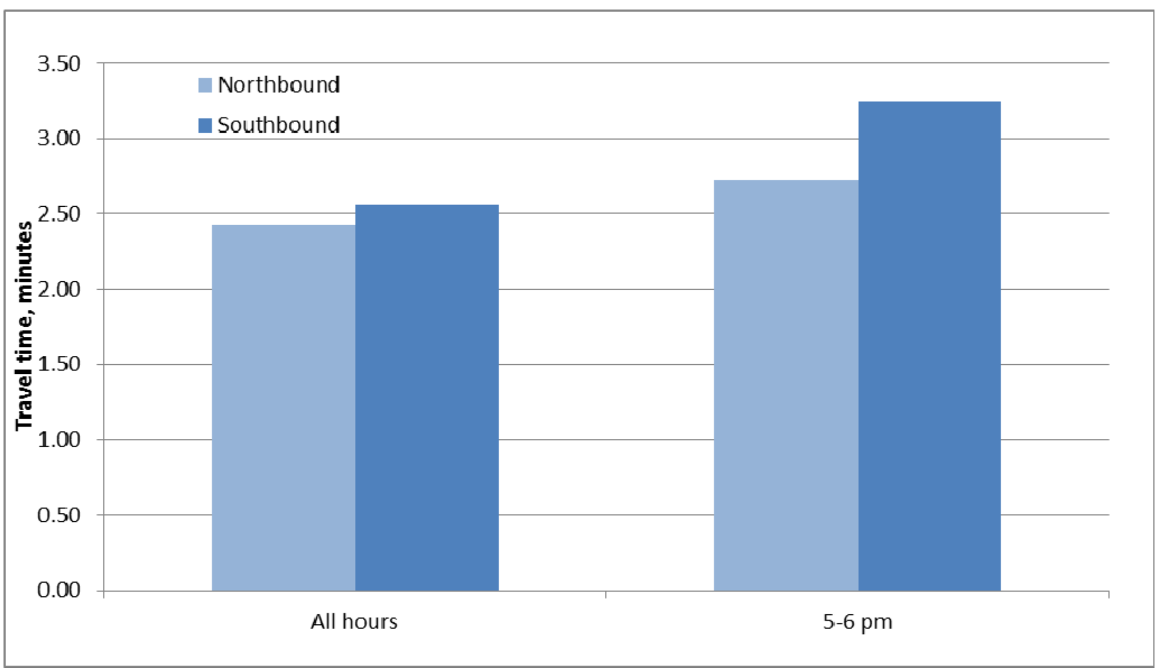


Figure 9: Study Corridor Travel Times

Table 4: Existing Intersection Operations

Intersection	Operating Standard	Existing A.M. Peak Hour			Existing P.M. Peak Hour		
		Delay	*LOS*	*V/C*	*Delay*	*LOS*	*V/C*
Signalized							
Willamette Street/24th Avenue	LOS D	9.5	A	0.52 (0.53)	13.9	B	0.61 (0.74)
Willamette Street/25th Avenue	LOS D	4.0	A	0.34 (0.36)	9.3	A	0.39 (0.49)
Willamette Street/27th Avenue	LOS D	7.7	A	0.34 (0.39)	8.4	A	0.45 (0.46)
Willamette Street/29th Avenue	LOS D	29.9	C	0.82 (0.82)	41.3	D	0.83 (0.85)
Willamette Street/32nd Avenue	LOS D	26.4	C	0.97 (0.97)	10.5	B	0.67 (0.73)
Unsignalized							
Willamette Street/Woodfield Station Driveway	LOS D	0.7	A/B	0.29	3.4	A/C	0.44

Signalized Intersections:
LOS = Level of Service of Intersection
V/C = Volume-to-Capacity Ratio of Intersection (Critical Movement)

Unsignalized Intersections:
LOS = Level of Service of Major Street/Minor Street
V/C = Volume-to-Capacity Ratio of Worst Movement

Field observations were performed during the p.m. peak conditions at the study intersections. Extensive queuing was observed on the southbound approach to the Willamette Street/29th Avenue intersection which resulted in vehicles having to wait more than a full traffic signal cycle to move through the intersection. It was also observed that the northbound left-turn movement experienced long queues that did not clear during each cycle. Traffic volume and congestion levels were observed to vary from day to day.

Multimodal LOS

Auto, pedestrian, bicycle and transit operations along Willamette Street were evaluated using multimodal level of service (MMLOS) methodologies.[(12)] The MMLOS evaluation assesses how well a facility meets the needs of the traveling community by reporting a LOS grade (A-F) for each mode of transportation. This evaluation is performed for roadway segments and focuses on the users' perceived comfort level as they travel along the corridor.

Using signalized intersections as break points, Willamette Street was divided into four segments for analysis. Analysis was performed based on p.m. peak hour conditions when the higher traffic volumes would result in the worst case level of service for each mode of transportation. The methodology does not account for intersection operations, which were addressed previously.

Pedestrian LOS is influenced by traffic volumes, vehicle speeds, sidewalk width, and presence of a buffer. Bicycle LOS is influenced by bike lane width, pavement quality, on-street parking, and heavy vehicle percentage. Transit LOS is influenced by service frequency, bus reliability, average passenger load, and transit stop amenities.

The limitations of the MMLOS analysis should be noted. For example, the existing bicycle facilities on Willamette Street were evaluated as LOS "D" MMLOS operations, a better than expected rating. Based on stakeholder interviews, most bicycle users are not comfortable biking on Willamette Street without bike lanes. Therefore, it is clear that the comfort level of motorists driving on a roadway with LOS "D" conditions is not a suitable comparison to bicyclists travelling on a facility with LOS "D" conditions. Despite the limitations, the MMLOS evaluation provides value as an objective comparison that considers multiple modes.

The existing MMLOS operations for Willamette Street are shown in Figure 10. The auto, pedestrian, and bicycle LOS range from "B" to "D". The LOS for transit ranges from "C" to "E" based on the current bus service frequency. One transit route currently serves the Willamette Street segment from 24th Avenue to 29th Avenue which results in LOS "D/E". Two transit routes serve the corridor from 29th Avenue to 32nd Avenue, which is reflected in the LOS "C" operations for that segment.

Collision Analysis

Collision analysis was performed for the study corridor and study intersections to identify collision trends and potentially hazardous locations in need of safety improvements.[13] As shown in Table 5, the collision rate for Willamette Street was calculated to be 5.2 collisions per million vehicle-miles traveled (VMT), nearly double the statewide average of 2.9

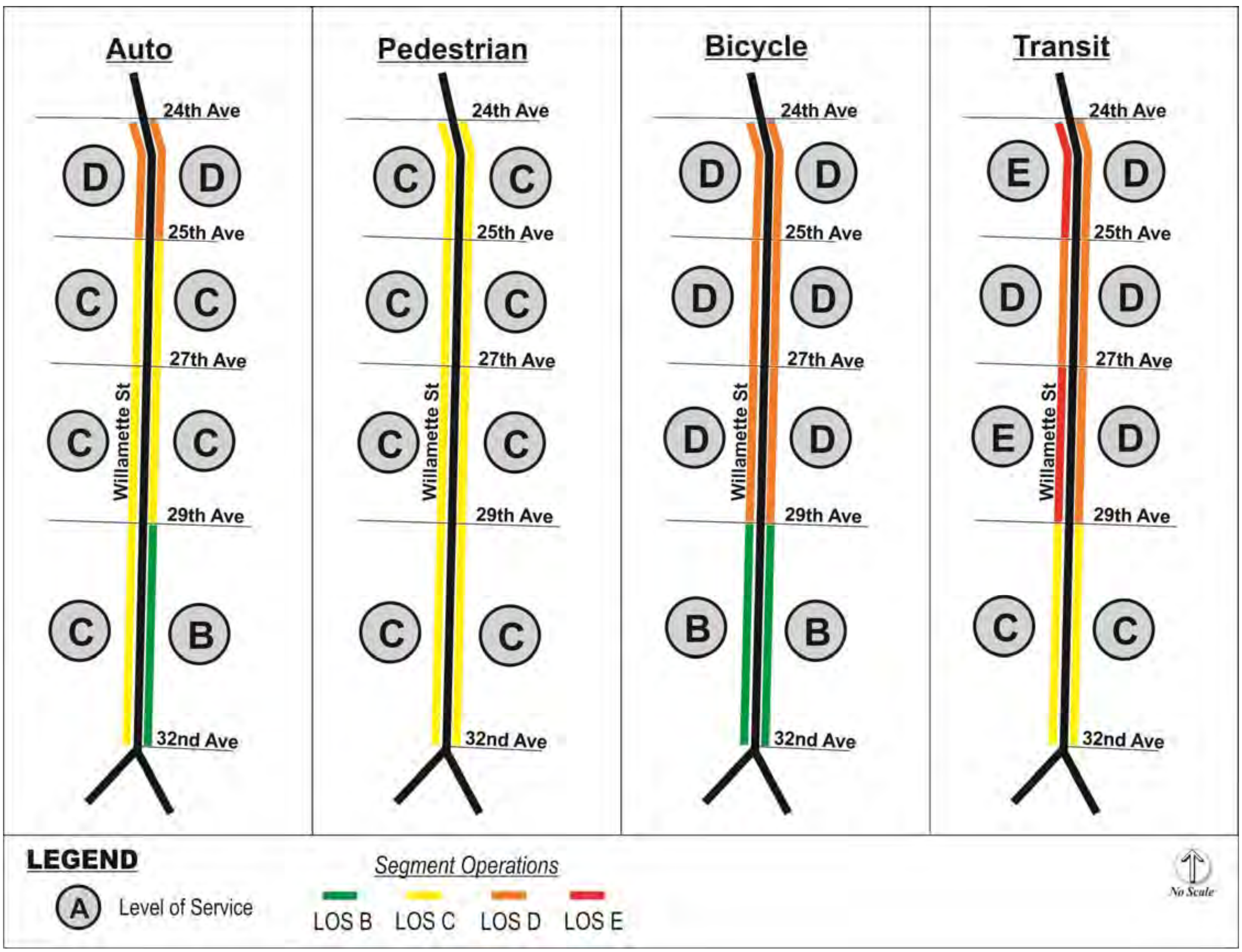


Figure 10: Existing PM Peak Hour Multimodal Level of Service (MMLOS)

Table 5: Segment Collision Summary (2008-2010)

Segment (Distance)	Severity		Type				Total	Collision Rate[b]
	Injury	*PDO[a]*	*Turn*	*Rear-End*	*Angle*	*Other*		
24th Ave thru 27th Ave (0.30 mi.)	14	10	7	10	6	1	24	-
27th Ave thru 29th Ave (0.20 mi.)	15	18	22	8	1	2	33	-
29th Ave thru 32nd Ave (0.28 mi.)	11	6	6	10	0	1	17	-
Entire Study Corridor (0.78 mi.)	**40**	**34**	**35**	**28**	**7**	**4**	**74**	**5.2**
% of Total	**54%**	**46%**	**47%**	**38%**	**10%**	**5%**	**100%**	-

[a] PDO = Property Damage Only
[b] Rate Calculation = Collision per year / (Average Daily Traffic x 365 days / 1 million vehicle-miles traveled)

collisions per million VMT for urban city minor arterial roadways for the same years.[(14)]

In total, the Willamette Street corridor between 24th Avenue and 32nd Avenue experienced 74 collisions during the three years evaluated (2008-2010). For the years evaluated, there were no collisions resulting in a fatality and roughly half of the collisions on the corridor (54%) resulted in an injury.

Collision analysis was also performed at the individual study intersections to pinpoint high collision locations. The six study intersections had a total of 53 collisions during the three years evaluated. Intersection collisions include those that occur along the intersecting cross street, as well as on Willamette Street, therefore the total number of intersection collisions differs from the total segment collisions.

Table 6 lists the number of collisions at each study intersection and categorizes them by severity, type, and collision rate. The majority of the collisions were related to turning movements, and roughly half of all intersection collisions resulted in an injury.

During the three years evaluated, there were four bicycle collisions and no pedestrian collisions. Three of the collisions involving bicycles were within 200 feet

Table 6: Intersection Collision Summary (2008-2010)

Intersection	Severity		Type				Total	Collision Rate[b]
	Injury	*PDO[a]*	*Turn*	*Rear-End*	*Angle*	*Other*		
Willamette St/24th Ave	2	2	0	1	3	0	4	0.21
Willamette St/25th Ave	5	1	2	3	1	0	6	0.34
Willamette St/27th Ave	5	4	4	2	2	1	9	0.44
Willamette St/ Willamette Plaza Driveway	3	5	8	0	0	0	8	0.45
Willamette St/29th Ave	8	14	12	7	2	1	22	0.76
Willamette St/32nd Ave	3	1	2	2	0	0	4	0.23
Total	**26**	**27**	**28**	**15**	**8**	**2**	**53**	-
% of Total	**49%**	**51%**	**53%**	**28%**	**15%**	**4%**	**100%**	-

[a] PDO = Property Damage Only
[b] Collisions per 1 million entering vehicles

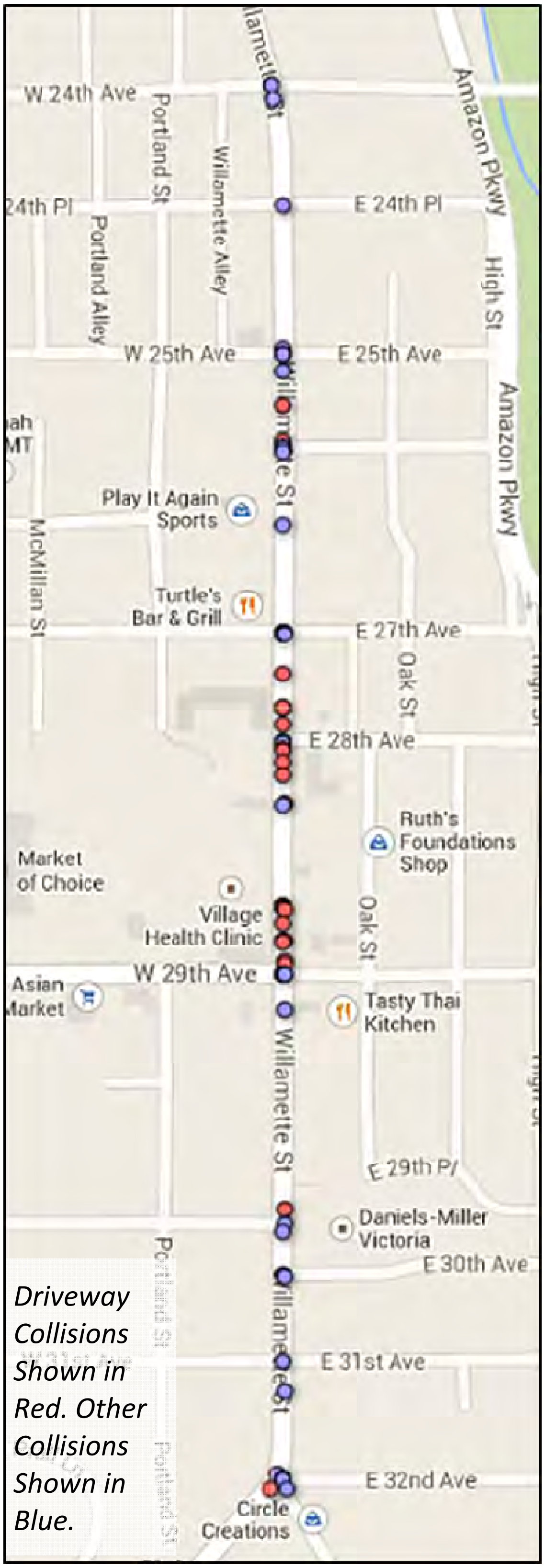


Figure 11: Willamette Street Collisions

of the Willamette Street/29th Avenue intersection and the fourth was at the intersection of 27th Avenue. Two of the bicycle collisions were related to vehicles making turning movements into and out of driveways.

In addition, of the 74 reported collisions, 26 (35%) were related to movements into or out of an alley or driveway. As shown in Figure 11, a majority of the driveway-related collisions were concentrated between 27th Avenue and 29th Avenue (collisions related to driveways are shown in red). When considering time of day, the number of collisions increased around the lunch hour and remained high until 6:00 pm.

Community Forum #1 – Explore the Alternatives

Community Forum 1 was held in November of 2012. The meeting introduced the project to the broader community and explained the process toward development of a preferred alternative design.

This forum was designed to solicit community input on key issues and priorities for travel on Willamette Street, as well as generate ideas for potential improvements.

Participants overwhelmingly agreed that Willamette Street is a stressful experience for all modes of travel. Adding bike lanes, improving pedestrian crossings, and enhancing sidewalks were key priorities for participants.

When participants were asked a specific question about improving bicycle facilities, bike lanes on Willamette Street was the preferred option of the majority. However, participants also questioned the impacts of reducing travel lanes in order to add bike lanes. Individuals who use the corridor to commute to work and school expressed a clear desire for the street to continue to move automobile traffic efficiently.

Merchants located on Willamette Street stressed that they need current traffic volumes to maintain their businesses. Additionally, there was near unanimous support for undergrounding utilities, careful landscaping to beautify and to improve stormwater problems, and consolidating some of the corridor's more than seventy driveways. The idea of slowing car traffic to the speed limit was acceptable to almost all attendees.

3. Alternative Concepts

Multiple improvement alternatives were considered for the South Willamette Street corridor. Conceptual graphics, such as this one, were prepared to help visualize the improvements.

Six alternative cross-section concepts were proposed for consideration for the South Willamette Street Improvement Plan. The six proposed alternatives are illustrated via conceptual cross-sections and overhead plan views (Figures 12 through 17). The following section identifies each of the proposed cross-section alternatives along with alternative-specific considerations for key elements of the facility design.

The proposed alternatives were focused on developing a design for short term improvements, while also supporting a long-term corridor vision. To facilitate development of a design plan that can be adopted and implemented in the short-term, an effort was made to minimize the costs related to right-of-way acquisition and curb reconstruction. Each of the conceptual cross-sections maintains existing right-of-way and only two of the six cross-sections would require curbs to be relocated for the majority of the corridor.

Although different segments of Willamette Street vary in existing design and surrounding land use characteristics, the alternative cross-section concepts attempt to create a foundation for a continuous and cohesive corridor while balancing needs and broad objectives. Differences may exist in roadway configurations for different segments but the design for the preferred alternative will be refined to be as consistent as possible while taking into consideration multimodal needs across the corridor.

Alternative 1: 4-Lane

Alternative 1 maintains the existing (curb-to-curb) roadway configuration north of 29th Avenue (see Figure 12). Sidewalks would be expanded to their maximum width (approximately nine feet) within the existing right-of-way. The cross-section illustration is not being considered south of 29th Avenue because it does not include any dedicated bicycle facilities and no parallel facilities are available near Willamette Street, south of 30th Avenue.

Alternative 1 Considerations	
Motor Vehicle Mobility	• Maintains existing four travel lanes • Left-turning vehicles block travel lanes
Walkability	• Consistent nine-foot sidewalks • Sidewalks narrower than ten-foot standard width (A) • Sidewalk width is not sufficient to support active commercial streetscape (B)
Bicycle Facilities	• No on-street bike lanes • Improved bike access would occur via parallel route improvements and crossing enhancements (see Figure 23) • Bike sharrows possible on curbside lanes
Transit Service	• Maintains eleven-foot outside travel lane for buses
Cost	• Relatively low cost to maintain current cross-section

(A) Minimum width defined for curbside sidewalks in pedestrian-oriented commercial areas. *Design Standards and Guidelines for Eugene Streets, Sidewalks, Bikeways and Accessways*, City of Eugene, November 1999

(B) A concept for the "Heart of the Walkable Business District" characterized by a "Safe, Attractive Pedestrian Experience for Business, Shopping and Entertainment" was identified in the *South Willamette Area Draft Concept Plan*, City of Eugene, October 2012.

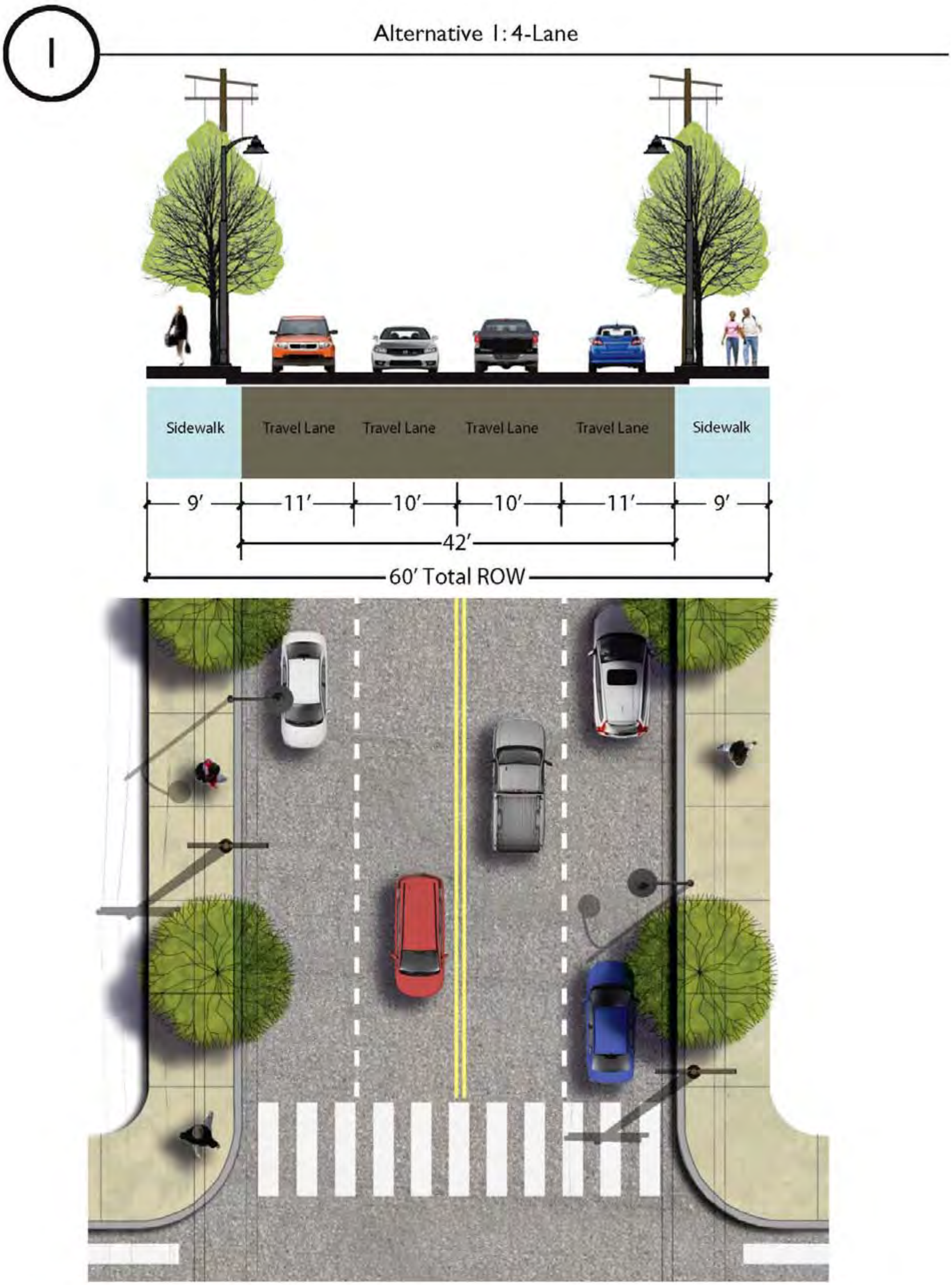


Figure 12: Alternative 1 Concept

Alternative 2: 4-Lane with Center Left-turn Lane

Alternative 2 maintains four travel lanes north of 29th Avenue, with one of the existing northbound lanes converted to a two-way center left-turn lane (see Figure 13). The roadway would include two southbound through lanes, one northbound through lane, and a two-way center left-turn lane.

Sidewalks would be expanded to their maximum width (approximately nine feet) within the existing right-of-way. The cross-section illustration is not being considered south of 29th Avenue because it does not include any dedicated bicycle facilities and no parallel facilities are available near Willamette Street, south of 30th Avenue.

Alternative 2 Considerations	
Motor Vehicle Mobility	• Four total travel lanes maintained (2 Southbound, 1 Northbound, and 1 Center left-turn lane) • Provides center left-turn lane • Southbound capacity increased • Northbound capacity reduced • Northbound buses stopped in a single through lane will have impact on northbound travel
Walkability	• Consistent nine-foot sidewalks • Sidewalks narrower than ten-foot standard width (A) • Sidewalk width is not sufficient to support active commercial streetscape (B)
Bicycle Facilities	• No on-street bike lanes • Improved bike access would occur via parallel route improvements and crossing enhancements (see Figure 23) • Bike sharrows possible on curbside lanes
Transit Service	• Maintains eleven-foot outside travel lane for buses
Business Accessibility	• Improves motor vehicle access during PM period, when commercial traffic is highest • Center left-turn lane improves access for turning vehicles • Does not significantly change accessibility for transit and bicycle modes
Cost	• Relatively low cost to convert lane direction north of 29th Avenue • Intersections and traffic signals would need to be reconfigured north of 29th Avenue

(A) Minimum width defined for curbside sidewalks in pedestrian-oriented commercial areas. *Design Standards and Guidelines for Eugene Streets, Sidewalks, Bikeways and Accessways*, City of Eugene, November 1999.

(B) A concept for the “Heart of the Walkable Business District” characterized by a “Safe, Attractive Pedestrian Experience for Business, Shopping and Entertainment” was identified in the *South Willamette Area Draft Concept Plan*, City of Eugene, October 2012.

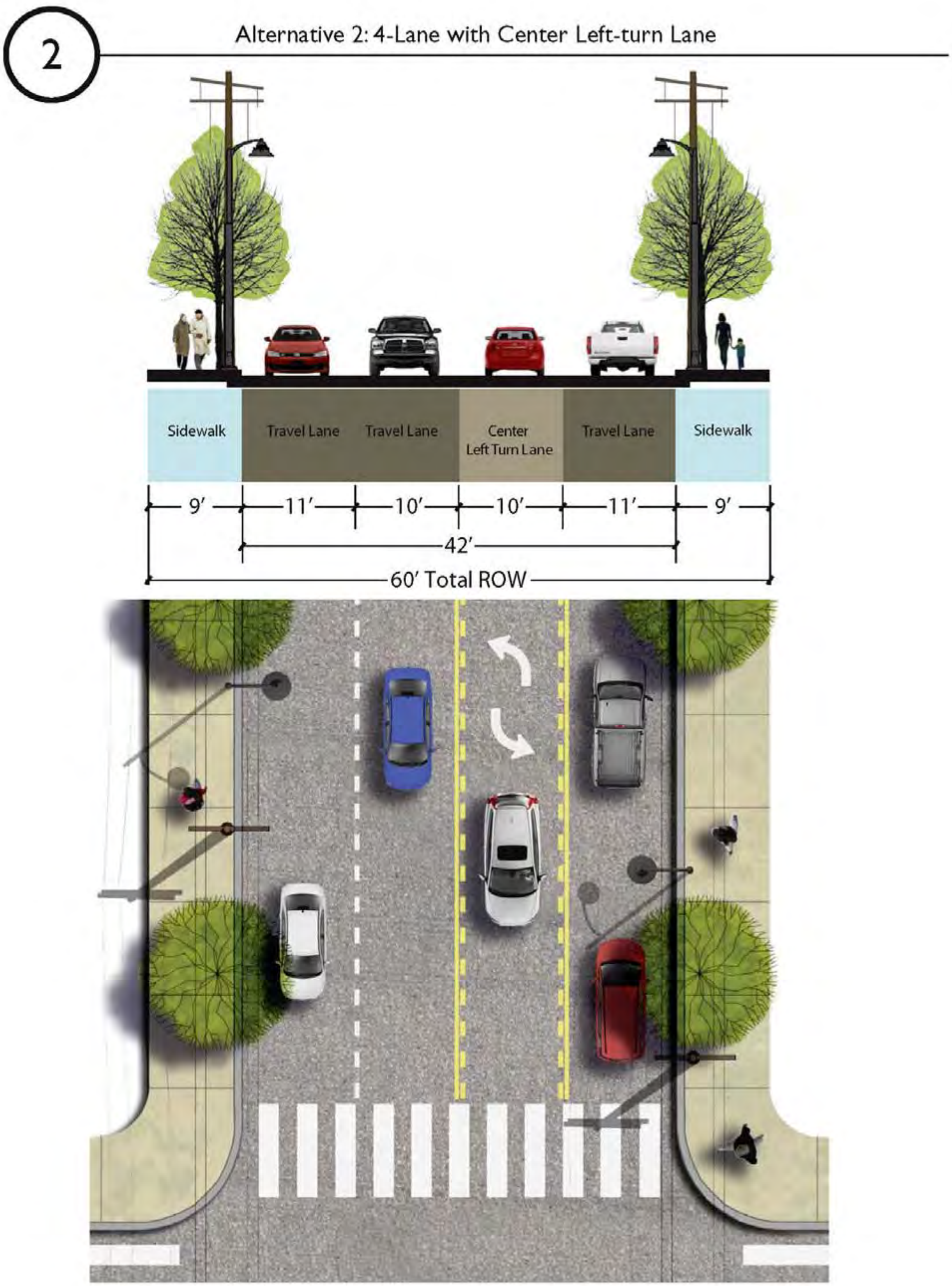


Figure 13: Alternative 2 Concept

ALTERNATIVE 3: 3-LANE WITH BIKE LANES

Alternative 3 would provide one northbound through lane, one southbound through lane, a two-way center left-turn lane, and a bike lane in each direction (see Figure 14). This configuration would convert most of the segment north of 29th Avenue from four motor vehicle lanes to three, while adding two bike lanes. Three travel lanes would be maintained south of 29th Avenue.

Sidewalks would be expanded to the maximum available width within the remaining right-of-way. Sidewalk and lane widths may vary across the corridor depending on the existing curb-to-curb width.

Alternative 3 Considerations	
Motor Vehicle Mobility	• Reduces number of travel lanes from four to three, north of 28th Avenue • Capacity reduced and travel time increased for through-traveling vehicles • Ten-foot travel lanes are narrow for trucks and less than the eleven-foot standard width (A)
Walkability	• Consistent nine-foot sidewalks • Sidewalks narrower than ten-foot standard width (B) • Bike lanes provide separation from motor vehicle lanes • Sidewalk width is not sufficient to support active commercial streetscape (C)
Bicycle Facilities	• Includes six-foot bike lanes
Transit Service	• Ten-foot travel lanes are narrow for buses • Potential conflicts with bike lanes
Business Accessibility	• Center left-turn lane improves access for turning vehicles • Improved bicycle access
Cost	• Moderate cost to provide center left-turn lane and bike lanes • Intersections and traffic signals would need to be reconfigured
Other	• Center left-turn lane offers opportunities for design elements including median treatments (e.g., landscaping, pedestrian refuge, access management)

(A) Minimum travel lane width on Minor Arterials is 11 feet. *Design Standards and Guidelines for Eugene Streets, Sidewalks, Bikeways and Accessways*, City of Eugene, November 1999

(B) Minimum width defined for curbside sidewalks in pedestrian-oriented commercial areas. *Design Standards and Guidelines for Eugene Streets, Sidewalks, Bikeways and Accessways*, City of Eugene, November 1999.

(C) A concept for the "Heart of the Walkable Business District" characterized by a "Safe, Attractive Pedestrian Experience for Business, Shopping and Entertainment" was identified in the *South Willamette Area Draft Concept Plan*, City of Eugene, October 2012.

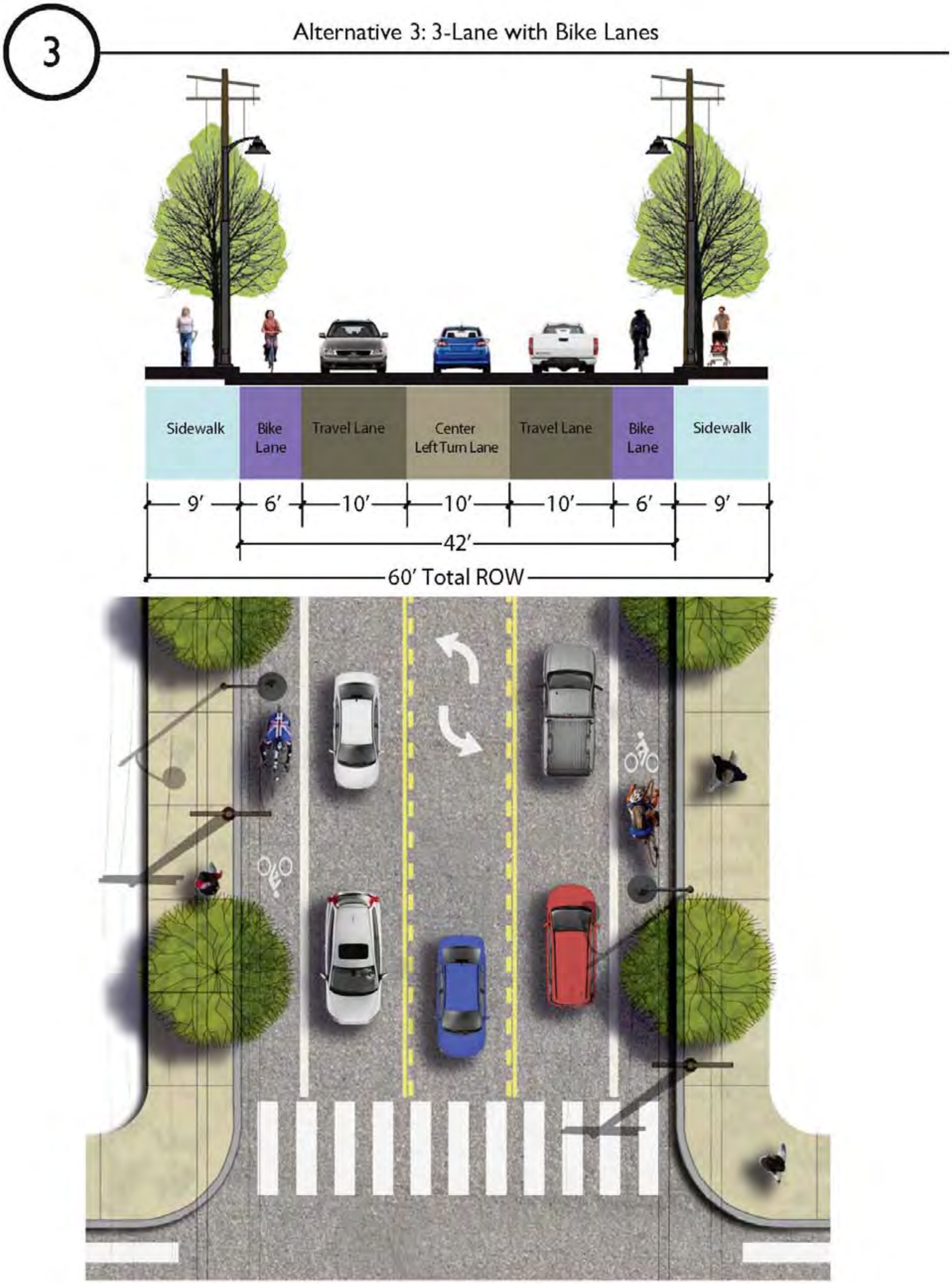


Figure 14: Alternative 3 Concept

Alternative 4: 3-Lane with Buffered Bike Lanes

Alternative 4 would include one northbound through lane, one southbound through lane, a two-way center left-turn lane, and a buffered bike lane in each direction (see Figure 15). The roadway would need to be reconstructed to expand curb-to-curb width to 47 feet. The alternative may apply to the north and south of 29th Avenue.

Sidewalks would be expanded to the maximum available width within the remaining right-of-way. However, with the 47 foot curb-to-curb width, sidewalk width would be limited to approximately six and one-half feet on both sides of the street, unless additional right-of-way is acquired.

Alternative 4 Considerations	
Motor Vehicle Mobility	• Reduces number of travel lanes from four to three, north of 29th Avenue • Capacity reduced and travel time increased for through-traveling vehicles • Maintains eleven-foot outside travel lanes
Walkability	• Sidewalks only 6.5 foot in width • Curbside sidewalks far narrower than ten-foot standard width (A) • Buffered Bike lanes provide separation from motor vehicle lanes • Sidewalk width is not sufficient to support active commercial streetscape (B)
Bicycle Facilities	• Includes five-foot bike lanes with two-foot buffers • Bike lanes painted green to distinguish from motor vehicle lanes
Transit Service	• Maintains eleven-foot travel lanes for buses • Potential conflicts with bike lanes
Business Accessibility	• Center left-turn lane improves access for turning vehicles • Improved bicycle access
Cost	• Higher cost for reconstruction to expand existing curb-to-curb width • With reconstruction, utilities should be relocated for ADA compliance • Intersections and traffic signals would need to be reconfigured
Other	• Center left-turn lane offers opportunities for design elements including raised median treatments (e.g., landscaping, pedestrian refuge, access management) • Sidewalk and right-of-way width may be widened with redevelopment (i.e., as a condition of development approval) • Narrow width limits sidewalk design treatments (e.g., landscaping, lighting)

(A) Minimum width defined for curbside sidewalks in pedestrian-oriented commercial areas. *Design Standards and Guidelines for Eugene Streets, Sidewalks, Bikeways and Accessways*, City of Eugene, November 1999.

(B) A concept for the “Heart of the Walkable Business District” characterized by a “Safe, Attractive Pedestrian Experience for Business, Shopping and Entertainment” was identified in the *South Willamette Area Draft Concept Plan*, City of Eugene, October 2012.

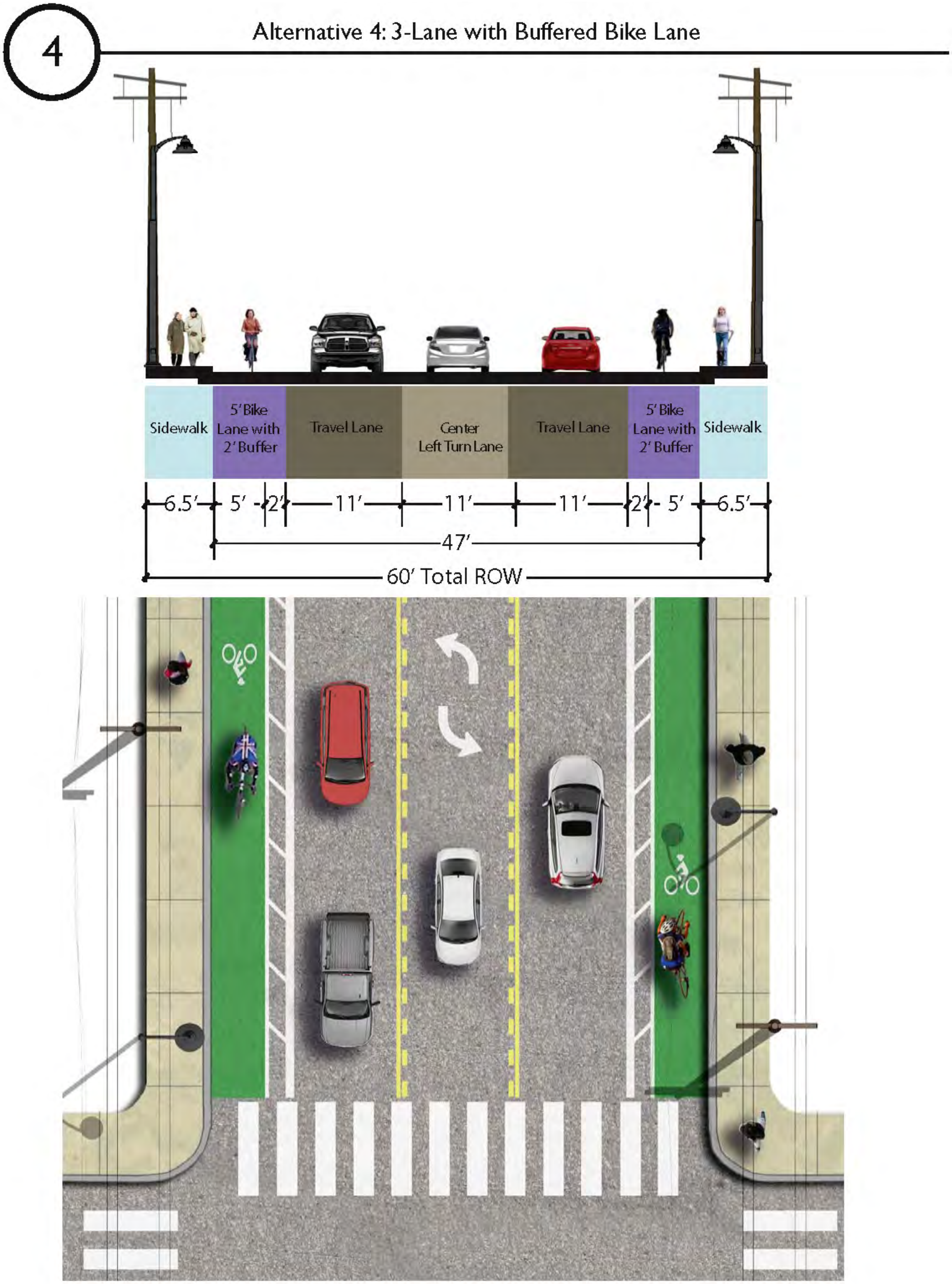


Figure 15: Alternative 4 Concept

Alternative 5: 3-Lane with Wide Sidewalks

Alternative 5 would convert most of the roadway segment north of 29th Avenue from four motor vehicle lanes to three (see Figure 16). The roadway would be reconstructed to expand sidewalks, resulting in a narrower curb-to-curb width (34 feet instead of the current 41 to 42 foot width.) No new bike lanes would be included on Willamette Street.

Sidewalks would be expanded to the maximum available width within the remaining right-of-way. With the 34-foot curb-to-curb width, sidewalks could be extended up to 13-feet. The cross-section illustration is not being considered south of 29th Avenue because it does not include any dedicated bicycle facilities and no parallel facilities are available near Willamette Street, south of 30th Avenue.

Alternative 5 Considerations	
Motor Vehicle Mobility	• Reduces number of travel lanes from four to three, north of 29th Avenue • Capacity reduced and travel time increased for through-traveling vehicles • Maintains eleven-foot outside travel lanes
Walkability	• Provides wide (13-foot) sidewalks to facilitate a transformative pedestrian environment including design treatments (e.g., storefront displays, café seating, landscaping)
Bicycle Facilities	• No on-street bike lanes • Improved bike access would occur via parallel route improvements and crossing enhancements (see Figure 23) • Bike sharrows possible on curbside lanes • Potential to provide raised bike facility if additional right-of-way acquired for sidewalk widening and reconstruction
Transit Service	• Maintains eleven-foot travel lanes for buses
Business Accessibility	• Center left-turn lane improves access for turning vehicles • Wide sidewalks provide opportunities for design treatments to support commercial development, aesthetic treatments, and walkability
Cost	• Higher cost to reconstruct curbs to expand/reconstruct sidewalks • Intersections and traffic signals would need to be reconfigured
Other	• Center left-turn lane offers opportunities for design elements including raised median treatments (e.g., landscaping, pedestrian refuge, access management) • Wide sidewalks support “Green Street” design treatments

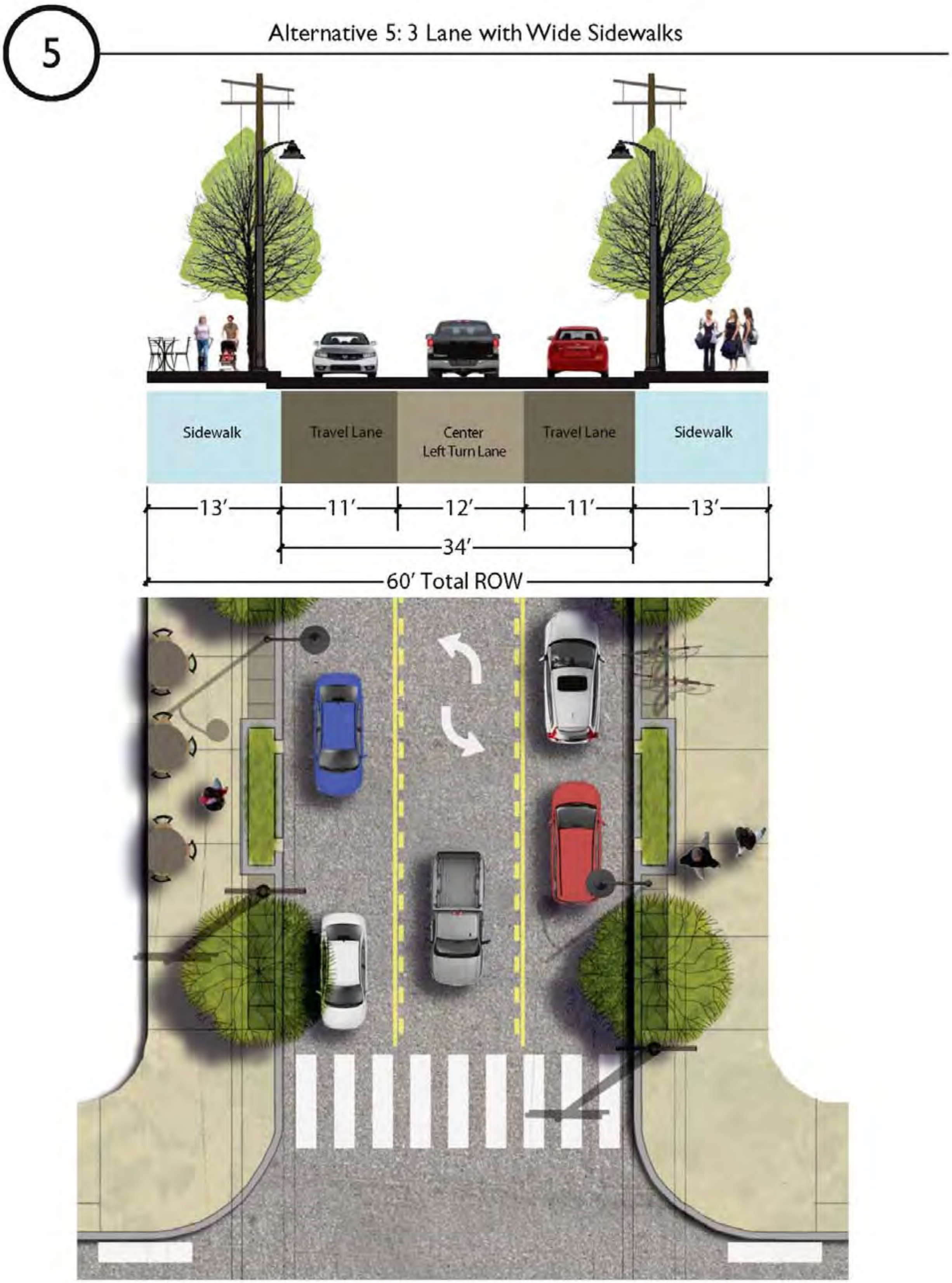


Figure 16: Alternative 5 Concept

Alternative 6: 2-Lane with Bike Lanes, Median & Roundabouts

Alternative 6 would convert the corridor to two motor vehicle lanes with bike lanes in each direction (see Figure 17). A median would be constructed in the middle of the roadway, with roundabouts at intersections. The curb-to-curb roadway width would not need to be modified outside of intersections. Sidewalks would be expanded to the maximum available width within the remaining right-of-way. Sidewalk and lane widths may vary across the corridor depending on the existing curb-to-curb width.

Alternative 6 Considerations	
Motor Vehicle Mobility	• Reduces number of travel lanes from four (or three) to two • Capacity reduced and travel time increased for through-traveling vehicles • Median would restrict turns at many driveways to right-in-right-out • Intersections with roundabouts would provide opportunities for U-turns • Maintains eleven-foot outside travel lanes • Medians and roundabouts would greatly improve corridor safety
Walkability	• Consistent nine-foot sidewalks • Sidewalks narrower than ten-foot standard width (A) • Bike lanes provide separation from motor vehicle lanes • Wide median provides opportunities for pedestrian crossing refuges • Sidewalk width is not sufficient to support active commercial streetscape (B)
Bicycle Facilities	• Includes six-foot bike lanes
Transit Service	• Maintains eleven-foot travel lanes for buses • Potential conflicts with bike lanes
Business Accessibility	• Right-in-right-out limits motor vehicle access to driveways • Improved bicycle access
Cost	• Very high cost to construct medians and roundabouts • Property acquisition needed to construct appropriately-sized roundabouts
Other	• Raised median offers opportunities for streetscape design elements (e.g., landscaping, pedestrian refuge, access management) • Impact on properties near intersections due to constructing roundabouts • More consistent cross-section throughout the corridor

(A) Minimum width defined for curbside sidewalks in pedestrian-oriented commercial areas. *Design Standards and Guidelines for Eugene Streets, Sidewalks, Bikeways and Accessways*, City of Eugene, November 1999.

(B) A concept for the "Heart of the Walkable Business District" characterized by a "Safe, Attractive Pedestrian Experience for Business, Shopping and Entertainment" was identified in the *South Willamette Area Draft Concept Plan*, City of Eugene, October 2012.

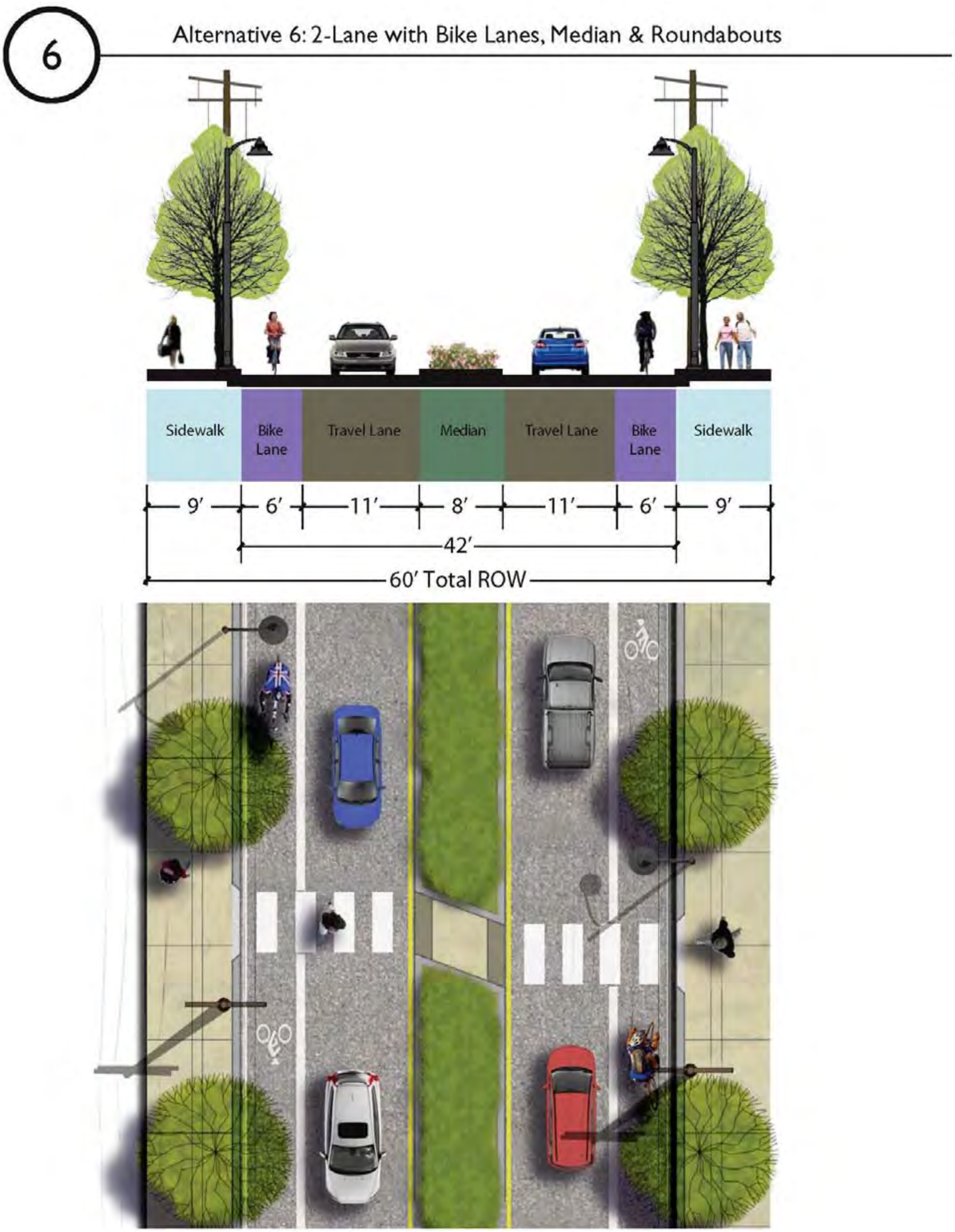


Figure 17: Alternative 6 Concept

Community Forum #2 – Evaluate the Alternatives

Community Forum 2 was held in February of 2013. The meeting allowed the project team to present the alternatives concepts that had been developed and describe how well they met evaluation criteria. This event was designed to help narrow down to three alternatives to advance to Tier 2 screening.

The meeting participants listened carefully to the alternatives and were respectful and thoughtful in asking questions and sharing a wide range of opinions. After meeting in small groups to discuss the alternatives, participants completed Input Forms to indicate which three alternatives they prefer to forward for further study. The results of the meeting input forms are shown below.

- **Alternative 3:** 3-Lane with bike lanes (**208** preferences)
- **Alternative 4:** 3-Lane with buffered bike lanes (**142** preferences)
- **Alternative 5:** 3-Lane with wide sidewalks (**139** preferences)
- **Alternative 6**: 2-Lane with bike lanes, median & roundabout (**113** preferences)
- **Alternative 1**: 4-Lane (**97** preferences)
- **Alternative 2**: 4-Lane with center left-turn lane (**83** preferences)

4. Screening Evaluation

Public input was gathered in multiple ways throughout the project, including at displays along the corridor. The input received played a key role in the alternatives screening process.

From the six alternatives initially identified, three were selected by the City of Eugene for further refinement and more detailed analysis. The three alternatives provide the community and decision makers a range of options for the South Willamette Street Improvement Plan. This decision was based on both technical review and public input received. The three alternative configurations advanced to the Tier 2 screening phase were a 4-lane (Alternative 1), 3-lane with bike lanes (Alternative 3) and 3-lane with wide sidewalks (Alternative 5).

The Tier 1 screening evaluated community priorities and identified broad level tradeoffs that exist within a constrained right-of-way. The screening provided a qualitative assessment for each alternative based on criteria and scoring methodology identified in Technical Memorandum #1 (South Willamette Street Improvement Plan – Evaluation Criteria). As previously described, the evaluation criteria were established to assess the potential of alternatives to best meet the transportation needs of the users of Willamette Street based on goals and objectives from other planning efforts.

The scoring evaluation results assisted the City of Eugene staff in selecting three alternatives to advance for further consideration. The evaluation was considered together with community and stakeholder input received through the public involvement process. Evaluation criteria scoring for each of the six proposed alternative cross-section concepts is summarized in Table 7. The screening criteria and scoring for each alternative are further detailed in the appendix.

Table 7: Evaluation Criteria Scoring of Alternatives

Alternative		#1 4-Lane	#2 4-Lane with Center Left-turn Lane	#3 3-Lane with Bike Lanes	#4 3-Lane with Buffered Bike Lanes	#5 3-Lane with Wide Sidewalks	#6 2-Lane with Bike Lanes, Median & Roundabouts
Access & Mobility	Reliability (For All Modes)	0	0	0	0	0	0
	Neighborhood Connectivity	0	0	1	1	0	1
	Motor Vehicle Travel Time	0	0	-1	-1	-1	-1
	Active Mode Travel Time	0	0	1	1	0	1
Safety & Health	Safety	0	0	1	1	1	1
	Security	0	0	1	1	1	1
	Emergency Response	0	0	-1	-1	-1	-1
Social Equity	Equity	0	0	1	1	1	1
	Economic Access	0	0	1	1	1	1
Economic Benefit	Freight Mobility	0	0	-1	-1	-1	-1
	Walkable/Bikeable Business District	0	0	1	1	1	1
	Business Vitality	0	1	0	0	0	-1
Cost Effectiveness	Fundability	1	0	0	-1	-1	-1
	Asset Management	1	1	1	1	1	1
	Project Benefits	1	1	1	1	1	1
Climate & Energy	Reduce Vehicle Miles Traveled	0	0	0	0	0	0
	Pedestrian Facilities	0	0	0	-1	1	0
	Bicycle Facilities	0	0	1	1	0	1
	Transit Facilities	0	0	0	0	1	0
Ecological Function	Stormwater Design	0	0	0	0	0	0
	Landscape Design	0	0	0	0	0	0
Community Context	Community Vision and Land Use	0	0	0	-1	1	0
	Transportation Planning Compatibility	0	0	0	0	0	0
TOTAL		3	3	7	4	6	5

The overall results of the scoring evaluation did not show an alternative that was clearly superior to others. The scoring differences between alternatives where relatively small. Total scores ranged from 3 to 7 resulting in a maximum difference of four across 23 scoring criteria.

Alternatives 3, 5, and 6 scored highest in the Tier 1 screening evaluation, while alternatives 1, 2, and 4 where lower scoring. Although the 4-lane alternatives (Alternative 1 and 2) scored the lowest on the evaluation criteria, the public input received indicated that further analysis and discussion was needed before reductions to motor vehicle capacity should be further considered. Therefore, Alternatives 1, 3, and 5 were selected by the City of Eugene for further evaluation.

Community involvement played a key role in the development of the Improvement Plan

Stakeholder Interviews/Focus Groups

Key project issues and potential solutions were discussed in advance of each Community Forum.

Community Forum #1 - Explore

"Explore the Alternatives" -- The community provided input on key considerations, priorities, and objectives for Willamette Street.

Community Forum #2 - Evaluate

"Evaluate the Alternatives" -- The community provided feedback on the project alternatives and facility design considerations.

Community Forum #3 - Refine

The community provided feedback on the first screening process and technical findings for the three alternatives advanced for consideration.

Improvement Plan

5. Alternatives Refinement

Three South Willamette Street corridor alternatives were selected for further refinement and more detailed analysis. Conceptual sketches were prepared to help visualize the alternatives.

This section describes additional roadway design details and options for corridor implementation of each of the three alternative concepts advanced for the South Willamette Street Improvement Plan. Discussion is presented for how roadway elements are applied on different segments of Willamette Street, intersection configurations, bicycle and pedestrian connections to the corridor, and other design considerations. Cost estimates for each alternative are also identified.

Some planned improvements are desired throughout the corridor and will be assumed for each alternative. These improvements include new pavement, improved drainage, wider sidewalks, and enhancements to pedestrian and bicycle access around Willamette Streets. Other improvements may vary depending on the location and alternative configuration.

Potential Segment Changes

The following section describes an overview of potential differences by roadway segment. The cross section concepts previously illustrated apply on the north segment of Willamette Street, from 24th Avenue to near 28th Avenue. In the south segment of the study corridor, no differences are proposed for any alternative. Around 29th Avenue, a transition area will provide continuity between the corridor segments while best meeting the needs and objectives identified for South Willamette Street.

The application of the alternative configurations through the corridor are further detailed and illustrated through overhead plan views that show configurations for travel lanes, bike lanes, sidewalks, and other roadway elements. Plan views for the entire corridor (from 24th Avenue to 32nd Avenue) are included in the appendix.

24th Avenue to near 28th Avenue Roadway Configuration: Alternative 1 maintains the existing 4-lane roadway between 24th Avenue and near 28th Avenue. Alternative 3 illustrates a 3-lane roadway (two travel lanes and a continuous Center left-turn lane) and continuous bike lanes. Alternative 5 is also a 3-lane alternative, but with widened sidewalks rather than continuous bike lanes.

24th Avenue to near 28th Avenue Sidewalk Configuration: All three alternatives attempt to maximize the sidewalk width within the existing right-of-way. For Alternative 1 and Alternative 3, the sidewalks would be reconstructed to approximately 9-feet wide. For Alternative 5, the sidewalk widths would expand to approximately 13 feet wide by replacing the bike lanes illustrated for Alternative 3 with additional sidewalk space.

Near 28th Avenue to near 30th Avenue Roadway Configuration: This section is a "transition area" from the proposed cross-sections identified for each conceptual alternative, through the 29th Avenue intersection to near 30th Avenue. Alternative 1 would maintain the existing roadway configuration, which widens from one northbound motor vehicle lane to two (and a left-turn pocket at 29th Avenue) and widens between the Woodfield Station Driveway and 29th Avenue to add a southbound left-turn pocket to the two existing southbound motor vehicle through lanes. The northbound bike lane would end at 29th Place and the southbound bike lane would begin south of 29th Avenue, as currently configured.

In Alternative 3, the existing bike lanes would be extended northward through the 29th Avenue intersection in order to provide continuous bike lanes between 32nd Avenue and 24th Avenue. Adding bike lanes would require either expanding the curb-to-curb width of the roadway or removing

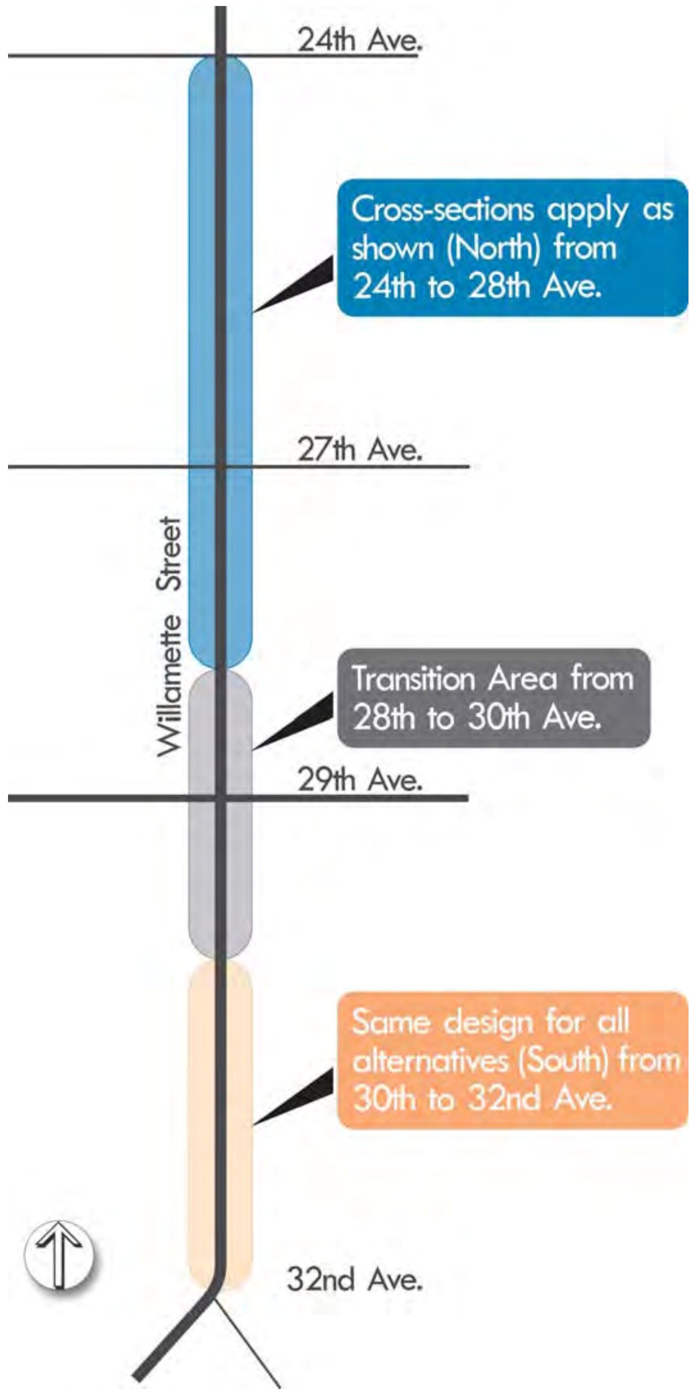


Figure 18: Potential Changes by Segment

a motor vehicle lane. Widening the curb-to-curb width would likely require narrower sidewalks or additional right-of-way near the 29th Avenue intersection. A proposed design modification presented for Alternative 3 (and Alternative 5) would add a second southbound travel lane just north of the Woodfield Station Driveway, but not include a second northbound through travel lane (included in Alternative 1).

The configuration of travel lanes for Alternative 5 would be similar to Alternative 1 for bike lanes and Alternative 3 for motor vehicle lanes. Bike lanes would begin (southbound) and end (northbound) south of the 29th Avenue intersection. A single northbound motor vehicle through lane would be included, instead of the two existing lanes. The additional space made available by potentially not including a second northbound travel lane in this section would accommodate wider sidewalk space rather than the bike lanes provided in Alternative 3.

Near 28th Avenue to near 30th Avenue Sidewalk Configuration: Sidewalk widths in this "transition area" could vary depending on the specific design of motor vehicle lanes, turn pocket lengths, bike lanes, etc. In general, Alternative 5 provides the narrowest curb-to-curb width and therefore the most space for sidewalks and pedestrian amenities within the existing right-of-way.

Near 30th Avenue to 32nd Avenue Roadway Configuration: No changes to the existing travel and bike lane configurations are proposed in any alternative between 32nd Avenue and near 29th Place (where the existing northbound bike lane ends).

Near 30th Avenue to 32nd Avenue Sidewalk Configuration: All three alternatives would expand sidewalk widths to approximately 8.5 feet, or the maximum available within the existing right-of-way.

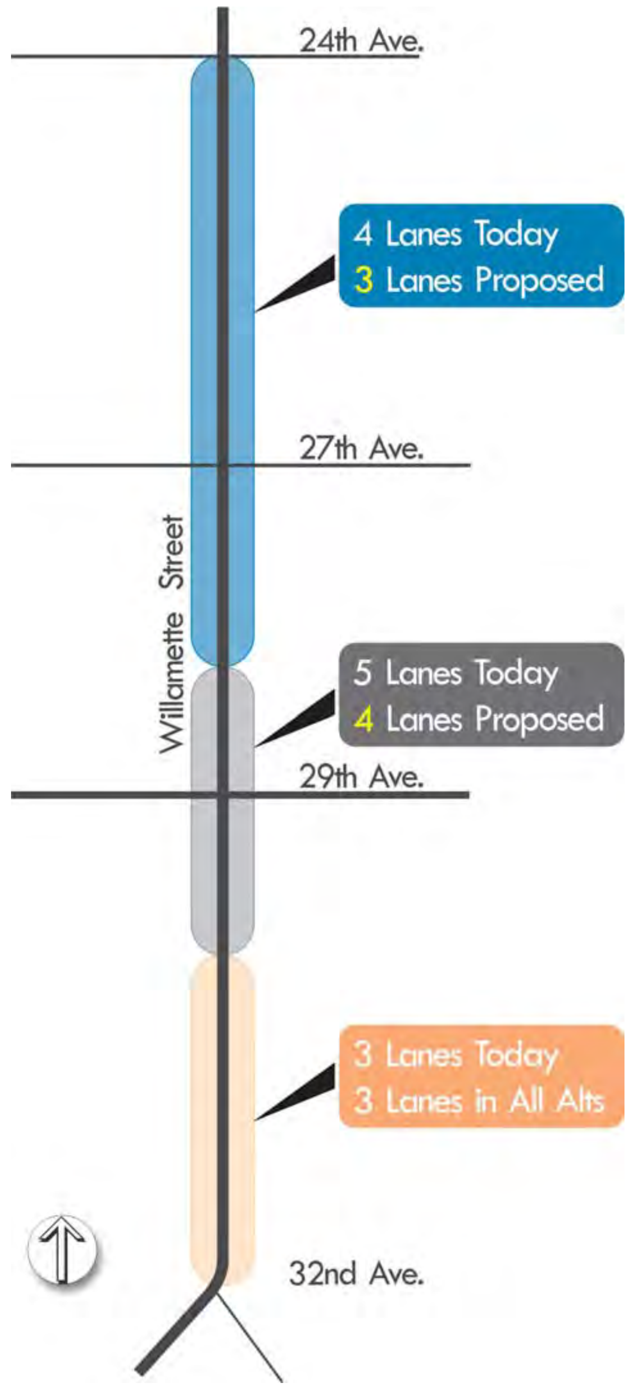


Figure 19: Potential Motor Vehicle Lane Changes by Segment for Alternatives 3 & 5

Potential Intersection Changes

The following section describes how each alternative would be accommodated at the study intersections. Plan views displaying intersection configurations for each alternative are included in the appendix.

24th Avenue Intersection: No changes to right-of-way or curb-to-curb width are proposed at the intersection in Alternatives 1 or 3. In Alternative 5, the south leg of Willamette Street would be reconstructed with curb-to-curb width narrowed to accommodate wider sidewalks. In Alternative 3 and Alternative 5, the south leg of Willamette Street would be reconfigured from four travel lanes to three lanes (one lane in each direction with a center left turn lane in the middle). The space gained from removing one of the four travel lanes would be used for either bicycle lanes (Alternative 3) or wider sidewalks (Alternative 5). The north leg of Willamette Street would convert from two through lanes to one through lane and a dedicated left turn lane. The traffic signal would also need to be modified in Alternatives 3 and 5. No changes to right-of-way are proposed at the intersection in any alternative.

25th Avenue Intersection & 27th Avenue Intersection: No changes to right-of-way or curb-to-curb width are proposed in Alternatives 1 or 3, while sidewalks are expanded in Alternative 5. Traffic signals would need to be reconfigured to accommodate the 3-lane configuration identified in Alternative 3 and Alternative 5. No changes are identified for 25th Avenue or 27th Avenue approaches at Willamette Street.

Woodfield Station Driveway Intersection: It is recommended that a traffic signal at this intersection be considered as a design option in all alternatives. A traffic signal would provide better access for turning vehicles and an additional pedestrian crossing opportunity. No changes to the existing lane configuration would be needed in Alternative 1. In Alternative 3 and Alternative 5, there would be a left turn lane on the northbound approach, and a single northbound through travel lane. Southbound, one travel lane would widen to two approximately 100 feet north of the intersection. Driveway modifications would likely be necessary on the east side of Willamette Street, across from the Woodfield Station Driveway. No right-of-way changes are anticipated in any of the alternatives. Sidewalks will be extended within the existing right-of-way.

29th Avenue Intersection: Compared to other study intersections, 29th Avenue has significantly higher traffic volumes (see Table 8). To adequately serve the

Figure 20: Conceptual Back-to-Back Turn Lanes at Woodfield Station and 29th Avenue Intersections

intersection traffic demand and meet City of Eugene traffic operations performance standards, the Willamette Street approaches require more than a single through lane on each approach. Alternative 1 includes a 5-lane cross-section at 29th Avenue, as exists currently. For Alternative 3 and 5, the proposed design option would include a 4-lane cross-section at 29th Avenue including a single northbound travel lane. Removing one of the two existing northbound travel lanes may be considered to accommodate bike lanes or wider sidewalks. Without reducing the number of vehicle lanes, additional right -of-way would be required to provide bike lanes or wider sidewalks.

32nd Avenue Intersection: No changes are proposed in any alternative to this intersection.

Roundabout Compatibility

Roundabouts can improve traffic flow and reduce overall delay at many roadway intersections. Roundabouts generally reduce the number of overall collisions and fatalities when they are installed and are less expensive to operate and maintain compared to traffic signals. However, emergency vehicle and truck operators may be opposed to roundabouts in some areas. Furthermore, there may be significant property acquisition costs to provide the right-of-way needed to construct appropriately-sized roundabouts.

Roundabouts would need to be constructed with multiple lanes to serve the four travel lanes included in Alternative 1. The three-lane configurations (Alternatives 3 and 5) could be constructed with single lane roundabouts; however, the traffic analysis results (shown in Technical Memorandum #8) indicate that single lane roundabouts may not comfortably accommodate peak hour traffic demand at several intersections. Multi-lane roundabouts could be considered but would require a larger intersection configuration.

Table 8: Intersection Volume (2012 PM Peak Hour)

Intersection	Total Entering Traffic Volume
Willamette Street/24th Avenue	1,834
Willamette Street/25th Avenue	1,668
Willamette Street/27th Avenue	1,914
Willamette Street/Woodfield Station Driveway	1,706
Willamette Street/29th Avenue	2,732
Willamette Street/32nd Avenue	1,613

These larger configurations would require property acquisition to provide the right-of-way needed to construct the appropriately sized roundabouts. Right-of-way acquisition can have significant costs and impacts to adjacent properties, particularly in a developed commercial area. The intersection of 29th Avenue and Willamette Street would likely require a multi-lane roundabout that would have significant impacts to adjacent properties and businesses.

While other intersections on Willamette Street could be configured with smaller layouts, the impacts and costs for the right-of-way acquisition and construction may be significant even if the 29th Avenue intersection remained as currently configured. Figure 21 illustrates a potential configuration for a single-lane roundabout at the 27th Avenue intersection. This roundabout configuration is typical for an urbanized area and has a 110 foot inscribed circle diameter (the distance from one curb to the other, directly through the center of the roundabout).

Roundabouts are not explicitly included in the facility design of any alternative but may be considered further as potential design refinements. Total costs for constructing roundabouts are estimated to be approximately $650,000 per intersection based on the single lane roundabout illustrated for Figure 21. This cost estimate includes right-of-way and would replace costs associated with traffic signal modifications, which are generally estimated to cost

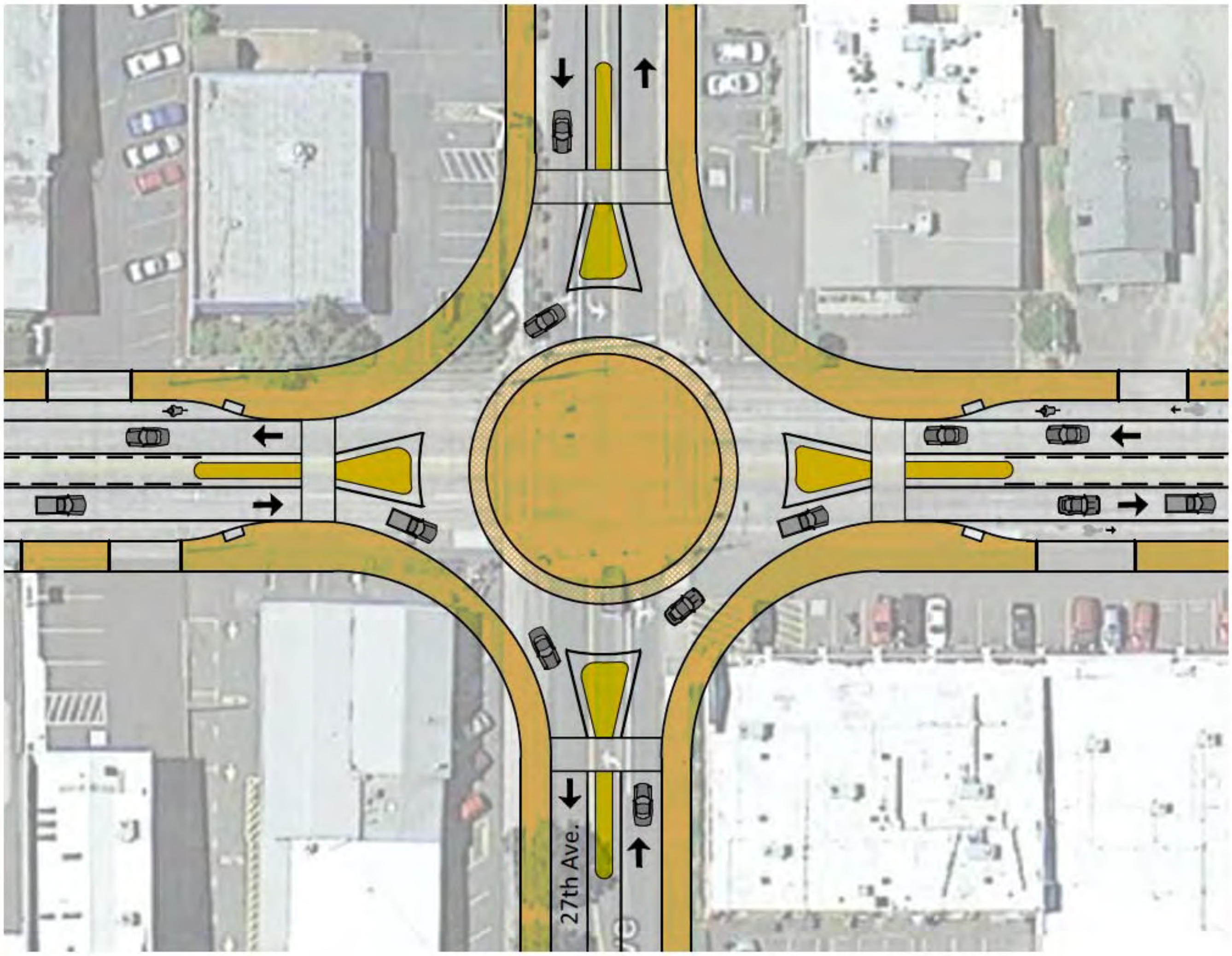


Figure 21: Potential Single-lane Roundabout Configuration at 27th Avenue and Willamette Street

$250,000 per intersection. Therefore, the estimated additional cost for roundabout construction would be approximately $400,000 per intersection. The cost differences are primarily due to right-of-way acquisition and the need to reconstruct the minor street (e.g., 27th Avenue) approaches leading to the roundabout.

Access Management on Public and Private Approaches

There are currently over 70 driveways on Willamette Street from 24th Avenue to 32nd Avenue. This creates numerous conflict points for motor vehicles, pedestrians and bicyclists. Reducing conflict points is likely to result in fewer crashes and increased capacity along the corridor. Managing access points along the corridor requires finding an appropriate balance between safety, mobility, and access. Consolidating driveway access points will be considered as part of each alternative, particularly where specific safety benefits would result.

Preliminary consideration of access management strategies for the corridor indicates that recommended strategies will not be significantly different for any alternative compared to another. The following strategies will be considered for the Willamette Street corridor:

- Removing and consolidating access points to existing businesses
- Sharing accesses between adjacent property owners
- Implementing turn lanes at driveways
- Parking circulation enhancements

Bus Stops and Pullouts

Lane Transit District (LTD) currently services two bus routes along Willamette Street. Buses stop on the street and block the curbside travel lane during passenger boarding and alighting. Constructing bus pullouts would remove stopped vehicles from travel lanes, but would likely require right-of-way acquisition and would also require buses in the pullouts to merge back into the traffic stream. Figure 22 illustrates the dimensions of a potential bus pullout along Willamette Street. The traffic impacts of bus pullouts are further discussed in Technical Memorandum 8.

No bus pullouts are recommended for the corridor given the frequency of bus uses (five per hour south of 29th Avenue and two per hour north of 29th Avenue), right-of-way impacts, and increased delay for transit vehicles.

Improving bicycle and pedestrian access to transit stops would support transit usage along the corridor. If sidewalks are expanded there may be space available for improved bus stop amenities such as covered benches (shelters), real-time arrival information, or other transit stop amenities. No additional transit stop amenities are suggested for the corridor. Ridership should be monitored to identify potential future improvements as the Willamette Street corridor is redesigned and the surrounding land uses change over time.

Enhanced Bicycle Connections

The following section describes potential bicycle facility improvements nearby, connecting to, and crossing Willamette Street. These improvements may be combined with bike lanes on Willamette Street or considered independently. The bicycle connections identified may apply for any alternative under consideration.

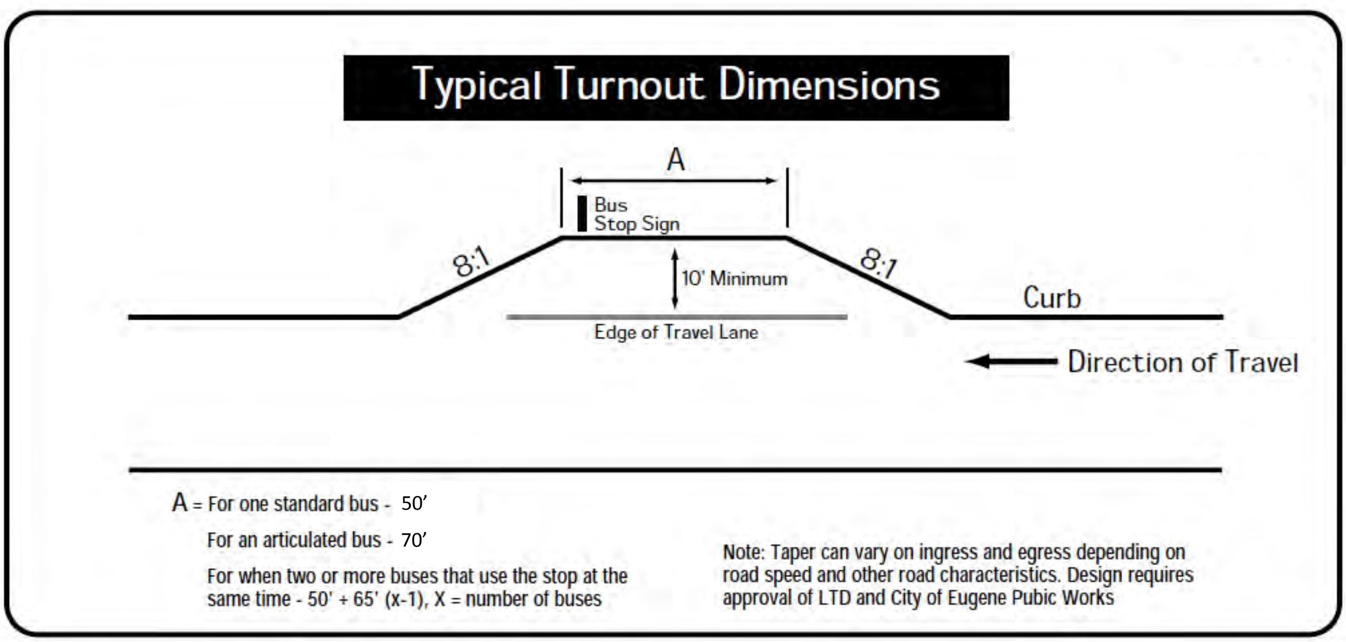


Figure 22: Bus Pullout Illustration

(Source: City of Eugene, revised per Lane Transit District guidance)

Nearby Bike Routes

Bicycle facility improvements could include improved bicycle access on local streets, with a variety of bike boulevard treatments applied. Figure 23 illustrates existing and proposed bike routes near the study corridor that would improve connections to Willamette Street and/or provide parallel routes of travel. Most of the routes identified were proposed in the Eugene Pedestrian and Bicycle Master Plan, which also provides design guidance on a variety of bicycle design options.

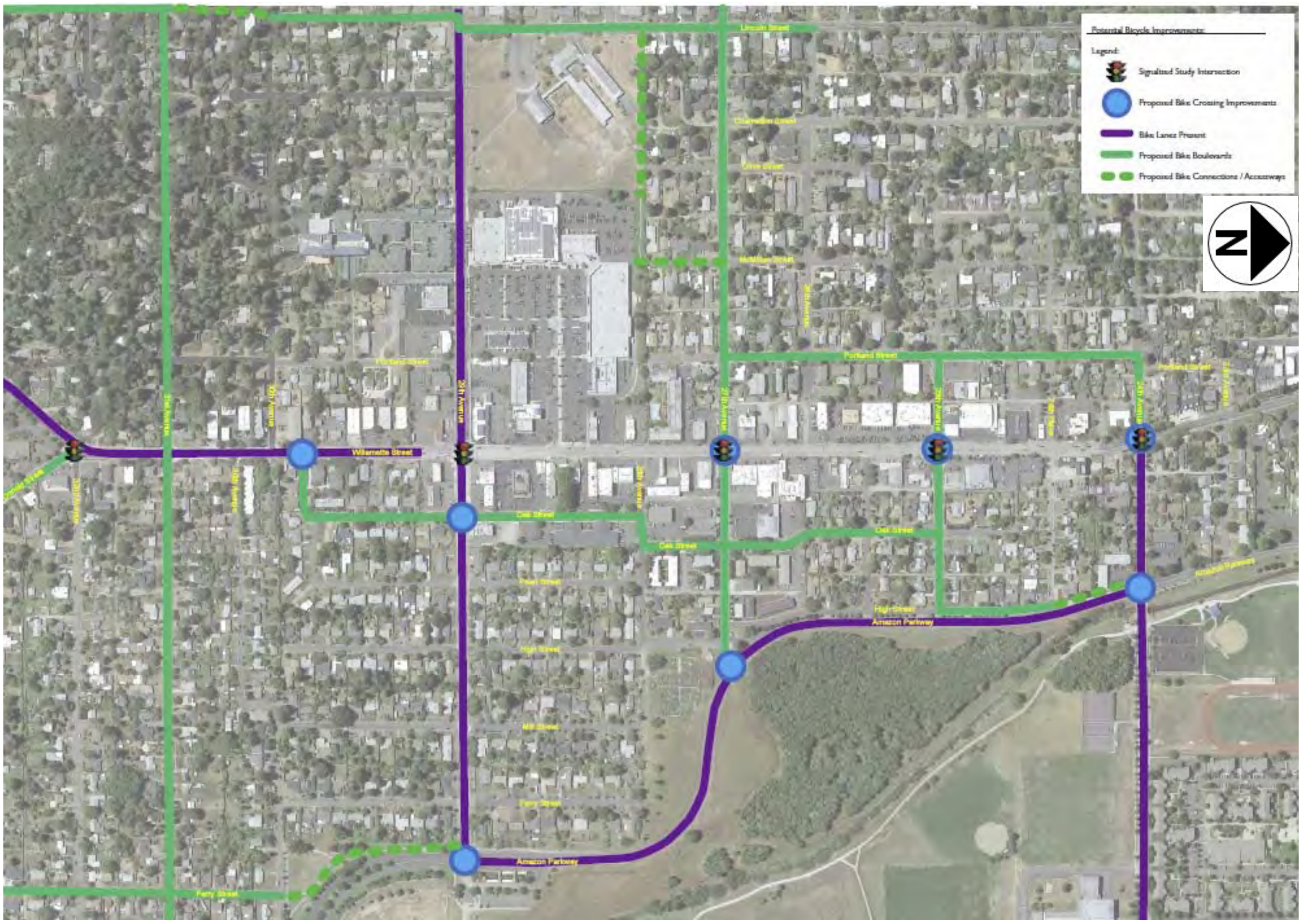


Figure 23: Bicycle Facility Improvements

Crossing Improvements for Bicycles

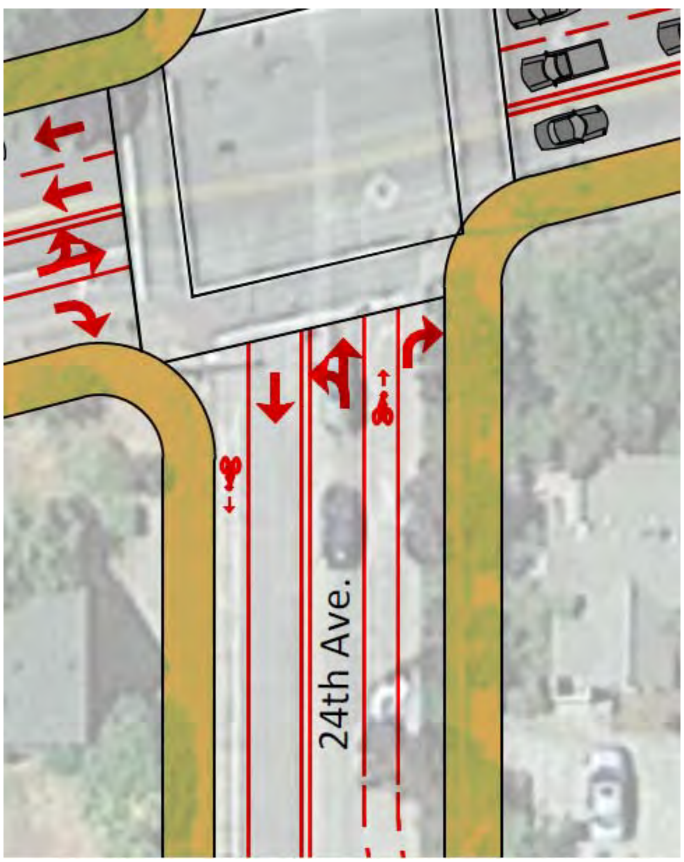
To support development of the surrounding bicycle network, crossing improvements could be provided such as intersection priority areas (i.e., "Green Boxes") or rider-activated push-button signals for crossing at intersections with traffic signals.

Two crossing improvement options are proposed on Willamette Street for the alternatives:

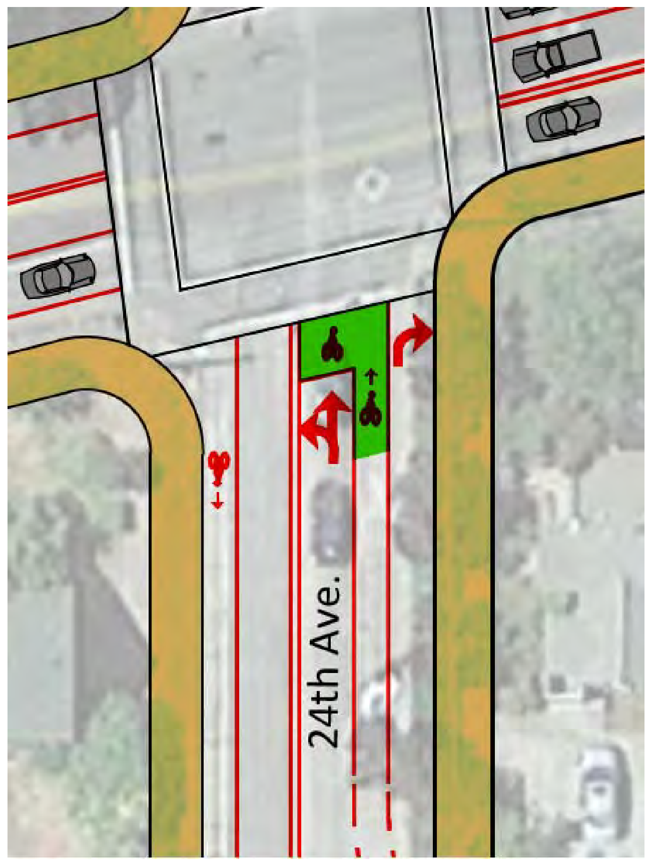
- **Combined bike/turn lane on 24th Avenue**: a bike lane would be striped with a dashed line within the inside portion of the existing right turn lane. Signage would be used to identify the combined lane and guide users toward the proper positioning. This would extend the existing bike lane on 24th Avenue (which currently drops away) and improve comfort for some riders who wish to travel through to the proposed Bike Boulevard on Portland Street. A local example of this configuration is located on 13th Avenue at Patterson Street. For Alternative 3 (which includes bike lanes on Willamette Street) a green bike box may be added to improve access for bicycle riders making a left turn from 24th Avenue to Willamette Street.

- **Crosswalk with Pedestrian Hybrid Beacon at 29th Place**: a Pedestrian Hybrid Beacon is a traffic control device that stops roadway traffic to allow pedestrians or bicycles to cross safely. The beacon is activated only when a pedestrian or bicyclist pushes the button to cross. By locating a safe crossing where the current northbound bike lane ends north of 30th Avenue (at the driveway/path connecting to 29th Place), safe access will be provided for southbound bicycle riders wishing to connect to Willamette Street from Oak Street, via 29th Place. The beacon would be most beneficial in Alternatives 1 and 5, where there are no continuous bike lanes on Willamette Street, but may also be considered as part of Alternative 3.

These improvements are illustrated in the excerpts of the plan view drawings shown in Figure 24 below for Alternative 1 and Alternative 3. The plan view illustrations for each alternative are included in the appendix.



Alternative 1 – Shared Lane



Alternative 3 – Shared Lane with Bike Box

Figure 24: Bicycle Improvement Design Options

Enhanced Pedestrian Connections

The pedestrian environment on Willamette Street will be improved with wider sidewalks that are included in each alternative. To further enhance the pedestrian experience, crossing opportunities should be improved along Willamette Street. A variety of design treatments can be implemented to enhance the pedestrian crossings.

- **Signing and striping:** pedestrian accessibility may be emphasized through enhanced signing or striping near intersections
- **Modified pavement surface**: physical differences such as raised pavement or textured crosswalks provide a visual signal to drivers to watch for pedestrians.
- **Median pedestrian crossing refuges** (i.e., island): pedestrians may cross a roadway in stages when a median pedestrian refuge is available. This is especially beneficial for users who require more time for crossings.
- **Leading pedestrian interval**: pedestrians at signalized intersections could be provided with a three- to four-second head start for entering into the crossing, before parallel traffic is given a green light. Leading pedestrian intervals allow for pedestrians to be more visible to turning vehicles.
- **Mid-block crossings**: Opportunities for pedestrian crossings outside of existing intersections may be provided at mid-block crossing locations. Mid-block crossings improve pedestrian access by decreasing the distance between destinations that require crossing the roadway. A variety of design treatments exist for mid-block crossings including rectangular rapid flashing beacons and overhead flashing beacons.

Currently the two largest distances between signalized crossings on the corridor are over 1,400 feet (between 29th Avenue and 32nd Avenue) and

Median pedestrian crossing refuges provide a waiting area for a two-stage pedestrian crossing.

Overhead flashing beacons inform drivers that pedestrians are crossing the road.

Rectangular Rapid Flashing Beacons (RRFBs) are also used to inform drivers that pedestrians are crossing the road.

over 900 feet (between 27th Avenue and 29th Avenue.) Two potential crossing improvements are proposed for the corridor:

- **Traffic signal with crosswalks at Woodfield Station Driveway**: a traffic signal at this location would provide a safe crossing for pedestrians between commercial areas and transit stops on both sides of the street. The intersection could be designed with a median pedestrian crossing refuge (i.e., island) on the north crosswalk in Alternatives 3 and 5, which include a center left-turn lane. The median refuge allows pedestrians to cross a roadway in stages, which is especially beneficial for users who require more time for crossings.
- **Crosswalk with Pedestrian Hybrid Beacon at 29th Place**: a Pedestrian Hybrid Beacon could be located south of 29th Avenue to provide a safe crossing for both pedestrians and bicycle riders. The signal would be most beneficial in Alternatives 1 and 5, where there are no continuous bike lanes on Willamette Street, but may also be considered as part of Alternative 3.

These improvements are illustrated in the plan view drawings included in the appendix.

On-Street Parking

On-street parallel parking provides convenient access for adjacent businesses and a buffer between pedestrians and motor vehicles. On-street parking would likely have a very favorable benefit to the pedestrian environment, however, given the constrained right-of-way and community priorities, on-street parking is not considered in any of the three design alternatives. On-street parking may be reconsidered as part of long-term enhancements to the corridor.

To provide on-street parking along Willamette Street, either travel lanes will need to be eliminated, or the right-of-way will need to be expanded to relocate sidewalks further from the roadway travel lanes. On-street parallel parking spots are typically seven to eight feet wide. Figure 25 illustrates one concept regarding how on-street parking may be incorporated into the corridor. The concept effectively swaps off-street private parking for on-street public parking. This strategy may be applied along the length of the corridor or along individual blocks.

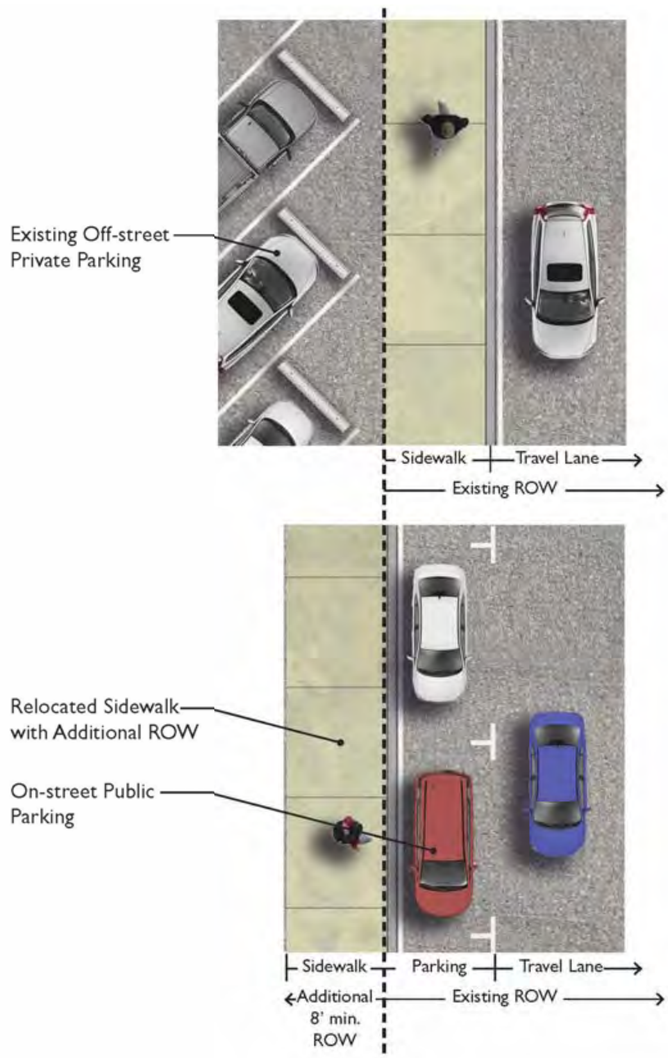


Figure 25: Conceptual Illustration of On-Street Parking on Willamette Street

Alternative Cost Estimates

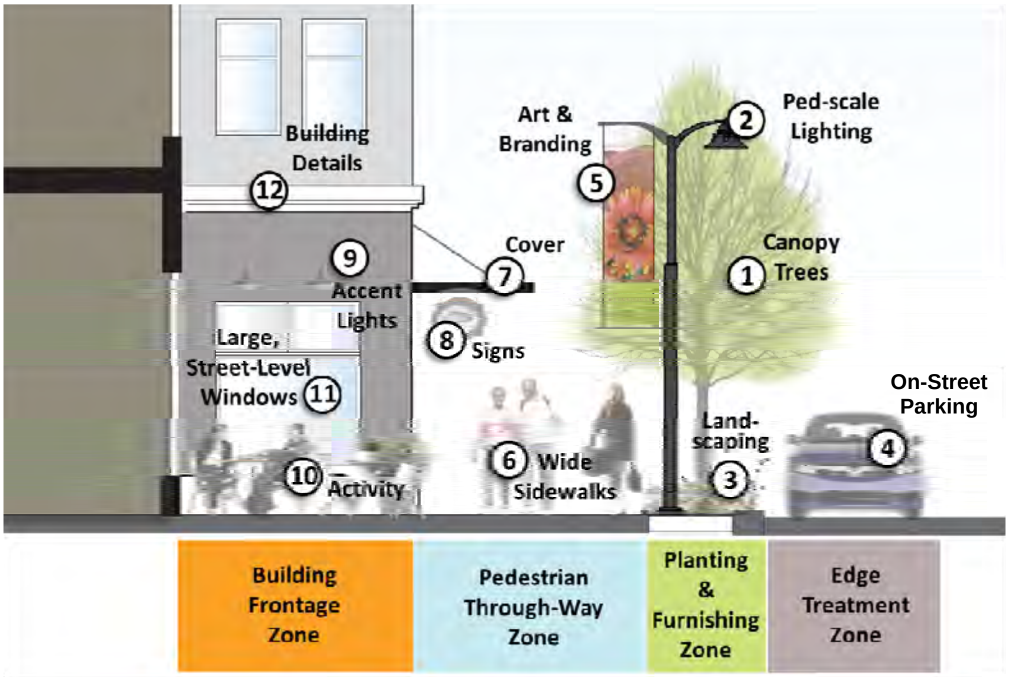
Planning-level cost estimates were developed for each alternative, with the facility designs specified in this memorandum. The cost estimates are shown in Table 9. The cost of the paving project ($2.1 Million) is the same for each alternative. The remaining costs vary by alternative, with the bulk of the costs due to rebuilding the sidewalks. Alternative 5 is the most expensive because it would provide the widest sidewalk and require reconstruction of existing curbs.

All costs shown are planning-level estimates in 2013 dollars and are subject to change. Details and assumptions for the cost estimates are shown in the appendix. The costs estimated for utility relocation ($2.6 Million) are not included in the estimates shown in Table 9.

Table 9: Planning-Level Cost Estimates (Million Dollars, in 2013 Dollars)

Alternative	Pavement Project	24th to 29th Ave	29th to 32nd Ave	Total
1	$2.1	$1.7	$0.3	$4.1
3	$2.1	$1.8	$0.3	$4.2
5	$2.1	$2.4	$0.3	$4.8

Pavement Project – City of Eugene project is planned to include paving, ADA accessibility, and stormwater improvements from 24th to 29th Avenue
24th to 29th Avenue – Additional costs vary by alternative
29th to 32nd Avenue – Additional costs same for all alternatives
*All costs are planning-level estimates subject to change



There are multiple elements of a successful street-side realm. While right-of-way constraints and other limitations can not be ignored, incorporating as many of these elements as feasible can help improve the functioning of the street.

Travel lanes, sidewalks, bike lanes, intersection design and transit stops are fundamental facility design elements. Each has a function and must provide safety and comfort for the intended users. The configuration of these elements will play a part in the streetscape design of Willamette Street, as the perceptions of ease of travel and the sense of safety and comfort may change for different users with each alternative.

The following section is focused on the elements of a unified streetscape that should be considered in conjunction with the roadway facility design alternatives described previously. The design concepts are intended to better balance comfort, safety, and appeal for all users and may be incorporated into many or all Plan alternatives to varying degrees.

Streetscape Elements

Most of the right-of-way design elements that will be experienced and appreciated as a streetscape occur within the sidewalk corridor. The sidewalk corridor is defined by the roadway curbs and the back of sidewalks. When that corridor has been well-designed, it accommodates three primary functions, with design treatments to support those functions. Figure 26 illustrates conceptual sidewalk corridors and how the streetscape elements and the pedestrian experience may be affected.

Through Pedestrian Zone: Comfortable and unobstructed walking is the primary function of the sidewalk corridor. Draft federal guidelines developed by the Public Rights-of-Way Access and Advisory Committee (PROWAAC), require a minimum

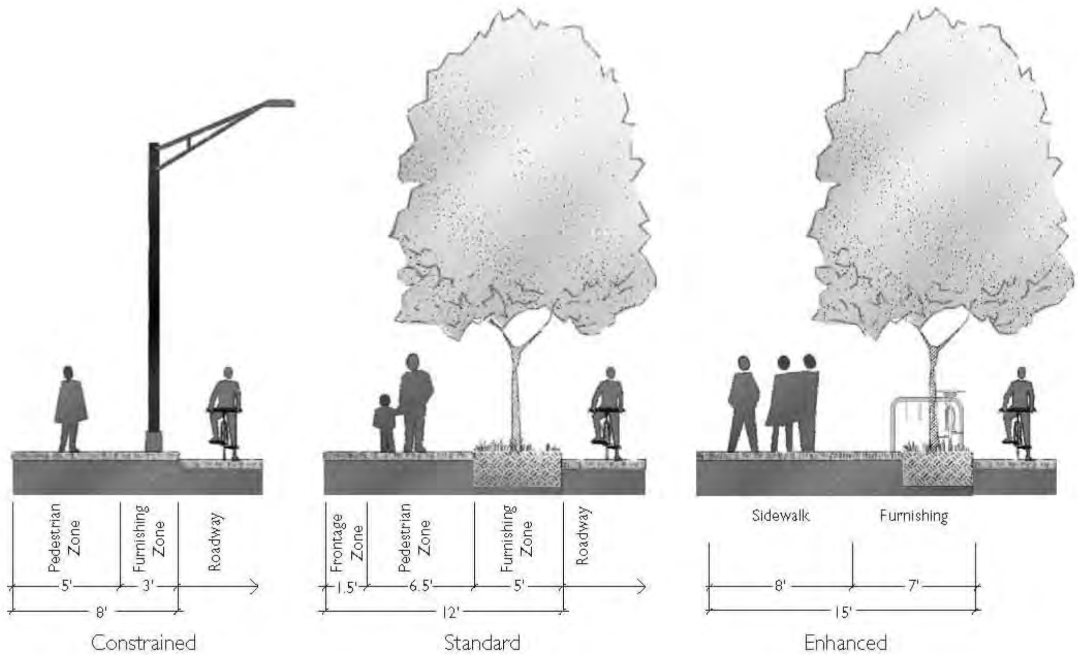


Figure 26: Sidewalk Corridor Design

width of 4-feet and a preferred width of 5-feet. A useful urban design standard is the ability of two people to walk comfortably side-by-side, which typically requires at least 6-feet.

Furnishings Zone: Accommodates streetscape elements such as utility poles, street lights, planters, trees, benches, bike racks and bus shelters. It may also accommodate Low-Impact Development (LID) features such as flow-through storm water planters. Pedestrian activities include transit boarding at designated stops, access to bike racks and access to on-street parking. The minimum desired width is 4-feet, with preferred widths of 5-feet to 7-feet.

Building Front Zone: For streets that support a significant amount of pedestrian-oriented retail, with buildings set close to sidewalks, an additional 1-foot to 2-feet is desirable to support storefront displays and window shopping.

Developing a Design Theme

Potential elements of a streetscape design theme for Willamette Street are described in the following section. Graphic representations of the potential elements are included in the appendix.

Unifying Streetscape Elements

Typical unifying elements of a streetscape are texture, color and form, along with other distinctive elements that create a unique functional or art-based character. Each of these elements can play an important role in the eventual transformation of Willamette into a signature street for the district.

Texture: Texture can be a unifying element by using a consistent palette of materials such as paving, walls, columns and railings. Opportunities for Willamette Street include sidewalk reconstruction and textured crosswalks at intersections, formalized mid-block pedestrian crossings or distinctive pavements for bike lanes.

Color: Color is a unifying element visually linked to texture. Colors can tie together places separated by distance and by function. Opportunities include any of the above elements that have special textures, as well as street furnishings such as bike racks, benches and bus shelters, and landscape materials with distinctive flowers or foliage colors.

Form: Form can provide both visual unity and visual distinction. Both unity and distinction have a place in a well-designed streetscape. Form also provides a sensed of orientation within the public realm and can provide visual landmarks for the district. Opportunities include site furnishings, pedestrian-scale lighting, signage and bus shelters.

Flow-through planters serve for both landscaping and bioretention.

Additional Distinctive Elements — Green Street

Green Streets are primarily thought of as innovative facilities to treat and manage stormwater within the right-of-way. Those facilities create an ecological function for our streets, in addition to the traditional mobility and access functions. There are a number of Green Street facilities for stormwater. The selection of one or more facilities for Willamette Street will require detailed engineering analysis and consistency with existing City of Eugene stormwater standards. The choice of techniques will also be affected by the width of the sidewalk corridor in a preferred alternative. Typical facilities include the following:

Flow-Through Planters: Flow-through stormwater planters are a common bioretention facility in urban areas. They provide a distinctive architectural feature for the sidewalks of an urban Green Street where sidewalk widths are 12 feet or greater, with a minimum 5-foot furnishing zone available. The design and location of planters should consider other sidewalk uses, such as outdoor seating storefront displays, as well as maintenance of adequate passenger loading/unloading space for on-street parking.

Example of a basin.

Basins: Because of their larger size, basins are usually located behind the sidewalk. They are an alternative to planters in the furnishing zone if the sidewalk width is too constrained to accommodate both the planter and a comfortable walking space for pedestrians. In those instances, the overall street right-of-way need may be greater, or a stormwater management easement required since the width of a basin is greater than a planter due to side slopes.

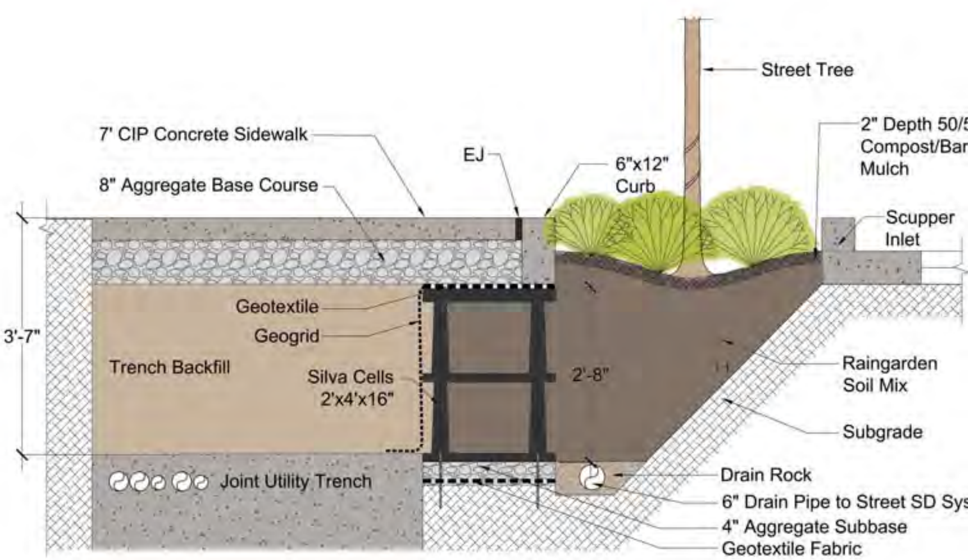
Filterras: Proprietary devices that treat stormwater through a physical process using amended soil and bioretention media combined with small street tree or a shrub. These devices can fit within the furnishing zone of a sidewalk corridor of 12-feet or greater in width.

Example of Filterras.

Permeable Paving: Many of the impermeable surfaces within the sidewalk corridor could be constructed using permeable paving material such as landscape planting, permeable concrete or porous paving blocks. This requires well-draining native soil. The disadvantages of permeable paving include difficulties with maintenance and repair, higher cost, and limited infiltration effectiveness of streets with a gradient over five percent. Permeable pavement can be used in conjunction with other Green Street features and will help reduce the required size of these facilities by lessening the amount of runoff coming off the paved surface.

Example of permeable paving.

Sidewalk Silva Cells: This technique creates a sidewalk rain garden along the roadway and partially under the sidewalk. Rain falls directly on permeable pavers and planters. The silva cells extend the rain garden underneath the sidewalk and into a soil media that treats stormwater and nurtures the landscaping.



Example concept diagram of sidewalk silva cells, which are located under the edge of the sidewalk adjacent to the landscaping subgrade.

It should be noted that Green Street principles are not limited to stormwater management. Other key elements of a Green Street are:

- Safe and appealing pedestrian environment
- Multimodal travel choices
- Maximizing opportunities for trees and landscaping
- Visual and physical connections to public spaces and open spaces
- Renewable energy for public signs and lighting

Additional Distinctive Elements – Public Art

Public art becomes another means for people to interact with each other and with the urban context. Creating a lively public realm with art intrigues, challenges and inspires us as it becomes part of our larger goal of improving the quality if civic life. Within the unifying elements of streetscape, it is also another opportunity to explore texture, color and form. Implementing a public art program should include assessing the potential for city and regional funding support and coordination with local businesses. Examples of public art within or along a street right-of-way have been included in the appendix.

Sidewalk Design

Existing sidewalks on Willamette Street are generally narrow with numerous obstructions and no separation from travel lanes. Each of the alternatives presented assumes sidewalks will be widened to construct the maximum allowable width within the existing right-of-way. Wider sidewalks that extend beyond the existing right-of-way may be constructed incrementally as properties redevelop.

Sidewalks on South Willamette Street are generally narrow with numerous obstructions, no separation from travel lanes, and a mixture of pedestrian and bicycle traffic.

Sidewalk Widening

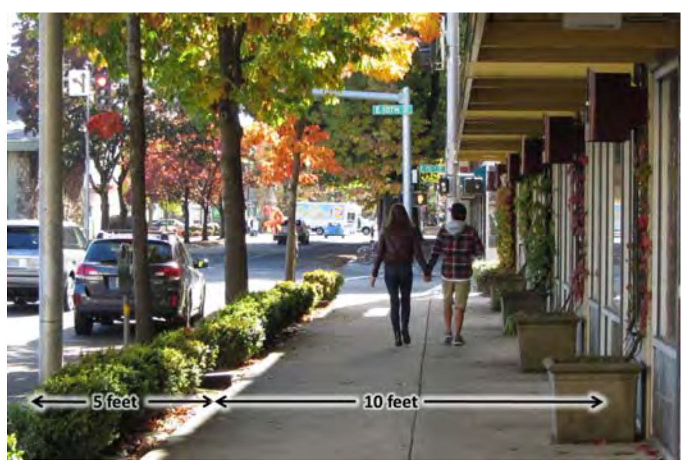
Widening sidewalks will provide a more comfortable pedestrian environment that is accessible to more users and offers substantially greater support for the success of future businesses as the area redevelops. Wider sidewalks may also provide opportunities for landscaping, vegetation, storm water/drainage elements (e.g., bioswales), café seating, overhead signing, decorative lighting, bike parking, etc.

Example of narrow sidewalk with clearly defined planting and furnishings zone.

Example of bioswales (Source: OTAK)

Example of medium width sidewalk with furnishings and bike parking.

Example of vegetation/landscaping (Source: OTAK)



Example of wide sidewalk with planting buffer, street trees, and on-street parking .

Utility Relocation

Utilities (poles, hydrants, pedestals, etc.) currently located along the sidewalks result in an inconsistent and obstructed pedestrian environment. Relocating the utilities underground would improve the sidewalk environment by removing some barriers to pedestrian access and making the corridor more aesthetically pleasing. Similar opportunities, as were identified for widened sidewalks, would become available with utility relocation, since the available sidewalk space would be increased.

Alternative 1 and Alternative 3 have the most constrained sidewalk conditions (approximately 9-feet width with reconstruction). Even minor adjustments of utility pole locations to be fully within the Furnishings Zone represents a significant cost, but would increase the Through Pedestrian Zone to minimum widths. Reconstruction of the sidewalk corridor to 13-feet in Alternative 5 would require relocation of all above-ground utilities to the new Furnishings Zone location created by moving the curb lines into the current roadway area. In this scenario, ample pedestrian circulation space would be available.

The planning-level cost estimate for utility relocation on Willamette Street between 24th Avenue and 32nd Avenue is $2.6 Million.[(15)] Enhancing the Pedestrian Zone by moving utility poles at select locations would be less expensive than putting all utilities underground.

Example of utility conflicts in sidewalk.

Streetscape Design Matrix

Figure 27 provides a summary matrix of how easily some of the typical amenities of a streetscape can be accommodated within the sidewalk corridors depicted in the alternatives. It is based on design principles described in the Streetscape Design Basics for Willamette Street figure (included in the appendix) and the accompanying narrative.

Willamette Street Amenities Matrix

	Alternative 1	Alternative 3	Alternative 5
Bus Stop Amenities			
Enhanced Bus Shelters	⊗	⊗	●
Sidewalk Character			
Wide Sidewalks (10' or greater)	⊗	⊗	●
Paved furnishing zone	●	●	●
Planter strip	●	●	●
Outdoor seating/retail focus	⊗	⊗	●
Textured Crosswalk	●	●	●
Sidewalk Furnishings			
Bike Racks	⊗	⊗	●
Benches	⊗	⊗	●
Trash receptacles	●	●	●
Lighting			
Pedestrian scale (18' tall or shorter)	●	●	●
Landscaping			
Deciduous tree canopy	⊗	⊗	●
Street corner planting	⊗	⊗	●
Landscaped tree wells	●	●	●
Stormwater facilities	⊗	⊗	●

Key	
Comfortably Accommodated	●
Constrained	⊗

Figure 27: Amenities Matrix

7. Transportation Impacts

Participants at Community Forum #3, held in June 2013, benefited from a group discussion about the three South Willamette Street corridor alternatives and their expected transportation impacts. The purpose of the forum was to inform participants about the alternatives and solicit input regarding a preferred alternative.

This section compares transportation impacts of the three alternatives advanced for the South Willamette Street Improvement Plan. Traffic analysis was performed for the year 2018, and results include estimates of intersection operations, delay, vehicle queuing, travel time, neighborhood traffic shift and multimodal system performance for bicycles, pedestrians and transit. The analysis findings are further detailed in Technical Memorandum #8. Three case studies are also provided.

Future Traffic Operations

Future year traffic operations were analyzed for 2018 based on forecasts of future travel demand for the study corridor. Travel volume forecasts were developed using the regional travel demand model developed by the Lane Council of Governments (LCOG). The LCOG model provides land use and transportation estimates for base year 2011 and future year 2035. Traffic volumes for 2018 were developed by scaling between traffic counts taken in 2012 and future year 2035 forecasts.

Peak Hour Intersection Operations

Traffic operations analysis is based on applying *2000 Highway Capacity Manual* methodology[16] for isolated intersections. The estimated average delay, level of service (LOS), and volume to capacity (v/c) ratio of each study intersection is included.

Table 10 compares traffic operations for existing conditions (2012) and future year (2018) conditions for the existing configuration of Willamette Street. As shown, all of the study intersections are anticipated to meet the minimum performance

Table 10: Intersection Operations – Existing (2012) and Future No-Build (2018)

Intersection	Operating Standard	Existing P.M. Peak Hour			2018 P.M. Peak Hour		
		Delay	*LOS*	*V/C*	*Delay*	*LOS*	*V/C*
Signalized							
Willamette Street/24th Avenue	LOS D	12.4	B	0.61 (0.74)	12.5	B	0.62 (0.72)
Willamette Street/25th Avenue	LOS D	10.9	B	0.39 (0.50)	11.7	B	0.40 (0.51)
Willamette Street/27th Avenue	LOS D	8.6	A	0.47 (0.50)	9.5	A	0.51 (0.53)
Willamette Street/29th Avenue	LOS D	40.7	D	0.83 (0.85)	46.8	D	0.88 (0.90)
Willamette Street/32nd Avenue	LOS D	6.1	A	0.63 (0.63)	6.6	A	0.64 (0.64)
Unsignalized							
Willamette Street/Woodfield Station Driveway	N/A	4.7	A/D	0.58	4.7	A/D	0.59

Signalized Intersections:
LOS = Level of Service of Intersection
V/C = Volume-to-Capacity Ratio of Intersection (Critical Movement)

Unsignalized Intersections:
LOS = Level of Service of Major Street/Minor Street
V/C = Volume-to-Capacity Ratio of Worst Movement

standard of LOS "D" operations. However, more delay is anticipated in 2018 as a result of expected growth in motor vehicle traffic volumes.

Table 11 compares 2018 p.m. peak hour traffic operations for Alternatives 1, 3, and 5.(17) Alternatives 3 and 5 are considered to be the same for motor vehicle traffic operations. Key facility design assumptions affecting traffic operations are listed below:

- Applying the proposed 3-lane facility design (for Alternatives 3 and 5) on Willamette Street at the 29th Avenue would result in failing operations (LOS F) with traffic demand reaching capacity (v/c of 1.0). Therefore, the previously described design modification was applied to include both of the existing southbound through travel lanes (and a left turn pocket) at 29th Avenue for Alternatives 3 and 5.
- For northbound travel through the 29th Avenue intersection, there are two travel lanes on Willamette Street included in Alternative 1 and one in Alternatives 3 and 5. The existing second northbound travel lane would be replaced by bike lanes (Alternative 3) or wider sidewalks (Alternative 5).
- A traffic signal at the Woodfield Station Driveway intersection is assumed to be constructed in each alternative. The signal provides a pedestrian crossing and improved turning opportunities for motor vehicle traffic.
- The Willamette Street approaches at 24th Avenue, 25th Avenue, and 27th Avenue intersections each have one through lane and a center left turn lane (with permissive left turn signal phasing assumed) in Alternatives 3 and 5.

For most study intersections, more delay is anticipated in Alternatives 3 and 5 due to the reduction of travel lanes for motor vehicles. However, all of the study intersections are anticipated to meet the minimum performance standard of LOS "D" operations in all alternatives,

Table 11: Intersection Operations for Alternatives - Future Year 2018 P.M. Peak Hour

Intersection	Operating Standard	Alternative 1			Alternative 3 and 5		
		Delay	*LOS*	*V/C*	*Delay*	*LOS*	*V/C*
Willamette Street/24th Avenue	LOS D	13.2	B	0.63 (0.75)	22.4	C	0.80 (0.81)
Willamette Street/25th Avenue	LOS D	11.8	B	0.40 (0.51)	17.4	B	0.69 (0.91)
Willamette Street/27th Avenue	LOS D	10.7	B	0.51 (0.53)	13.9	B	0.82 (0.94)
Willamette Street/Woodfield Station Driveway	LOS D	12.0	B	0.41 (0.46)	16.2	B	0.45 (0.50)
Willamette Street/29th Avenue[a]	LOS D	48.5	D	0.87 (0.90)	56.3	E	0.90 (0.94)
Willamette Street/32nd Avenue	LOS D	6.6	A	0.64 (0.64)	6.4	A	0.63 (0.63)

Signalized Intersections:
LOS = Level of Service of Intersection

[a] The saturation flow rate for the northbound approach was reduced by approximately 15% to reflect simulation results showing lanes being blocked in Alternatives 3 and 5.

with the exception of Willamette Street at 29th Avenue in Alternative 3 or 5.

At the intersection of Willamette Street and 29th Avenue, the southbound capacity is maintained (two southbound travel lanes and a left turn pocket) to serve the peak direction of travel (critical movement) resulting in no significant change in traffic delay in the southbound direction. However, the northbound approach has one fewer travel lanes and motor vehicle delay would increase for northbound travel.

Furthermore, the northbound left turn lane may regularly exceed the available storage length of 150 feet. In the existing configuration (and Alternative 1), through traveling vehicles may use the right lane to get around when the left lane is blocked by the full left turn lane. With one through travel lane (Alternatives 3 and 5), the second lane will not be available and therefore through traveling vehicles will be blocked. This situation may be mitigated by modifying signal timing to provide more green time to the northbound left turn (which requires increasing delay for other movements) or widening to extend the storage length of the northbound left turn pocket.

Off-Peak Intersection Operations

Intersection operations were also analyzed for three periods outside of the p.m. peak hour: the a.m. peak hour (8-9 a.m.), the mid-day peak hour (12-1 p.m.), and the p.m. peak shoulder (4-5 p.m.). Traffic volume forecasts for each period were based on the traffic counts and the growth rate identified for the p.m. peak hour.[18] The off-peak periods generally had less delay than the p.m. peak hour and all of the study intersections were anticipated to meet the minimum performance standard of LOS “D” operations in all alternatives, with the exception of Willamette Street at 29th Avenue during the a.m. peak hour in Alternative 3 or 5.

Due to the directional characteristics of the a.m. traffic volume, delay on northbound approaches is higher in the a.m. peak compared to the p.m. peak. The intersection at 29th Avenue would have higher overall average delay in Alternative 3 and 5 during the a.m. peak hour compared to the p.m. peak hour. Alternative 3 and 5 provide one northbound through lane (compared to two in Alternative 1). The northbound approach volumes would come close to the available capacity during the 2018 a.m. peak, resulting in slightly higher overall delay compared to the p.m. peak hour.

Vehicle Queuing

Traffic simulations were performed for the 2018 p.m. peak hour to estimate expected vehicle queuing. The results of the p.m. peak hour vehicle queuing comparison between Alternative 1 and Alternatives 3 and 5 indicate that vehicle queuing increases most significantly for southbound through travel between 24th Avenue and 27th Avenue and northbound through travel at 29th Avenue.

Average southbound vehicle queues between 24th and 27th Avenue may increase by 50 to 150 feet (or approximately 2-6 car lengths) at these intersections. However, with dedicated left turn lanes present, vehicle queues for left turns would decrease. At 29th Avenue, removing one of the two northbound through travel lanes would increase northbound vehicle queues by up to 200 feet (or approximately 8 car lengths). As a result, access to the northbound left turn lane may be blocked more frequently during peak hours.

Overall, locations where motor vehicle lanes are reduced for through travel may expect to see vehicle queues approximately double in length. A comparison of the average southbound vehicle queue during the p.m. peak hour is illustrated in Figure 28 for Alternatives 1 and 5. The simulation results including vehicle queuing for all lane movements are detailed in the appendix.

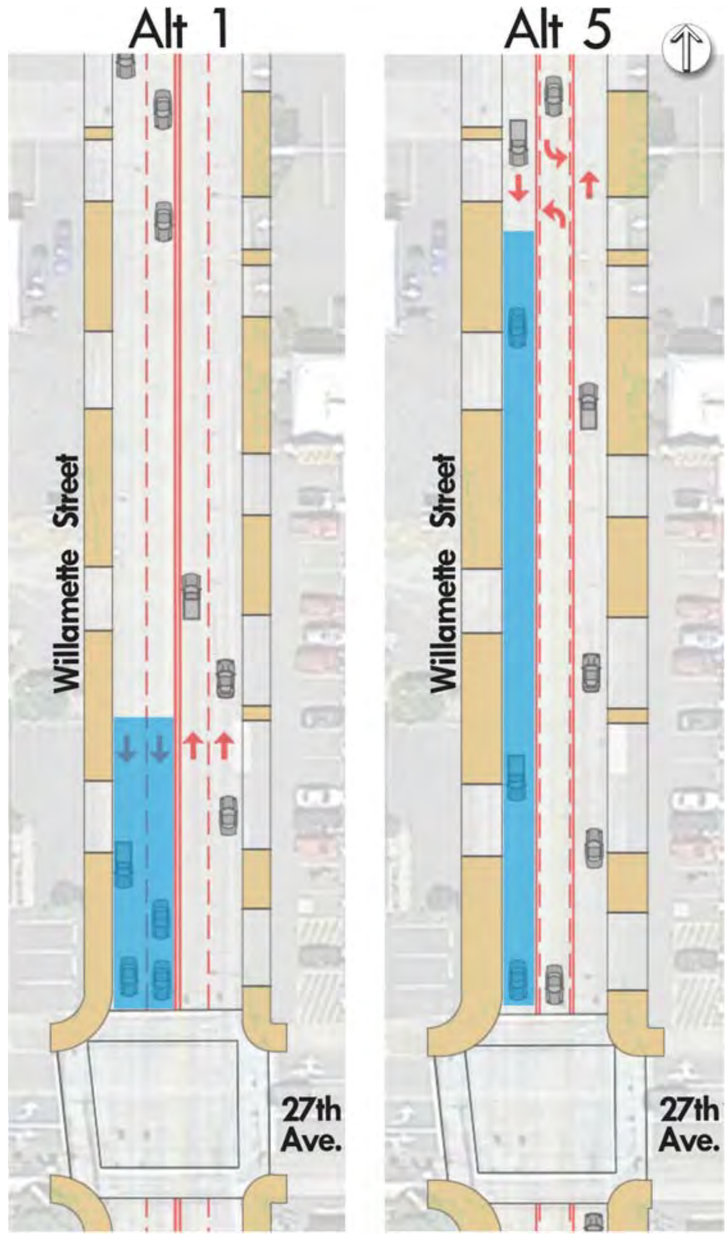


Figure 28: Comparison of Average Southbound Vehicle Queues

Travel Time

The estimated average travel times between 24th Avenue and 32nd Avenue during the 2018 p.m. peak hour are summarized in Table 12 for each alternative and illustrated in Figure 29. The estimated travel times are averages over the hour, based on traffic simulations of a weekday p.m. peak hour in 2018. The base year simulations were calibrated to field-measured travel times for typical weekday travel.

The simulation results including travel times are detailed in the appendix.

Results of the simulation indicate average p.m. peak hour travel times would increase by approximately 30 seconds in both directions for Alternatives 3 and 5. In addition, the reliability of travel time may be better in Alternative 1, as simulation results for Alternatives 3 and 5 showed increased variance.

Table 12: Travel Time Comparison for Alternatives - Future Year 2018 P.M. Peak Hour

Direction	Alternative 1	Alternative 3 and 5
Northbound (32nd Avenue to 24th Avenue)	2 minutes 55 seconds – 3 minutes 05 seconds	3 minutes 15 seconds – 3 minutes 45 seconds
Southbound (24th Avenue to 32nd Avenue)	3 minutes 20 seconds – 4 minutes 10 seconds	3 minutes 30 seconds – 4 minutes 50 seconds

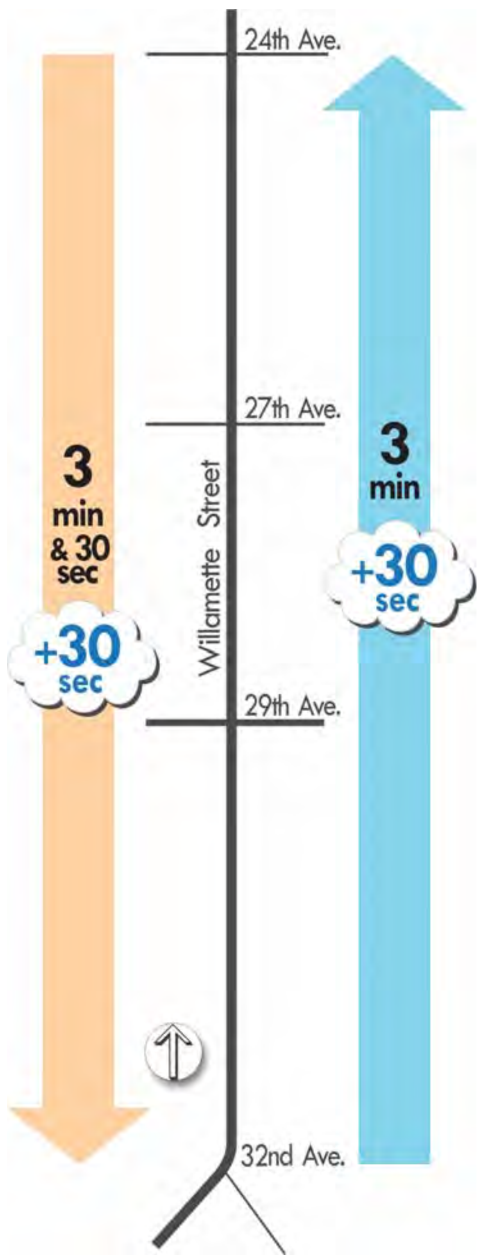


Figure 29: Change in Estimated Average Travel Times (2018 p.m. peak hour) for Alternative 3 & 5 compared to Alternative 1

Roundabout Evaluation

To evaluate the effectiveness of roundabouts on Willamette Street, each of the study intersections was analyzed with a potential roundabout configuration. The assumed size and layout of the roundabouts analyzed are typical for urban environments. The results of the traffic operations analysis for the 2018 p.m. peak hour indicate that that some intersections (at 24th Avenue and 27th Avenue) would have approaches operating near capacity during the p.m. peak hour if constructed as single lane roundabouts.

Although roundabout operations would adequately serve traffic demand at the 25th Avenue and Woodfield Station Driveway intersections, mixing traffic signals and roundabouts in close proximity along the corridor could present negative outcomes for traffic operations and safety due to driver expectations. Roundabouts are not explicitly included in the facility design of any alternative but may be considered further as potential design refinements.

Bicycle Lanes Effects on Traffic Operations

The bicycle lanes included in Alternative 3 would make Willamette Street a more attractive bike route to many types of riders. The bike lanes would also provide a buffer for pedestrians. Bike lanes make it easier for cars and trucks to maneuver in and out of driveways, compared to a three-lane section with no bike lanes. In addition, buses would stop in bike lanes during passenger boarding and alighting, which would provide additional space for motor vehicles to overtake the bus when it is safe to do so.

However, to construct bike lanes either the roadway must be widened or existing travel lanes must be removed. Previous sections of this memorandum have covered the increased motor vehicle delay that results from removing travel lanes (i.e., traffic operations in Alternative 1 compared to Alternatives 3 and 5). This section discusses the differences in traffic operations between Alternative 3 and Alternative 5 (i.e., the effect of bike lines to otherwise identical roadway configurations).

Although bicycle lanes would not have a significant direct effect on motor vehicle operations, higher volumes of bicycles on the roadway may increase delays for turning motor vehicles. The magnitude of potential increase in bicycle traffic is not precisely known. However, to demonstrate potential sensitivity of motor vehicle operation to bike lanes, the intersection operations analysis was repeated with existing bicycle volumes doubled. Traffic operations analysis outputs, with bicycle volumes doubled for Alternative 3 are included in the appendix.

The results of this analysis indicate that doubling bike volumes would increase average delay per motor vehicle by less than half a second at all study intersections. No changes to level of service were found to result from this sensitivity test. Therefore, motor vehicle traffic operations for Alternatives 3 and 5 are considered to be the same.

Bus Pullout Effects on Traffic Operations

Bus pullouts provide a dedicated space outside of the primary travel lane for passenger boarding and alighting. Where bus pullouts are constructed, buses exit the travel lane for passenger boarding and reenter (merge) after boarding is complete.

The primary benefit of bus pullouts is that motor vehicles avoid delays when the travel lane is blocked by stopped buses. However, bus service would likely incur increased delay and potential conflicts when attempting to merge back into the travel lane. Therefore, transit operators often prefer to locate bus stops within the travel lane. Lane Transit District (LTD) has no official policy on bus pullouts, but would generally prefer to keep curbside transit stops along Willamette Street.(19)

To attempt to quantify the effect of including bus pullouts, p.m. peak hour intersection traffic operations were evaluated with and without bus blockages for Alternatives 3 and 5. The analysis assumed the existing service frequency was doubled (i.e., twice the number of buses on the corridor relative to the existing service which provides two per hour north of 29th Avenue and the five per hour south of 29th Avenue.) Details for intersection operations with bus pullouts are included in the appendix. Bus pullouts are not considered for Alternative 1 due to the presence of two travel lanes for most of the corridor.

Although travel time would likely increase a few times an hour for vehicles delayed behind slower-moving buses, the average effect for the overall p.m. peak hour is negligible. The results of the analysis indicate that bus pullouts would reduce average delay per vehicle by less than one second at all study intersections. No changes to level of service results were found.

Due to the relatively minor differences in travel delay, the right-of-way impacts if constructed, increased difficulty for bus operations and lack of support from LTD, bus pullouts are not included in any of the alternatives. Constructing bus pullouts may be revaluated with future redevelopment of the corridor or if additional transit services are provided (e.g., increased frequency, routing changes).

Traffic Shift

Potential changes in traffic patterns could result from modifying portions of Willamette Street from four motor vehicle travel lanes (in Alternative 1) to three (in Alternatives 3 and 5). With increased travel times on Willamette Street estimated for Alternative 3 and 5, some traffic may shift away from Willamette Street to other roadways. Table 13 and Figure 30 identify estimated traffic volumes on Willamette Street for each alternative.[20]

Traffic shifting away from Willamette Street would primarily reroute to streets east of Willamette Street. Approximately two thirds of the shift would go to Amazon Parkway and Hilyard Street. Approximately one third of the shift would redistribute to streets west of Willamette Street including Lincoln Street, Jefferson Street, Adams Street and Polk Street. The traffic shift west of Willamette Street would be fairly evenly distributed between those roadways.

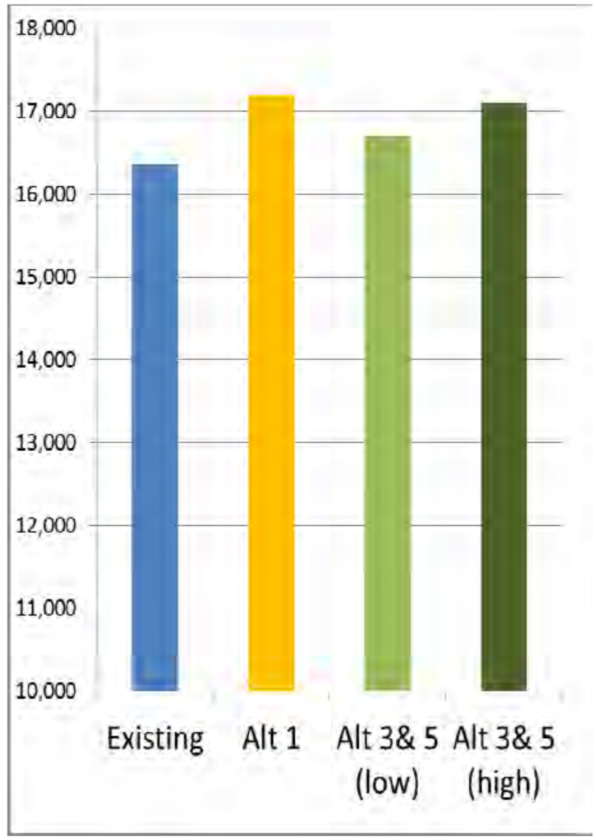


Figure 30: Average Daily Traffic Volumes

Table 13: Willamette Street Traffic Volume Comparison for Alternatives – Future Year 2018

Scenario/Measure	Average Daily	P.M. Peak Hour
Current Year (2012)	16,360	1,550
Alternative 1	17,200	1,625
Alternative 3 & 5	16,700 to 17,100	1,525 to 1,600
Change (reduction compared to Alternative 1)	-100 to -500	-25 to -100
Percent Change (compared to Alternative 1)	-1 to -3%	-2 to -6%
Traffic volume estimates are for Willamette Street south of 27th Avenue		

Multimodal Level of Service

Auto, pedestrian, bicycle and transit operations along Willamette Street were evaluated for the plan alternatives by using the multimodal level of service (MMLOS) methodologies previously described for the existing conditions analysis. The MMLOS evaluation assesses users' perceived comfort level along a facility segment for each mode of transportation.

Analysis was performed based on 2018 p.m. peak hour conditions when the higher traffic volumes would result in the worst case level of service for each mode of transportation. Despite the previously noted limitations of the approach, the MMLOS evaluation provides value as an objective comparison between alternatives that consider multiple modes.

The expected MMLOS operations for Willamette Street in the 2018 p.m. peak hour are shown for Alternative 1 in Figure 31, Alternative 3 in Figure 32, and Alternative 5 in Figure 33. Results are summarized for each mode below:

- The auto mode results indicate the best performance in Alternative 1, with southbound segments from 24th Avenue to 27th Avenue degrading from LOS C or D to LOS F in Alternatives 3 and 5.

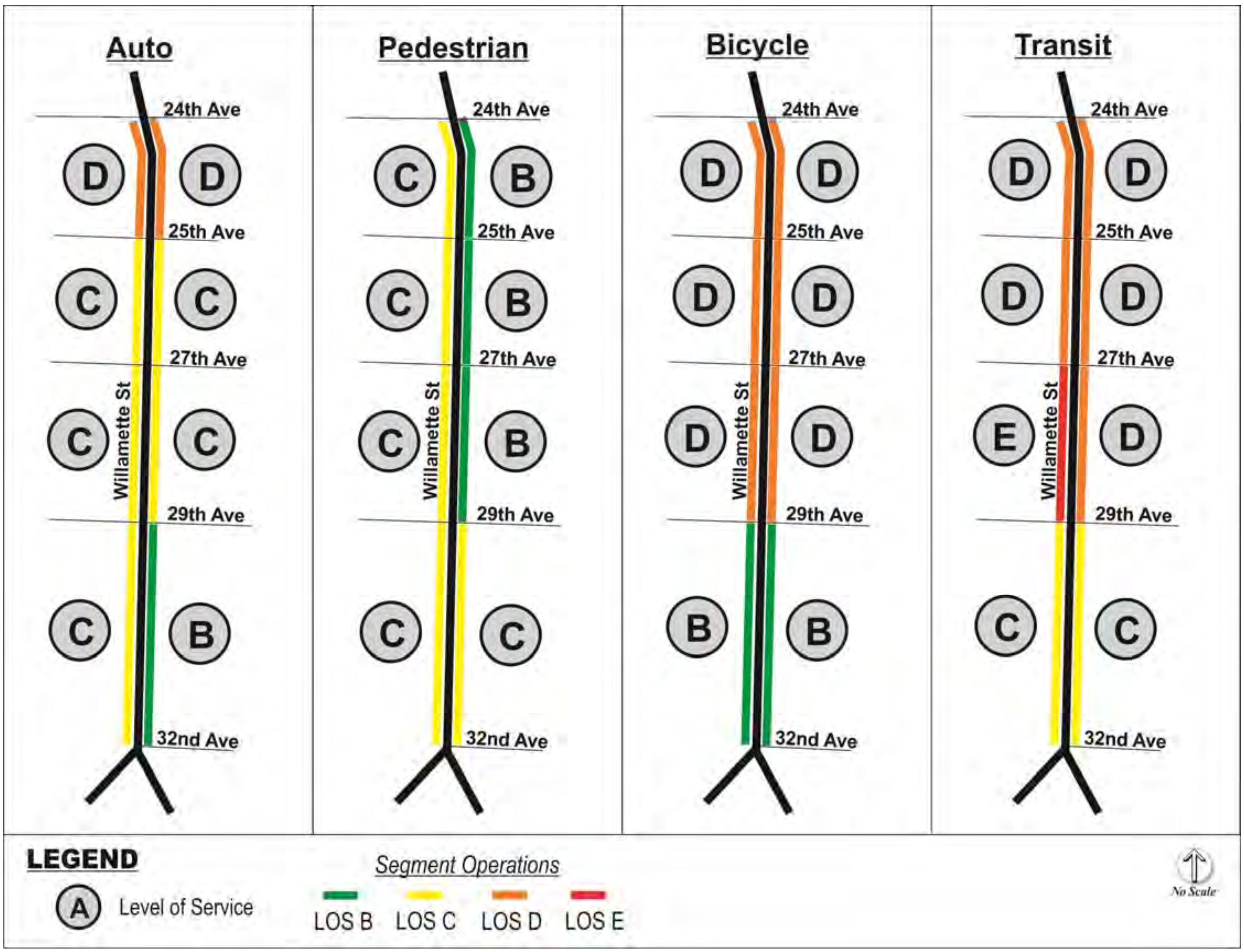


Figure 31: Alternative 1 — 2018 PM Peak Hour Multimodal Level of Service (MMLOS)

- The pedestrian mode results are best for Alternative 5, with several segments improving due to wider sidewalks than Alternative 1 or 3. Alternative 3 results in the lowest pedestrian operations; LOS D southbound between 24th Avenue and 27th Avenue, due to the higher volume of vehicles in the near travel lane. It should be noted that the MMLOS methodology rates pedestrian comfort higher in Alternative 1 than Alternative 3 despite the presence of a bike lane serving as a buffer between cars and pedestrians.
- Bicycle operations would improve from LOS D to LOS B by replacing a motor vehicle lane with continuous bike lanes (Alternative 3). However, bicycle operations would degrade from LOS D to LOS E on some segments if travel lanes are reduced without adding bike lanes (Alternative 5).
- Transit operations are rated slightly higher in Alternative 1 than in Alternatives 3 and 5 due to providing the highest level of mobility (i.e., travel time) for all motor vehicles, including buses.

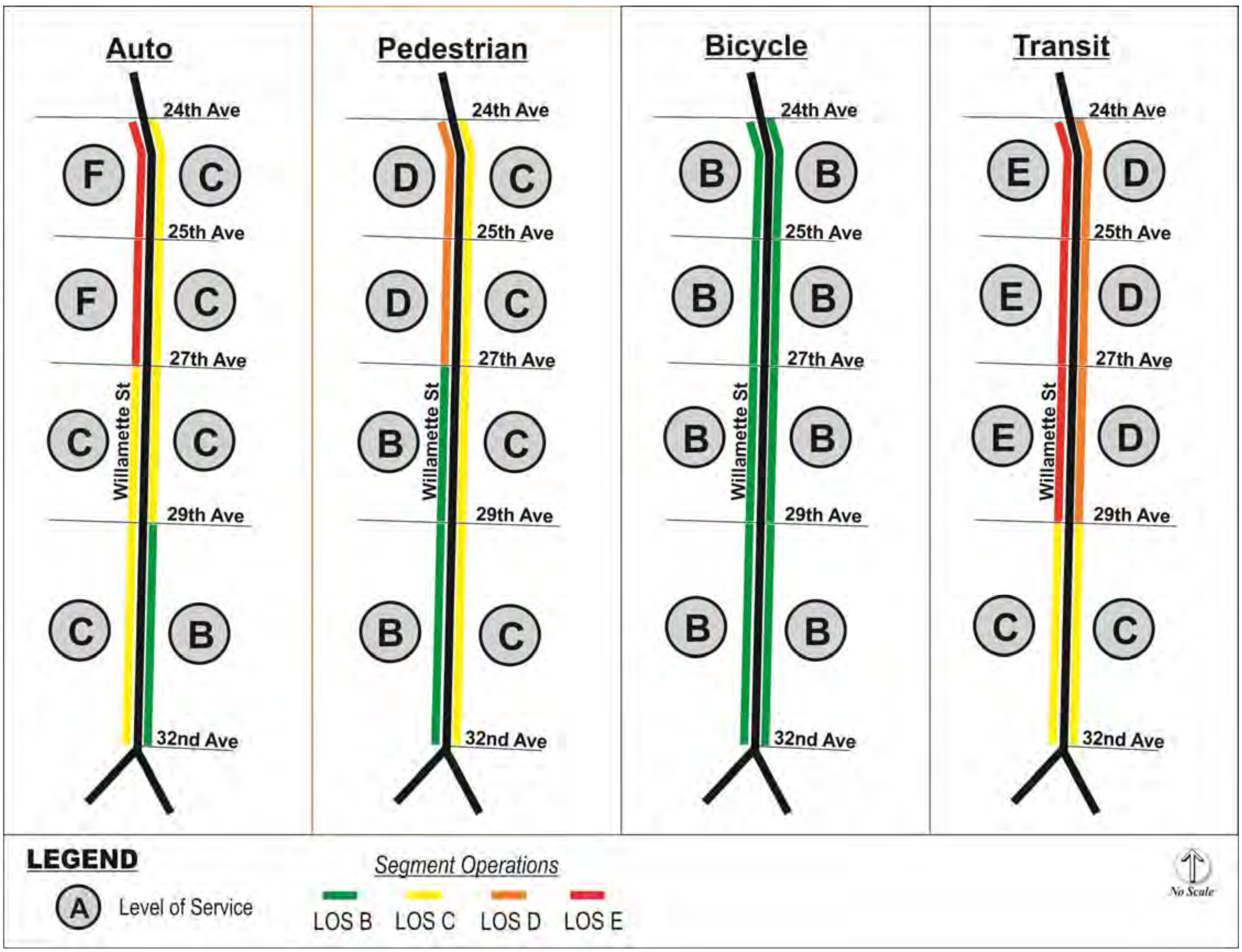


Figure 32: Alternative 3 — 2018 PM Peak Hour Multimodal Level of Service (MMLOS)

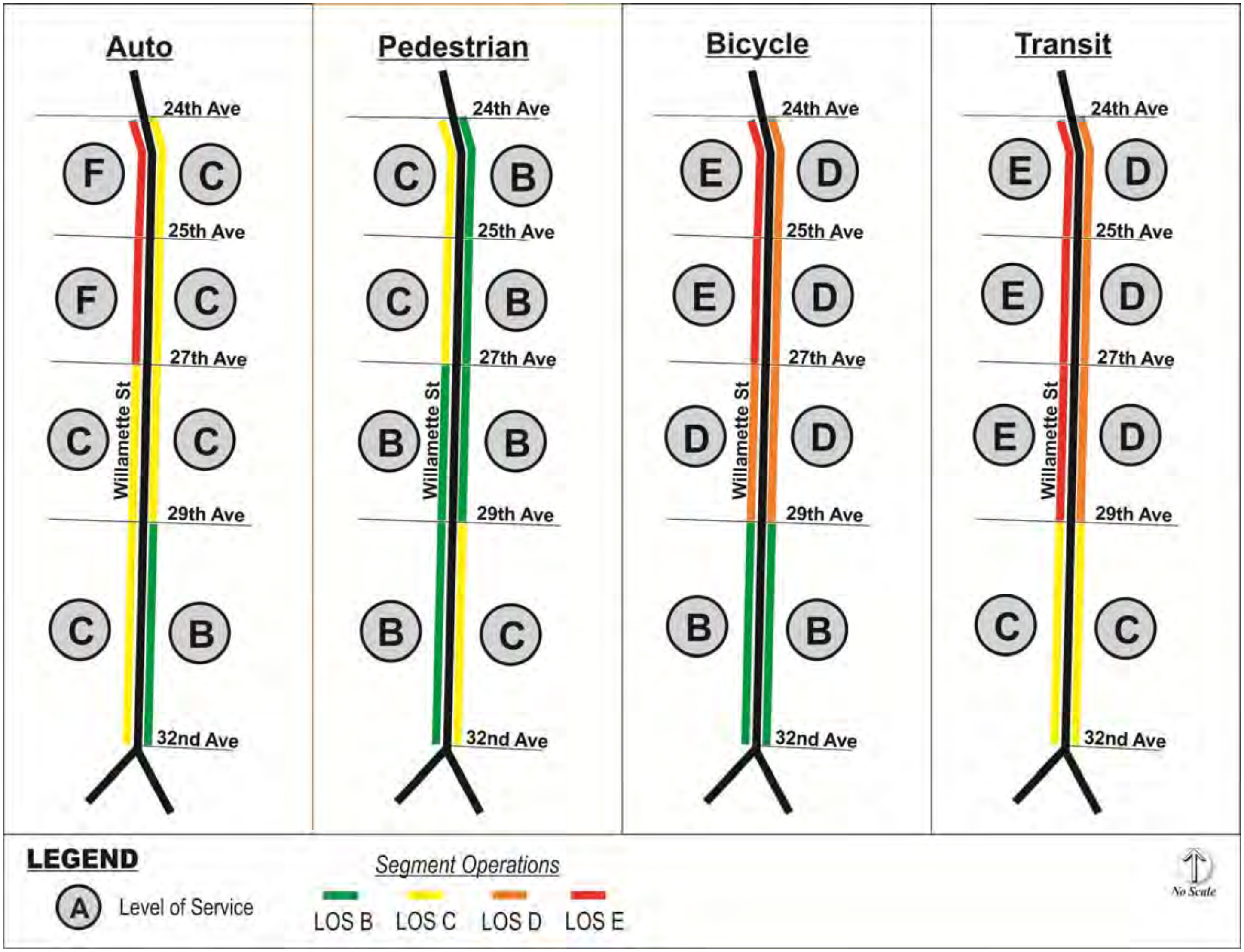


Figure 33: Alternative 5 — 2018 PM Peak Hour Multimodal Level of Service (MMLOS)

CASE STUDIES

Converting a 4-lane roadway into a 3-lane roadway has become a common practice to improve safety, accessibility and livability of a corridor. Several corridors with characteristics similar to Willamette Street were selected as case studies to demonstrate the potential effectiveness of this strategy, which has been proposed in Alternatives 3 and 5.

The average daily traffic (ADT) is a key characteristic when selecting comparable corridors, as there is concern that traffic volumes along Willamette Street will result in excessive congestion if it is converted to a 3-lane roadway. Other important factors to determining the potential effectiveness of this strategy along Willamette Street include adjacent land use, number of driveways, and the frequency of signalized intersections.

Table 14 summarizes the characteristics of Willamette Street along with the corridors selected as case studies. Each case study is described in further detail in the following paragraphs. The roadway conversion outcomes are summarized in Table 15.

Table 14: Case Study Corridors — Characteristics Summary

Corridor	Length	Posted Speed	ADT	Number of Traffic Signals	Adjacent Land Use
Willamette Street (Eugene, OR)	0.8 miles	25 mph	16,500	5	Mostly commercial, some single-family homes and apartments
Nickerson Street (Seattle, WA)	1.2 miles	30 mph	18,500	4	Commercial, light industrial, medium-density residential
Fourth Plain Blvd (Vancouver, WA)	1.0 miles	30 mph	17,000	5	Single-family residential, some commercial and light industrial
Edgewater Drive (Orlando, Florida)	1.5 miles	30 mph	20,000	8	Commercial and retail

Table 15: Case Study Corridors — Roadway Conversion Outcomes Summary

Outcome Category	Measure	Corridor	Before	After	Change
Motor Vehicle Speed	85^{th} Percentile Speed	Nickerson St.	41 mph WB 44 mph EB	33 mph WB 33 mph EB	-18% WB, -24% EB
	Average Speed	Fourth Plain Blvd.	29 mph	24 mph	-18%
	Top-End Speeders	Nickerson St.	17% WB 38% EB	1% WB 2% EB	-92% WB, -96% EB
	Top-End Speeders	Edgewater Dr.	18%	12%	-33%
Safety	Collisions	Nickerson St.	34 per year	26 per year	-23%
	Collisions	Fourth Plain Blvd.	4.2 per month	2.0 per month	-52%
	Collision Rate (per Million Vehicle Miles)	Edgewater Dr.	12.6	8.4	-34%
	Injury Collision Rate (per Million Vehicle Miles)	Edgewater Dr.	3.6	1.2	-68%
Volume	Average Daily Traffic	Nickerson St.	18,500	18,300	-1%
	Average Daily Traffic	Edgewater Dr.	20,500	18,100	-12%
	Pedestrians	Edgewater Dr.	2,136	2,632	23%
	Bicycles	Edgewater Dr.	375	486	30%

Note: WB = Westbound, EB = Eastbound

Nickerson Street (Seattle, WA)

In 2010, a 1.2 mile section of Nickerson Street was reconfigured from four lanes to two travel lanes, a two-way left-turn lane, and bike lanes in select locations.[21] When compared to Willamette Street, this corridor carried slightly higher traffic volumes, was similar in adjacent land use and driveway frequency, and had fewer traffic signals. Similar to Willamette Street, it also had two local bus routes operating with peak headways of 15-60 minutes.

Collision, speed and traffic volumes were monitored before and after the conversion to determine its effectiveness. Prior to the conversion, motor vehicle speeds commonly exceeded the posted speed limit of 30 mph. The 85^{th} percentile traffic speeds were measured as 41 mph westbound and 44 mph eastbound. After the reconfiguration, 85^{th} percentile speeds reduced to approximately 33 mph in both directions, a decrease of 18% for westbound traffic and 24% for eastbound traffic. The number of top-end speeders (i.e., those traveling 10+ mph over the speed limit) was reduced by over 90% in both directions.

The number of collisions was monitored for one year after completion of the project. A total of 26 collisions were recorded, 23% less than the previous 5-year average of 33.6 collisions per year. Traffic volumes on Nickerson Street decreased from 18,500 to 18,300 vehicles, or approximately 200 fewer vehicles per day (1% decrease). Potential alternative routes also experienced slight decreases in traffic volume, indicating that the change was likely part of a region-wide decrease.

Fourth Plain Boulevard (Vancouver, WA)

In 2001, a 1.0 mile stretch of Fourth Plain Boulevard was restriped to include two travel lanes, a center two-way left-turn lane, and bicycle lanes on both sides. This corridor is surrounded by slightly more residential land uses than Willamette Street, but it is similar in ADT, driveway spacing, and number of traffic signals. There are several closely spaced signalized intersections along the western portion of the project.

Figure 34 depicts conditions along the corridor before and after implementation. In addition, a post-

Figure 34: Before (Top) and After (Bottom) Photos along Fourth Plain Boulevard[22]

implementation report[22] was prepared to evaluate the impact of the roadway changes. It was found that speeds dropped approximately 18% (from 29 mph to 24 mph) in the year following the conversion, stabilizing around 25 mph afterwards. The number of collisions dropped by more than 50% (from approximately four per month to two) following implementation when compared to the previous three years of crash data.

Traffic operations were a major concern associated with changing the lane configuration of the corridor. There were no reports of queues continually interrupting access to adjacent residences or businesses, rather, improvements in access were noted due to the addition of a center turn lane. While minor increases in travel time were observed, improved quality of service and safety resulted in an overall positive rating for the project. Periodic signal timing adjustments were identified as a follow-up task to ensure optimal performance between closely spaced intersections.

Edgewater Drive (Orlando, FL)

Edgewater Drive was transformed from four lanes to two lanes, a center two-way left-turn lane, and bike lanes in 2002.[23] The project corridor was approximately 1.5 miles long and almost exclusively surrounded by commercial and retail land uses. This roadway serves as the primary north-south road through the College Park neighborhood and carried approximately 20,000 vehicles a day prior to the conversion. Some portions of Edgewater Drive have on-street parking and there are numerous driveways and unsignalized intersections along the corridor.

A before-and-after evaluation of the implementation found the crash rate decreased by 34%, with injury-causing crashes decreasing by 68%. It was reported that the number of vehicles traveling over 36 mph (posted speed of 30 mph) decreased from roughly 18% to 12%.

Traffic volumes along Edgewater Drive decreased by roughly 12%, dropping from 20,500 vehicles per day to 18,100 vehicles per day. While some locations adjacent to Edgewater Drive experienced up to a 30% increase in traffic volumes, the total combined traffic volumes on all the surrounding streets decreased by an average of 4%. Bicycle and pedestrian counts at 18 locations indicated that the number of pedestrians increased by 23% and the number of bicycles increased by 30%.

Community Forum #3 – Refine the Alternatives

Community Forum 3 was held in June of 2013. The project team presented more detailed information about the three alternatives advanced for public consideration. The information included transportation performance measures, traffic impacts of each alternative, more details of facility design, and cost estimates.

The primary objective of the meeting was to inform participants about the alternatives and ask participants for input in regards to a preferred alternative. Input was received via a survey that was filled out at the meeting or online.

Survey Results

The project developed a survey to gather public input on the impacts of the three remaining design alternatives for the South Willamette Street Improvement Plan. Survey questions were designed to gather public opinion on the results of the transportation analysis presented at Community Forum 3.

The survey was conducted at both Community Forum #3 and online for a 7-day period following the June 11th forum. Out of approximately 275 people who attended Forum #3, 223 completed surveys. In addition, 394 surveys were conducted online. Forum participants benefited from a presentation and group discussion, while online participants relied on graphics built into the survey.

The surveys are unscientific and the results do not represent community demographics. Key highlights of the survey results are summarized below.

- Safety, access to businesses, and improved pedestrian crossings rated highest on a list of nine possible objectives for the study area.
- Support was expressed for further evaluation of a potential installation of a traffic signal at the Woodfield Station driveway, with less than 20% of survey responses in the “definitely not” or “I don’t think so” response. The most common response was “It might be helpful.”
- More than 60% of respondents said an additional 60 seconds of delay per trip on the corridor would be acceptable to them.
- More than 50% of the respondents said they were “OK with the idea” for a small portion of Willamette Street traffic to shift to parallel routes during peak hours.

Alternative 3 received the most favorable responses in meeting the needs of the community amongst the three alternatives presented.

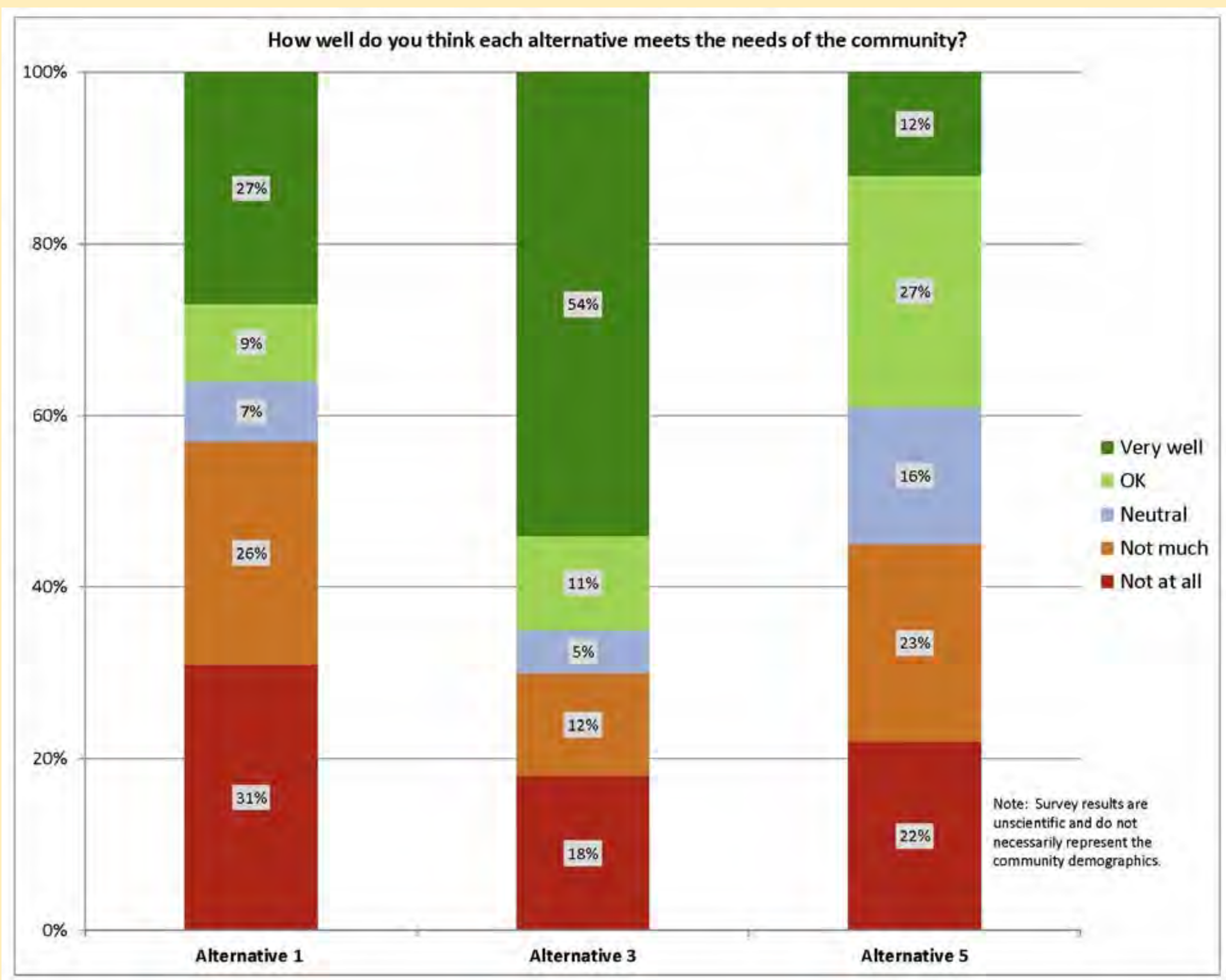


Figure 35: Online Public Survey Response—Meeting Community Needs

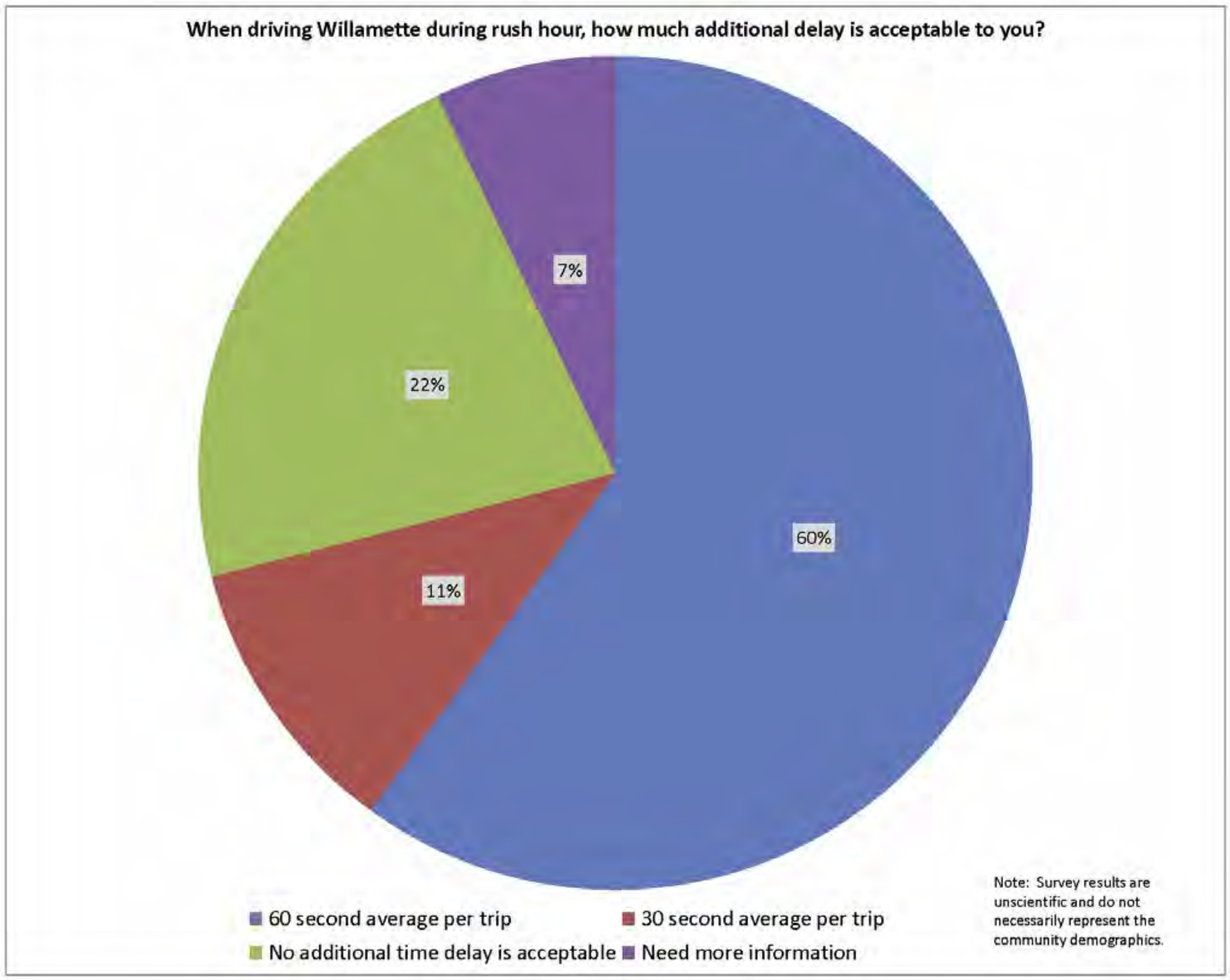


Figure 36: Online Public Survey Response— Additional Delay

Stakeholder Group Discussions

In addition to public meetings and an online survey, stakeholder group discussions were held at four key points during the Plan development process. The discussions provided an opportunity to hear diverse perspectives from business and property owners, freight vehicle operators, bicyclists, pedestrians, local residents, and commuters from south of the study area.

Generalized stakeholder views are summarized below:

Business and Property Owners, and Freight Vehicle Operators

- Many stakeholders expressed serious concern about potential negative impacts on businesses from reducing car travel lanes
- Other stakeholders felt the status quo was unacceptable and welcomed change
- Supported improved pedestrian environment and utility relocation
- Final outcome should do no harm to existing businesses
- Impacts of buses stopped in through lanes were a major concern
- Must be functional for EMS and large delivery vehicles
- Supported development of bike routes on parallel streets with connections to Willamette Street
- Mostly positive feedback toward adding a traffic signal at the Woodfield Station driveway

Local Residents, Bicyclists, Pedestrians, and Commuters from South of the Study Area

- Variety of opinions expressed
- Many stakeholders favored 3-lane with bike lanes (Alternative 3) while others strongly favored 4-lane (Alternative 1)
- Safety is a primary consideration for most
- Separate pedestrians from bicyclists by adding bike lanes, otherwise bicyclists will use sidewalk
- Some stakeholders felt that bike lanes on Willamette will never be safe
- Some bicyclists felt that parallel routes are inadequate and that they have right to use public roadway for their chosen method of transportation
- Support for traffic signal at Woodfield Station driveway and additional pedestrian crossing opportunities

Endnotes

(1) *Tube counts collected south of the Willamette Street/27th Avenue intersection on 7/22/2010*

(2) *TransPlan: The Eugene –Springfield Transportation System Plan, Lane Council of Governments, July 2002*

(3) *Eugene Pedestrian and Bicycle Master Plan Road Reconfiguration Assessment, May 2011*

(4) *Walkable Community Workshop Summary Report, May 2004*

(5) *Willamette Street Traffic Analysis, McKenney Engineering, June 2001*

(6) *City of Eugene 2007 Traffic Flow Map, downloaded from City website (www.eugene-or.gov)*

(7) *24-hour data was collected on weekdays between May 28th and June 5th, 2013.*

(8) *24-hour bi-directional volume count taken on July 20, 2010 and 24-hour speed counts taken on October 2, 2012.*

(9) *Turn movement counts taken on October 2nd and 3rd, 2012.*

(10) *24-hour data was collected on weekdays between May 28th and June 5th, 2013.*

(11) *Turn movement counts taken on October 2nd and 3rd, 2012.*

(12) *This analysis was performed using the LOS+ software that is a hybrid tool that utilizes two different MMLOS methodologies. The auto LOS component of the analysis is based on NCHRP Project 3-70, while the pedestrian, bicycle, and transit components are based on the HCM2010. While NCHRP 3-70 provided the basis for the MMLOS methodology described in the HCM2010, there were some significant differences. One of the main differences is that the LOS methodology for autos presented in the NCHRP 3-70 report requires less input data and is less intensive computationally. The LOS+ software was developed by Fehr and Peers.*

(13) *The most recent three years of available collision data (2008-2010) were obtained from the ODOT Crash and Analysis Reporting Unit and verified against collision data provided by the City of Eugene.*

(14) *2011 State Highway Crash Rate Tables, ODOT Crash Analysis and Reporting Unit, August 2011; Table II, pg. 7.*

(15) *The cost estimate is based on 2013 dollars. The cost shown is a preliminary high-level estimate, subject to change. Estimate was received by email on June 11, 2013 from Mark Oberle, Eugene Water & Electric Board.*

(16) *2000 Highway Capacity Manual, Transportation Research Board, Washington DC, 2000.*

(17) *The 2018 traffic analysis of alternatives assumes bus service frequency is doubled compared to existing service. Pedestrian crossing volumes at study intersections are also assumed to approximately double.*

(18) *The 2018 p.m. peak hour growth rate for each intersection was applied to the traffic counts taken for the a.m. peak hour and p.m. peak shoulder to estimate the 2018 turn movement volumes. Although intersection traffic counts were not available for the mid-day peak hour, 24 -hour bidirectional counts taken on Willamette Street (south of 27th Avenue) were used together with the p.m. peak hour intersection traffic counts to estimate the intersection turn movements from 12-1 p.m.*

(19) *South Willamette Street Improvement Plan Memorandum from Will Mueller, Lane Transit District, March 12, 2013.*

(20) *The LCOG travel demand model was used to evaluate the potential traffic shift away from Willamette Street and the relative effects to other roadways. The expected traffic shift was estimated by comparing differences in alternative model traffic volumes for the 2035 p.m. peak hour.*

(21) *Nickerson Street Rechannelization: Before and After Report, Seattle Department of Transportation, 2012*

(22) *Fourth Plain Boulevard Demonstration Re-Striping Project: Post Implementation Report, City of Vancouver, WA, 2004.*

(23) *Edgewater Drive Before and After Re-Striping Results, City of Orlando-Transportation Planning Bureau, 2002.*

APPENDIX

OCTOBER 2013

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Appendix Contents

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Acknowledgements

The South Willamette Street Improvement Plan was a collaborative process among various public agencies, key stakeholders and the community. Input, assistance, and outreach by the following people helped make the Improvement Plan possible:

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SECTION A

EVALUATION CRITERIA

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TECHNICAL MEMORANDUM #1

DATE: November 5, 2012

TO: **Project Management Team**

FROM: Scott Mansur, P.E., PTOE
Brad Coy, P.E.
Derek Moore, E.I.T

SUBJECT: **South Willamette Street Improvement Plan - Evaluation Criteria** P10086-012

This memorandum defines the evaluation criteria and scoring methodology that will be used to analyze alternatives developed for the South Willamette Street Improvement Plan. A point-based technical rating methodology will be used to rate how well proposed design alternatives meet measure of effectiveness criteria. By summing ratings (and weighting if desired), alternatives can be compared and prioritized. In this way, a consistent method will be used to evaluate and rank the alternatives based on how well they meet the identified goals and objectives. The ranking will be used to inform the Technical Advisory Committee, stakeholders and appointed and elected officials; however, the final recommended alternative will be based on feedback and direction from these parties.

Evaluation Criteria and Scoring Methodology

The City's Draft Transportation System Plan[1] (TSP) identifies numerous goals and objectives that guide future transportation projects and programs. These goals and objectives are based on a review of local and regional plans, the Sustainable Transportation Access Rating Systems (STARS) draft guidance document, and input from Eugene's Transportation Community Resource Group (TCRG). The goals provide broad statements that describe the desires of the Eugene community, and a list of 20 objectives is provided which are focused on achieving the goals. These objectives are separated into the following eight STARS goal categories:

- Access and Mobility (for all modes)
- Safety and Health
- Social Equity
- Economic Benefit
- Cost Effectiveness
- Climate and Energy
- Ecological Function
- Community Context

The goals and objectives in the Draft TSP provided a basis for the development of the evaluation criteria, which are intended to assess a project's potential to meet the transportation needs of the City. The evaluation criteria were then refined based on a review of planning documents more specific to the study

[1] *Eugene Transportation System Plan: Existing Conditions and Deficiencies*, March 2011

area, such as the South Willamette Concept Plan. The criteria are summarized in Table 1 according to the goal category they support.

Table 1: South Willamette Street Evaluation Criteria and Scoring

Criteria	Evaluation Score
Access and Mobility	
Reliability Improves trip reliability, consistency, comfort and convenience for all modes (walk, bike, transit, cars).	+1. Improves trip reliability 0. No change -1. Reduces trip reliability
Neighborhood Connectivity Increases the number of households that can safely walk, bike, or use transit services to meet basic (non-work) daily needs.	+1. Increases # of connected households 0. No change -1. Decreases # of connected households
Motor Vehicle Travel Time Reduces travel time between key origins and destinations for motor vehicles.	+1. Decreases travel time for motor vehicles 0. No change -1. Increases travel time for motor vehicles
Alternative Mode Travel Time Reduces travel time between key origins and destinations for alternative modes.	+1. Decreases travel time for alternative modes 0. No change -1. Increases travel time for alternative modes
Safety and Health	
Safety Improve safety and security for all users, especially for the most vulnerable; strive for zero fatalities.	+1. Improves safety for all modes 0. No change -1. Reduces safety for all modes
Security Improve actual and perceived sense of security (i.e. Safe driving, getting to and riding transit, walking and biking).	+1. Improves sense of security 0. No change -1. Decreases sense of security
Emergency Access Improves or maintains emergency response times within and through the corridor.	+1. Improves emergency response times 0. No change -1. Reduces emergency response times

Table Continued on next page.

(Continued) Table 1: South Willamette Street Evaluation Criteria and Scoring

Criteria	Evaluation Score
Social Equity	
Equity Contributes to closing the transportation access gap between the general user and populations with limited choices, such as the elderly, low income, minority populations, and people with disabilities.	+1. Specifically benefits populations with limited choices 0. No Change -1. Negatively impacts populations with limited choices
Economic Access Improves access from residences to employment and neighborhood centers within a 20-minute walk, bike, or transit trip.	+1. Improves employment access 0. No change -1. Decreases employment access
Economic Benefit	
Freight Mobility Provides safe, efficient, and continuous motor vehicle operation to allow timely freight movement along Willamette Street.	+1. Improves corridor's freight movement 0. No Change -1. Negative impact on freight movement
Walkable/Bikeable Business District Promotes a "Safe, Attractive Pedestrian Experience for Business, Shopping and Entertainment."	+1. Improves business district pedestrian and bicycle experience 0. No change -1. Reduces business district pedestrian and bicycle experience
Business Vitality Supports access and visibility of businesses that rely on drive-by traffic by balancing congestion with economic vitality	+1. Supports economic vitality 0. No change -1. Negative impact on economic vitality

Table Continued on next page.

(Continued) Table 1: South Willamette Street Evaluation Criteria and Scoring

Criteria	Evaluation Score
Cost Effectiveness	
Fundability Available funding sources exist to implement projects in a timely fashion.	+1. Funding sources are available 0. Feasible costs, but no identified funding -1. High costs and no funding expected
Asset Management Favors the enhancement and maintenance of existing systems over system expansion.	+1. Enhances existing transportation system 0. Minimal enhancement or expansion -1. Expands transportation system
Project Benefits Optimizes benefits relative to public, private and social costs over the life-cycle of the project	+1. Provides maximum benefits 0. Minimal benefits -1. Provides no benefits
Climate and Energy	
Reduce Vehicle Miles Traveled (VMT) Improves the corridor as an attractive area without having to drive. Increases mode share for walk, bike, and transit thus reducing greenhouse gases and fossil fuel consumption.	+1. Reduces VMT 0. No change -1. Increases VMT
Pedestrian Facilities Adds sidewalks and crosswalks that fill in system gaps, improve system connectivity, removes obstructions and are accessible to all users.	+1. Improves pedestrian facilities 0. No change -1. Negative impact on pedestrian facilities
Bicycle Facilities Adds bikeways that fill in system gaps, improve system connectivity, and are accessible to all users.	+1. Improves bicycle facilities, including bike lanes 0. No change -1. Negative impact on bicycle facilities
Transit Facilities Improves transit facilities and accessibility to transit stops (for all users) along and near the corridor.	+1. Improves transit facilities 0. No change -1. Negative impact on transit facilities

Table Continued on next page.

(Continued) Table 1: South Willamette Street Evaluation Criteria and Scoring

Criteria	Evaluation Score
Ecological Function	
Stormwater Design Transportation improvements lower the rate of storm water runoff and improve water quality.	+1. Minimizes storm water runoff 0. No change -1. Increases storm water runoff
Landscape Design Reduces the urban heat island through landscape design, less pavement, and increased tree canopy.	+1. Reduces heat island 0. No change -1. Increases heat island
Community Context	
Community Vision and Land Use Supports implementation of Envision Eugene land use and growth management goals and A *Community Climate and Energy Action Plan for Eugene*.	+1. Supports Envision Eugene 0. No change -1. Conflicts with Envision Eugene
Transportation Planning Compatibility Compatible with City's transportation plans (TSP, Long Range Transit Plan, and Pedestrian and Bicycle Master Plan [PBMP])	+1. Compatible with City transportation plans 0. Has little or no impact (or has offset impacts) -1. Not compatible with City transportation plans

The scoring methodology can be applied in one of the following three ways:

1. **Equal weight for each criteria**– The evaluation scores for all criteria are summed to determine the overall evaluation score. This method allows a goal category with more supporting criteria to have a larger influence on the overall score.
2. **Equal weight for each goal category**– Each of the eight categories receives an equal weight. In this method, evaluation scores for each criterion under a particular goal category would be averaged to determine one score for each goal category. They would then be summed to arrive at an overall evaluation score.
3. **Stakeholder feedback to determine weight**– Feedback from stakeholders would be solicited to help determine the weight of each goal category. Criteria scores for a particular category would be averaged and the weight would then be applied.

Typically, scoring methods involve either 1 or 2 or a combination of both for verification. However, if stakeholder input is provided to allow for weighting of project goals, then method 3 could also be applied.

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SECTION B

EXISTING CONDITIONS, FUTURE CONDITIONS, AND PLANNED IMPROVEMENTS

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TECHNICAL MEMORANDUM #2

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DATE: February 12, 2013

TO: **Project Management Team**

FROM: Scott Mansur, P.E., PTOE
Brad Coy, P.E.
Derek Moore, E.I.T

SUBJECT: **Task 2.1-Existing Conditions, Forecast Conditions, and Planned Improvements** P10086-012

This memorandum summarizes the existing transportation conditions for the South Willamette Street Improvement Plan in Eugene, Oregon. Information contained in this document will be used to inform the development and analysis of alternatives as part of a project focused on revitalizing South Willamette Street.

The purpose the South Willamette Street Improvement Plan is to explore options for people to easily and safely walk, bike, take the bus, or drive in an eight-block study area from 24th Avenue to 32nd Avenue. The goal of this study is to help South Willamette Street become a vibrant urban corridor accessible by bicycle, foot, car, and bus. This memorandum identifies the study corridor, provides a summary of the existing transportation facilities, and summarizes the existing travel conditions for all users. In addition, it documents improvements planned for the study corridor and will also include the forecasted traffic conditions when they become available.

Study Corridor

The study corridor is a 0.8 mile segment of Willamette Street between 24th Avenue and 32nd Avenue. This section of Willamette Street is a minor arterial that carries approximately 16,500 vehicles per day[1] and has five signalized and several unsignalized intersections. All five signalized intersections and one unsignalized intersection (as listed below) were analyzed in conjunction with this memorandum. These intersections are listed below and shown in Figure 1.

- Willamette Street/24th Avenue
- Willamette Street/25th Avenue
- Willamette Street/27th Avenue
- Willamette Street/Willamette Plaza Driveway (unsignalized)
- Willamette Street/29th Avenue
- Willamette Street/32nd Avenue

[1] Tube counts collected on 7/22/2010 south of the Willamette Street/27th Avenue intersection.

LEGEND

- Study Corridor

- Study Intersection

DKS

No Scale

Figure 1

Willamette Street Corridor Study Area

Existing Facilities

This section of the memorandum documents the existing roadway conditions, including key characteristics about the roadway network, bicycle and pedestrian facilities, transit facilities, and adjacent land uses.

Roadway Network

The transportation characteristics of the study corridor and key intersecting roadways are shown in Table 1 and include functional classification, approximate street width, number and direction of travel lanes, posted speeds, and the presence of sidewalks and/or bike lanes. The functional classification is a key characteristic because it specifies the purpose of the roadway and is a determining factor for applicable cross-section, access spacing, and intersection performance standards. At the north end of the study corridor, 24th Avenue provides an important connection to the east and attracts a high number of vehicles traveling north along Willamette Street. To the south, 29th Avenue is a minor arterial that carries approximately 12,000 to 15,700[2] vehicles per day, and the remaining cross streets primarily provide local access to businesses and residential areas.

Table 1: Roadway Characteristics

Roadway	Functional Classification	Street Width	Travel Lanes	Posted Speed	Sidewalk	Bike Lanes
Willamette Street (North of 29th Avenue)	Minor Arterial	42 feet	4	25	Yes	No
Willamette Street (South of 29th Avenue)	Minor Arterial	41 feet	3 (2 Southbound, 1 Northbound)	25	Yes	Yes
24th Avenue (East of Willamette Street)	Minor Arterial	36 feet	2	30	Yes	Yes
24th Avenue (West of Willamette Street)	Local	32 feet	2	25	Yes	No
25th Avenue	Local	33 feet	2	25	Yes	No
27th Avenue	Major Collector	32-38 feet	2	25	Yes	No
29th Avenue	Minor Arterial	40 feet	3 (TWLTL)[a]	30	Yes	Yes
Donald Street	Major Collector	34 feet	2	25	Yes	No

[a] TWLTL= Two-Way Left Turn Lane

As shown in Table 1, there are three primary cross sections for Willamette Street. From 24th Avenue to 29th Avenue, Willamette Street consists of 4 lanes, 2 lanes in each direction, and no bike lanes (shown in Figure 2a). As it approaches 29th Avenue, the roadway widens to 5 lanes to accommodate left-turn lanes on both the northbound and southbound approaches (shown in Figure 2b). A southbound bike lane originates south of 29th Avenue and continues south through the study area. Roughly 500 feet south of 29th Avenue, the cross section

[2] City of Eugene 2007 Traffic Flow Map, downloaded from City website (www.eugene-or.gov)

transitions to include bike lanes in both directions, one northbound travel lane, and two southbound travel lanes (shown in Figure 2c).

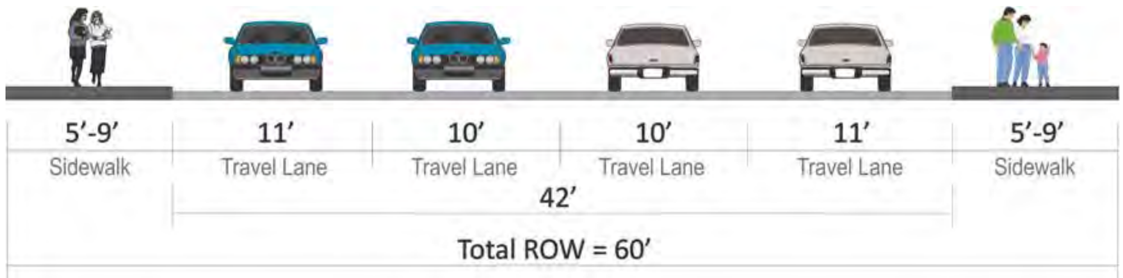


Figure 2a: 4-Lane Cross Section

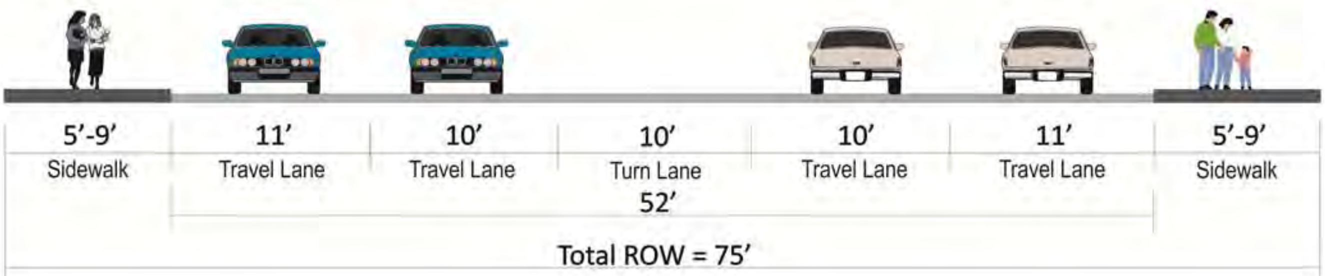


Figure 2b: 5-Lane Cross Section

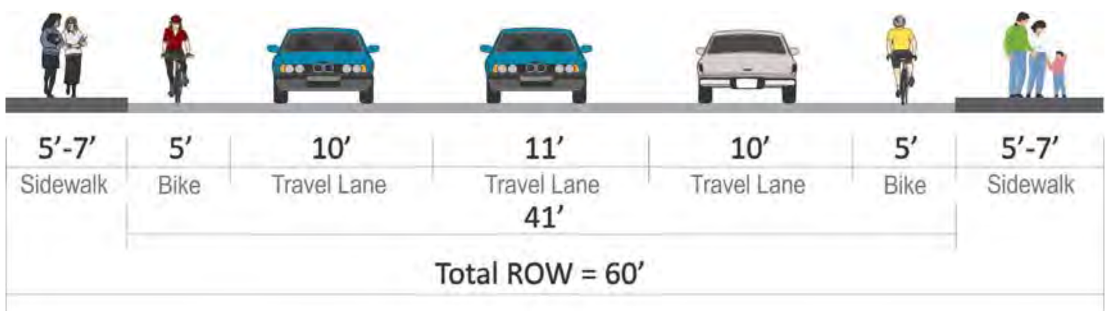


Figure 2c: 3-Lane Cross Section

Bicycle and Pedestrian Facilities

Sidewalks are present on both sides of Willamette Street for the full length of the study corridor and they vary in width ranging from 5 feet to 9 feet. Most of the study area has curbside sidewalks with the exception of small sections of landscaping near the north and south limits of the study area. Utility poles and other objects create obstacles and impact accessibility. There are marked pedestrian crossings at the five signalized intersections. No other marked crosswalks currently exist within the study area.

Bike lanes exist from approximately 250' south of 29th Avenue and continue south through 32nd Avenue. There are currently no bicycle facilities to the north of 29th Avenue. Bike lanes are present on the cross streets of 24th

Avenue and 29th Avenue; however the lack of bike lanes on Willamette Street hinders connectivity to these facilities. Portland Street (one block to the west) and Oak Street (one block to the east) provide potential alternate bike routes to Willamette Street but these roadways include connectivity gaps in the network.

Figure 3 below shows the location of existing bike lanes, sidewalks, and paths.

Figure 3: Existing Bicycle (Left) and Pedestrian (Right) Facility Inventory.

Driveways and Access Points

There are over 70 driveways on the 0.8 mile corridor of Willamette Street. The Arterial and Collector Street Plan (ACSP) indicates that for a typical minor arterial, emphasis should be given to mobility rather than accessibility and that access regulation is of high priority for roadways with this classification. However, the commercial nature of Willamette Street will require a balanced approach to maintaining access and supporting mobility.

Transit Facilities

Lane Transit District (LTD) provides public transit service to the Eugene-Springfield areas. The following two routes provide service to the study area.

- Route 24 (Donald) – Route 24 runs both directions over the length of the study corridor. On weekdays, it operates from roughly 6:15 am to 11:00 pm with 30-minute headways. After 7:00 pm, it operates with one-hour headways. On Saturdays, this route operates very similar to weekdays, and on Sundays it operates on one-hour headways from 8:00 am to 8:00 pm.
- Route 73 (UO/Willamette) – Route 73 runs both directions on Willamette Street from 29th Avenue to 40th Avenue. At 29th Street, the route head east to Hilyard Street. On weekdays, this route operates from about 7:00 am to 7:00 pm with headways ranging from 20 minutes to two hours, and there is no service on weekends.

Figure 4 shows the locations of marked bus stops located within the study area as well as the available transit routes through the study corridor.

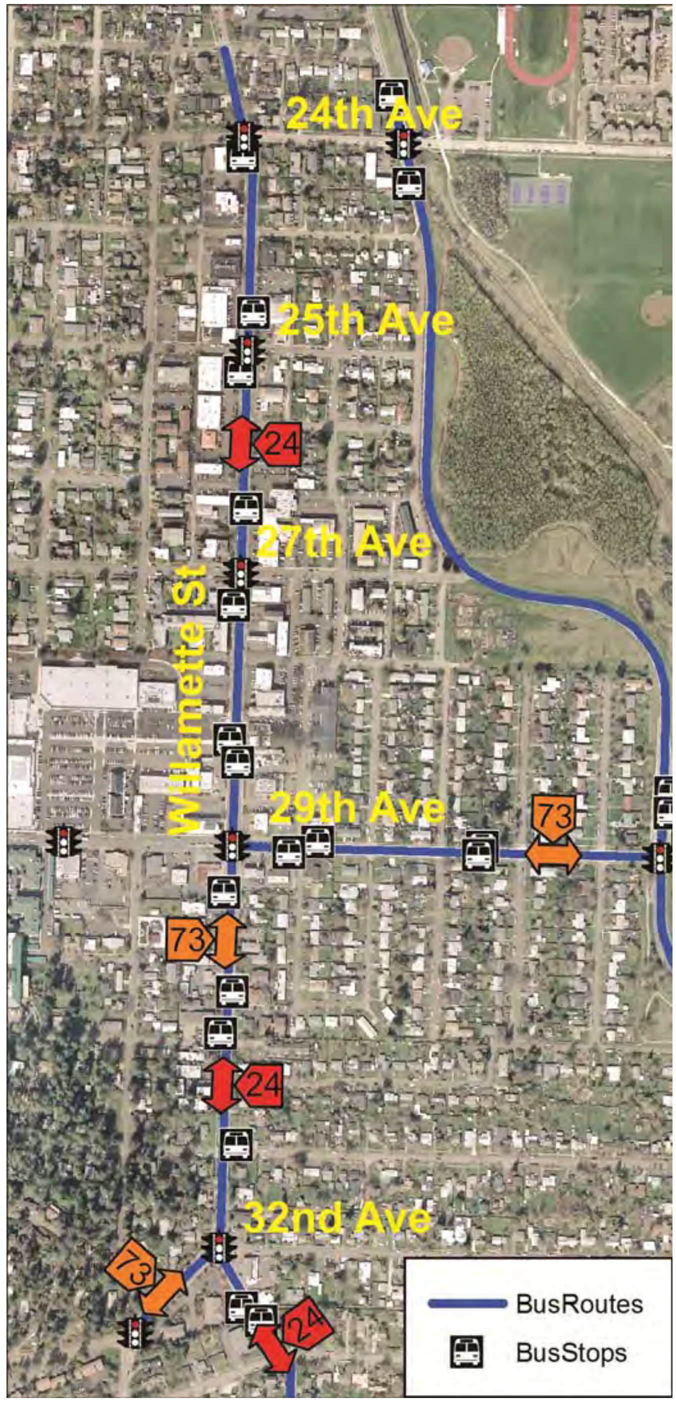


Figure 4: Transit Stops and Routes

Adjacent Land Uses

Figure 5 on the following page summarizes the land uses adjacent to the study corridor. From 24th Avenue to 29th Avenue, the adjacent land use is a combination of a few single family homes, apartment buildings, and retail stores. Woodfield Station is located between 28th Avenue and 29th Avenue on the west side of Willamette Street. Adjacent land use south of 29th Avenue consists mostly of apartment buildings and single family residential units.

Travel Conditions

This section summarizes existing travel conditions, including traffic volume, speed, and classification along the Willamette Street corridor; turning movement volumes and operations for the six study intersections; multi-modal level of service for Willamette Street segments; and collision analysis results.

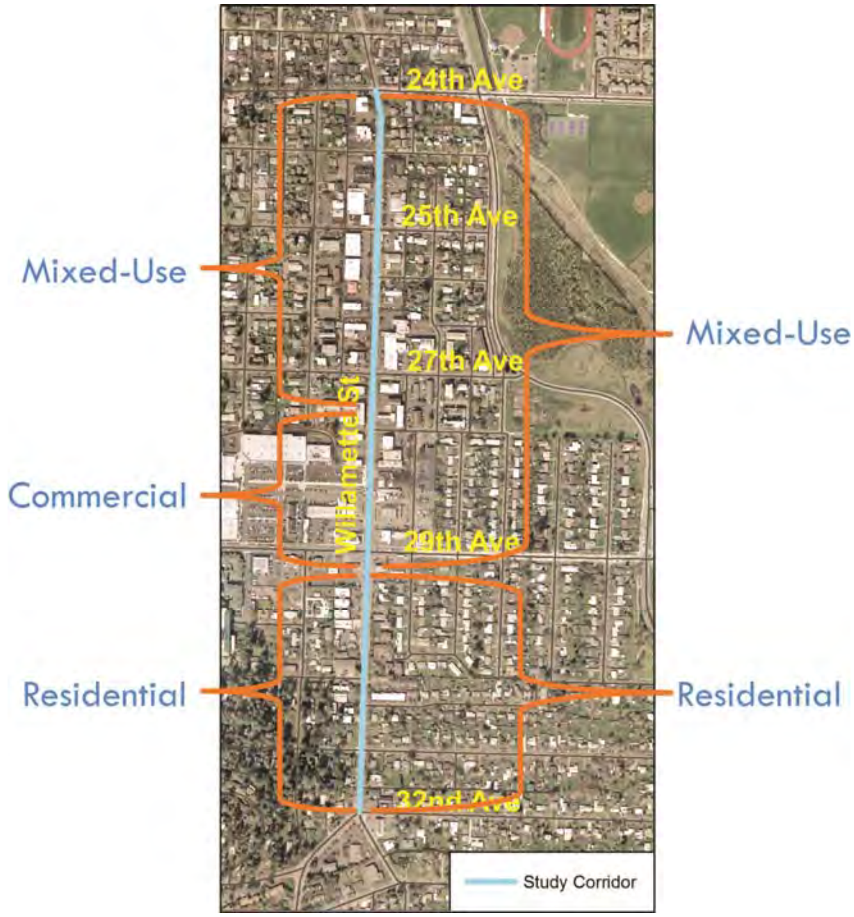


Figure 5: Adjacent Land Use

Volumes, Speed, and Classification

Table 2 presents data collected from 24-hour tube counts[3] taken south of the Willamette Street/27th Avenue intersection. The data presented includes vehicular bi-directional volumes, 85th percentile speeds, and heavy vehicle percentages from intersection manual turn counts[4]. As shown, the daily traffic volume is approximately 16,500 along the study corridor and the daily directional split is fairly even. The 85th percentile speeds (meaning 85% of vehicles travel at this speed or slower) along Willamette Street are approximately 5 mph higher than the posted speed of 25 mph and the heavy vehicle percentages are around 2%.

Table 2: Willamette Street ADT, Speed, and Classification

	Northbound	Southbound	Total
Average Daily Traffic	7,610 (47%)	8,750 (53%)	16,360
85th Percentile Speed	31.7 mph	29.8 mph	30.7 mph
Heavy Vehicle Percentage	2%	2%	2%

To further understand the use of this roadway over the course of a 24-hour period, Figure 6 shows vehicle movements throughout the day. This graph shows that the highest northbound traffic volume occurs during the

[3] 24-hour bi-directional volume count taken on July 20, 2010 and 24-hour speed counts taken on October 2, 2012.
[4] Turn movement counts taken on October 2nd and 3rd, 2012.

lunch hour and the highest southbound volumes occur during the p.m. peak hours. The northbound direction is used more heavily during the a.m. hours and the southbound direction tends to have higher volumes during the p.m. hours. This directionality split is a typical commuting scenario with the a.m. flow towards the downtown business district and the p.m. traffic moving away from the downtown core.

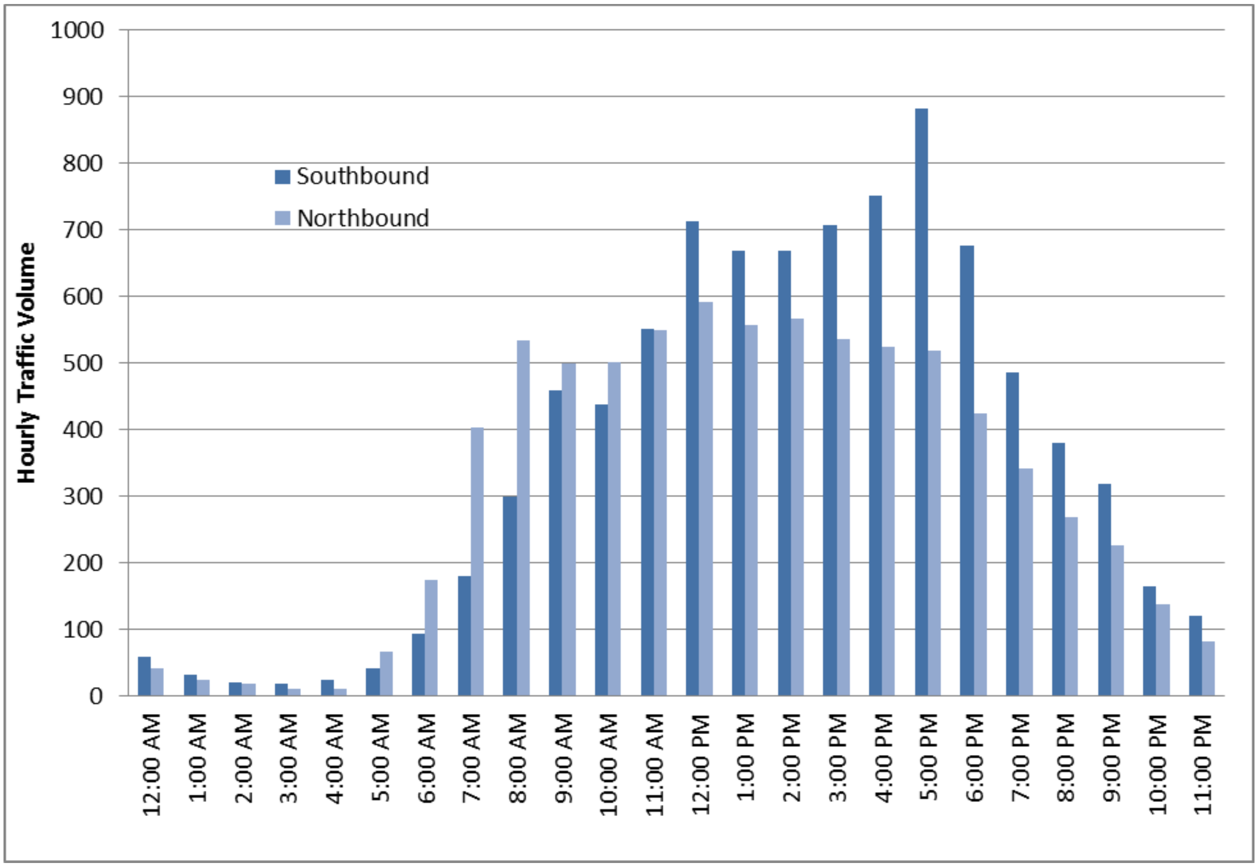
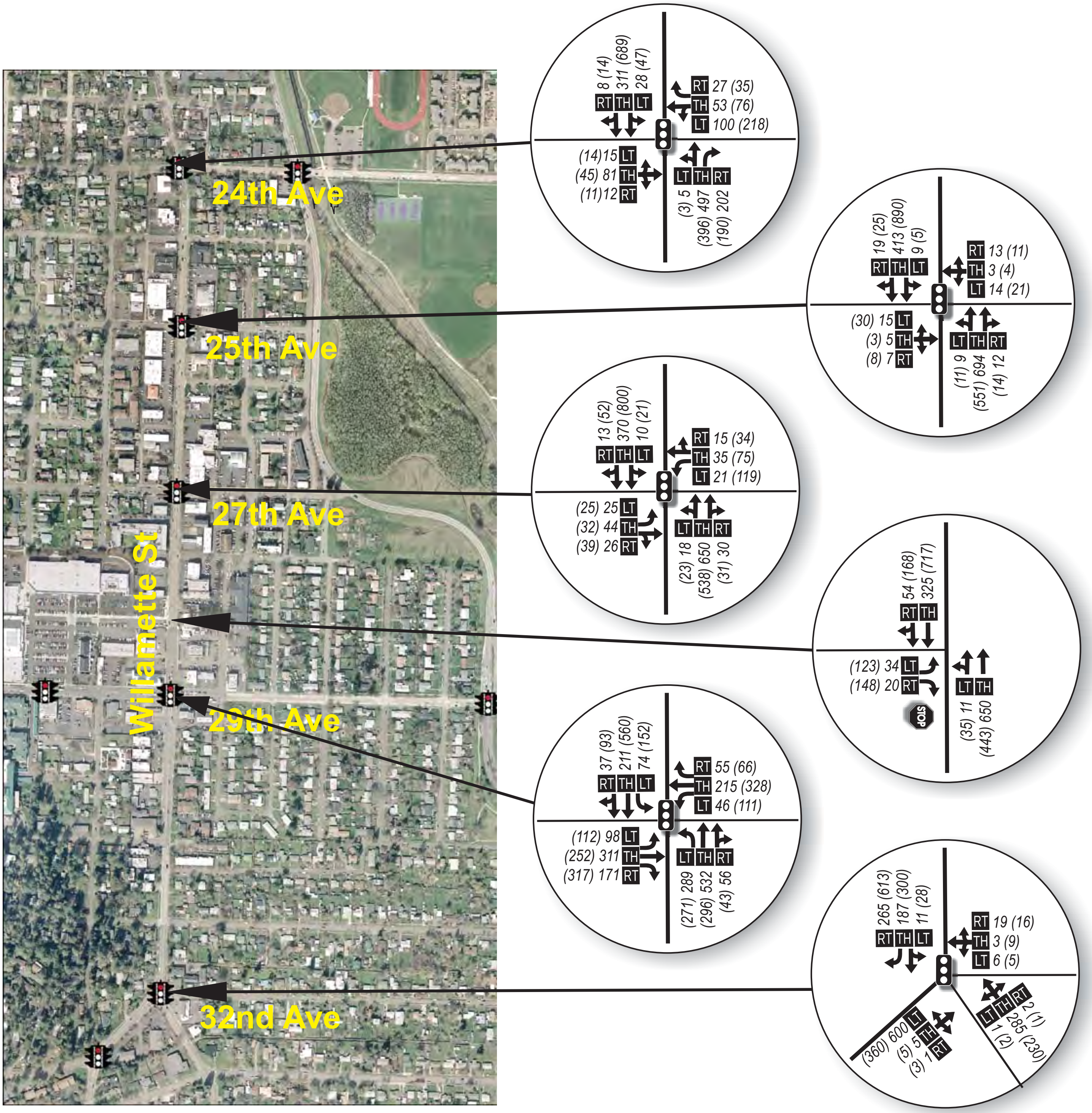


Figure 6: 24-Hour Bi-Directional Volume (Willamette Street south of 27th Avenue)

Intersection Turn Movement Volumes

Intersection turn movement volumes were collected at the six study intersections listed previously during the a.m. (7:00 a.m. to 10:00 a.m.) and the p.m. (4:00 p.m. to 7:00 p.m.) peak periods[5]. The a.m. and p.m. peak hour traffic volumes for the study intersection are shown in Figure 7 along with the associated lane configurations and traffic control. Figure 8 shows the a.m. and p.m. peak hour bicycle and pedestrian volumes at each intersection.

[5] Turn movement counts taken on October 2nd and 3rd, 2012.



LEGEND

- Stop Sign
- Traffic Signal
- Lane Configuration

000 (000) - AM (PM) Peak Hour Traffic Volumes

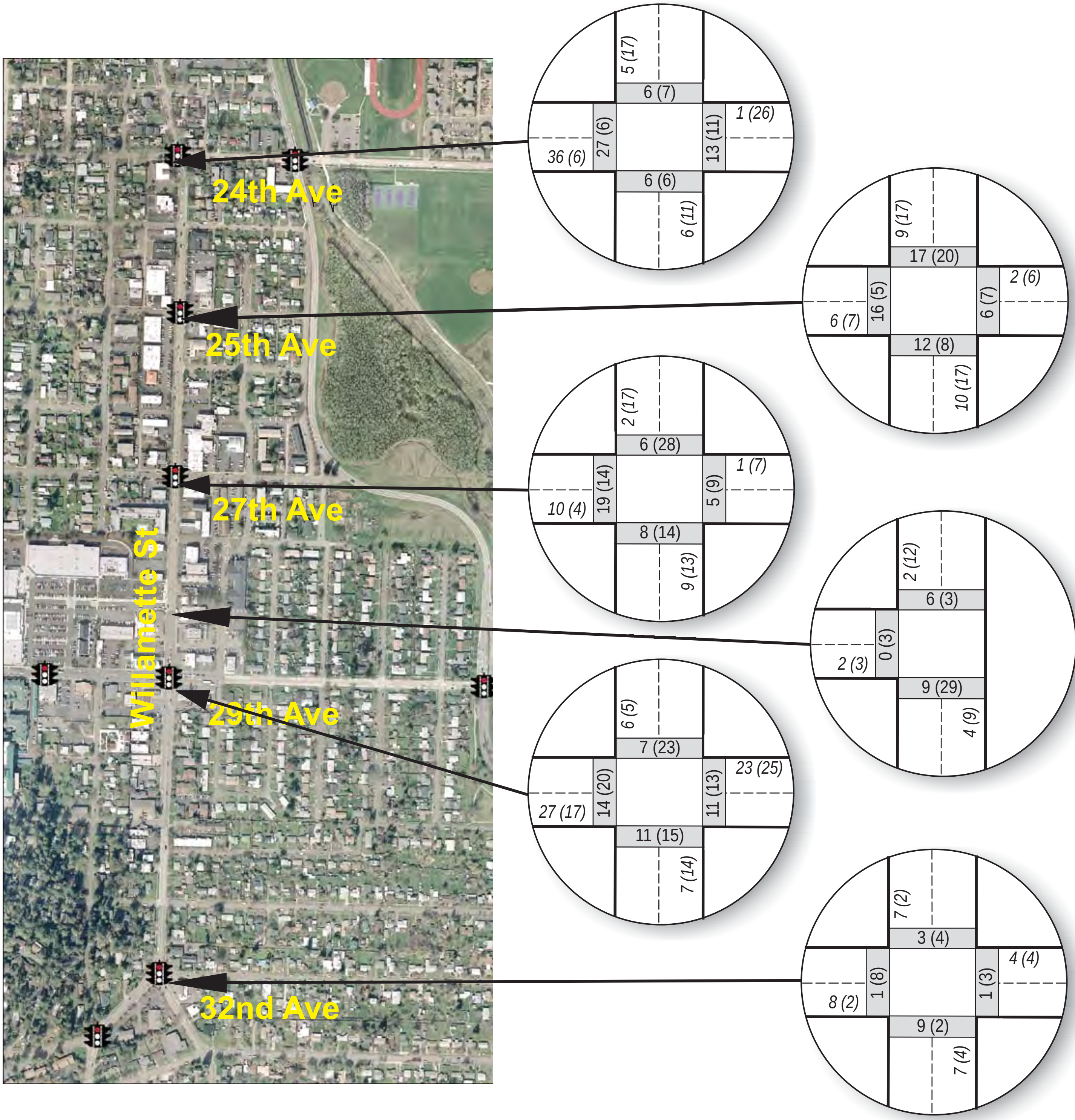
LT TH RT (Left•Thru•Right) - Volume Turn Movement

DKS

No Scale

Figure 7

EXISTING 2012 AM & PM PEAK HOUR TRAFFIC VOLUMES



LEGEND

000 (000) - AM (PM) Peak Hour Bicycle Volumes

000 (000) - AM (PM) Peak Hour Pedestrian Volumes

DKS

No Scale

Figure 8

EXISTING 2012 AM & PM PEAK HOUR BIKE AND PED VOLUMES

DKS

Mobility Standards

The City of Eugene bases intersection mobility standards on level of service (LOS) and currently specifies a minimum performance of LOS "D" at signalized and unsignalized intersections.[6]

Intersection Operations

The existing traffic operations at the study intersections were determined for the a.m. and p.m. peak hours based on *2000 Highway Capacity Manual* methodology[7]. The estimated average delay, level of service (LOS), and volume to capacity (v/c) ratio of each study intersection are shown in Table 3. As shown, all of the study intersections currently meet operating standards. The Willamette Street/29th Avenue intersection experiences the greatest delay.

Table 3: Existing Intersection Operations

Intersection	Operating Standard	Existing A.M. Peak Hour			Existing P.M. Peak Hour		
		Delay	*LOS*	*V/C*	*Delay*	*LOS*	*V/C*
Signalized							
Willamette Street/24th Avenue	LOS D	9.5	A	0.52 (0.53)	13.9	B	0.61 (0.74)
Willamette Street/25th Avenue	LOS D	4.0	A	0.34 (0.36)	9.3	A	0.39 (0.49)
Willamette Street/27th Avenue	LOS D	7.7	A	0.34 (0.39)	8.4	A	0.45 (0.46)
Willamette Street/29th Avenue	LOS D	29.9	C	0.82 (0.82)	41.3	D	0.83 (0.85)
Willamette Street/32nd Avenue	LOS D	26.4	C	0.97 (0.97)	10.5	B	0.67 (0.73)
Unsignalized							
Willamette Street/Willamette Plaza Driveway	N/A	0.7	A/B	0.29	3.4	A/C	0.44

Signalized Intersections:
LOS = Level of Service of Intersection
V/C = Volume-to-Capacity Ratio of Intersection (Critical Movement)

Unsignalized Intersections:
LOS = Level of Service of Major Street/Minor Street
V/C = Volume-to-Capacity Ratio of Worst Movement

Field Observations

Field observations were performed during the p.m. peak conditions at the study intersections. Extensive queuing was observed on the southbound approach to the Willamette Street/29th Avenue intersection which resulted in multiple cycle failures. It was also observed that the northbound left-turn movement experienced long queues that did not clear during each cycle.

[6] The one exception to the City's LOS D mobility standard is that within the Central Area Transportation Study Area (primarily downtown and near the University of Oregon), the City allows LOS "E" for signalized intersection operations. However, this does not apply to the study corridor.
[7] *2000 Highway Capacity Manual*, Transportation Research Board, Washington DC, 2000.

DKS

Multimodal LOS

Auto, pedestrian, bicycle and transit operations along Willamette Street were evaluated using the multi-modal level of service (MMLOS) methodologies outlined in the *Highway Capacity Manual 2010 (HCM2010)*. This evaluation is performed for roadway segments (not accounting for intersection operations) and focuses on the users' perceived comfort level as they travel along the corridor. Using signalized intersections as break points, Willamette Street was divided into four segments for analysis. Analysis was performed based on p.m. peak hour conditions when the higher traffic volumes would result in the worst case level of service for each mode of transportation.

This analysis was performed using the *LOS+* software that is a hybrid tool that utilizes two different MMLOS methodologies[8]. The auto LOS component of the analysis is based on NCHRP Project 3-70, while the pedestrian, bicycle, and transit components are based on the HCM2010. While NCHRP 3-70 provided the basis for the MMLOS methodology described in the HCM2010, there were some significant differences. One of the main differences is that the LOS methodology for autos presented in the NCHRP 3-70 report requires less input data and is less intensive computationally.

Pedestrian LOS is influenced by traffic volumes, vehicle speeds, sidewalk width, and presence of a buffer. Bicycle LOS in influenced by bike lane width, pavement quality, on-street parking, and heavy vehicle percentage. Transit LOS is influenced by service frequency, bus reliability, average passenger load, and transit stop amenities. The LOS+ software assesses how well a facility meets the needs of the traveling community by reporting a LOS grade (A-F) for each mode of transportation.

The existing MMLOS operations for Willamette Street are shown in Figure 9. The auto, pedestrian, and bicycle LOS range from "B" to "D". The LOS for transit ranges from "C" to "E" based on the current bus service frequency. One transit route currently serves the Willamette Street segment from 24th Avenue to 29th Avenue which results in LOS "D/E". Two transit routes serve the corridor from 29th Avenue to 32nd Avenue, which is reflected in the LOS "C" operations for that segment. It should be noted that the existing LOS "D" MMLOS operations for the existing bicycle facilities was a better level of service than was expected. Based on stakeholder interviews, most bicycle users are not comfortable biking on Willamette Street without bike lanes. Therefore, it is clear that the comfort level of motor vehicles driving on a roadway with LOS "D" conditions is not a suitable comparison to cyclists travelling on a facility with LOS "D" conditions.

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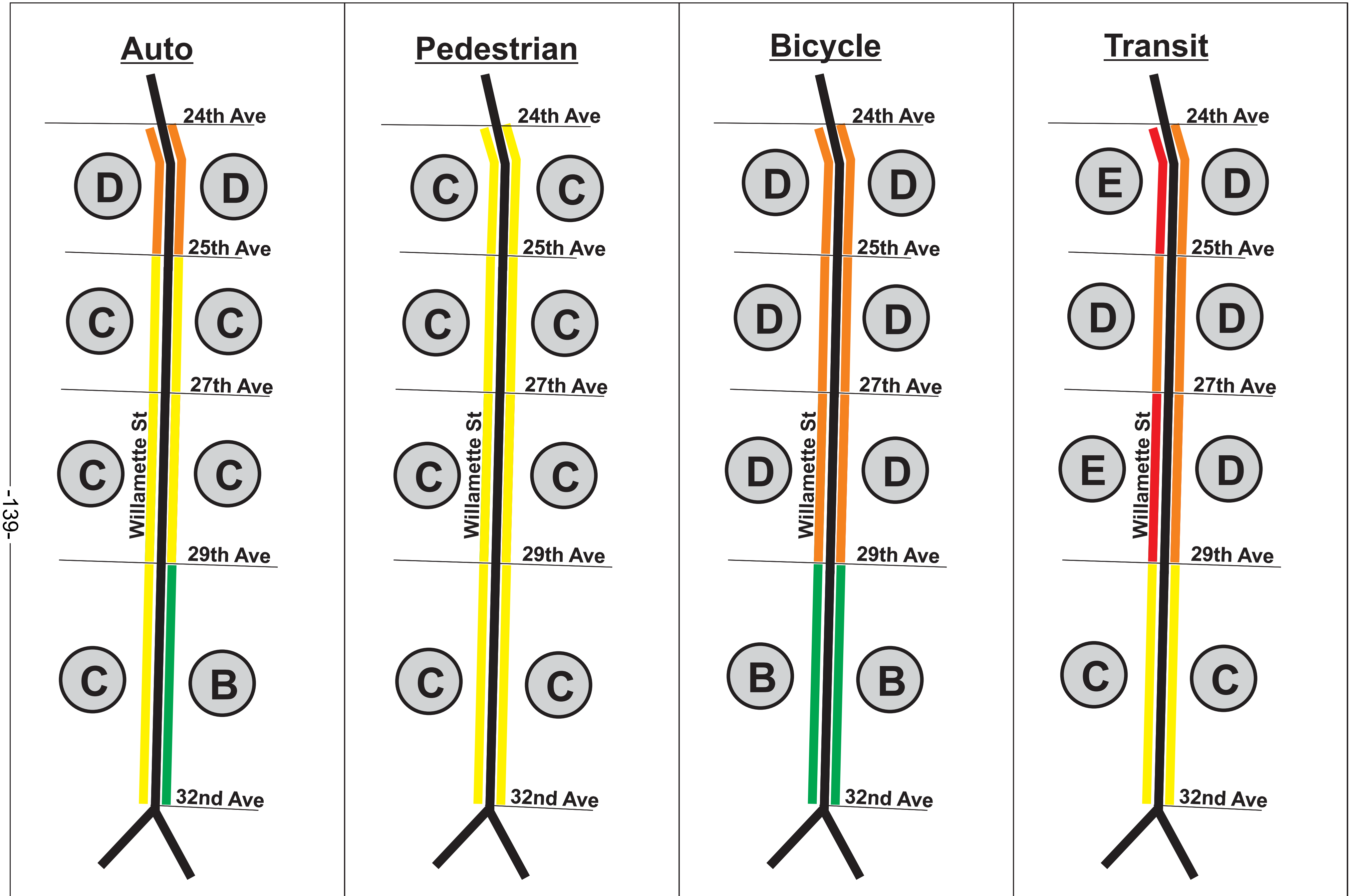
[8] LOS+ Software developed by Fehr & Peers.



LEGEND

(A) Level of Service

Segment Operations

LOS B LOS C LOS D LOS E

DKS

No Scale

Figure 9

EXISTING PM MULTI-MODAL LEVEL OF SERVICE (MMLOS)

South Willamette Street Improvement Plan

Collision Analysis

Collision analysis was performed for the study corridor as well as the study intersections to identify collision trends and potentially hazardous locations in need of safety improvements. The most recent three years of available collision data (2008-2010) were obtained from the ODOT Crash and Analysis Reporting Unit and verified against collision data provided by the City of Eugene.

In total, the Willamette Street corridor between 24th Avenue and 32nd Avenue experienced 74 collisions during the three years evaluated. Of the 74 reported collisions, 26 (35%) were related to movements into or out of an alley or driveway. The study corridor was divided into three segments with the northernmost segment including collisions occurring at the 24th Avenue intersection as well as those occurring up to and at the 27th Avenue intersection. The middle segment includes collisions occurring south of 27th Avenue up to and at 29th Avenue, and the southern segment includes collision occurring south of 29th Avenue through 32nd Avenue. Table 4 provides a summary of the collisions occurring along each segment.

The yearly collision rate for this segment of Willamette Street was calculated based on the total number of collisions occurring over the length of the study corridor. The resulting collision rate is 5.2 collisions per million vehicle-miles traveled (VMT). This is nearly double the statewide average of 2.91 collisions per million VMT for urban city minor arterial roadways for the same years (i.e., 2008-2010). [9]

Table 4: 2008-2010 Segment Collision Summary

Segment (Distance)	Severity		Type				Total	Collision Rate[b]
	Injury	PDO[a]	Turn	Rear-End	Angle	Other		
24th Ave thru 27th Ave (0.30 mi.)	14	10	7	10	6	1	24	-
27th Ave thru 29th Ave (0.20 mi.)	15	18	22	8	1	2	33	-
29th Ave thru 32nd Ave (0.28 mi.)	11	6	6	10	0	1	17	-
Entire Study Corridor (0.78 mi.)	**40**	**34**	**35**	**28**	**7**	**4**	**74**	**5.2**
% of Total	**54%**	**46%**	**47%**	**38%**	**10%**	**5%**	**100%**	-

[a] PDO = Property Damage Only
[b] Rate Calculation = Collision per year / (Average Daily Traffic x 365 days / 1 million vehicle-miles traveled)

Collision analysis was also performed at the individual study intersections to pinpoint high collision locations. Table 5 lists the number of collisions at each study intersection and categorizes them by severity, type, and collision rate. Collisions occurring along this corridor are associated with the nearest intersection, although in many cases they are not specifically related to intersection operations. All collisions occurring within 100 feet of an intersection were included in the totals shown in Table 5. Individual vehicle movements were examined to determine if a collision should be included in the total for each study intersection when coded as occurring more than 100 feet from the intersection. For the years evaluated, there were 5 bike collisions, no pedestrian collisions, and no collisions resulting in a fatality. As shown, roughly half of the collisions resulted in an injury and over half of the collisions were related to turning movements.

[9] *2011 State Highway Crash Rate Tables*, ODOT Crash Analysis and Reporting Unit, August 2011; Table II, pg. 7.

Development to an update of the Eugene TSP[10] identified a potential safety concern at the Willamette Street/29th Avenue intersection due to a collision rate of 1.40; however it also acknowledges that many of the collisions were related to driveways or alleys. The collision rate in this analysis for the Willamette Street/29th Avenue intersection was found to be significantly lower (0.76). As discussed above, this reduction is attributed to removing driveway-related collisions that were outside the influence of the intersection.

Table 5: 2008-2010 Intersection Collision Summary

Intersection	Severity		Type				Total	Collision Rate[b]
	Injury	PDO[a]	Turn	Rear-End	Angle	Other		
Willamette Street/24th Avenue	2	2	0	1	3	0	4	0.21
Willamette Street/25th Avenue	5	1	2	3	1	0	6	0.34
Willamette Street/27th Avenue	5	4	4	2	2	1	9	0.44
Willamette Street/Willamette Plaza Driveway	3	5	8	0	0	0	8	0.45
Willamette Street/29th Avenue	8	14	12	7	2	1	22	0.76
Willamette Street/32nd Avenue	3	1	2	2	0	0	4	0.23
Total	**26**	**27**	**28**	**15**	**8**	**2**	**53**	-
% of Total	**49%**	**51%**	**53%**	**28%**	**15%**	**4%**	**100%**	-

[a] PDO = Property Damage Only
[b] Collisions per 1 million entering vehicles

PLANNED IMPROVEMENTS

To accurately predict future traffic volumes and operations, it is critical to identify planned improvements to the transportation system that would alter the existing conditions. This section summarizes the identified planned improvements that would impact the study corridor.

The Eugene TSP identifies potential projects to address recognized needs and deficiencies throughout the City; however it does not recommend specific projects at this time. One of the identified projects was a bike and pedestrian transformation between 24th Avenue and 32nd Avenue (the subject of this study).

The Eugene Pedestrian and Bicycle Master Plan (PBMP) identifies existing conditions and needed improvements to the bicycle and pedestrian facilities. In developing this plan, three corridors were selected for a more detailed level of feasibility analysis, one of which was Willamette Street from 18th Avenue to 32nd Avenue. As a companion document to the PBMP, a technical memorandum[11] documents the recommended improvements as well as several alternatives. Some of these alternatives maintain existing curb-to-curb widths, and some require utilization of additional available ROW to widen the road. Additional details regarding the identified alternative can be found in the referenced document.

[10] *Eugene Transportation System Plan: Existing Conditions and Deficiencies, March 2011*
[11] *Eugene Pedestrian and Bicycle Master Plan Road Reconfiguration Assessment*, May 2011

A rehabilitation of Willamette Street from 19th Avenue to 24th Avenue is planned to occur in 2013. This project will include replacing deteriorating and failing sections of pavement, as well as reconstructing sidewalk access ramps to meet accessibility standards. This project is currently in the public involvement process and the project website[12] has information about the public feedback received so far. Among the many concerns identified, roughly 96% of respondents to an online survey indicated that they would like to see bike lanes added to this segment of Willamette Street. If bike lanes are included in the redesign, it will further increase the benefit of providing connecting bike facilities from 24th Avenue to 32nd Avenue.

FORECAST CONDITIONS

This section provides a summary of future year (2035) motor vehicle traffic operations for the p.m. peak hour. Traffic operations analysis is based on *2000 Highway Capacity Manual* methodology[13]. The estimated average delay, level of service (LOS), and volume to capacity (v/c) ratio of each study intersection are shown in Table 6. As shown, all of the study intersections are anticipated to meet the minimum performance standard of LOS "D" operations, with the exception of the Willamette Street/29th Avenue intersection. Future year travel volume forecasts were developed using the regional travel demand model developed by the Lane Council of Governments (LCOG). Future year 2035 motor vehicle volumes and intersection operations are documented in the appendix.

Table 6: Future Intersection Operations

Intersection	Operating Standard	Existing P.M. Peak Hour			2035 P.M. Peak Hour		
		Delay	*LOS*	*V/C*	*Delay*	*LOS*	*V/C*
Signalized							
Willamette Street/24th Avenue	LOS D	13.9	B	0.61 (0.74)	16.0	B	0.72 (0.80)
Willamette Street/25th Avenue	LOS D	9.3	A	0.39 (0.49)	11.3	B	0.45 (0.56)
Willamette Street/27th Avenue	LOS D	8.4	A	0.45 (0.46)	11.6	B	0.57 (0.60)
Willamette Street/29th Avenue	LOS D	41.3	D	0.83 (0.85)	70.8	**E**	>1.0 (>1.0)
Willamette Street/32nd Avenue	LOS D	10.5	B	0.67 (0.73)	18.6	B	0.81 (0.95)
Unsignalized							
Willamette Street/Willamette Plaza Driveway	N/A	3.4	A/C	0.44	3.7	A/D	0.53

Signalized Intersections:
LOS = Level of Service of Intersection
V/C = Volume-to-Capacity Ratio of Intersection (Critical Movement)

Unsignalized Intersections:
LOS = Level of Service of Major Street/Minor Street
V/C = Volume-to-Capacity Ratio of Worst Movement

[12] http://www.eugene-or.gov/index.aspx?NID=2195
[13] *2000 Highway Capacity Manual*, Transportation Research Board, Washington DC, 2000.

Appendix

Level of Service Descriptions

HCM Analysis – Existing

HCM Analysis – Future

Level of Service Descriptions

TRAFFIC LEVELS OF SERVICE

Analysis of traffic volumes is useful in understanding the general nature of traffic in an area, but by itself indicates neither the ability of the street network to carry additional traffic nor the quality of service afforded by the street facilities. For this, the concept of *level of service* has been developed to subjectively describe traffic performance. Level of service can be measured at intersections and along key roadway segments.

Level of service categories are similar to report card ratings for traffic performance. Intersections are typically the controlling bottlenecks of traffic flow and the ability of a roadway system to carry traffic efficiently is generally diminished in their vicinities. Levels of Service A, B and C indicate conditions where traffic moves without significant delays over periods of peak travel demand. Level of service D and E are progressively worse peak hour operating conditions and F conditions represent where demand exceeds the capacity of an intersection. Most urban communities set level of service D as the minimum acceptable level of service for peak hour operation and plan for level of service C or better for all other times of the day. The *Highway Capacity Manual* provides level of service calculation methodology for both intersections and arterials.[1] The following two sections provide interpretations of the analysis approaches.

1 *2000 Highway Capacity Manual*, Transportation Research Board, Washington D.C., 2000, Chapters 16 and 17.

UNSIGNALIZED INTERSECTIONS (Two-Way Stop Controlled)

Unsignalized intersection level of service is reported for the major street and minor street (generally, left turn movements). The method assesses available and critical gaps in the traffic stream which make it possible for side street traffic to enter the main street flow. The *2000 Highway Capacity Manual* describes the detailed methodology. It is not unusual for an intersection to experience level of service E or F conditions for the minor street left turn movement. It should be understood that, often, a poor level of service is experienced by only a few vehicles and the intersection as a whole operates acceptably.

Unsignalized intersection levels of service are described in the following table.

Level of Service	Expected Delay	(Sec/Veh)
A	Little or no delay	0-10.0
B	Short traffic delay	>10.1-15.0
C	Average traffic delays	>15.1-25.0
D	Long traffic delays	>25.1-35.0
E	Very long traffic delays	>35.1-50.0
F	Extreme delays potentially affecting other traffic movements in the intersection	> 50

Source: 2000 *Highway Capacity Manual*, Transportation Research Board Washington, D.C.

SIGNALIZED INTERSECTIONS

For signalized intersections, level of service is evaluated based upon average vehicle delay experienced by vehicles entering an intersection. Control delay (or signal delay) includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. In previous versions of this chapter of the HCM (1994 and earlier), delay included only stopped delay. As delay increases, the level of service decreases. Calculations for signalized and unsignalized intersections are different due to the variation in traffic control. The *2000 Highway Capacity Manual* provides the basis for these calculations.

Level of Service	Delay (secs.)	Description
A	≤10.00	**Free Flow/Insignificant Delays:** No approach phase is fully utilized by traffic and no vehicle waits longer than one red indication. Most vehicles do not stop at all. Progression is extremely favorable and most vehicles arrive during the green phase.
B	10.1-20.0	**Stable Operation/Minimal Delays:** An occasional approach phase is fully utilized. Many drivers begin to feel somewhat restricted within platoons of vehicles. This level generally occurs with good progression, short cycle lengths, or both.
C	20.1-35.0	**Stable Operation/Acceptable Delays:** Major approach phases fully utilized. Most drivers feel somewhat restricted. Higher delays may result from fair progression, longer cycle lengths, or both. Individual cycle failures may begin to appear at this level, and the number of vehicles stopping is significant.
D	35.1-55.0	**Approaching Unstable/Tolerable Delays:** The influence of congestion becomes more noticeable. Drivers may have to wait through more than one red signal indication. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high v/c ratios. The proportion of vehicles not stopping declines, and individual cycle failures are noticeable.
E	55.1-80.0	**Unstable Operation/Significant Delays:** Volumes at or near capacity. Vehicles may wait though several signal cycles. Long queues form upstream from intersection. These high delay values generally indicate poor progression, long cycle lengths, and high v/c ratios. Individual cycle failures are a frequent occurrence.
F	≥80.0	**Forced Flow/Excessive Delays:** Represents jammed conditions. Queues may block upstream intersections. This level occurs when arrival flow rates exceed intersection capacity, and is considered to be unacceptable to most drivers. Poor progression, long cycle lengths, and v/c ratios approaching 1.0 may contribute to these high delay levels.

Source: *2000 Highway Capacity Manual*, Transportation Research Board, Washington D.C.

HCM Analysis – Existing AM Peak

HCM Signalized Intersection Capacity Analysis
1: Willamette Street & 24th Avenue

S. Willamette Street Corridor
Existing AM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	81	12	100	53	27	5	497	202	28	311	8
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.5			4.5	4.5		4.5	4.5		4.5	
Lane Util. Factor		1.00			1.00	1.00		1.00	1.00		0.95	
Frpb, ped/bikes		1.00			1.00	0.92		1.00	0.93		1.00	
Flpb, ped/bikes		1.00			1.00	1.00		1.00	1.00		1.00	
Frt		0.99			1.00	0.85		1.00	0.85		1.00	
Flt Protected		0.99			0.97	1.00		1.00	1.00		1.00	
Satd. Flow (prot)		1694			1677	1367		1715	1363		3079	
Flt Permitted		0.95			0.76	1.00		1.00	1.00		0.90	
Satd. Flow (perm)		1626			1318	1367		1711	1363		2770	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	16	89	13	110	58	30	5	546	222	31	342	9
RTOR Reduction (vph)	0	8	0	0	0	22	0	0	87	0	2	0
Lane Group Flow (vph)	0	110	0	0	168	8	0	551	135	0	380	0
Confl. Peds. (#/hr)	6		6	6		6	13		27	27		13
Confl. Bikes (#/hr)			1			36			5			6
Heavy Vehicles (%)	0%	1%	0%	0%	2%	0%	0%	2%	1%	4%	7%	12%
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6		6	8		8	4		
Actuated Green, G (s)		18.5			18.5	18.5		42.5	42.5		42.5	
Effective Green, g (s)		18.5			18.5	18.5		42.5	42.5		42.5	
Actuated g/C Ratio		0.26			0.26	0.26		0.61	0.61		0.61	
Clearance Time (s)		4.5			4.5	4.5		4.5	4.5		4.5	
Vehicle Extension (s)		3.0			3.0	3.0		2.0	2.0		2.0	
Lane Grp Cap (vph)		429			348	361		1038	827		1681	
v/s Ratio Prot												
v/s Ratio Perm		0.07			c0.13	0.01		c0.32	0.10		0.14	
v/c Ratio		0.26			0.48	0.02		0.53	0.16		0.23	
Uniform Delay, d1		20.3			21.7	19.1		8.0	6.0		6.3	
Progression Factor		1.00			1.00	1.00		0.61	0.68		1.00	
Incremental Delay, d2		0.3			1.1	0.0		1.9	0.4		0.3	
Delay (s)		20.6			22.8	19.1		6.7	4.5		6.6	
Level of Service		C			C	B		A	A		A	
Approach Delay (s)		20.6			22.2			6.1			6.6	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	9.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	70.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
2: Willamette Street & 25th Avenue

S. Willamette Street Corridor
Existing AM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	5	7	14	3	13	9	694	12	9	413	19
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.5			4.5			4.5			4.5	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frpb, ped/bikes		0.99			0.98			1.00			1.00	
Flpb, ped/bikes		0.99			0.99			1.00			1.00	
Frt		0.97			0.94			1.00			0.99	
Flt Protected		0.97			0.98			1.00			1.00	
Satd. Flow (prot)		1615			1570			3276			3204	
Flt Permitted		0.81			0.84			0.95			0.94	
Satd. Flow (perm)		1342			1352			3109			3010	
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	18	6	8	17	4	16	11	836	14	11	498	23
RTOR Reduction (vph)	0	7	0	0	14	0	0	1	0	0	2	0
Lane Group Flow (vph)	0	25	0	0	23	0	0	860	0	0	530	0
Confl. Peds. (#/hr)	17		12	12		17	6		16	16		6
Confl. Bikes (#/hr)			2			6			9			10
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	1%	8%	0%	3%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)		7.2			7.2			53.8			53.8	
Effective Green, g (s)		7.2			7.2			53.8			53.8	
Actuated g/C Ratio		0.10			0.10			0.77			0.77	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Vehicle Extension (s)		3.0			3.0			2.0			2.0	
Lane Grp Cap (vph)		138			139			2389			2313	
v/s Ratio Prot												
v/s Ratio Perm		c0.02			0.02			c0.28			0.18	
v/c Ratio		0.18			0.16			0.36			0.23	
Uniform Delay, d1		28.7			28.7			2.6			2.3	
Progression Factor		1.00			1.00			0.59			1.71	
Incremental Delay, d2		0.6			0.6			0.4			0.2	
Delay (s)		29.3			29.2			1.9			4.1	
Level of Service		C			C			A			A	
Approach Delay (s)		29.3			29.2			1.9			4.1	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	4.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	50.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Willamette Street & 27th Avenue

S. Willamette Street Corridor
Existing AM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	25	44	26	21	35	15	18	650	30	10	370	13
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frpb, ped/bikes	1.00	0.99		1.00	0.99			1.00			1.00	
Flpb, ped/bikes	0.99	1.00		0.99	1.00			1.00			1.00	
Frt	1.00	0.94		1.00	0.96			0.99			1.00	
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)	1588	1592		1649	1657			3261			3143	
Flt Permitted	0.72	1.00		0.70	1.00			0.94			0.94	
Satd. Flow (perm)	1203	1592		1222	1657			3067			2948	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	29	51	30	24	40	17	21	747	34	11	425	15
RTOR Reduction (vph)	0	24	0	0	14	0	0	3	0	0	2	0
Lane Group Flow (vph)	29	57	0	24	43	0	0	799	0	0	449	0
Confl. Peds. (#/hr)	6		8	8		6	5		19	19		5
Confl. Bikes (#/hr)			1			10			2			9
Heavy Vehicles (%)	4%	0%	8%	0%	0%	0%	0%	1%	0%	0%	5%	8%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	14.4	14.4		14.4	14.4			46.6			46.6	
Effective Green, g (s)	14.4	14.4		14.4	14.4			46.6			46.6	
Actuated g/C Ratio	0.21	0.21		0.21	0.21			0.67			0.67	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			2.0			2.0	
Lane Grp Cap (vph)	247	327		251	340			2041			1962	
v/s Ratio Prot		c0.04			0.03							
v/s Ratio Perm	0.02			0.02				c0.26			0.15	
v/c Ratio	0.12	0.17		0.10	0.13			0.39			0.23	
Uniform Delay, d1	22.6	22.9		22.5	22.7			5.3			4.6	
Progression Factor	1.00	1.00		1.00	1.00			1.00			0.90	
Incremental Delay, d2	0.2	0.3		0.2	0.2			0.6			0.3	
Delay (s)	22.8	23.2		22.7	22.8			5.9			4.4	
Level of Service	C	C		C	C			A			A	
Approach Delay (s)		23.1			22.8			5.9			4.4	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	7.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	57.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

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HCM Unsignalized Intersection Capacity Analysis
4: Willamette Street & Willamette Street Plaza Driveway

S. Willamette Street Corridor
Existing AM Peak

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	34	20	11	650	325	54
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	39	23	13	747	374	62
Pedestrians				9	6	
Lane Width (ft)				12.0	12.0	
Walking Speed (ft/s)				4.0	4.0	
Percent Blockage				1	1	
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				341	673	
pX, platoon unblocked	0.86					
vC, conflicting volume	809	227	436			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	445	227	436			
tC, single (s)	6.9	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	91	97	99			
cM capacity (veh/h)	455	776	1135			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	39	23	262	498	249	187
Volume Left	39	0	13	0	0	0
Volume Right	0	23	0	0	0	62
cSH	455	776	1135	1700	1700	1700
Volume to Capacity	0.09	0.03	0.01	0.29	0.15	0.11
Queue Length 95th (ft)	7	2	1	0	0	0
Control Delay (s)	13.7	9.8	0.5	0.0	0.0	0.0
Lane LOS	B	A	A			
Approach Delay (s)	12.2		0.2		0.0	
Approach LOS	B					

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	40.6%	ICU Level of Service	A
Analysis Period (min)	15		

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HCM Signalized Intersection Capacity Analysis
5: 29th Ave & Willamette St

S. Willamette Street Corridor
Existing AM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	98	311	171	46	215	55	289	532	56	74	211	37
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	10	10	10	10	11	10	10	12	12	12	12
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.95	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1630	1601	1264	1349	1586	1373	1492	2986		1539	3021	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1630	1601	1264	1349	1586	1373	1492	2986		1539	3021	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	111	353	194	52	244	62	328	605	64	84	240	42
RTOR Reduction (vph)	0	0	90	0	0	48	0	9	0	0	17	0
Lane Group Flow (vph)	111	353	104	52	244	14	328	660	0	84	265	0
Confl. Peds. (#/hr)	7		11	11		7	11		14	14		11
Confl. Bikes (#/hr)			23			27			6			7
Heavy Vehicles (%)	2%	2%	8%	15%	3%	0%	4%	1%	11%	8%	6%	11%
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2	3	1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	6.7	20.3	40.5	3.6	17.2	17.2	20.2	26.8		6.5	13.1	
Effective Green, g (s)	6.7	20.3	40.5	3.6	17.2	17.2	20.2	26.8		6.5	13.1	
Actuated g/C Ratio	0.09	0.27	0.54	0.05	0.23	0.23	0.27	0.36		0.09	0.17	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	145	432	756	64	362	314	400	1064		133	526	
v/s Ratio Prot	c0.07	c0.22	0.04	0.04	0.15		c0.22	c0.22		0.05	0.09	
v/s Ratio Perm			0.05			0.01						
v/c Ratio	0.77	0.82	0.14	0.81	0.67	0.05	0.82	0.62		0.63	0.50	
Uniform Delay, d1	33.5	25.7	8.6	35.5	26.4	22.6	25.8	20.0		33.2	28.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	19.2	10.8	0.0	50.3	3.9	0.0	11.8	0.8		7.0	0.3	
Delay (s)	52.7	36.5	8.7	85.7	30.3	22.6	37.6	20.8		40.2	28.4	
Level of Service	D	D	A	F	C	C	D	C		D	C	
Approach Delay (s)		31.0			37.0			26.3			31.1	
Approach LOS		C			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	30.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	75.2	Sum of lost time (s)	18.0
Intersection Capacity Utilization	64.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
6: Donald Street & Willamette St & 32nd Ave

S. Willamette Street Corridor
Existing AM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	600	5	1	6	3	19	1	285	2	11	187	265
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		5.0			4.0			4.0			4.0	5.0
Lane Util. Factor		1.00			1.00			1.00			1.00	1.00
Frpb, ped/bikes		1.00			0.98			1.00			1.00	0.98
Flpb, ped/bikes		1.00			1.00			1.00			1.00	1.00
Frt		1.00			0.91			1.00			1.00	0.85
Flt Protected		0.95			0.99			1.00			1.00	1.00
Satd. Flow (prot)		1629			1545			1681			1666	1403
Flt Permitted		0.67			0.91			1.00			0.97	1.00
Satd. Flow (perm)		1138			1423			1680			1617	1403
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	714	6	1	7	4	23	1	339	2	13	223	315
RTOR Reduction (vph)	0	0	0	0	10	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	721	0	0	24	0	0	342	0	0	236	315
Confl. Peds. (#/hr)	2		3	3		2	4		4	4		4
Confl. Bikes (#/hr)			4			8			7			7
Heavy Vehicles (%)	2%	0%	0%	0%	0%	0%	0%	4%	0%	0%	5%	4%
Turn Type	custom	NA		Perm	NA		Perm	NA		Perm	NA	custom
Protected Phases					8			2			6	
Permitted Phases	3	3		8			2			6		3 6
Actuated Green, G (s)		51.0			45.7			18.4			18.4	78.4
Effective Green, g (s)		51.0			45.7			18.4			18.4	74.4
Actuated g/C Ratio		0.65			0.58			0.23			0.23	0.95
Clearance Time (s)		5.0			4.0			4.0			4.0	
Vehicle Extension (s)		2.0			2.5			2.5			2.5	
Lane Grp Cap (vph)		740			829			394			379	1331
v/s Ratio Prot												
v/s Ratio Perm		c0.63			0.02			c0.20			0.15	0.22
v/c Ratio		0.97			0.03			0.87			0.62	0.24
Uniform Delay, d1		13.1			6.9			28.8			26.9	0.1
Progression Factor		1.00			1.00			1.00			1.00	1.00
Incremental Delay, d2		26.5			0.0			17.8			2.7	0.0
Delay (s)		39.6			6.9			46.6			29.6	0.2
Level of Service		D			A			D			C	A
Approach Delay (s)		39.6			6.9			46.6			12.8	
Approach LOS		D			A			D			B	

Intersection Summary			
HCM 2000 Control Delay	31.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	78.4	Sum of lost time (s)	11.0
Intersection Capacity Utilization	70.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Item A.

HCM Analysis – Existing PM Peak

HCM Signalized Intersection Capacity Analysis — S. Willamette Street Corridor

1: Willamette Street & 24th Avenue — Existing PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			↰	↱		↰	↱		↰↑↱	
Volume (vph)	14	45	11	218	76	35	3	396	190	47	689	14
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.5			4.5	4.5		4.5	4.5		4.5	
Lane Util. Factor		1.00			1.00	1.00		1.00	1.00		0.95	
Frpb, ped/bikes		0.99			1.00	0.96		1.00	0.96		1.00	
Flpb, ped/bikes		1.00			1.00	1.00		1.00	1.00		1.00	
Frt		0.98			1.00	0.85		1.00	0.85		1.00	
Flt Protected		0.99			0.96	1.00		1.00	1.00		1.00	
Satd. Flow (prot)		1684			1675	1427		1732	1408		3271	
Flt Permitted		0.92			0.73	1.00		1.00	1.00		0.90	
Satd. Flow (perm)		1565			1273	1427		1726	1408		2958	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	15	49	12	240	84	38	3	435	209	52	757	15
RTOR Reduction (vph)	0	8	0	0	0	25	0	0	97	0	1	0
Lane Group Flow (vph)	0	68	0	0	324	13	0	438	112	0	823	0
Confl. Peds. (#/hr)	7		6	6		7	11		6	6		11
Confl. Bikes (#/hr)			26			6			17			11
Heavy Vehicles (%)	0%	0%	0%	0%	1%	0%	0%	1%	1%	0%	1%	0%
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6		6	8		8	4		
Actuated Green, G (s)		25.8			25.8	25.8		40.2	40.2		40.2	
Effective Green, g (s)		25.8			25.8	25.8		40.2	40.2		40.2	
Actuated g/C Ratio		0.34			0.34	0.34		0.54	0.54		0.54	
Clearance Time (s)		4.5			4.5	4.5		4.5	4.5		4.5	
Vehicle Extension (s)		3.0			3.0	3.0		2.0	2.0		2.0	
Lane Grp Cap (vph)		538			437	490		925	754		1585	
v/s Ratio Prot												
v/s Ratio Perm		0.04			c0.25	0.01		0.25	0.08		c0.28	
v/c Ratio		0.13			0.74	0.03		0.47	0.15		0.52	
Uniform Delay, d1		16.9			21.7	16.3		10.8	8.8		11.2	
Progression Factor		1.00			1.00	1.00		0.64	0.78		1.00	
Incremental Delay, d2		0.1			6.7	0.0		1.7	0.4		1.2	
Delay (s)		17.0			28.3	16.3		8.6	7.2		12.4	
Level of Service		B			C	B		A	A		B	
Approach Delay (s)		17.0			27.1			8.2			12.4	
Approach LOS		B			C			A			B	

Intersection Summary			
HCM 2000 Control Delay	13.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	80.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis — S. Willamette Street Corridor

2: Willamette Street & 25th Avenue — Existing PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			↰↑↱			↰↑↱	
Volume (vph)	30	3	8	21	4	11	11	551	14	5	890	25
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.5			4.5			4.5			4.5	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frpb, ped/bikes		0.99			0.99			1.00			1.00	
Flpb, ped/bikes		0.98			0.99			1.00			1.00	
Frt		0.97			0.96			1.00			1.00	
Flt Protected		0.96			0.97			1.00			1.00	
Satd. Flow (prot)		1570			1599			3275			3275	
Flt Permitted		0.82			0.86			0.93			0.95	
Satd. Flow (perm)		1340			1419			3063			3121	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	32	3	9	23	4	12	12	592	15	5	957	27
RTOR Reduction (vph)	0	7	0	0	9	0	0	2	0	0	2	0
Lane Group Flow (vph)	0	37	0	0	30	0	0	617	0	0	987	0
Confl. Peds. (#/hr)	20		8	8		20	7		5	5		7
Confl. Bikes (#/hr)			6			7			17			17
Heavy Vehicles (%)	3%	0%	0%	0%	0%	0%	0%	1%	0%	0%	1%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)		18.0			18.0			48.0			48.0	
Effective Green, g (s)		18.0			18.0			48.0			48.0	
Actuated g/C Ratio		0.24			0.24			0.64			0.64	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Vehicle Extension (s)		3.0			3.0			2.0			2.0	
Lane Grp Cap (vph)		321			340			1960			1997	
v/s Ratio Prot												
v/s Ratio Perm		c0.03			0.02			0.20			c0.32	
v/c Ratio		0.12			0.09			0.31			0.49	
Uniform Delay, d1		22.3			22.1			6.1			7.1	
Progression Factor		1.00			1.00			1.76			0.88	
Incremental Delay, d2		0.2			0.1			0.4			0.8	
Delay (s)		22.4			22.2			11.1			7.0	
Level of Service		C			C			B			A	
Approach Delay (s)		22.4			22.2			11.1			7.0	
Approach LOS		C			C			B			A	

Intersection Summary			
HCM 2000 Control Delay	9.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	53.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Willamette Street & 27th Avenue

S. Willamette Street Corridor
Existing PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	25	32	39	119	75	34	23	538	31	21	800	52
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frpb, ped/bikes	1.00	0.98		1.00	0.98			1.00			1.00	
Flpb, ped/bikes	0.97	1.00		0.98	1.00			1.00			1.00	
Frt	1.00	0.92		1.00	0.95			0.99			0.99	
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)	1613	1554		1620	1609			3218			3247	
Flt Permitted	0.68	1.00		0.71	1.00			0.91			0.93	
Satd. Flow (perm)	1163	1554		1210	1609			2921			3038	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	26	33	40	123	77	35	24	555	32	22	825	54
RTOR Reduction (vph)	0	30	0	0	27	0	0	4	0	0	4	0
Lane Group Flow (vph)	26	43	0	123	85	0	0	607	0	0	897	0
Confl. Peds. (#/hr)	28		14	14		28	9		14	14		9
Confl. Bikes (#/hr)			7			4			15			13
Heavy Vehicles (%)	0%	3%	0%	1%	3%	0%	0%	2%	3%	5%	1%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	18.2	18.2		18.2	18.2			47.8			47.8	
Effective Green, g (s)	18.2	18.2		18.2	18.2			47.8			47.8	
Actuated g/C Ratio	0.24	0.24		0.24	0.24			0.64			0.64	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			2.0			2.0	
Lane Grp Cap (vph)	282	377		293	390			1861			1936	
v/s Ratio Prot		0.03			0.05							
v/s Ratio Perm	0.02			c0.10				0.21			c0.30	
v/c Ratio	0.09	0.11		0.42	0.22			0.33			0.46	
Uniform Delay, d1	22.0	22.1		23.9	22.7			6.2			7.0	
Progression Factor	1.00	1.00		1.00	1.00			1.00			0.45	
Incremental Delay, d2	0.1	0.1		1.0	0.3			0.5			0.7	
Delay (s)	22.1	22.3		24.9	23.0			6.7			3.9	
Level of Service	C	C		C	C			A			A	
Approach Delay (s)		22.2			24.0			6.7			3.9	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	8.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	64.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
4: Willamette Street & Willamette Street Plaza Driveway

S. Willamette Street Corridor
Existing PM Peak

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	123	148	35	443	717	168
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	127	153	36	457	739	173
Pedestrians				29	3	
Lane Width (ft)				12.0	12.0	
Walking Speed (ft/s)				4.0	4.0	
Percent Blockage				2	0	
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				341	673	
pX, platoon unblocked	0.97	0.94	0.94			
vC, conflicting volume	1129	485	912			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	821	327	781			
tC, single (s)	6.8	6.9	4.2			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	56	75	95			
cM capacity (veh/h)	289	617	777			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	127	153	188	304	493	420
Volume Left	127	0	36	0	0	0
Volume Right	0	153	0	0	0	173
cSH	289	617	777	1700	1700	1700
Volume to Capacity	0.44	0.25	0.05	0.18	0.29	0.25
Queue Length 95th (ft)	53	24	4	0	0	0
Control Delay (s)	26.8	12.7	2.3	0.0	0.0	0.0
Lane LOS	D	B	A			
Approach Delay (s)	19.1		0.9		0.0	
Approach LOS	C					

Intersection Summary			
Average Delay	3.4		
Intersection Capacity Utilization	60.0%	ICU Level of Service	B
Analysis Period (min)	15		

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HCM Signalized Intersection Capacity Analysis
5: 29th Ave & Willamette St

S. Willamette Street Corridor
Existing PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑↑↱		↰	↑↑↱	
Volume (vph)	112	252	317	111	328	66	271	298	43	152	560	93
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	10	10	10	10	11	10	10	12	12	12	12
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.96	1.00	0.99		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1662	1601	1339	1492	1617	1356	1536	2931		1646	3202	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1662	1601	1339	1492	1617	1356	1536	2931		1646	3202	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	118	265	334	117	345	69	285	314	45	160	589	98
RTOR Reduction (vph)	0	0	56	0	0	52	0	9	0	0	11	0
Lane Group Flow (vph)	118	265	278	117	345	17	285	350	0	160	676	0
Confl. Peds. (#/hr)	8		18	18		8	5		10	10		5
Confl. Bikes (#/hr)			25			17			5			14
Heavy Vehicles (%)	0%	2%	1%	4%	1%	2%	1%	3%	5%	1%	1%	0%
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2	3	1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	10.4	25.3	48.4	11.2	26.1	26.1	23.1	35.1		14.4	26.4	
Effective Green, g (s)	10.4	25.3	48.4	11.2	26.1	26.1	23.1	35.1		14.4	26.4	
Actuated g/C Ratio	0.10	0.24	0.47	0.11	0.25	0.25	0.22	0.34		0.14	0.25	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	166	389	681	160	405	340	341	989		227	812	
v/s Ratio Prot	0.07	0.17	0.09	c0.08	c0.21		c0.19	0.12		0.10	c0.21	
v/s Ratio Perm			0.12			0.01						
v/c Ratio	0.71	0.68	0.41	0.73	0.85	0.05	0.84	0.35		0.70	0.83	
Uniform Delay, d1	45.3	35.7	18.3	44.9	37.1	29.6	38.6	25.9		42.8	36.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	11.3	3.9	0.1	13.7	15.2	0.0	15.4	0.1		7.9	7.0	
Delay (s)	56.6	39.6	18.5	58.7	52.3	29.6	54.1	26.0		50.6	43.7	
Level of Service	E	D	B	E	D	C	D	C		D	D	
Approach Delay (s)		32.6			50.8			38.4			45.0	
Approach LOS		C			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	41.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	104.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	76.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
6: Donald St & Willamette St & 32nd Ave

S. Willamette Street Corridor
Existing PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			↰↑	↱
Volume (vph)	360	5	3	5	9	16	2	230	1	28	300	613
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		5.0			4.0			4.0			4.0	5.0
Lane Util. Factor		1.00			1.00			1.00			1.00	1.00
Frpb, ped/bikes		1.00			0.99			1.00			1.00	0.98
Flpb, ped/bikes		1.00			1.00			1.00			1.00	1.00
Frt		1.00			0.93			1.00			1.00	0.85
Flt Protected		0.95			0.99			1.00			1.00	1.00
Satd. Flow (prot)		1648			1537			1714			1726	1451
Flt Permitted		0.65			0.96			1.00			0.96	1.00
Satd. Flow (perm)		1123			1481			1710			1666	1451
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	379	5	3	5	9	17	2	242	1	29	316	645
RTOR Reduction (vph)	0	0	0	0	9	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	387	0	0	22	0	0	245	0	0	345	645
Confl. Peds. (#/hr)	1					1	2		8	8		2
Confl. Bikes (#/hr)			4			2			2			4
Heavy Vehicles (%)	1%	0%	0%	0%	0%	6%	0%	2%	0%	0%	1%	1%
Turn Type	custom	NA		Perm	NA		Perm	NA		Perm	NA	custom
Protected Phases					8			2			6	
Permitted Phases	3	3		8			2			6		3 6
Actuated Green, G (s)		34.2			29.0			17.2			17.2	60.4
Effective Green, g (s)		34.2			29.0			17.2			17.2	56.4
Actuated g/C Ratio		0.57			0.48			0.28			0.28	0.93
Clearance Time (s)		5.0			4.0			4.0			4.0	
Vehicle Extension (s)		2.0			2.5			2.5			2.5	
Lane Grp Cap (vph)		635			711			486			474	1354
v/s Ratio Prot												
v/s Ratio Perm		c0.34			0.01			0.14			c0.21	0.44
v/c Ratio		0.61			0.03			0.50			0.73	0.48
Uniform Delay, d1		8.7			8.3			18.0			19.5	0.2
Progression Factor		1.00			1.00			1.00			1.00	1.00
Incremental Delay, d2		1.1			0.0			0.6			5.2	0.1
Delay (s)		9.8			8.3			18.6			24.7	0.3
Level of Service		A			A			B			C	A
Approach Delay (s)		9.8			8.3			18.6			8.8	
Approach LOS		A			A			B			A	

Intersection Summary			
HCM 2000 Control Delay	10.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	60.4	Sum of lost time (s)	11.0
Intersection Capacity Utilization	71.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Item A.

HCM Analysis – Future PM Peak

HCM Signalized Intersection Capacity Analysis
1: Willamette Street & 24th Avenue

S. Willamette Street Corridor
2035 PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	50	15	280	85	50	5	480	215	50	735	20
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.5			4.5	4.5		4.5	4.5		4.5	
Lane Util. Factor		1.00			1.00	1.00		1.00	1.00		0.95	
Frpb, ped/bikes		0.99			1.00	0.96		1.00	0.95		1.00	
Flpb, ped/bikes		1.00			0.99	1.00		1.00	1.00		1.00	
Frt		0.98			1.00	0.85		1.00	0.85		1.00	
Flt Protected		0.99			0.96	1.00		1.00	1.00		1.00	
Satd. Flow (prot)		1679			1673	1428		1732	1406		3268	
Flt Permitted		0.92			0.72	1.00		0.99	1.00		0.86	
Satd. Flow (perm)		1553			1257	1428		1720	1406		2817	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	16	55	16	308	93	55	5	527	236	55	808	22
RTOR Reduction (vph)	0	10	0	0	0	33	0	0	122	0	2	0
Lane Group Flow (vph)	0	77	0	0	401	22	0	532	114	0	883	0
Confl. Peds. (#/hr)	7		6	6		7	11		6	6		11
Confl. Bikes (#/hr)			26			6			17			11
Heavy Vehicles (%)	0%	0%	0%	0%	1%	0%	0%	1%	1%	0%	1%	0%
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6		6	8		8	4		
Actuated Green, G (s)		29.8			29.8	29.8		36.2	36.2		36.2	
Effective Green, g (s)		29.8			29.8	29.8		36.2	36.2		36.2	
Actuated g/C Ratio		0.40			0.40	0.40		0.48	0.48		0.48	
Clearance Time (s)		4.5			4.5	4.5		4.5	4.5		4.5	
Vehicle Extension (s)		3.0			3.0	3.0		2.0	2.0		2.0	
Lane Grp Cap (vph)		617			499	567		830	678		1359	
v/s Ratio Prot												
v/s Ratio Perm		0.05			c0.32	0.02		0.31	0.08		c0.31	
v/c Ratio		0.13			0.80	0.04		0.64	0.17		0.65	
Uniform Delay, d1		14.3			20.0	13.8		14.5	10.9		14.6	
Progression Factor		1.00			1.00	1.00		0.51	0.13		1.00	
Incremental Delay, d2		0.1			9.1	0.0		3.6	0.5		2.4	
Delay (s)		14.4			29.1	13.9		11.0	2.0		17.0	
Level of Service		B			C	B		B	A		B	
Approach Delay (s)		14.4			27.3			8.2			17.0	
Approach LOS		B			C			A			B	

Intersection Summary			
HCM 2000 Control Delay	16.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	91.7%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
2: Willamette Street & 25th Avenue

S. Willamette Street Corridor
2035 PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	35	10	10	30	10	20	15	645	25	10	990	30
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.5			4.5			4.5			4.5	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frpb, ped/bikes		1.00			0.99			1.00			1.00	
Flpb, ped/bikes		0.99			1.00			1.00			1.00	
Frt		0.98			0.95			0.99			1.00	
Flt Protected		0.97			0.98			1.00			1.00	
Satd. Flow (prot)		1592			1599			3267			3273	
Flt Permitted		0.82			0.86			0.92			0.95	
Satd. Flow (perm)		1349			1413			3023			3103	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	38	11	11	32	11	22	16	694	27	11	1065	32
RTOR Reduction (vph)	0	8	0	0	17	0	0	3	0	0	2	0
Lane Group Flow (vph)	0	52	0	0	48	0	0	734	0	0	1106	0
Confl. Peds. (#/hr)	20		8	8		20	7		5	5		7
Confl. Bikes (#/hr)			6			7			17			17
Heavy Vehicles (%)	3%	0%	0%	0%	0%	0%	0%	1%	0%	0%	1%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)		18.0			18.0			48.0			48.0	
Effective Green, g (s)		18.0			18.0			48.0			48.0	
Actuated g/C Ratio		0.24			0.24			0.64			0.64	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Vehicle Extension (s)		3.0			3.0			2.0			2.0	
Lane Grp Cap (vph)		323			339			1934			1985	
v/s Ratio Prot												
v/s Ratio Perm		c0.04			0.03			0.24			c0.36	
v/c Ratio		0.16			0.14			0.38			0.56	
Uniform Delay, d1		22.5			22.4			6.4			7.6	
Progression Factor		1.00			1.00			1.93			1.05	
Incremental Delay, d2		0.2			0.2			0.5			0.9	
Delay (s)		22.8			22.6			13.0			8.8	
Level of Service		C			C			B			A	
Approach Delay (s)		22.8			22.6			13.0			8.8	
Approach LOS		C			C			B			A	

Intersection Summary			
HCM 2000 Control Delay	11.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	60.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Willamette Street & 27th Avenue

S. Willamette Street Corridor
2035 PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	50	60	90	170	155	40	45	595	40	25	895	90
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frpb, ped/bikes	1.00	0.98		1.00	0.99			1.00			1.00	
Flpb, ped/bikes	0.98	1.00		0.99	1.00			1.00			1.00	
Frt	1.00	0.91		1.00	0.97			0.99			0.99	
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)	1621	1541		1623	1640			3211			3229	
Flt Permitted	0.56	1.00		0.64	1.00			0.84			0.93	
Satd. Flow (perm)	949	1541		1088	1640			2692			3002	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	52	62	93	175	160	41	46	613	41	26	923	93
RTOR Reduction (vph)	0	65	0	0	15	0	0	5	0	0	8	0
Lane Group Flow (vph)	52	90	0	175	186	0	0	695	0	0	1034	0
Confl. Peds. (#/hr)	28		14	14		28	9		14	14		9
Confl. Bikes (#/hr)			7			4			15			13
Heavy Vehicles (%)	0%	3%	0%	1%	3%	0%	0%	2%	3%	5%	1%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	20.1	20.1		20.1	20.1			45.9			45.9	
Effective Green, g (s)	20.1	20.1		20.1	20.1			45.9			45.9	
Actuated g/C Ratio	0.27	0.27		0.27	0.27			0.61			0.61	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			2.0			2.0	
Lane Grp Cap (vph)	254	412		291	439			1647			1837	
v/s Ratio Prot		0.06			0.11							
v/s Ratio Perm	0.05			c0.16				0.26			c0.34	
v/c Ratio	0.20	0.22		0.60	0.42			0.42			0.56	
Uniform Delay, d1	21.3	21.3		24.0	22.7			7.6			8.6	
Progression Factor	1.00	1.00		1.00	1.00			1.00			0.66	
Incremental Delay, d2	0.4	0.3		3.5	0.7			0.8			1.1	
Delay (s)	21.7	21.6		27.4	23.3			8.4			6.8	
Level of Service	C	C		C	C			A			A	
Approach Delay (s)		21.6			25.2			8.4			6.8	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	11.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	96.6%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
4: Willamette Street & Willamette Street Plaza Driveway

S. Willamette Street Corridor
2035 PM Peak

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	130	170	40	550	905	185
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	134	175	41	567	933	191
Pedestrians				29	3	
Lane Width (ft)				12.0	12.0	
Walking Speed (ft/s)				4.0	4.0	
Percent Blockage				2	0	
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				341	673	
pX, platoon unblocked	0.93	0.89	0.89			
vC, conflicting volume	1397	591	1124			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	876	292	891			
tC, single (s)	6.8	6.9	4.2			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	47	71	94			
cM capacity (veh/h)	253	614	667			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	134	175	230	378	622	502
Volume Left	134	0	41	0	0	0
Volume Right	0	175	0	0	0	191
cSH	253	614	667	1700	1700	1700
Volume to Capacity	0.53	0.29	0.06	0.22	0.37	0.30
Queue Length 95th (ft)	71	29	5	0	0	0
Control Delay (s)	34.2	13.2	2.5	0.0	0.0	0.0
Lane LOS	D	B	A			
Approach Delay (s)	22.3		1.0		0.0	
Approach LOS	C					

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	67.3%	ICU Level of Service	C
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis — S. Willamette Street Corridor
5: 29th Ave & Willamette St — 2035 PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑↑↱		↰	↑↑↱	
Volume (vph)	140	350	330	140	480	100	290	350	55	210	720	135
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	10	10	10	10	11	10	10	12	12	12	12
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.96	1.00	0.99		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1662	1601	1331	1492	1617	1356	1536	2922		1646	3193	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1662	1601	1331	1492	1617	1356	1536	2922		1646	3193	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	147	368	347	147	505	105	305	368	58	221	758	142
RTOR Reduction (vph)	0	0	34	0	0	67	0	10	0	0	13	0
Lane Group Flow (vph)	147	368	313	147	505	38	305	416	0	221	887	0
Confl. Peds. (#/hr)	8		18	18		8	5		10	10		5
Confl. Bikes (#/hr)			25			17			5			14
Heavy Vehicles (%)	0%	2%	1%	4%	1%	2%	1%	3%	5%	1%	1%	0%
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2	3	1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	10.5	33.6	56.1	12.5	35.6	35.6	22.5	36.0		19.9	33.4	
Effective Green, g (s)	10.5	33.6	56.1	12.5	35.6	35.6	22.5	36.0		19.9	33.4	
Actuated g/C Ratio	0.09	0.28	0.47	0.10	0.30	0.30	0.19	0.30		0.17	0.28	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	145	448	672	155	479	402	288	876		272	888	
v/s Ratio Prot	0.09	0.23	0.09	c0.10	c0.31		c0.20	c0.14		0.13	c0.28	
v/s Ratio Perm			0.15			0.03						
v/c Ratio	1.01	0.82	0.47	0.95	1.05	0.09	1.06	0.48		0.81	1.00	
Uniform Delay, d1	54.8	40.4	21.8	53.4	42.2	30.5	48.8	34.3		48.3	43.3	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	78.4	11.0	0.2	55.9	56.2	0.0	69.4	0.1		15.9	29.7	
Delay (s)	133.2	51.4	21.9	109.3	98.4	30.6	118.2	34.4		64.1	72.9	
Level of Service	F	D	C	F	F	C	F	C		E	E	
Approach Delay (s)		53.5			91.1			69.4			71.2	
Approach LOS		D			F			E			E	

Intersection Summary			
HCM 2000 Control Delay	70.8	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	94.7%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis — S. Willamette Street Corridor
6: Donald St & Willamette St & 32nd Ave — 2035 PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			↰↑	↱
Volume (vph)	390	10	5	10	10	20	5	285	5	30	440	635
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		5.0			4.0			4.0			4.0	5.0
Lane Util. Factor		1.00			1.00			1.00			1.00	1.00
Frpb, ped/bikes		1.00			0.99			1.00			1.00	0.98
Flpb, ped/bikes		1.00			1.00			1.00			1.00	1.00
Frt		1.00			0.93			1.00			1.00	0.85
Flt Protected		0.95			0.99			1.00			1.00	1.00
Satd. Flow (prot)		1648			1551			1711			1727	1450
Flt Permitted		0.65			0.91			0.98			0.97	1.00
Satd. Flow (perm)		1127			1429			1686			1679	1450
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	411	11	5	11	11	21	5	300	5	32	463	668
RTOR Reduction (vph)	0	0	0	0	11	0	0	1	0	0	0	0
Lane Group Flow (vph)	0	427	0	0	32	0	0	309	0	0	495	668
Confl. Peds. (#/hr)	1					1	2		8	8		2
Confl. Bikes (#/hr)			4			2			2			4
Heavy Vehicles (%)	1%	0%	0%	0%	0%	6%	0%	2%	0%	0%	1%	1%
Turn Type	custom	NA		Perm	NA		Perm	NA		Perm	NA	custom
Protected Phases					8			2			6	
Permitted Phases	3	3		8			2			6		3 6
Actuated Green, G (s)		35.1			29.7			20.0			20.0	64.1
Effective Green, g (s)		35.1			29.7			20.0			20.0	60.1
Actuated g/C Ratio		0.55			0.46			0.31			0.31	0.94
Clearance Time (s)		5.0			4.0			4.0			4.0	
Vehicle Extension (s)		2.0			2.5			2.5			2.5	
Lane Grp Cap (vph)		617			662			526			523	1359
v/s Ratio Prot												
v/s Ratio Perm		c0.38			0.02			0.18			c0.29	0.46
v/c Ratio		0.69			0.05			0.59			0.95	0.49
Uniform Delay, d1		10.6			9.4			18.6			21.5	0.2
Progression Factor		1.00			1.00			1.00			1.00	1.00
Incremental Delay, d2		2.7			0.0			1.4			26.3	0.1
Delay (s)		13.3			9.5			20.0			47.8	0.3
Level of Service		B			A			B			D	A
Approach Delay (s)		13.3			9.5			20.0			20.5	
Approach LOS		B			A			B			C	

Intersection Summary			
HCM 2000 Control Delay	18.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	64.1	Sum of lost time (s)	11.0
Intersection Capacity Utilization	81.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

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Section C

Assesment of Previous Transportation Planning Efforts

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TECHNICAL MEMORANDUM #3

117 Commercial Street NE
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Salem, OR 97301
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www.dksassociates.com

DATE: November 1, 2012

TO: **Project Management Team**

FROM: Scott Mansur, P.E., PTOE
Brad Coy, P.E.
Derek Moore, E.I.T

SUBJECT: **Assessment of Previous Planning Efforts** P10086-012

This memorandum summarizes key elements from previous planning efforts related to the configuration of Willamette Street in the project area. This memorandum will be used as a resource in the preparation of the Willamette Street Improvement Plan to help ensure that the plan builds off of past effort, addresses outstanding issues, and fits into the larger regional context. The following documents have been reviewed and included in the summary:

- South Willamette Area Draft Concept Plan
- Draft City of Eugene Transportation System Plan
- Eugene Pedestrian and Bicycle Master Plan
- Walkable Community Workshops Summary Report
- Willamette Street Traffic Analysis Report

This memorandum begins with a description of how Willamette Street fits into the regional context, followed by summaries of applicable standards and previously identified design alternatives.

South Willamette Area Draft Concept Plan

The South Willamette Draft Concept Plan provides high-level guidance and vision on how development in the area should progress. The concept plan concentrates on residential and shopping areas surrounding Willamette Street that are bound by 24th Street to the north, 32nd Street to the south, Portland Street to the west, and Amazon Parkway to the east. It focuses on promoting business success in an urban district while supporting walking, biking, and driving.

A key concept identified in the plan is developing the “Heart of the Walkable Business District,” which is characterized by a “Safe, Attractive Pedestrian Experience for Business, Shopping and Entertainment.” The portion of Willamette Street extending from 24th Place to 27th Avenue is identified as part of this district. Additional segments (Oak Street between 28th and 29th Avenues, 24th Avenue to 24th Place, 27th- 29th Avenue and the alley between Oak and Willamette, from 27th to 28th Avenues) are identified as needing enhancements to the existing pedestrian experience. The Concept Plan identifies the potential for a pedestrian walkway across Willamette Street located between 27th Avenue and 29th Avenue. It also identifies gateways into the district located at the Willamette Street/23rd Avenue and Willamette Street/31st Avenue intersections.

The plan also recommends the establishment of shared parking facilities to support the commercial district.

Eugene Arterial and Collector Street Plan (ACSP)

The primary purpose of the Eugene ACSP (adopted 1999) is to provide an updated street classification map and the appropriate street design standards and guidelines. The ACSP recognizes that streets of similar classification may have very different characteristics, therefore rather than providing specific thresholds, a more general priority level is provided to help guide decision making related to street improvements. Table 1 provides a summary of the priorities for improvement or regulation relevant to Willamette Street (minor arterial).

Table 1: Priority of Improvement or Regulation for Minor Arterials

Improvement Type	Priority
Regulate Access	High
Traffic Calming	Medium
Adding Sidewalks	High
Adding Bike Lanes	High
Upgrade Urban Standards	High
Major Corridor Improvements	Medium
New Street Mileage	Low

As shown, the highest priorities are identified to be regulating access, adding sidewalks and bike lanes, and upgrading urban standards. Regarding access management, the ACSP goes on to say "attempts should be made, wherever possible, to consolidate multiple driveways on arterial streets into a single access point." The City has also adopted access management standards within the City of Eugene Code (7.408) that are intended to:

A. Balance the need for a safe and efficient roadway system against the need to provide ingress and egress to developed land adjacent to the street.

B. Reduce conflict points in the transportation system by managing the number, spacing, location and design of access connections.

C. Preserve intersection influence areas to allow drivers to focus on traffic operational tasks, weaving, speed changes, traffic signal indications, etc.

D. Reduce interference with through movement, caused by slower vehicles exiting, entering or turning across the roadway, by providing turning lanes or tapers and restricting certain movements.

The City Code also provides direction on access spacing standards that are dependent upon the roadway classification and influence to adjacent intersections.

Draft City of Eugene Transportation System Plan (TSP)

The City's Draft TSP[1] identifies this portion of Willamette Street as a minor arterial, which should comply with the following standards (obtained from the Eugene ACSP):

- Right-of-way (ROW) widths from 65' to 100'
- Minimum 11' travel lanes

[1] *Eugene Transportation System Plan: Existing Conditions and Deficiencies*, March 2011

- Continuous sidewalks on both sides of street and set back from curb.
- Minimum sidewalk widths of 10’ for curbside sidewalks, and 5’ for setback sidewalks
- Bicycle lanes should be striped 6’ (standard) or 5’ (in constrained situations) and free from drainage grates and utility covers

The TSP specifies a minimum performance of Level of Service (LOS) “D” for signalized intersections. Within the Central Area Transportation Study Area Boundary (primarily downtown and near the University), the city allows LOS “E”. The intersection of Willamette Street and 29th Avenue was evaluated when the TSP was developed, and was found to be operating at a LOS C. A crash rate of 1.40 crashes/million entering vehicles was reported, however only 24% of the crashes occurred within the intersection, meaning that a high number of crashes could be associated with nearby driveways. Additionally, the TSP identifies an over-representation of turning crashes, which represented 53% of all crashes at this intersection.

The TSP identifies potential projects to address recognized needs and deficiencies; however it does not recommend specific projects at this time. It identified as a potential project, a bike and pedestrian transformation between 24th Avenue and 32nd Avenue. As findings from this study are made available, they will be used to help inform the TSP update.

Eugene Pedestrian and Bicycle Master Plan

The Eugene Pedestrian and Bicycle Master Plan (PBMP) identifies existing conditions and needed improvements to the bicycle and pedestrian facilities. In developing this plan, three corridors were selected for a more detailed level of feasibility analysis, one of which was Willamette Street from 18th Avenue to 32nd Avenue. As a companion document to the PBMP, a technical memorandum[2], documents the recommended improvements as well as several alternatives.

The current roadway configuration does not include bike lanes, and the desired improvement along this corridor is to provide wider sidewalks and 5-6’ bike lanes (6’ is preferred). Several potential solutions are presented, some of which maintain existing curb-to-curb widths, and some require utilization of additional available ROW to widen the road. The potential reconfigurations specific to Willamette Street between 24th Avenue and 32nd Avenue are as follows:

Option 1: Meet Design Standards (recommended)

- From 32nd Avenue to approaching the 29th Avenue intersection the width would be 65’ including three 11’ lanes (1 northbound, 2 southbound), two 6’ bike lanes, and 10’ sidewalks on each side.
- Approaching 29th Avenue from the south and leaving 29th Avenue north the roadway would be 87’ including five 11’ lanes (1 center turn lane each direction), 6’ bike lanes, and 10’ sidewalks.
- Leaving 29th Avenue to 24th Avenue the width would be 76’ including four 11’ lanes, 6’ bike lanes, and 10’ sidewalks. The fourth lane is dropped in the northbound direction.

This option provides standard width pedestrian/bicycle facilities, but requires significant road widening, potential impacts to properties and structures, and is anticipated to have a high cost.

[2] *Eugene Pedestrian and Bicycle Master Plan Road Reconfiguration Assessment*, May 2011

Option 2: Two Travel Lanes and Center Turn Lane

- This option reduces the sidewalks widths from 10' to 6' allowing for maximum curb-to-curb width without widening outside of the existing 60' ROW. The cross section would include three 11' lanes (1 northbound, 1 southbound, and 1 center turn lane), two 6' bike lanes, and 6' curbside sidewalks. The section would be reconfigured to a left turn lane, through lane, and right turn lane on both the northbound and southbound approaches to 29th Avenue. This option provides standard width bicycle facilities and adds a center turn lane without requiring additional ROW. However, it reduces vehicular capacity by eliminating travel lanes.

Option 3: Three Travel Lanes, No Widening

- This option reduces the cross section from four lanes to three so that bike lanes can be additional curb-to-curb width. It would include three 10' lanes (1 northbound, 2 southbound), 5' bike lanes, and would maintain existing curbs and sidewalks. The cross section would be widened near 29th Avenue to allow for the addition of left turn lanes. This option provides bike facilities without widening the roadway, however vehicle capacity is reduced and there are no improvements to pedestrian facilities.

Option 4: Two Travel Lanes, No Center Turn Lane

- This option would reduce the cross section to two 14' lanes (one in each direction), 6' bike lanes, and 10 sidewalks. Approaching 29th Avenue, the configuration would include a left turn lane, through lane, and bike lane in each direction. This option provides standard bicycle facilities and wider sidewalks without requiring additional ROW. However, it also has the highest reduction in vehicle capacity.

Walkable Community Workshops

In 2004, a series of interactive workshops were held with community members to identify and propose solutions to concerns about walkability. [3] One workshop focused on Willamette Street between 24th Avenue and 29th Avenue and the surrounding neighborhood. Four small groups discussed potential solutions after walking around the area. Many ideas were documented and a few identified by multiple groups are reiterated here (not a comprehensive list):

- Convert Willamette Street from its exiting four-lane configuration to a three-lane configuration with a center turn lane, bike lanes, and pedestrian refuge medians.
- Create bus pullouts at all stops to prevent buses from blocking traffic.
- Reduce the number of curb cuts and driveways wherever possible.
- Make pedestrian crossing of Willamette Street easier with refuge medians at key locations.
- Add landscaped medians for improved aesthetics.
- Move utilities underground or to alleyways for improved aesthetics and pedestrian circulation.

The summary report contains many additional ideas generated by the small groups. It also identified improved access management and a comprehensive look at traffic circulation in a broader area around Willamette Street as necessary steps to be taken before enhancements can be implemented.

[3] *Walkable Community Workshop Summary Report*, May 2004

Willamette Street Traffic Analysis

A traffic analysis[4] was conducted in 2001 to evaluate alternative designs for the section of Willamette Street between 24th and 29th Avenues. It was directed at improving pedestrian access while maintaining traffic capacity and safety. The recommended alternative involved re-striping Willamette Street to a three-lane section with a center turn lane, bicycle lanes, and pedestrian refuges at strategic points. The analysis also evaluated a variable three/four-lane section with pedestrian refuges, as well as traffic signal options (full signal vs. mid-block pedestrian signal) at or near the Willamette Street/25th Avenue intersection.

[4] *Willamette Street Traffic Analysis*, McKenney Engineering, June 2001

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SECTION D

PUBLIC INVOLVEMENT PLAN

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Think

South Willamette Street Improvement Plan
June 2012- June 2013

PUBLIC INVOLVEMENT PLAN

INTRODUCTION

Guiding Principles

- Respect the intelligence of the public
- Seek out and facilitate the involvement of those potentially affected
- Identify issues and concerns early and throughout the process
- Widely disseminate complete information in a timely manner
- Include the public's contribution in decisions
- Report how input was considered & reasons for decisions in each phase
- Encourage open and honest communication

Goals

- Broad participation
- Confidence in process integrity
- Timely, authentic & useful public input
- Thoughtful responses to individual comments, concerns, questions
- Public information on city policies, such as the 20-minute neighborhood

Decisions and Roles

A Project Management Team that includes the City of Eugene, Oregon Department of Transportation and DKS Associates consulting team will guide this 13-month long project. The Project Management Team will gather input at four critical junctures from the Technical Advisory Committee, a series of stakeholder conversations, and public meetings to help formulate plans and give feedback as they evolve to a preferred alternative. It will then move to Eugene's Planning Commission and City Council for approval.

KEY ELEMENTS OF PLAN

- Stakeholder Outreach Meetings at four junctures
- Focus Groups on two key perspectives: Businesses & Users
- Community Meetings at three points: Alternatives, Evaluation, & Refinement
- Direct Outreach (street displays, speaking with organizations)
- Meetings with Planning Commission & City Council

Stakeholder Outreach Meetings (Four times at specific project steps)

Identified individuals, who are directly impacted or represent key issues and regularly communicate with their constituencies, will be consulted throughout the project, and function as advisors with an ear to the ground. Developed in collaboration with the City, an inclusive analysis of stakeholders will be the basis for this dynamic stakeholders' list.

#1 Stakeholder Outreach Meetings August- up to 6 small groups):

- Establish positive relationship
- Explain project overview and parameters
- Ensure the public involvement plan will work for them
- Learn how to communicate with their constituencies (i.e. newsletters, websites, guest speaker, high volume events)
- Collect input on existing conditions, problem statement, goals, and evaluation criteria
- Listen for other ideas and alternatives to be considered
- Identify any "hot button" issues and highly concerned individuals

#2 Stakeholder Outreach Meeting (January 2013- up to 4 small groups):

- Collect input on results of Tier 1 Screening analysis
- Listen for concerns, questions, new information
- Get information to those with constituencies in formats to easily shared

#3 Stakeholder Outreach Meeting (May 2013- up to 4 small groups):

- Collect input on results to Tier 2 Screening analysis
- Listen for concerns, questions, new information
- Get information to those with constituencies in formats easily shared

#4 Stakeholder Outreach Meeting (June 2013- up to 4 small groups):

- Collect input on Draft Plan
- Listen for concerns, questions, new information
- Get information to those with constituencies in formats easily shared

Two Focus Groups (September 2012)

Focus Groups tap the insight and knowledge of local experts and advocates to identify creative solutions to core challenges and provide a venue for explaining limitations and tradeoffs in a small setting. Consultants can get feedback on assumptions and help on challenges. Participants will learn more about the study area and expand the pool of people who can be articulate about the complexities, and contribute to setting realistic project goals and parameters.

Focus groups were organized by constituency, such as (1) Corridor Users-- bicycle, pedestrian, bus and car commuters and (2) Businesses & Property Owners.

The Focus Groups, ranging from twelve to twenty participants, were held in a group discussion format and included the wisdom and experiences of:

- Bicyclists, Pedestrians and Transit Users

- Owners, customers, and employees of area businesses
- Residents who live in or near the Project Study Area
- Commuters living to the south, who use Willamette Street
- People with physical disabilities
- Seniors

All Focus Groups invitees will receive a project update that shows how their input affected the outcome to date. Why did some ideas move forward, while others seem to have dropped off the table? We will also invite their ongoing participation and ask them to help us to expand the public engagement.

Public Events

Three large community meetings will build on the knowledge gained from the Stakeholder Meetings and Focus Groups. Well advertised, meetings will have an engaging agenda, pleasant atmosphere, and amenities designed to maximize attendance and diversity, such as food and accommodations for people with disabilities. Public events also provide an opportunity to address the broader community through direct "street" outreach with displays prior to the event and media coverage of the event. The website offers an additional way to receive public input. Meeting Summaries will be emailed to all who attend and posted on the project website.

#1 Community Forum: Explore the Alternatives (November 2012)
This first meeting will introduce the project to the broader community and explain the role of the three public meetings in developing the preferred alternative. Public input will be collected on the existing conditions, deficiencies and needs, potential improvements and evaluation criteria. Ideas for improvements will be welcomed and evaluated.

#2 Community Forum: Evaluate the Alternatives (February 2013)
The second meeting will welcome new participants and recap the project. Three to six alternatives will be presented in light of how they meet Tier 1 evaluation criteria. This event will collect input to help narrow which two to three alternatives advance to Tier 2 screening.

#3 Community Forum: Refine the Preferred Alternative (May 2013)
The third meeting will present the results of Tier 2 evaluation, giving more information about the remaining alternatives for public consideration. The participants will be asked to give input in regards to a preferred alternative.

Planning Commission & City Council

The project team will keep the Planning Commission and City Council informed, and will meet to review alternatives with them prior to the second public event, and again in the formal process of adoption during the summer and fall of 2013.

Website

The City will develop a webpage that is interesting, visually pleasing, and easy to navigate and understand. It will have a unique project masthead and include key project information, including a brief overview, meeting dates, other public involvement opportunities, and a library of technical memos and public involvement summaries. The website will provide the opportunity for public comments and questions, and will be regularly monitored.

Interested Parties List

Cogito will develop a comprehensive Interested Parties List that identifies individuals based on their connection to the project. All interested parties will receive project information and invitations to the Community Forums. The project will use the City's existing list, and connect to organizations' lists with interest in the project. Additionally, Cogito will collect contact information from those we meet during "street" outreach with display boards.

Display Outreach

As a method of outreach prior to each Community Forum, Cogito will staff display boards where there is high-volume foot traffic. This expands the base of who attends the meeting, shares accurate information with those who do not attend, provides the project with a broader view of public concerns and sentiments, and ensures that the public involvement results are representative. Display board graphics are also used at the Community Forums, speaking engagements, and provide the high quality graphics required for media.

Media

While there is not a budget for media work for this project, the city will use media to advertise public events and seek to gain media coverage of public events to reach a broader audience. To the degree the project generates discussion in the media, the project will monitor and respond with accurate information, if necessary.

Public Comments

Calls and emails about the project will be received by the city and routed to the appropriate staff person to answer the question or respond to the comment. This is critical, as thoughtful and timely responses to vocal advocates earns trust and credibility. The city will catalogue all comments and responses, and share with the project team in a timely manner for consideration.

Level of Public Involvement

According to the ODOT Public Involvement Resource Guide, the South Willamette Street Improvement Plan ranks "Tier 3": Complex repair, safety, replacement or modernization scope of work. Public involvement for this project will be comprehensive, ongoing, and target a variety of key stakeholders. According to the principles of International Association for Public Participation (IAP2) Spectrum of Public Involvement, the process will range from "inform" to "collaborate." We will also use the Hans & Anne Marie Bleiker Strategic Development of Informed Consent (SDIC) method to check-in with identified stakeholders.

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SECTION E

COMMUNITY FORUM #1 SUMMARY

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SOUTH WILLAMETTE Street Improvement Plan

Meeting Summary
Community Forum #1: Explore the Alternatives

Tuesday, November 13, 6-8 pm, Roosevelt Middle School Cafeteria, Eugene

Overview

The goal of the first of three community forums was to share project goals, report the results of recent traffic studies, explore alternatives, and listen to community priorities for future improvements to the design and condition of Willamette Street between 24th and 32nd avenues. The study aims to help South Willamette Street become a vibrant urban corridor accessible by bicycle, foot, car, and bus. The area includes residential, commercial, and mixed uses, and has six intersections being studied over about a ¾ mile stretch.

Community participation was robust! Approximately one hundred and fifty people filled the room to capacity and respectfully engaged with staff and consultants for two hours. Many perspectives were aired at the meeting, and geographic representation was balanced. Cyclists represented about 30% of all participants, and the crowd was primarily middle aged. After the Register Guard erroneously reported that the forum would be held on Wednesday, November 14, City staff quickly organized a second meeting, and this report includes the results of both events.

Participants overwhelmingly agreed that Willamette Street is a stressful experience for all modes of travel. Adding bike lanes, improving pedestrian crossings, and enhancing sidewalks were key priorities for participants. When participants were asked a specific question about improving bicycle facilities, bike lanes on Willamette Street was the preferred option of the majority. However, participants also questioned the impacts of reducing travel lanes in order to add bike lanes. Individuals who use the corridor to commute to work and school expressed a clear desire for the street to continue to move automobile traffic efficiently. Merchants located on Willamette Street stressed that they need current traffic volumes to maintain their businesses. Additionally, there was near unanimous support for undergrounding utilities, careful landscaping to beautify and to improve stormwater problems, and consolidating some of the corridor's more than seventy driveways. The idea of slowing car traffic to the speed limit was acceptable to almost all attendees.

Electronic polling, or "clickers," were used in the meeting, and are not meant to provide scientific data. Clickers ensure that everyone's opinion is heard in large time-limited meetings, and create transparency, since everyone sees response results immediately. This allows the facilitator to focus and draw out the various points of view for discussion. Also the first questions asked allowed everyone to quickly understand the representation in the room.

"The staff is here to hear what 'fix it' means to you and wants to find a solution that fits most," said Chris Henry, City of Eugene Project Manager. Ellen Teninty, who facilitated the meeting, discussed that the next steps in this project will be to have two more Community Forums – one likely in February and one likely in May- to first evaluate the alternatives and then refine the preferred alternatives. These will help inform recommendations to the Eugene Planning

Commission and City Council in the fall of 2013. For more information, or to view the slideshow presentation, please visit the project website at http://www.eugene-or.gov/SWillametteStreet.

Detailed Summary

Ellen Teninty asked the audience a couple of hand-raise polling questions to help audience members understand who is in the room. The conclusion was that there were more men than women present, and the audience was overwhelmingly over the age of 34. Then the audience used clickers to participate in a group poll of the following three questions. Due to audience size, some participants did not get clickers and instead filled out a paper survey. Results of the poll were automatically displayed for all to see on a large screen. (Note: Percentages do not equal 100% because some people did not vote).

1. Willamette Street between 24th & 32nd Avenues has some problems.
   A. Agree: 90%
   B. Disagree: 4%
   C. Not sure: 5%

2. How do you <u>usually</u> travel on Willamette Street?
   A. Walk or mobility device (wheelchair, scooter): 20%
   B. Bus: 1%
   C. Bike: 29%
   D. Car: 48%
   E. Other: 1%

3. Where is your neighborhood?
   A. South of 32nd Ave towards Spencer's Butte: 19%
   B. West of Willamette Street towards Friendly Street: 34%
   C. East of Willamette Street towards Amazon Parkway: 31%
   D. Elsewhere: 15%

Project consultants Scott Mansur of DKS Associates and Tom Litster of OTAK presented information about existing conditions and design elements; visit http://www.eugene-or.gov/SWillametteStreet to view the presentation. Questions and comments from the audience followed:

Audience member: Will this project address sidewalk issues near the baseball stadium?
> *Response:* That is north of the project area, however it is part of a separate paving project also currently in planning.

Audience member: I believe there might be a lot of people not represented here, especially drivers, and I have concerns about equitable representation.

Audience member asked questions about counts of automobile traffic and freight in the presentation, airing concern that bicycles and pedestrians were not counted.
> *Response:* We did count bicyclists and pedestrians however we don't have 24-hour counts. Freight counts provide a typical measure for pavement design (or thickness).

Audience member describes concern over drainage deficiencies that affect the sidewalk usability.

Response: The drainage would be fixed as part of paving project improvements regardless.

Audience member: Is there a safe way to have cyclists use roundabouts?

Response: Some ways were described.

Other audience members expressed concern about these methods and the safety of roundabouts for cyclists.

Audience member: I would love to see streets with a "sharrow" on them however there isn't anywhere for it to link up and sidewalks are dangerous to ride on.

Audience member: In a recent survey we conducted at the Market of Choice on Willamette Street, a lot of people said they drove, but wished they biked.

Audience member: When talking about the roundabout possibility with bikes, what would that look like?

Response: It can be shared use, or separate paths.

Audience member: With a lot of right of way, we could consider some alternative stormwater drainage.

Audience member: The bus works well for people. I think that Willamette Street gets clogged up with commuters and they should use another route.

Audience member: It would be great to have undergrounded utilities. *Some clapping of approval is heard from the audience.

Response: We will be asking EWEB what it would take to underground the utilities on Willamette Street.

Audience member: Do we know where the traffic is destined? It seems important to know.

Response: The planning team had to scale back on the scope and remove destination research from this project. We are relying upon other methods described in the presentation.

Audience member: Asks a question regarding the project deadline.

Response: The next five years is the deadline for the project because it needs to meet the bond timing.

Audience member: More stop signs and a reduction in speed limits might increase the number of people using the Amazon Parkway.

Audience member: The bus doesn't loop from Willamette Street through the neighborhood. I would take the bus if that were the case. *Some clapping in agreement is heard from the audience.

Audience member: Have you thought of using bioswales?

Response: Yes and this is a consideration.

Audience member: A comment about a preference for improvement to turn lanes on 29th Ave.

Audience member: I would like to see bicycle counts on the bike ways paralleling Willamette to better understand how cyclists connect to Willamette Street.

> *Response:* Our partners at LCOG might have that information for us. This project may need more funding to work on bicycle and pedestrian improvement.

Audience member: Why does the City Council need to approve this project for it to move forward?

> *Response:* As a capital improvement project, it needs to be approved by Council.

Community members used clickers to answer two more questions:

4. What's your #1 priority for improving this section of Willamette Street?
   A. Make bus stop improvements: 2%
   B. Add bike lanes: 47%
   C. Improve pedestrian crossings: 23%
   D. Have better sidewalks: 29%
   E. Improve traffic flow: 18%
   If not one of these, then write your #1 priority here:
   - Complete streets
   - Find an alternate route for through traffic
   - Improve bike infrastructure, not necessarily lanes
   - Improve bus service to the area. Today there are no local buses to and from nearby neighborhoods
   - Make bike lanes at least 6' wide
   - Plan that includes all
   - Reduce speeding
   - Safety for all modes, slower speed
   - Safety! It is hard to see bikes from car
   - Stormwater management
   - Streetside housing, trees

5. What's your #2 priority for improving this section of Willamette Street?
   A. Make bus stop improvements: 4%
   B. Add bike lanes: 24%
   C. Improve pedestrian crossings: 23%
   D. Have better sidewalks: 29%
   E. Improve traffic flow: 11%
   If not one of these, then write your #2 priority here:
   - Find an alternate route for through traffic
   - Traffic law enforcement
   - Improve cohesiveness/boundaries of neighborhood
   - Streetside housing, trees

Responses from audience members who selected having better sidewalks as one of their top priorities:

Audience member: I walk a lot on Willamette Street and the utility poles and other obstructions are in the way.

Audience member: The cars coming from the street into parking lots are under a lot of pressure to get off the street and it makes it dangerous for pedestrians.

Audience member: Sidewalk in front of Woodfield Station does not have room for pedestrians because cars have to pull all the way out to see traffic and get their opportunity to pull out.

Audience member: We should be able to park in one area –whether you bike or car- and walk to other destinations. People want to visit more than one place on Willamette Street.

Audience member: Can we get grant funding for improvements to the private way as well as the public way?

> *Response:* Some longer-term planning can provide for public-private alternatives and improvements that require redevelopment.

Audience member: The sidewalks need a buffer between the traffic and pedestrians.

Audience member: I've been drenched walking on the sidewalk by cars driving by. Also automobile side mirrors are dangerous to pedestrians on Willamette Street.

Responses from audience members who selected improving traffic flow as one of their top priorities:

Audience member: Traffic stress makes people do weird things. We need to slow down traffic to reduce the stress.

Audience member: 'Improve bike lanes' and 'improve traffic flow' seems like the same thing.

Audience member: What if the lanes are reduced and the idea is that automobiles shouldn't use the street? That would be bad, because it would actually cause a lot of problems.

Audience member: To me, improving traffic flow is for walking, biking, and cars and it means slowing it down, making it more thoughtful. I would like to sit outside at a restaurant and enjoy it but you can't do that now on Willamette Street.

Audience member: I don't drive a lot, but I do if I have to go to Willamette Street, especially if I bring my kids. Even driving there is very stressful.

Audience member: Regardless of the mode, it is stressful for people.

Audience member: Sometimes congestion is a calming (slowing) device.

6. Cyclists <u>only</u> (self-define): What would you prefer?

A. Bike lanes on street: 23%
B. Bike lanes separated from street: 27%
C. Bikes & cars sharing lanes: 0%
D. Parallel bike route off Willamette Street: 8%
E. Other: 0%

This question was asked again removing separated bike lanes as an option, since it is likely to be a more long-term solution.

A. Bike lanes on street: 40%
B. Bikes & cars sharing lanes: 1%
C. Parallel bike route off Willamette Street: 11%
D. Other: 0%

7. Non-cyclists only: What would help you to ride your bike on Willamette Street?

A. Bike lanes on street: 11%
B. Bike lanes separated from street 15%
C. Bikes & cars sharing lanes 0%
D. Parallel bike route off Willamette Street 10%
E. Other: 3%

Discussion on bikes:

Audience member: Bicycle safety means anti texting laws.

Audience member: Despite the fact that you have to have the speed limit the way it is, the lights could be set slower.

Audience member: My middle school son used to ride his bike up Willamette Street and there are tons of kids in the area. This needs to be safe for kids because even if you tell them not to use a certain route, if it's the most direct way, and it has no hills, they will use it.

Audience member: Question about application of a multi-modal level of service analysis for each of the modes.

Response: We performed an analysis of each of the transportation modes (auto, bicycle, pedestrian, and transit) for the existing street segments on Willamette Street, but found that the results were not particularly helpful at this stage. For example, the results indicated a current level of service for bicycles of "D" while we don't think most users would agree with that assessment. We do plan to use the multi-modal level of service analysis tool to help compare alternatives to better understand some of the trade-offs. (The MMLOS results are included in the Existing Conditions Report on the project website).

Audience member: Use concrete because it is better than asphalt and lasts longer. It's good for cyclists.

Audience member: Cycling up Willamette Street is a gauntlet and stressful.

Ellen Teninty asks some questions for response by raising hands: and the audience overwhelming agreed that they supported slower traffic on Willamette Street, undergrounding of utilities, improvements to stormwater, and consolidation of some driveways.

Additional comments and questions:

Audience member: I have concerns about this project being separate from the long-term planning.

Response: We have coordinated between the efforts and we hope to be responsible stewards for the public interest.

Audience member: Even if we had separate bike lanes, I wouldn't use them because of all the driveways.

Audience member: We need to look at the possibility of bus pullouts.

Audience member: Is there any effort to link this project more with 18th & 20th & Willamette and the rest of the routes to downtown?

Response: We have done a lot of work and will continue.

Audience member: Many people here walk and bike or would like to and I think this speaks to the need for complete streets.

Audience member: Alternate bikeways are very important and I believe that if you put a bicycle lane on Willamette Street, it will put the bicyclists in great danger. A lot of people are not used to sharing the road with bicyclists.

Audience member: For the next forum, I wish you would put in a slide with options for painting the lanes on the street for the full range of potential alternatives.

Audience member: I heard some people bring up parallel ways to get around the area in bikeways off of Willamette Street. What I want to do is access the businesses and services on the street and have equal access as anybody else.

Audience member: If I'm riding my bike, I'm more likely to just stop by one of the stores on a whim.

Before people left, they filled out the following two questions and dropped them in a collection bin:

1. One thing I want to make sure is front and center in the plan is: (see below for answers)
2. After this evening, I am most encouraged by: (see below for answers)

Ellen Teninty concludes at the meeting at 8pm and thanks everyone for attending. The audience applauds. Some audience members shout 'thank you' for having the meeting.

Additional Meeting

Wednesday, November 14, 6-8 pm, Roosevelt Middle School Cafeteria, Eugene

The morning after the forum, the Register Guard erroneously reported that the forum would be held that night. The City recognized the implications of the error and quickly made plans to host an additional meeting. Following are the comments, questions, and survey responses from this group of 20 participants, some of whom also attended the previous evening:

Audience member: So there isn't a design already?
> *Response:* No, we are developing alternatives.

Audience member: Is there a specific design on the table?
> *Response:* We are developing the alternatives and are in the idea-generation phase.

Audience member: If the group said, "Let's not do a project," would you listen to us and not do a project?
> *Response:* We would report it to the City Council. There will still be a paving project. There is a need to fix some of the major issues, however, and the money is already there (for the pavement preservation project through recent passage of the pavement preservation bond).

Forms were handed out to mark, and show of hands was requested. A total of 16 surveys were returned and the results are:

1. Willamette Street between 24th & 32nd Avenues has some problems.
   - A. Agree: 100%
   - B. Disagree: 0%
   - C. Not sure: 0%

2. How do you usually travel on Willamette Street?
   - F. Walk or mobility device (wheelchair, scooter): 19%
   - G. Bus: 13%
   - H. Bike: 12%
   - I. Car: 56%
   - J. Other: 0%

3. Where is your neighborhood?
   - E. South of 32nd Ave towards Spencer's Butte: 51%
   - F. West of Willamette Street towards Friendly Street: 14%
   - G. East of Willamette Street towards Amazon Parkway: 33%
   - H. Elsewhere: 2%

Audience member: How will these tallies be used? I'm concerned about equal representation.
> *Response:* We are concerned about equal representation too. The information will help us determine where else we need to reach out to in order to gain equitable and robust representation.

Audience member: Was the Bailey Hill project effective as far as travel and congestion?

Response: There was a fatality there before the project and it is not yet known what the effectiveness is since completion of the project.

Audience member: How was the traffic study done? Specifically how were the number of lanes studied?

Response: Autos, pedestrians, and bicycles were counted during three-hour periods in the morning and evening peaks at the studied intersections.

Audience member: It sounds like you're there: that there *is* a problem. Are we beyond debating that there is a problem or not?

Response: Yes. We believe it is our duty to do something about fixing this problem for the community. We are at the point of identifying what the solution is and going after grant funding to further achieve the solutions desired.

Audience member: Is this project reality-based or is it what we would like to do down the road?

Response: We are engineers and are very reality-based. We want to make it work with what we have.

Audience member: Is there any reason why a concrete barrier separation like a short wall might not be able to fit or work in the area? Her stepson ran out and got hit by a car and something like that would help prevent that.

Audience member: I would like to make sure that whatever happens in the planning area, that it connects and hooks into the bigger system.

Audience member: I was going to make the comment about how I appreciate the stats on injury and crashes on Willamette Street. I usually use Amazon Parkway. Wider sidewalks and lighting and having drivers be more aware of what's going on will help [the vision impaired]. The crosswalks seem to be in the right positions and I appreciate that the talking signals were installed.

Audience member: Are there plans for bus rapid transit to be installed?

Response: That could be 50 years from now, it's a long ways out.

Audience member: I'm delighted to hear plans to fix this dysfunctional disaster. I think it has tremendous potential and I encourage bold steps because it could be a wonderful place. I like the whole idea about facilitating bikes, because it needs to be easier and safer. I won't get out to ride my bike. I think that the planning should focus on enabling other modes, like pedestrians and bikes. When people walk on Willamette Street, people get sprayed with water by busses. There should be some specific stormwater improvements to areas around bus stops.

Audience member: Bicycles share the sidewalks with pedestrians and I think the speed of the bikes is a problem.

Response: Mostly it's because of two modes sharing the same space.

Audience member: I bike more risky and faster when I'm on Willamette Street because you sort of have to in order to be successful if you want to ride that corridor on a bike. It seemed like there was an opportunity to do some of the development I've seen in a better way than has been.

Response: We are looking into form-based code and design standards to help prevent some of those kinds of problems from happening.

Audience member: There are a lot of driveways and that causes a lot of issues. I see it as incompatible to have walking where there are a lot of driveways. There is a redundancy with bike and bus lanes but the sidewalk is what matters. I think we can't be all things to all people or it will be a disaster.

Audience member: I am not an all-weather biker. There isn't bicycle infrastructure that makes me feel safe there.

Audience member: Bikes can park and walk and in my opinion.

4. What's your #1 priority for improving this section of Willamette Street?
   A. Make bus stop improvements: 0%
   B. Add bike lanes: 31%
   C. Improve pedestrian crossings: 12%
   D. Have better sidewalks: 44%
   E. Improve traffic flow: 0%

If not one of these, then write your #1 priority here: Trees

5. What's your #2 priority for improving this section of Willamette Street?
   A. Make bus stop improvements: 1%
   B. Add bike lanes: 31%
   C. Improve pedestrian crossings: 19%
   D. Have better sidewalks: 19%
   E. Improve traffic flow: 13%

If not one of these, then write your #2 priority here: (no responses)

Discussion:

Audience member: Amazon Parkway is an alternative bicycle route to Willamette Street. Isn't it a little easier for drivers to go a little further away than it is for someone in a human-powered vehicle? There also needs to be more bike signage for where these bicycle routes are.

Audience member: I wonder if there are any ideas floating around about how you can widen the corridor while not compromising the business parking access?

> *Response:* Yes. Chris discussed alternatives and options, some of which would require more right-of-way.

Audience member: There just isn't enough room on Willamette Street. Why not just run a parallel bike route to Willamette Street? Reducing traffic lanes would be disastrous in this area.

Audience member: Alleys could be helpful and considered for improvements.

Audience member: The bicycle interest in this is not about finding alternative routes to bypass Willamette Street. It is because cyclists would like to access the businesses equally. For some people, walking is their primary mode of transportation. It is a basic right to be able to get there the way that people want to get there. The people who want to use the area will use the area more because it won't be a hellish place to visit.

Audience member: If we widen the sidewalk, people who bike can also use the sidewalk –they are already having to do that. And thank you for having this public forum.

Audience member: Is it clear at this point whether or not we need 4 lanes of traffic?

> *Response:* We haven't done that analysis yet. It can work today and it may work in the future, however in the future, the place may be different and we may need to adopt different mobility standards.

6. Cyclists only (self-define): What would you prefer?

   A. Bike lanes on street: 13%
   B. Bike lanes separated from street: 38%
   C. Bikes & cars sharing lanes: 0%
   D. Parallel bike route off Willamette Street: 0%
   E. Other: 0%

7. Non-cyclists only: What would help you to ride your bike on Willamette Street?
   A. Bike lanes on street: 0%
   B. Bike lanes separated from street: 25%
   C. Bikes & cars sharing lanes: 12%
   D. Parallel bike route off Willamette Street: 0%
   E. Other: 0%

Additional discussion:

Audience member: There could be a dedicated through-lane.

> *Response:* Please send us more information about that. It's a new idea.

Audience member: There is a growing movement about mechanized bikes and there could be a shift where there are just a lot more bikes and that should be accommodated.

Audience member: I'm not thrilled about alternative bike routes.

Audience member: Would it be possible to have the speed limit be slower, like 20 mph? It could help with congestion.

> *Response:* We set the speed limit to the travelled speeds so it would be highly unlikely that people would actually drive that speed.

Audience member: I'm not saying we should not try to accommodate bicycle access, however I think that alternative routes would be best. Also, there should be covered bike parking areas that maybe even have a special lock. They could be so that you could ride your bike, park it, and then ride your bike and park it. I also think there should be improved cross walks. There is a huge drop in traffic during the summer months and that's probably due to UO enrollment.

Audience member: My general appeal is to expand the way we think about this project to be more than just about traffic to be instead more about the creation of place. Thinking of a redesign of that space. I think front and center is really aesthetics: what does it look like to be there and what does it feel like to be there?

Audience member: Greenery and good materials and things that make it look nice and make it look inviting.

Audience member: I really think this corridor could be more things to more people. I think we need to be sensitive to look at what really does work for people with disabilities, people who walk and ride bikes and what they need.

Audience member: On beautification: greenscaping sounds lovely. They should underground the power lines. They are so ugly. It should be a top priority.

> *Response:* We will be asking EWEB what it will take to underground the utilities and that will be a decision by the City Council and the EWEB Board.

Audience member: Some kind of little topographical bump or something would be nice for cars to be able to tell that they are in the pedestrian realm.

Audience member: It would be good to have some signal to cars that they are in the pedestrian area.

Survey Comments: South Willamette Street Improvement Plan, Nov 13 and 14, 2012

One thing I want to make sure is front and center in the plan is:	**After this evening, I am most encouraged by:**
Complete integrated design	Principles for aesthetics, livability, social public space
Long term, holistic, integrated, forward thinking…	How many people showed up! Good notification from City and interested parties/groups
Sense of place	Good sense by participants - excellent points by all (most)
Balance between the modes	Discouraged by the lack of opinions by those living South of 29th Avenue
There is a sensible and safe solution as well as info mailed to Rob Inerfeld	Sorry. I could not stay.
The street is for everyone. It needs to be more attractive to walkers, bikers, and transit users	Number in attendance, recyclable plates.
Safety for all esp. peds and cyclists	The variety of helpful community suggestions.
Maintaining a balance that keeps the existing vitality on Willamette.	The great process
SAFETY FOR ALL. Ingress, egress on Will is crazy and scary (I'm a car driver)	People caring, showing up, and getting involved.
To consider equal priorities for various transportation modes: bike, ped, bus AND car	Vocalization of bike and ped advocates.
Safety for everyone	Citizen turnout
Equal accommodation of peds/bikes/transit and autos and reclamation of parking intrusions.	The openness of staff/consultants to consider unconventional approaches/ideas. If it goes rigid with engineering "RULES" it will be resisted.
Add right-of-way width for sidewalks, landscaping, and buffer bike lanes.	
I want biking and walking and driving to be safe along Willamette.	
Help many types of travelers to safely use the corridor	
Willamette should be safe for people of all ages using all modes of transportation.	Support for bike infrastructure.

Survey Comments: South Willamette Street Improvement Plan, Nov 13 and 14, 2012

One thing I want to make sure is front and center in the plan is:	**After this evening, I am most encouraged by:**
Equitable space for all modes - access along the street for motors/ped/bike	The variety of options being explored which includes bike and ped access.
This corridor needs a lot of fixing, not just pavement and re-striping	Good start by City. Tremendous potential for improving corridor.
Beautification	The idea that the best ideas will come to the forefront.
Street aesthetics improved	The emphasis on "complete street"
Business interests are foremost in the plan	Discouraged by the possibility of adding bike lanes to the street!
Consideration of the needs of business and property owners	Diverse opinions including consideration of those not present. i.e. the vast majority of car users. Statistical info was very helpful
There is not a parallel/alternate route to access Willamette.	The number of people who want to access the businesses on S Willamette.
Not overbuilding multi residences on street. (like the new one on 24th Place and Willamette). Supporting successful small businesses.	
Traffic calming that incorporates bike lanes to vegetated stormwater system	
Family destination oriented, multi-modal road design (not thoroughfare capacity)	Overwhelming community need/support for bike/multi-modal transit on S Willamette
Bike lanes	The timeline to make changes
Physical safety from cars for bicyclists. Please have a physical barrier!	Mention of bikes and peds having dedicated lanes
Adequately wide bike lanes (at least 6 feet)/paint the crosswalks!	Nothing. The opening comment that stated that there was no room on the road for bikes was beyond insulting. Bikes Belong!
Traffic flow with bike lanes on street. Two lane traffic with center turn out, 3 lane total. We need to keep traffic on Willamette not send elsewhere	Keeping business and property owners in mind

Survey Comments: South Willamette Street Improvement Plan, Nov 13 and 14, 2012

One thing I want to make sure is front and center in the plan is:	**After this evening, I am most encouraged by:**
Bike lanes	The focus on "complete streets"
Bike lanes on the street will help peds as well as calm traffic	Not much. There are a lot of confusing questions, people didn't get their personal questions answered as well as they could have.
Possibility of parallel bike route. Reducing to 3 lanes with buses using only lane available would make traffic flow unbearable.	Study by the City to arrive at solution.
Safe movement of bikes on Willamette	You are considering bike/ped/wheelchair transit since "concept" does not
Bike lanes and traffic stress reduction	The broad consensus in improving the state of the street
On street bike lanes (although separation would be awesome!)	Landscaping and utilities changes possibilities
Would love to see bike lane between 18th and 24th as well	Needed to leave early
Bike lanes with no car parking to the right of it since the lanes are always put in the door zone.	I am discouraged by staff's reluctance to slow traffic. Also seems like Eugene spends a huge amount of its funds on the city planners, and the hired consultants. Maybe we could skip the planners and just hire consultants.
Bike lanes	Openness to different design options
Reduction of through traffic. Two travel lanes w/center turn lane and on-street bike lanes	level of interest/turn-out for workshop
Good bicycle access on Willamette	The turnout! Must have been the pizza!
Bike lanes on street, 2 travel, 1 turn lane	This appears to be your goal - good!
Creating bike lanes whether separated or on street. BUT if we could increase buses to every 10-20 min I would prefer bus to bike. I commute from S Will to Valley River and if it was faster I would take bus.	Project appears very bike friendly.

Survey Comments: South Willamette Street Improvement Plan, Nov 13 and 14, 2012

One thing I want to make sure is front and center in the plan is:	After this evening, I am most encouraged by:
Make it so parents are comfortable biking with their kids. Aesthetic improvements could go a long way toward slowing traffic in a natural manner. Ideally thru a combination of public (brick sidewalks) and private (signage, lighting, awnings). Plantings, underground utilities, etc. could make a big difference. Driveway consolidation would be a great step.	That city staff (Chris Henry et al) seem to genuinely care about improving bike transit in that corridor, as well as including all types of users.
Good facilities for bikes	Consideration being given to a cross-section with bike lanes, 2 travel lanes, one turn lane, like the "road diet" concept.
Bicycle safety	Turnout was encouraging
On street bike lanes	The emphasis in the presentations on balanced multi-modal usage, not just traffic
Putting bike lanes on the street would make it safer/better for bikes and peds alike - both by getting bikes off the sidewalk and by the bike lane buffering the sidewalk. As density in the corridor grows, walking and bicycling must become a bigger part of the modes split. Also access control MUST be a part of it.	Near-consensus that better facilities for walking and bicycling on S Willamette is desired and needed.
I would like a safer more accessible bicycle experience	Finally looks like we will get an improved and hopefully more aesthetically pleasing transportation corridor.
Less cars, more safety for bikes and peds	
Bike lanes and an aesthetic that encourages people to walk and enjoy the area	
Improve safety for foot and bike traffic	Plans to extend bike paths. Need to add a striped/lighted crosswalk for entering Market of Choice at the True Value/Citibank end of parking lot.
Safety for bikes, pedestrians	Variety of ideas offered including public use/social
Encourage people to leave their cars at home	

Survey Comments: South Willamette Street Improvement Plan, Nov 13 and 14, 2012

One thing I want to make sure is front and center in the plan is:	After this evening, I am most encouraged by:
Bikes and pedestrians are apart	You are talking about peds being apart from bikes - YES! Also that the buildings will be nice.
Clear bike/ped travel corridors	Inclusion of ped and bicycle needs and services
Ability to safely travel with children along the corridor as a ped or cyclist.	The decorum of the presenters. Thank you.
Clear division of a shared bike/ped path	The # of people concerned re. changing a short but dangerous section of Willamette.
Enhancing access for walking and biking.	
Bikes on Willamette and safer ped environment	Community interest
Disincentives to drive, encouragement for non-motorized travel.	The turnout
Inclusion of bike lanes and ped improvements	The interest in making a bikeway. It has to be safe from the cars.
Pedestrian and bike friendly/safety	Something might improve in the not-too-distant future.
Bike lanes and better sidewalks	The fact that things might change, however I hope it happens while I am still able to walk and bike!!
A way to bike and walk safely	Outstanding turnout. Need a larger facility.
Bike lanes and better sidewalks	It is clear the project team is hearing what the users and future users see as needs for the street. It is great to see such a large population at a community forum.
Making walking/biking pleasing and safe and sustainable	Any changes to Willamette
Good separation between traffic and walkers.	The fact that planners sincerely want smart community input and are open to affordable creative solutions they've NOT yet imagined.
Bike and ped improvements	All the ideas, especially ones improving ped and bike

Survey Comments: South Willamette Street Improvement Plan, Nov 13 and 14, 2012

One thing I want to make sure is front and center in the plan is:	After this evening, I am most encouraged by:
Multi-modal: safe walking and biking for FAMILIES	The number of people!
Pedestrian and bike lane options	I loved the patience, knowledge and respect that Chris showed toward the audience.
"exposure" is first priority: pedestrians given highest, bikes next, cars last	high concern for non-auto transportation
Pedestrians	
Pedestrian friendly, inviting access. Storefronts closer to sidewalks.	Involvement of people from Portland
Pedestrian experience	Full consideration of all transportation modes, not just automobiles. For me, the ped experience is the most important.
No bikes or skateboards on sidewalks. Make Willamette one way from 20th to 24th to reduce congestion and make room for bike lanes past the Civic Stadium site.	The number of people who wanted slower traffic on Willamette and bike routes off Willamette
Sidewalks and driveways	
Safety for pedestrians - free of roostertail sprays and drivers who might at any moment hit a ped (me!)	Competency of the people running the meeting (the women!) and thanks, Chris for a good job, too.
Pedestrian access to businesses - safety	Some good ideas. I'm glad people are working on solutions. The audience had some of the best ones.
A better safer pedestrian environment with pedestrian crossings and aesthetic separation btwn the high speed traffic and the sidewalk - ie. planter boxes (concrete, 2' high) vs. just a flat planter strip. The sidewalk design should include parallel bike parking btwn the curb and ped walkway perhaps intersperse the concrete planter boxes with bike parking spaces. Include topo/relief marker where sidewalk intersects driveways so that the driver can feel that they are crossing into the ped area. I would like to see the old wooden electric poles and the traffic light poles replaced with modern sleek metal poles that serve both as elect. poles, traffic lights, and as lower street lights, and can accommodate banners for special events.	One way or another it's going to look better!

Survey Comments: South Willamette Street Improvement Plan, Nov 13 and 14, 2012

One thing I want to make sure is front and center in the plan is:	**After this evening, I am most encouraged by:**
A safer and more pedestrian-friendly Willamette.	The fact that something may finally happen to improve this part of Eugene.
Sidewalks and more careful drivers	All the planning that has happened so far and how well laid out the plans are.
traffic calming	bicycle advocacy in this city
less driveways, slower traffic	Comment: There was no mention of how climate change might guide your direction/planning
isolate bus stops from car lanes	Preparation for participation
To fix the problems created on 29th and make sure that we don't create the same congestion problems on Willamette.	The city planners do seem to be aware of the above problem.
A 3-lane alternative would force cars to stop behind buses. A bus turn-out would not work well because it would significantly delay buses, unless it is linked to a signal like one on Hilyard and 26th.	
Reduce speed, increase crosswalks (safe)	
Slower traffic and more congestion are NOT the same thing. If it's harder to drive and easier to use active transit options means less cars, which means less congestion.	The participants overwhelming desire for safe, separated bike facilities on Willamette.
Traffic flow improved	
Making sure it is less stressful to travel here.	
Close/consolidate driveways	City staff really wants to make this better :)
Driveway consolidation	Discussion about bike ways
Traffic has peaked and City plans do not (yet) reflect this fact	large turnout
Low impact development	I'm confident the City will hear great ideas from cyclists.

Survey Comments: South Willamette Street Improvement Plan, Nov 13 and 14, 2012

One thing I want to make sure is front and center in the plan is:	**After this evening, I am most encouraged by:**
Why are we limited to right-of-way? Use eminent domain to get more right of way to do it right the 1st time.	
Expand analysis to entire corridor i.e amazon, high, pearl, oak. Make the whole flow better!	Level of support for alt modes.
Roundabouts	
Run-off is huge and bioswales are a must!	Good change
Trees	An energetic citizen involvement. I appreciate the City doing this planning process, not only to improve transportation for cars, bikes and peds, but in the process to make a better place to live.
Keep costs under control. Consider what impacts will be on other alternate routes if Willamette becomes more difficult to get thru. Recognize the dependency we have on the CAR. Also recognize how the development at Civic Stadium may impact area.	
Coordinate with the rezoning project	
Street design and Trish's planning project need to work hand-in-hand to create a sense of place to assure both designs will work together. Work with police to enforce slow speeds and create a new norm of how traffic moves thru space. I am stressed by the poor driving, tailgating, etc.	Closure of driveways and possibility of reducing speed.
Safer for bikes/peds. I'd love to see on-street separated bike lane but if it can't be done well, then parallel route is my choice. High density of driveways concerns me greatly.	Consideration of kids in the discussion.
There are 2 gas stations and one lube in this area. Hindering traffic into these locations would be devastating for those businesses.	Please more vegetarian pizzas next time. This is Eugene after all.

SOUTH WILLAMETTE
Street Improvement Plan

Community Forum #1: Explore the Alternatives

Tuesday, November 13, 6-8 pm, Roosevelt Middle School Cafeteria, Eugene

Welcome and Introductions: Ellen Teninty, Cogito

Project Overview and Process : Chris Henry, City of Eugene

Clicker Questions #1, #2, and #3

Existing Conditions & Design Elements: Scott Mansur, DKS Associates

Ideas and Questions from the Audience

Clicker Questions #4, #5, #6, #7

Table Discussion

CLICKER QUESTIONS

1. Willamette Street between 24th & 32nd Avenues has some problems.
   A. Agree
   B. Disagree
   C. Not sure

2. How do you usually travel on Willamette Street?
   A. Walk or mobility device (wheelchair, scooter)
   B. Bus
   C. Bike
   D. Car
   E. Other: ____

3. Where is your neighborhood?
   A. South of 32nd Ave towards Spencer's Butte?
   B. East of Willamette Street towards Amazon Parkway
   C. West of Willamette Street towards Friendly Street
   D. Elsewhere:
   ____

4. What's your #1 priority for improving this section of Willamette?
    A. Make bus stop improvements
    B. Add bike lanes
    C. Improve pedestrian crossings
    D. Have better sidewalks
    E. Improve traffic flow

If not one of these, then write your #1 priority here: ________________________________

5. What's your #2 priority for improving this section of Willamette?
    A. Make bus stop improvements
    B. Add bike lanes
    C. Improve pedestrian crossings
    D. Have better sidewalks
    E. Improve traffic flow

If not one of these, then write your #2 priority here: ________________________________

6. Cyclists only (self-define): What would you prefer?
    A. Bike lanes on street
    B. Bike lanes separated from street
    C. Bikes & cars sharing lanes
    D. Parallel bike route off Willamette Street
    E. Other: ________________________________

7. Non-cyclists only: What would help you to ride your bike on Willamette?
    A. Bike lanes on street
    B. Bike lanes separated from street
    C. Bikes & cars sharing lanes
    D. Parallel bike route off Willamette Street
    E. Other: ________________________________

Table Discussion

1. One thing I want to make sure is front and center in the plan is: ________________________________.
2. After this evening, I am most encouraged by: ________________________________.

Website: eugene-or.gov/SWillametteStreet. Contact: Chris Henry, Chris.C.Henry@ci.eugene.or.us, 541-682-8472, Public Works Engineering, 99 E. Broadway, Ste. 400, Eugene, OR 97401

SECTION F

COMMUNITY FORUM #2 SUMMARY

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SOUTH WILLAMETTE
Street Improvement Plan

Meeting Summary
Community Forum #2: Evaluate the Alternatives

Wednesday, February 27th, 6:00-8:00 pm, South Eugene High School, Eugene, Oregon

Overview

At the second of three community forums, the public learned about six alternatives for redesigning Willamette Street between 24th and 32nd Avenues, asked questions, and shared views on which three alternatives should be chosen for further study. The study aims to help South Willamette Street become a vibrant urban corridor accessible by bicycle, foot, car, and bus. The area includes residential, commercial, and mixed uses, and has six intersections being studied over about a ¾ mile stretch.

The large cafeteria at South Eugene High School was filled to capacity with over 300 participants: almost double the number of participants that attended the first forum. The public listened carefully to the alternatives and was respectful and thoughtful in asking questions and sharing a wide range of opinions. After meeting in small groups to discuss the alternatives, participants completed Input Forms to indicate which three alternatives they prefer to forward for further study. The meeting ended with a large group discussion.

When making the decision about which alternatives to study further, the City considers several elements, including:

- Comments from stakeholder meetings
- The results of Community Forum #2
- Email and phone comments to City staff
- Technical issues and how each alternative meets the Project Criteria
- Review and concurrence by the project Technical Advisory Committee

For more information, or to view the slideshow presentation or Forum #2 Appendix, please visit the website at http://www.eugene-or.gov/SWillametteStreet. The files are located in Project Documents, upper left section of the webpage.

Results of the Public Input Forms

285 People signed-in at the meeting and **301** Input Forms were filled out (see the end of this document for a sample Input Form). Of the Input Forms, **114** checked off alternatives without comments or adaptations, and **187** included adaptations or written comments.

Question #1: Please check the 3 alternatives that you would like the City to evaluate in more depth. Results:

Alternative 3: 3-Lane with bike lanes (**208** preferences)
Alternative 4: 3-Lane with buffered bike lanes (**142** preferences)
Alternative 5: 3-Lane with wide sidewalks (**139** preferences)
Alternative 6: 2-Lane with bike lanes, median & roundabout (**113** preferences)
Alternative 1: 4-Lane (**97** preferences)
Alternative 2: 4-Lane with center left-turn lane (**83** preferences)
There were 3 "I don't know's"

Question #2: Are there modifications you suggest to the above checked alternatives (such as width of lanes, sidewalk, etc.)? Results:

For details, please review Forum #2 Appendix: Input Form Comments. Written comments from the Input Forms were sorted into three categories: Modifications, Questions, and Comments. Then, the input was sorted according to topic. Following are reflections on the written input:

Suggested Modifications

Alternative	Total Comments	Topics Addressed
1	10	varied
2	7	varied
3	23	19 suggestions on lane width or bike lanes
4	17	10 on lane width or bike lanes, 7 on sidewalk issues
5	45	24 on cycle track ideas, 7 on sidewalk issues
6	22	varied
Mixed	22	varied
All	100	27 on pedestrian or sidewalk issues 16 on transit 9 on utilities 9 on parallel bike route

Questions

Topics varied widely.

Comments

Alternative 6 generated the most comments (16), perhaps because it was challenging to conceptualize. Bike and pedestrian issues were the most common comment topics (28%)

Detailed Summary of the Meeting

Kurt Corey, the City's Public Works Director, gave opening comments of confidence in the team and gratitude for community turn out. Project Manager Chris Henry discussed funding and the decision-making process for the project, "Tonight we will look at six alternatives and then we will narrow them down to three." Mr. Henry said that asking for public input will help the City be good stewards of public dollars by not wasting time exploring alternatives that are not supported. Chris Watchie, Public Involvement Specialist, briefly reviewed 150 years of history of Willamette Street. She showed slides of old photos of the street illustrating its evolution. Robin Hostick, City of Eugene Senior Planner, described the long-range concept for the street. He showed a slide illustrating how street-side development may change in the future due to future redevelopment. Ellen Teninty, Public Involvement Specialist, asked participants to use this forum as an opportunity to think beyond their personal experience and more holistically about all users and broader considerations.

Scott Mansur, Project Manager from DKS Associates, explained the framework for the alternatives that have been developed. He described the stakeholder outreach process, the first community forum, Technical Advisory Committee feedback, and elected official involvement. He described the alternatives screening process, the study corridor, and each alternative design option in detail. Peter Coffey, Principal of DKS Associates, reviewed the screening criteria evaluation and findings that have taken place so far and the screening that will occur for the next three alternatives.

Questions on the alternatives:

Audience Member: You said you would talk about capacities tonight. What capacities will these plans cover?

Response: Capacity refers to the potential for each street design alternative to accommodate the demand for mobility from motorists, bicyclists, pedestrians, and bus riders. We won't have those details until we perform more in-depth analysis.

Audience Member: What is the measurement of the sidewalk right now?

Response: Up to and less than 9 feet of width.

Audience Member: Will you also be taking into account the traffic pattern changes on related streets? Will this be a part of your study? Specifically Lincoln, Jefferson and other streets located in that area.

Response: It is beyond our scope to go into that level of detail.

Audience Member: Are the traffic counts higher going South than North?

Response: Yes (explains and includes discussion of traffic patterns).

Audience Member: Do any of these plans address left turn signals at intersections?

Response: Yes.

Audience Member: Is there any standard for a sidewalk where pedestrians and cyclists use just the sidewalks?

Response: Alternative 5, and a cycle track could do that.

Audience Member: Who pays and how are they assessed?

Response: There are multiple funding sources for any street improvement. (explains funding opportunities and sources).

Audience Member: Will the 3-lane options hold the current capacity that the street does now?

Response: It reduces the capacity, however, it should be adequate depending on the number and location of driveway accesses.

Audience Member: How are you measuring current capacity for bikes? How about for Vehicle Miles Traveled (VMT)?

Response: Explains the measure and process. Notes that the trend is that people are driving less.

Audience Member: Will businesses have to give up any of their parking spaces or any of their property for these alternatives?

Response: Largely not.

Audience Member: Can you describe these alternatives by comparing them to other existing streets in Eugene?

Response: Somewhat. Describes comparisons for consideration, and the project team will try to find more examples.

Audience Member: Regarding option 6, is it certain that eliminating traffic signals will reduce capacity?

Response: Option 6 is the safest. The roundabouts have the capacity to accommodate the motor vehicle demand on the intersection.

Audience Member: If driveways will have to be eliminated, who will cover the cost?

Response: We are not at that level of detail yet, however that is an important consideration that we will look at in the future.

The group moved to a 20-minute small group discussion. Group instructions:

Review each alternative as a group. Ask questions. Talk to people with different points of view to understand perspectives. Table materials:

- *11x17 copies of 6 alternatives*
- *Half sheet input forms*
- *Flip chart paper and pens to draw, record group ideas if desired*

We do not expect you to come to agreement as a group or record your conversation during this time. The goal is to help you make an informed decision about which alternatives you think the City should study further. The flip chart paper and pens are there if you feel inspired to draw or write ideas. This is an opportunity for each participant to study the alternatives, ask questions, listen to different perspectives, and formulate your own opinion.

Participants then moved into a full group discussion:

Audience Member: I was wondering why we are not looking at a 2-way cycle track like on Alder Street?

Response: It was reviewed for the goals of the project and how it impacts the other modes. Other options were developed that provide a balance of access, mobility, and safety for users of the street.

Audience Member: How does the number of trips per day affect the alternatives?

Response: The number of bicyclists is not a factor in calculating the level of service. Bicycle level of service (as well as the pedestrian experience) is dependent on the speed, volume, and proximity of adjacent motor vehicle traffic.

Audience Member: Cycle tracks would make it more difficult for cyclists to get to different destinations. Is there anything that is not a part of the pedestrian master plan?

*Response: T*he Pedestrian and Bicycle Master Plan (PBMP) identified the need for bike lanes and parallel routes in the corridor. The alternatives presented respond to the PBMP guidance.

Audience Member: One of the primary problems is that the sidewalks are too narrow and the alternatives, except for number 5, all are going to require expanding beyond the necessary profile.

Response: All of the options work within the public right of way.

Audience Member: [During small group discussion] options 3 through 6 concerned our table about conflicts with busses. Could you talk about that?

Response: We will look at opportunities for bus turnouts in next analysis.

Audience Member: I'm concerned about your bike counts because many of us use the alleyways as an alternative. How is the planning for the northern section going to work with these alternatives?

Response: The project to the north (pavement preservation between 19th and 24th avenues) provides the opportunity to connect the bike lane system on 18th Avenue and further north on Willamette Street to the bike lane system on 24th Avenue. So, that project serves a need independent of what occurs between 24th and 32nd avenues.

Audience Member: What are your criteria for the number of driveways allowed?

Response: Fewer are better. Reducing the number of driveway conflicts improves safety for all the users of the street and also improves the flow of motor vehicle traffic.

Audience Member: What is the collision rate?

Response: It is almost twice as high as we would expect for similar streets in Oregon (5.2 collisions per million vehicle miles travelled versus 2.91 collisions per million vehicle miles statewide).

Audience Member: Are there plans that you have for Amazon Parkway to divert some of this traffic?

Response: We don't have specific plans for Amazon Parkway but we will look at what diversion may happen with the alternatives.

Audience Member: When will there be an analysis of the economic consequences for any of these alternatives on the 120 businesses that rely upon the traffic?

Response: In the refinement of the alternatives "tier 2 analysis."

Audience Member: Instead of having bus pullouts, the center turn lane could be striped to allow the traffic to pass the bus at stops.

Response: Yes and they will look into that. It's certainly possible.

Audience Member: I did my own count and there were 250 cars and 1 bicycle go by in 15 minutes [within the study area on Willamette Street].

Response: The project team is following established City policies to provide for a balanced transportation system that provides options for people to meet their mobility needs.

Audience Member: How much would the gridlock be with option 6? Will it be a five-minute delay or a half an hour delay?

Response: There will be a delay and we will look at the specifics in the next analysis.

Audience Member: The street itself should cater to all modes since it is public money.

Response: A balanced transportation system will serve all users. That is our goal and our policy guidance.

Audience Member: I'm wondering if we could consider encouraging Eugene Police to enforce the rules on Willamette Street?

Response: I shared with the police today that people have been concerned about the travel speeds on the street.

Audience Member: Is there a difference between people commuting on Willamette or people stopping and shopping?

Response: Our grant funding constrains our work but we will try to estimate that.

Audience Member: If you build it, will they [bicycles] come?

Response: We don't have the ability to tell, however we could do some case studies with other communities to compare what happened to them and what they saw afterwards.

Audience Member: I would be scared to go through a roundabout as a cyclist or pedestrian. Do the roundabouts have safety accommodations for them?

Response: We will look at ways to make people more comfortable using them. There are two options for how a roundabout would be designed for bicycle use.

Audience Member: There are a lot of things in our master planning processes over the years. Which one of these alternatives will point us in the direction of what we have already said we want?

Response: The plans say what we want. They do not say how and that is why we are here.

Audience Member: Why not have bikes on the sidewalks?

Response: Typically we do not have bikes share where there are a lot of driveways. Pedestrians do not feel safe with bikes on the sidewalk. Cars do not see bikes when they are pulling out of driveways.

Audience Member: Surveys should be done to talk to residents, asking them what should be done to make them want to walk it more.

Response: We are looking at that information in some other ways.

Audience Member: Concern over decline in availability of fossil fuel. How are you incorporating this into your study long term?

Response: By giving people options for how they travel.

Chris Watchie wraps up the meeting by thanking participants for coming, reminding participants to leave their opinion forms on the tables for collection, reviewing the next steps, and taking final questions. Meeting ends at 8:00pm.

Example of Public Input Form

South Willamette Street Improvement Plan
Community Forum #2: Evaluate the Alternatives

1. Please check the 3 alternatives that you would like the City to evaluate in more depth:

   ☐ 1: 4-Lane

   ☐ 2: 4-Lane with Center Left-turn Lane

   ☐ 3: 3-Lane with Bike Lanes

   ☐ 4: 3-Lane with Buffered Bike Lanes

   ☐ 5: 3-Lane with Wide Sidewalks

   ☐ 6: 2-Lane with Bike Lanes, Median & Roundabouts

   ☐ I don't know

2. Are there modifications you suggest to the above checked alternatives (such as width of lanes, sidewalk, etc.)? If so, please describe on the back of this sheet. Suggestions that expand the project beyond the current right of way (60 feet) cannot be included in the short-term.

Alt #	1. Suggested Modifications to Alternatives
1	With a turn lane.
1	At least reduce driveways, improve and widen sidewalks, add trees, do something about ugly utility poles; also add bus turnouts; designate/improve bike routes in study area.
1	Might work with consistent 9' sidewalks.
1	I like the idea of one side 6'/ other side 12' sidewalks in this one.
1	Reduce sidewalks to maintain some parking lots.
1	With sharrows.
1	Include sharrow lanes
1	Add better bike accommodations/ sharrows/ or adjacent bike infrastructure.
1	Needs sharrows. Not optional.
1	I would like to see LTD bus turnouts on both sides.
2	Could you consider some center islands in left turn lanes so that crossing would be easier? For pedestrians? Not great for emergency vehicles.
2	It is important to consider aesthetics, like trees, street lamps.
2	With bike "lane" on sidewalk
2	Must have sharrows and lower speed limits.
2	With sharrows.
2	If two lane with center lane: Has anyone considered bus only lane in center with bus stops with proper pedestrian crossings from center point of stops (no bike lanes).
2	And bus pull out or center lane modified
3	Consider raised bike lanes.
3	Needs soft hit posts to separate bikes from cars.
3	If option 3 was chosen I would want the bike lanes to be marked clearly, perhaps with different pavement coloring at driveways/ intersections or a different striping pattern.
3	Need bike buffer, less width sidewalk.
3	Need buffers -safety for bike.
3	Is there a way of having the center left turn lane be a variable lane so that during peak capacity times, the center lane becomes a traffic lane in the peak direction, with no left turn allowed during peak times? Overhead indicator lights could tell you whether you drive or turn left or not enter that lane.
3	Consider narrowing the bike lanes (or ped sidewalks) slightly to allow for 11' wide lanes. Or provide special design considerations where bus stops exist.
3	Create 11 foot travel lanes by reducing bike lanes to 5.5' and reduce sidewalks to 8.5'.
3	With 11' thru lanes and 5' bike lanes.
3	Reduce bike lane to 5' and add back to travel lanes to get 11'.
3	Put 5' bike lanes and 11' travel lanes.
3	And travel lanes at 11'
3	8.5' - 5' - 11' - 11' center turn -11' - 5' -8.5': Change the bike lanes to 5 feet, increase the car travel lanes to 11 feet to accommodate trucks. This would also require decreasing the sidewalks by 1/2 foot on both sides (only) to gain the extra foot width in the center lane.

3	Can the bike lanes be reduced to 5', giving back to the two travel lanes?
3	Possibly #3 with 5 or 5 1/2 ' bike lanes and 11' outside travel lane?
3	If you make the bike lanes 5 feet wide (standard width), you could either make 10' sidewalks or 11' travel lanes (better for transit vehicles).
3	8', 6', 11', 11', 11', 6', 8' Can sidewalks be 8'? Then we would gain more room for vegetation and bike lanes and retain 3 car lanes.
3	11' travel lanes and 8' sidewalks
3	Reducing the bike lanes to five feet and expanding the through lanes to eleven feet would seem to help transit without impacting bikers much.
3	I think it is important to have bike lanes and to have a turn lane. Alternative 3 best meets this, but has narrower than standard width. Meeting travel lane width standards could be met by shifting 6 inches from each of the bike lanes and sidewalks.
3	"Bike lane" on sidewalk possibility.
3	Need bus turnouts!
3	Needs to have bus pullouts -narrower sidewalks or no center turn lane to allow traffic to pass. Sharrows in the 29th Ave vicinity. Limit restrict left turns during peak traffic periods to maximize through traffic capacity.
3	To minimize bus/ bike conflict, maybe sidewalk curbs could be lowered at the front and back of the bus stop so that if a bus is at the stop or coming in it, a biker could roll easily into a designated lane on the sidewalk to bypass the bus stop. Pedestrians could stay out of the bus-stop-bike-bypass designated area! Maybe could keep things moving.
4	Raised bike lanes.
4	Buffers not needed.
4	Don't need buffer.
4	Take option 4, eliminate 2' buffer give one foot to bike lane and one ft to sidewalk.
4	Reduce 11' lanes to 10' and increase sidewalk to 8' wide with 3' wide tree and light planters (rectangular) and 5' sidewalk. Keep or move telephone/ power poles into 3' planters -keep them out of sidewalks!
4	With 10 ft. travel lanes to allow for wider sidewalks.
4	Make car lanes 10' wide or widen sidewalks.
4	Reduce car lane width to 10' to make sidewalks wider.
4	Maybe travel lanes 10' each, that will provide buffer for bikes as well as 8' sidewalks.
4	Lessen sidewalk widths. Why the need for 9' sidewalks? Not necessary. Lessen width, more space for bike lanes and buffers etc.
4	If neighborhood concept plan requires 5ft setback so sidewalks would eventually be wider.
4	This option would need to consider larger sidewalks to be viable.
4	Would like a wide enough sidewalk where bikers that aren't comfortable w/ the road are able to ride on.
4	Could be almost 8' sidewalk by narrowing travel and turn lanes could happen.
4	Narrows the sidewalk too much.
4	I like this option because, as a cyclist, I would feel more safe and comfortable and less vulnerable to vehicles. However, I wish the sidewalks could also be widened to 9'.

4	I like this option, but the space provided as a buffer could better be used to give more space on the sidewalk (where it will provide more value than the 2-ft buffer).
4	How will busses be accommodated?
5	Could ther instead be a curbed single lane cycle track w/a 6 foot sidewalk?
5	With cycle track.
5	Can there be wider sidewalk that has dedicated bike track on one side and narrower sidewalk on other?
5	Add or include raised bike track as medial part of sidewalk.
5	There should be a future plans for bicycle access using cycletracks in each direction.
5	That have designated bike ways on sidewalk
5	sidewalk 9', car 11', center left turn lane 12', car 11', cycle track 8', sidewalk 9'
5	Cycle track. Cycle tracks is the only safe option for bicyclists!
5	Add cycle tracks. I like the sidewalks here but there must be a bike option.
5	Cycle tracks.
5	I actually like number five too if it had a cycle track to accommodate bikes and reduce conflict with bikes and peds.
5	I would also be interested in pirsuing a cycle track option. Perhaps a 2-way cycletrack on one side of the street. I would not like cyclists and pedestrians to be on the same gradient.
5	Show how bike/ ped separation might occur.
5	With designated bike lane on sidewalk.
5	Preferred alternative if cycle track will be included!
5	What about some kind of signage to facilitate sharing the sidewalk; no speeding bikes through groups, no groups blocking the entire pathway...? i.e. "cycle track"!
5	Is impractical for bikeways (cycle tracks) shared with pedestrians and stormwater treatment areas it seems. Or is 13' wide enough for both stormwater and cycle track?
5	Only if sidewalk includes cycle track to separate bikes from pedestrians.
5	Include space for bikes on sidewalks i.e. cycletrack.
5	I really like the shared sidewalk idea -where the wide sidewalk has a lane in it for bicycles.
5	Allow bicycles on sidewalk -have a special lane.
5	Needs to consider options to improve bicycle options and access to businesses. Possible investment in Agate Alley/ Oak or shared sidewalk use with clear division between pedestrian and bikes.
5	Love the wide sidewalk with cycle markings/ tracks for shared ped/ cycle use.
5	Shared w/ bikes and delineated with striping.
5	W/ devoted bike lane.
5	11.5' wide shared bicycle pedestrian sidewalk, 11' wide South Bound traffic lane, 10' wide South Bound traffic lane, 10' wide North Bound traffic lane, 11' wide North Bound traffic lane, 6.5' sidewalk
5	Sidewalk 13.5', travel 11', turn 10', travel 11', sidewalk 13.5': take 1 foot from the center turn lane, put it to the sidewalk.
5	Would only be good if sharrow are added to the lane.
5	With bike sharrows.

5	Do not plan on bikes on the sidewalk. What kind of signage possible to help vehicles understand bikes allowed full use of lane?
5	With shared pedestrian/ bicycle use of sidewalk
5	Discuss cycle use in sidewalk "realm." If we do not incorporate bikes into this realm, bikes/ peds conflicts could be a concern.
5	Wider sidewalks 13' are a big priority!
5	w/ sidewalks being mixed use (bike and pedestrian friendly as are the park and river bike paths.
5	Big sidewalks. Sidewalks should be used for bikes as well as pedestrians.
5	Could bikes and peds share?
5	I would like to be able to bike on the sidewalk.
5	Only if it can accommodate bikes.
5	Show options that accommodate bikes. Or perhaps have widened sidewalks only in the key 2-3 block area (where good side streets for bike commuters exist hopefully). Or wide on one side only.
5	At least reduce driveways, improve and widen sidewalks, add trees, do something about ugly utility poles; allow bikes to share sidewalk, add bus turnouts or allow vehicles to pass bus when stopped.
5	Wider sidewalks, w/ bicycle parking in #5 with possible bus pull-offs makes most sense. Bicycles could (and possibly cars) use an alt. route if not visiting businesses/ locations in the area. Bike parking area & walk to businesses on wider sidewalks. Also cars could park in one lot and walk/ cross streets up and down to other businesses and locations = less car pull ins and outs. Less driveways for bikes, peds, less car turning to prevent backups.
5	And bus pullouts. Get poles off the sidewalks. Bikes allowed on sidewalks. Fewer driveways.
5	All modes eventually are pedestrians -wider, obstacle-free sidewalks are a must. I am concerned that Option 5, despite the wonderful 13' walkways, doesn't adequately address bike/ ped/ sidewalk seating conflict.
5	With bike turnouts.
5	For bikes and peds.
6	4 lanes w/ roundabouts would be my first choice, moving bicycle traffic to alternative routes with some level of dedicated access.
6	Crucial to maintain cyclist safety at roundabouts -diverting cyclists onto sidewalks at roundabouts is unsafe in my experience.
6	Intrigued (but concerned about bike/ ped safety at roundabouts).
6	Make the median a little smaller for emergency vehicles to travel easily -maybe combine side-walk w/ bike lane.
6	No "raised" median: emergency vehicle access at risk. Raised medians scare me with regard to emergency vehicle access. And people get frustrated (road rage) w/ raised median inconveniences.
6	Six feet seems a bit wider than necessary for bikers. Maybe we could reduce it a bit to give more width to the vehicle lanes and sidewalks.
6	Sidewalks could be expanded to 10' (standard) if median was narrowed.

6	Could reduce the median by 1-2' and add that width to the sidewalk. Also, the same could be done with the buffer and added to the bike lane while adding soft -hit posts.
6	Need to make safer pedestrian crossings since roundabouts can create accessibility option.
6	With round-abouts, would likely make it impossible for the blind to cross the street at those locations. It might work for vehicles but probably would add significant risk for pedestrians if there are no lights.
6	What about getting blind and disabled peds across Willamette? Without traffic lights…?
6	No buffer, wider sidewalk.
6	To help with diversion of commuter traffic off of Willamette, put a roundabout at 24th and Amazon Parkway -I think this would encourage more people to use this route as now the lights are short and turning laborious.
6	If roundabout, then ped. Xing 150 away with signals.
6	I would like to know more about how roundabouts work and if there are safety concerns for peds and bikes.
6	Would like to see what the roundabouts would look like.
6	I like (after much thought) the roundabout idea for 29th and Willamette only.
6	I like this option, but the buffer could be used as more sidewalk space. Also I like the pedestrian crossings and roundabout. And I like that this is the safest alternative.
6	Put a roundabout on 29th and Willamette.
6	Ugly center median.
6	How about a wider sidewalk with a turning lane and a bike lane in the roundabout. How about busses routed to Oak or Portland Street or alley bus lanes.
6	Hybridize this option with 3/4.
1, 2	Shared side walk, wider -less driveways.
1, 2	4 lanes with combo walk/ bike path w/o poles and standards.
1, 2, 3	With bike lanes moved to Oak and Portland
1, 2, 3	Combine sidewalk and bike plus let bike use the lanes with autos.
1, 3, 4	Keep street trees and lights in 4' planter.
2, 5	Include modifications to parallel streets for bicycles (a la Alder St. controls at 19th, 24th, 32nd) or include bike travel accomodation/ protection on sidewalk (plan 5).
3, 4	Only if sharrows are going to be added.
3, 4	We need bike lanes that work for people of all ages and ability levels -the only plan that allows that is alternative 4. Unfortunately, alternative 4 has the worst facilities for pedestrians. Why can't we have the car lanes and sidewalks from alternative 3 and the buffered lanes from alternative 4? I like the idea of 8' sidewalks, 5' lanes, 2' buffers, and 3 10 ft vehicle lanes.
3, 4	Should have green paint to keep cyclists safe.
3, 4	Is it possible to incorporate roundabouts in options 3 & 4?
3, 4, 5	Cycle tracks in sidewalk with three levels (2 curbs) like in Europe.

3, 4, 5	No to reduced capacity.
3, 4, 5	Clarify, in 3-lane configurations, what the signalized intersections would be like -would there be protected turn pockets at intersections?
3, 4, 5	Pull outs for busses would be good in three lane options.
3, 4, 5, 6	Can we explore cycle tracks like on Alder? Or Pioneer Parkway? Why not.
3, 4, 5, 6	Any bike lane need not be wider than 5'. Rather have 11' vehicle lanes. Must have bike lanes!
3, 4, 5, 6	There is no bus consideration for slowing traffic on only three bike lanes.
3, 4, 6	Possible to make a 2-way bike lane in one lane like on Alder?
3, 4, 6	5' Bike lanes, 10' sidewalks, reduce driveways. Common parking for bikes and cars to encourage visits to multiple businesses in a single trip.
3, 5	Combinations of 3 and 5. Consider narrower vehicular travel lanes -wide sidewalk- buffered bike lanes. Consider a 2 lane bike section to gain safety not at the cost of pedestrian use.
3, 5	Consider need to improve options for protected pedestrian crossing (islands) at inbetween intersections.
5, 6	Consider bus turnouts to reduce impact on blocking traffic flow.
All	Fixing (reducing) car turn access to businesses is critical for all alternatives and protected pedestrian crosswalks. They also have to be usable by bicyclists.
All	More police enforcement for the laws in the area, speed, rolling out of lots without stopping, passing cyclists safely.
All	Please consider vehicle- bike -pedestrian as in Amsterdam & Copenhagen
All	No reduction of traffic lanes.
All	Protected left turn lanes.
All	I like the concept of 2-lane South bound.
All	Would bike lanes have significant markings? E.g. bike boxes, reflective approach lanes (similar to Portland?), signage at driveways and intersections.
All	Each alternative should use bicycle travel lanes as a buffer between pedestrians and vehicles.
All	Bike lanes are a must.
All	I liked one suggestion that sidewalk be enlarged in width to accommodate bicycles, i.e. 13th on one side and 5' on the other, perhaps with a divider on the 13' side to separate pedestrians.
All	Primary importance- If no bike lanes chosen, highly support making adjacent N/ S routes become most bike friencly and smooth connections to beyond.
All	Save $ to ensure improvement to alternate routes for bikes for real improvement.
All	Please consider side street corridors for bike riders.
All	Side street bike route?
All	Evaluate potential alternative bike routes. Have to include bike lanes elsewhere.
All	Use parallel side streets for bikers. Way too much congestion already present with cars, etc. on Willamette.

All	Bike lanes and access on Portland and Oak.
All	Portland and Amazon for bike traffic.
All	Use Portland for bike lanes.
All	I want peds to be able to cross safely at intersections and midblock.
All	More mid-block crosswalks
All	More trees and plants close to sidewalks.
All	I like the consistent 9 foot sidewalks.
All	Any and all options should include signage at intersections explaining peds have R-O-W when crossing.
All	More signaled pedestrian crossings.
All	Mid-block cross walks.
All	I would like to see sidewalk improvements for ped. Bikes can use other off Willamette Street paths.
All	I would like to see sidewalk improvement as the highest priority -widening and removal of utilities. We also need a stop light at Woodfield Station's East entrance.
All	Put utilities in alley? More ped. Crossings!
All	Improve lighting from highway corridor to commercial scale.
All	Trees!
All	More trees for the health and beautification and safety of our community!
All	Would like sidewalks to be as wide as possible even buying a few of private property. A buffer would be the icing on the cake.
All	Pedestrians needs should get more attention. Is there some flasher crossings planned for ped. Xings.
All	Hide cars so people can see the building and sale items.
All	Include 'on demand' crossings mid-block.
All	More plants!
All	Show pedestrian-scale lighting!
All	Mount street lights off of businesses instead of on poles.
All	Access to Woodfield Station on end of Portland for strollers and bikes.
All	Keep sidewalks as wide as possible.
All	Do not reduce sidewalks whatever you do.
All	Wide sidewalks like Amazon Park "multi-use"
All	More bike parking on every block in plain view!
All	Possibly take the sidewalk width on a block (or property by property) basis. Of course, there would be a minimum width -say 5 feet, but not a standard 9 foot throughout.
All	Sidewalks need to be wider in all schemes. Existing sidewalks are too narrow.
All	We should consider roundabouts in alternatives other than just the center median alternative.
All	Option for sharrows.
All	Add sharrows on drawings with no bike lanes.
All	Bike sharrows are too dangerous for people on bikes.
All	Please fix drainage.
All	Make sure and fix drainage issues.
All	Include contemporary stormwater treatments.

All	Previous re-paving projects have not included adequate drainage for heavy rain, viz flooding regularly on Hilyard St. Please create more drainage for ALL street projects.
All	Driveways need to be part of traffic flow plan. Some parking areas may have to be used differently to fit traffic flow on streets.
All	Discourage thru traffic on Willamette; signs suggesting alternatives such as Amazon.
All	Yes to traffic signal at Woodfield Sta. driveway!
All	We need a traffic light for vehicles to/ from Market of Choice.
All	I have a priority of slowing traffic on Willamette.
All	Perhaps a slightly raised intersection, and/or crosswalks with a different texture to get traffic to slow down in intersections where bikes and people are at greater risk.
All	Suggest adding in other traffic-calming, especially at intersections. For example, intersections and or crosswalks that are just slightly raised, different color, and or different types of pavement such as bricks.
All	How about a slight raising of the street grade at intersections to help calm traffic?
All	Bus turnouts must be included in all concepts.
All	Yes on LTD pullouts.
All	I am concerned about stops for LTD busses. It would be ideal if there were "cutouts" or "turnouts" to prevent busses from blocking bicycle and auto traffic. I don't see this in the proposals.
All	Yes to increasing existing R-O-W to allow bus turnouts.
All	I would like to see cutouts along Willamette for busses for better traffic flow.
All	Pull outs for busses seem critical in any alternative.
All	With all alternatives bus pullouts are critical to improving safety.
All	Build transit stops w/ pull outs and shelters and accommodate the other modes around those points -include prominent signage to yield to bus and pedestrians -good to co-locate zebra crossings with transit stops (e.g. sharrows in lane adjacent to stop). Get LTD and businesses on board!
All	Bus turn outs.
All	Bus turnouts such as at Woodfield Station would help the flow of traffic.
All	Incorporate bus turn outs?
All	Bus pull outs?
All	Bus turnouts or better ways for cars to go around bus (without running into turn lane) could let bikes merge into travel lane and reduce sidewalk width at those spots.
All	Bus turn outs. Busses need turn outs not to stop in streets.
All	Bus lane pull outs.
All	Some accommodation needs to be made for bus pullouts.
All	Put utilities underground -safer all the way around (including during storm weather).
All	Utilities underground.
All	Underground all EWEB overheads -just street/ stop lights.
All	Utility poles need to be relocated to the outside of the ROW as far from the curb as possible.
All	Consider utility lines (telephone and electricity) in the alleys -would greatly improve look and feel of the entire corridor.
All	Bury utilities.

All	Put utilities underground. It will give an extra 2 ft to sidewalks.
All	Put phone/ utilities underground!! It creates space on sidewalk for bikes and peds.
All	Consolidate lighting poles with utility poles to reduce conflicts in sidewalks.
All	Non-buffered bike lane and 11 ft lanes for busses.
All	Bus turnouts. Divert through traffic to Amazon Parkway. Reduce speed limit on Willamette.
All	The selected alternatives for further study should increase accessibility to the business district and provide improved conditions for bikers and pedestrians, prioritizing those concerns above thru- traffic for p.m. commuters -Amazon Parkway serves that purpose, and by increasing foot and bicycle access and improving safety, business will be more supported.
All	Focus on creating a vital economic district that creates a positive experience and is accessible to all modes of complete street transport. Commuter vehicle traffic should be shifted toward Amazon Parkway (with roundabouts at 24th and 27th and 29th).
All	Concentrate on designs that enhance all user access to the businesses as opposed to catering to drivers that just are passing through. Same goes for cyclists -design lanes to enhance bike access to businesses -not bike freeway through the area.
All	Could there be a concrete barrier just North of 29th so people could not turn left across 3 lanes into the bank. This would be in middle of median. Not a whole wide strip, just a narrow 8" barrier.
All	Please use buffers, they are critical for safety and to attract new users who require the perception of safety.
All	Just repair or replace existing damaged roads and sidewalks or use effective striping and signage.
All	Left turn lanes and fewer driveways would be great. Removing utility poles would also be awesome
All	Add light traffic control at Woodfield Station. How about using light control that changes direction based on how busy the street get (South vs. North)?
	2. Questions
	In option 5, would telephone poles etc. be put underground?
	Would roundabouts be safe for peds?
	Does option 6 need a median? Less concrete = less cost without decreasing safety.
	How will the Woodfield Station parking lot driveways be consolidated to reduce congestion at 29th and Willamette?
	Will bikes really stay off the sidewalks if they have a designated lane?
	What similarities does this stretch of Willamette Street have with successful re-designs with three auto lanes and two bike lanes? How have these re-designs changed bicycle use? And how have the re-designs affected business?
	What evidence exists from other communities that reducing the number of automobile lanes can improve automobile traffic flow and/or reduce accidents?
	What is the future of housing development on S. Willamette -then there is the Civic sound where are the traffic plans if a large store is put there?

	What is the "expected" demographic change (psu???) for the affected residential neighborhoods? No young families are currently inbound.
	What are the anticipated multi-family structures that will be allowed?
	Is the middle turn lane in the 3 auto lane options safer for left turning cars than the current two lanes in each direction, especially when cars from each direction make lefts from the center lane at approximately the same spot?
	Capacity and street flexibility: If South bound traffic is peaking at a certain time and north bound at another time, why not have one way during the morning and the other way during the afternoon?
	Why isn't Willamette one way and Amazon Parkway the other way?
	What plans are being made to improve alleys for bike traffic and side streets and bike access from Amazon Parkway? And between Amazon Parkway(all the way to Hilyard) to Willamette Street. 24th Ave to 30th or 32nd.
	Why is the alley running from Capella parking lot South to Oak Street chopped up and not even fully accessible to any vehicle (not even emergency) and how will this plan remedy this even slightly?
	With the alts. w/o bike lanes what is the bike path? Would Portland and Oak be developed as bike boulevards?
	If there is reduced auto capacity, can alternate routes for bikes be different than auto alternate routes?
	What after-dark safety measures are in place for peds' safety at night?
	No mention of aesthetics -the current street is just ugly. While any change would be improvement, maybe some alternative would provide better aesthetics?
	Will any of the options require any properties or businesses along Willamette to give up any parking space or property?
	What are the safety factors that we are trying to fix? And I do mean -what are the statistics on accidents compared to other similar traffic situations? Please share this information widely.
	Due to the instability of Northbound traffic to turn West on 18th, lots of traffic turns West on 24th and 23rd through the neighborhood. Is there a solution using the Civic property to link Oak with Amazon?
	What plans best support bus stop improvements and bus turnouts?
	Which option might best accommodate EMX in the future?
	Is LTD going to get basements for busses?
	Could the utility poles be moved back from the pavement? Would that be cheaper than undergrounding?
	What physical design steps are being taken to prevent cars cyclists and pedestrians from "gaming the system" (ie. Cyclists going the wrong way, cars driving in parking lots, jay-walking peds) when frustrated?
	What is the life expectancy of the "project": 10 years? 15 years? More?
	What is happening South of Willamette/ 29th? Does it matter?
	Are there any near term sewer, water, wastewater "projects" needed/ anticipated? Dig a ditch, fill it in, dig a ditch, fill it in...

	3. Comments
	[The first alternative is] the only way! Maintain what works. Don't fix something that is not broken.
	#1 seems to be the least expensive project.
	[Option 3] Afraid of lowering people to business
	Alternative 3 is my highest priority, I think this is a reasonable design that provides access for everyone, regardless of their mode of travel.
	[Option 5] Sounds good for a far off future.
	Very concerned that roundabouts would be very dangerous for pedestrians and cyclists.
	Roundabouts are different for pedestrian crossing.
	[Option 6] is too dangerous for emergency vehicles! Think Crest Drive.
	I disagree that roundabouts are safer in Eugene. It doesn't seem safer for pedestrians or wheelchair users or those with limited vision.
	[Option 6] Bad idea for such a stop and go traffic "flow."
	Roundabouts at small-scale intersections are ridiculous! Terrible for bikes and peds! How can this be safer? Needs more R.O.W.
	I think we need to be very careful to make clear how bikers/ cars should behave in roundabouts to keep things as safe as possible.
	I am concerned about roundabouts and their safety to the visually impaired.
	The roundabout idea is a good one but has been coupled with a raised median which seems like a deal-breaker due to emergency access/ business access issues. Consider roundabouts for some portion of the other alternatives in the next design phase.
	Option 6 is a terrible idea: Northbound from 32nd (pws) would need to travel all the way to 27th roundabout to "come back" to Woodfield Station. Narrows access South forever. Very expensive to return to higher capacity.
	No roundabouts. They stink.
	Roundabouts are dangerous for bikes and pedestrians.
	[Option 6 is] not great for businesses, emergency vehicles or neighbor streets.
	Option 6: This plan would be a disasterous waste of space.
	Roundabouts are dangerous for bicyclists (pedestrians also).
	Roundabouts are incompatible with slower, denser, more urban character and also with pedestrians and bikes.
	Leave the 4 lanes -traffic is bad going South or rush hour and not good going North.
	Bikes shouldn't be on road.
	The 2-lane option is too extreme. Willamette is major route -like you said emergency vehicles would be affected and parallel streets would be significantly affected by traffic.
	No bike lanes. They are too dangerous. Bike riders should dismount and walk in pedestrian areas. Bike commuters should be required to use existing bike lanes and routes.
	205 Cars, 1 bicycle: 15 min tally in the afternoon.
	5 of 6 altern. Reduce travel lanes, not in favor, there should be more options including/ maintaining travel lanes.

	We really must have a discussion of what is going to happen between 18th - 24th because connections must be made. How or will 18th -24th be altered? Makes a big difference in future designs.
	I am very skeptical that the 3 lane options will have less capacity than existing conditions including the mess on Willamette between 24th and 18th.
	I would prefer any alternative with a center turn lane or similar (roundabout for example) to improve safety (for drivers, peds, bikes) and avoid the current "slalom" driving experience.
	The street is crying to be 3 lanes in my opinion.
	Options 1, 2, 5 do nothing to accommodate bicycle traffic on Willamette Street. The other options are better for all users.
	Too many driveways.
	Accessibility should also be considered -A turn lane provides greatly enhanced accessibility (don't just look at mobility).
	Restricting drive cuts and connecting businesses at rear could reduce vehicles on Willamette, Rear connectivity would be important.
	Intersection of 24th & Pearl/ Amazon is narrow for S.B cyclists
	"Detour" via Amazon Path adds more time and distance for cyclists. Plus no good access to west, i.e. S. Willamette.
	More safety and comfort for families with young kids to walk and bike.
	I ride an incumbent tricycle to many businesses along this segment of Willamette. I can usually get to anywhere I want to go, but bike parking is inadequate in all cases except Market of Choice and Capella. Bikes have to squeeze between cars and hop a sidewalk to get to bike racks. Parking is inherently the biggest deterent to cyclists use of Willamette Street.
	We should not consider any of these that don't include bike lanes.
	We should not consider any plans which don't ensure bike lanes.
	When you add bikes on the sidewalk or add a cycle track, 4 and 5 become almost the same.
	Bikes sharing sidewalks doesn't seem safe.
	Although improving parallel routes for through traffic is great, cyclists want to access the businesses on Willamette.
	It is important not to just consider "capacity of the road" being vehicles -what is the bicycle capacity?
	Bike lanes need signal change installed on street so bike can trip the signal to green.
	I disagree with the evaluation that all alternatives listed except for #4 are equal in social equity, because options 1 and 2 are unacceptable for cicyclists, offering no improvement whatsoever and maintaining current terrible conditions.
	I'm concerned that none of these options are sufficient for reticent cyclists to feel safe. Say, for parents with young kids to abandon their cars and bike with kids instead. Research shows they need to feel more protected to move forward in taking that step. And we want their activity, business, and inclusion on Willamette Street.
	We live near Amazon Community garden. We walk and ride bikes in this area for errands, etc.... We mostly use the side streets because of Willamette's condition.

	Through traffic that does not patronize any of the businesses could be "pushed" onto Amazon Parkway. Most automobile drivers and bus drivers know how to handle a bike lane on the right hand side so I don't think it should be thought of as a negative aspect for vehicle or transit access/ mobility.
	Need to make bike lanes visible to cars, sidewalks less ideal.
	Safe bike blvds. Or lane with buffer.
	This is difficult to choose as details of a potential "cycle track" on the wider sidewalks were not provided. Comparing the bike path and non-bike path plans is difficult with this info missing.
	First and foremost I believe we need dedicated bicycle lanes. But where the bike lanes are provided for, if lane widths can be narrowed to provide more sidewalk, that is my next personal priority. I cycle on this stretch of Willamette 4-6 days/ week and do most of my shopping there, using a bicycle and a trailer.
	Please consider the needs of aging citizens. We walk, use the bus and our children and grand children bike and bus to work and school. The auto continues to be importat but is not the most important. Willamette between 24th and 29th has wonderful businesses who would thrive under improved conditions for pedestrians and bicyclists.
	Bike/ ped infrastructure improvements = increased business!
	If you are looking at Portland for a bikeway, what happens southbound to get from 27th and 29th, no way you can expect cyclists to climb the hill on 27th to Linclon. Oak North doesn't get you to 24th either. Getting cyclists and pedestrians in the other area will increase business. Goal decrease cars, increase bikes and pedestrians.
	Top priorities in my opinion (in this order): Safety; bike lanes; cleaned up sidewalks, as wide as possible; fewer, wider driveways.
	Please become aware of your language use, it has real life consequences: capacity, volume are making yourdesigns but always refering to automobiles that then have to be accomodated. What about taking biking/ walking capacity as your guideline?
	Bike and ped only and public trans (bus). With a town as progressive as Eugene, start a greenway where cars have to go around. Pedestrians and bikes and trees will have the right of way. There would be space for parades, "street" performers, musicians, etc...
	Improve street trees. Improve bike ways in the area.
	Both as a driver and a cyclist, I prefer having a curb between cars and bikes. I have some concerns re: mixing bikes and pedestrians on the sidewalk, although that already happens on the existing 6 ft sidewalk.
	I believe left turn lanes would please businesses and car commuters to continue car flow. However, I am a pedestrian hoping to be a bicyclist visiting these businesses (already a bicyclist) if it were safer. Fewer lanes would make it so much better to cross. Wider sidewalks make a real visual impact that the area is being slowed down... also potential for beautification, which should be positive for businesses. Prevent driving on sidewalk with trees? Landscaping? Bicycle parking that doubles as preventing cars? Envision Eugene ideas for furniture, etc.
	I understand that VMT are decreasing, suggesting that we should weight non-auto needs higher than current usage to better prepare for the future.

	I own a not- yet - open business at 25th and Willamette and my customers (99% of them) drive to my bird seed and nature store to buy their bags of seed. So I'm concerned about a loss of convenience to drivers who are my customers. And I also ride my bike to and from work too! But I do avoid riding on Willamette.
	I am concerned about fewer people to my business area will make an impact in customers to my shop!
	This area of Willamette is not a great bike neighborhood to me the most important is to keep our special shopping area vital. I walk a lot to the shops -sidewalks are important.
	The section at Woodfield Station needs special consideration.
	Please question the need to have a left-turn lane. It takes a lot of the very limited avaliable space (percentage wise) for a benefit that is high conflict for lots of user groups includign competing left-turners from the opposite direction vehicle lane,
	In these budget crunching times, it is difficult to choose options without knowing costs.
	Budget consideration -Improved Willamette corridor will increase real estate prices enough to pay for it!
	The "cost effectiveness" screen for evaluating alternatives should consider the cost of operating vehicles -not just the cost of building the infrastructure.
	Police enforcement on 18th to 20th to keep bikes from riding wrong way (N) on the one-way street (I bike, but I also drive -don't want to fill anyone!)
	Compare design scenarios to similarly designed streets in Eugene with similar traffic counts. Compare lane widths for autos and bikes (and sidewalk widths) to help the public assess options.
	Carefully assess intersections and provide this data/ design.
	Use economic development research on different street redesigns and how the public investment drives market value. Look to PDX 2040 Growth Plan for examples. This would greatly diminish likelihood option 1 and 2 pens out for the Envision Eugene plan for long-term growth/ change. These should be considered jointly and not separately.
	Both in the Northern corridor, but especially in the Southern structures will be replaced! And they will be denser! (See SE corner of 24th/ Willamette) Also: a younger demo increase could substantially increase bike usage!!
	More energy needs to be spent on envisioning how these alternatives will affect the beyond-street realm: parking, business store fronts, residential, etc. Robin addressed this briefly, but if this is what we want, why not integrate it now? These are critical to discuss now not in the distant future. If we want complete streets, we need to think in a complete way. "Capacity" as a cup is a false analogy. The most important criteria are how attractive the area is for people to live, walk, work, etc. not how many cars and bikes it supports. Thinking about this project as a transportation project is a too narrow of a perspective. Reducing speed is a very positive outcome for most, if not all stakeholders.
	We should consider reducing travel lanes from 11' to 10' to slow traffic and increase sidewalk width.

	At a first meeting on this subject, I and others on our table suggested using Willamette as a one way street (coupled with Amazon). No mention has been made of why this would not work. All plans were to be talked about tonight. Not so, I see. There should be talk and studies on future transporation needs on Willamette. The planned apartment buildings will add a great many cars to the road. Give us the future planning figures. We need to know the "capacity" of each plan.
	The side street bikeway idea will hopefully involve some way to get on Oak down the alley at the very North end and also how to get from Portland directly into Southtowne without carrying it down steps.
	I'd like alternate bike street option or improved alleys.
	Oak and Portland streets are viable routes for bicyclists. I am very concerned about bicyclists' safety if bike lanes are added in 3, 4, or 6.
	Bike lanes, parallel to Willamette St. would allow cars to drive to their businesses. The older generation living in the South area may not be biking as frequently as the University areas.
	I'm in favor of bikes on alternative routes or cycle tracks sharing sidewalk. The combination of cars and bikes on this opens a lot of safety issues, bikes and crossing each other, multiple driveways, etc. Concerns for economic loss, cost, and esp. safety -fire trucks? Police? Busses?
	Like the sidewalk width. Not sure 3 lanes can work in option 5. Although I support improving and increasing bike access and facilities, Willamette is a major arterial and I don't think there is adequate space to add safe, dedicated bike lanes. I support improveing bike routes on Oak and Portland and alleys. I also would like to see bus turnouts. If there was an option to get additional space beyond the 60 ft I would like to see sidewalks wider than 9ft. Definetly need to reduce number of driveways. When I bike, I prefer not to bike on busy streets anyway, even with bike paths.
	If Willamette was pretty, if people could walk and gather there, if businesees integrated smoothly w/ the pedestrians, the notion of café's, places to sid, accomodation of bicycle traffic are wonderful and Willamette would stop being a blighted, ugly, car motivated place.
	Raised sidewalks at In-Shape.
	As a business owner I am very much looking forward to the 'upgrading' of Willamette Street to make it an attractive -tree lined- no pot holes- area that attracts families, singles, students, etc. to come to our area.
	Lighting can be a problem.
	Wider sidewalks create safer space.
	If sidewalk next to traffic lane, maybe some form of protective buffer to protect pedestrians.
	Mid block crosswalks should be considered in front of Market of Choice and around the Holy Cow area. There are big distances between cross walk for peds to travel.
	The traffic light for Woodfield Station would be great for pedestrians, like across 29th coming out of Market of Choice and Asian Market.
	Please provide all background data prior to the next meeting/ decision.

	There seems to be a distorted representation of bicycle advocates. The general public is far less prone to use bicycles to shop or commute in this area when there are perfectly flat areas immediately to the east. It seems irresponsible to cater to the minority at a significant disadvantage to the majority -with a blind optimism as to the economic consequences, and a failure to tudey where traffic uses Willamette to get to and whose neighborhood it would congest if we lost lanes.
	Please take these surveys with a grain of salt at the "more" road biking community seems to be more represented at this meeting.
	Get Mark Gillem involved.
	A horse designed by a committee looks an awful lot like a camel.
	Evaluate alternatives for safety. How does it impact safety compared with the current reality.
	Safety has to be part of evaluation.
	Drainage is hazardous on many sections of the northern corridor!!
	I assume all alternatives would improve drainage and prevent water pooling at curb and pedestrians being splashed. Not mentioned.
	The transportation model to analyze alternatives should account for the trend of decreasing VMT -or at least not assume continued growth in VMT.
	We cannot give up maximum traffic capacity for this critical travel route. We do need to establish a plan that will extend R.O.W. as soon as possible in the future, so at least sometime in the future, space would be available to make bike lanes and sidewalks as it seems people want but we don't have room to do it safely now.
	Carefully account for changes in traffic patterns in nearby residential streets. Provide this data.
	Assess nearby auto routes to accommodate thru commuter traffic (similar to your assessement of alt. bike routes). Spend money to fix overall problem.
	I wish substantial traffic could be diverted from Willamette to Amazon Parkway.
	Amazon Parkway should be an alternative for traffic N and S.
	Suggest adding in other traffic-calming, especially at intersections. For example, intersections and or crosswalks that are just slightly raised, different color, and or different types of pavement such as bricks.
	Traffic needs to slow to support urbanization.
	The assumed 30 mph speed limit doesn't seem compatible with sharrows.
	Are there any studies on whether 3 lanes (one middle lane turn lane) slows over all traffic -otherwise I have concerns about people still going too fast (as they do now) when trying to "commute" through) with fewer lanes for traffic -hence more dangerous.
	Sharrows would depend on car speed and density work better if cars go slower and not so many of them.
	Clarify how much travel time would increase when stated. Is it significant?
	Roads should not be designed around enforcement issues -such as vehicles not letting busses pull back into lanes.
	Though it cannot be considered within the scope of this project, pullouts for LTD buses are desired.
	North bound bus stop across from Woodfield Station needs a pedestrian crossing: people are sprinting out into the roadway now.

	Make public transit more affordable/ desirable to reduce vehicular capacities.
	We're concerned about bus pull-outs.
	I have a big concern about bus stops. Big delays unless have a pullout, but how would that affect sidewalks?
	Option 3 is too narrow for busses.
	Transit pull out alley -utilities reduced traffic from more walking/ biking.
	Spend money now to bury utilities -it will cost more in 10 years!
	In the long term, the overhead "utilities" must be buried.
	Utility poles are a hazard for bikes and pedestrians.
	Left turn signals are very much needed.
	Although I am in favor of any option that fits the needs of many people -with safety at the forefront- I feel it must be said that bike and pedestrian traffic occurs mostly in the summer -the rest of the year is too cold and rainy for most people to walk or bike.
	I really like alternative 6 but am concerned about the through traffic volumes. Then again if we make it easier to walk and bike than drive, people will be more likely to choose those modes. This would be beneficial in lessening the traffic volume and improving the atmosphere. I imagine that would be the best environment for the businesses but more difficult for through traffic. The way I see it, someone who is new to town and has not decided how they are going to transport themselves, should be able to look at Willamette and see a representation of our community values and unbiased options of how to use the street -it needs to work equally well for vehicles, bikes, and pedestrians and busses!
	I chose [the options I did] because they are the only complete streets and consider the safety and social equity ideals that our community values.
	All businesses applying for permits to expand or reconfigure their buildings or parking facilities should be put on notice that in the future the City may choose to widen its right or way and would be unwilling to compensate the businesses for any losses resulting from design changes.

Section G

Community Forum #3 Summary

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Meeting Summary
Community Forum #3: Evaluate the Alternatives

June 11th 4:00-5:45 and 7:00-7:45 pm
South Eugene High School

Overview

At the final of three community forums, participants reviewed the transportation study results regarding three alternatives for improving Willamette Street between 24th and 32nd Avenues, asked questions, discussed and shared their preferences. The study aims to help South Willamette Street be a vibrant urban corridor accessible by bicycle, foot, car, and bus. The area includes residential, commercial, and mixed uses, and six intersections over about a ¾ mile stretch. The study area is currently forty-two feet curb to curb, has sixty feet of right of way, no bike lanes, and irregular sidewalks with more than seventy driveways.

Two well-attended meetings were held on June 11, 2013 to accommodate the high level of civic engagement, filling the large cafeteria at South Eugene High School with 275 participants. DKS Associates presented their study findings and answered questions. In small groups, participants discussed what new information might influence their preference, and then reconvened as a full group for a thoughtful, structured discussion of the options. Surveys of participant opinions were collected at the end of the meeting.

Meeting

Chris Henry, City of Eugene Project Manager, explained that this project is part of a larger land use planning effort, "Envision Eugene," that plans for the 20-year future of Eugene's population and employment. The district around Willamette St. is the subject of a Concept Plan dealing with infill and redevelopment opportunities. The Street Improvement Plan project aims to develop a complete street redesign plan for an active transportation corridor, where people can walk, bike, access transit, drive, and access the area's businesses. The plan aims to support the area's existing businesses and the commercial district's vitality, create a balanced multi-modal transportation system, further City planning efforts to identify compact growth and redevelopment opportunities, and foster a well-informed community supportive of the plan.

Scott Mansur, DKS Associates, explained the inclusive process that led to selection of the three alternatives for deeper analysis being presented, and explained that in the autumn of 2013 the plan will be presented to the Eugene Planning Commission followed by a presentation and recommendation for action to the Eugene City Council. To see the presentation PowerPoint of study findings visit the project website at *eugene-or.gov/SWillametteStreet*.

Ellen Teninty, Cogito, facilitated clarifying questions prior to breaking into small groups for an opportunity to think about what participants had heard and listen to one another's views. Cogito then facilitated a process of large group discussion coordinated with survey feedback. See Attachment A for discussion notes, and Appendix B for survey comments.

In addition to the meeting, the survey was available on-line for the following week. The following pages are the separate survey results of (1) the June 11th meetings, and (2) the on-line survey.

Survey Results

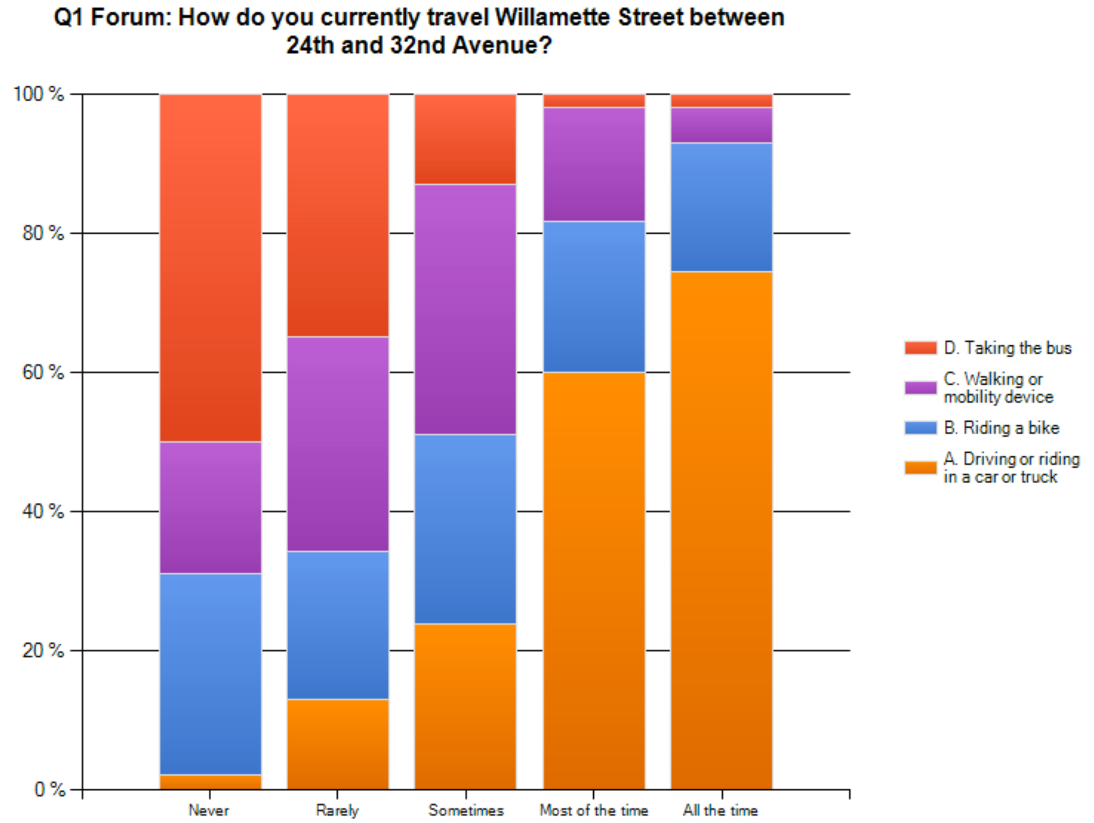
The project developed a survey to gather public input on the impacts of the three remaining design alternatives for the South Willamette Street Improvement Plan. Survey questions were designed to gather public opinion on the results of the traffic analysis conducted by DKS Associates for the City of Eugene. The goal of the traffic analysis was to understand the impact on motor vehicle traffic of each alternative. See page 12 for a copy of the survey.

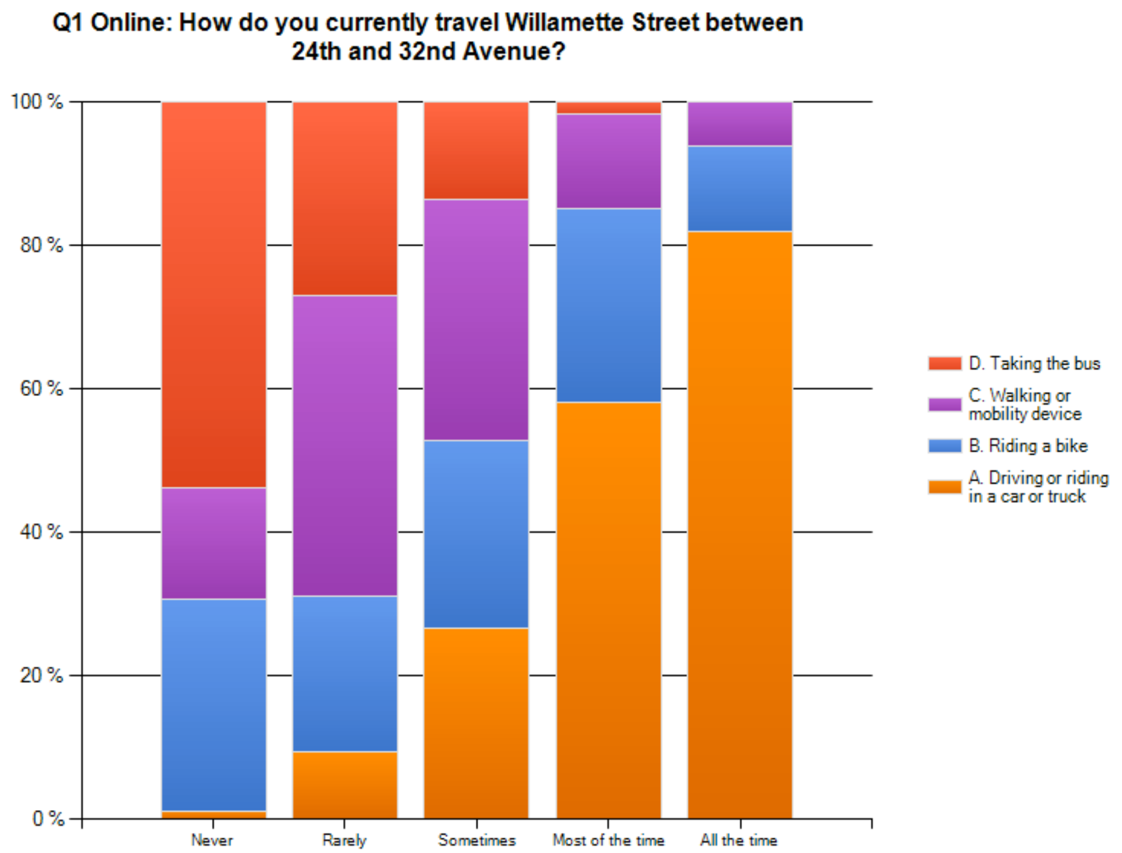
To develop the survey, the project team reviewed the results of the traffic analysis, discussed the content for Community Forum #3, and identified areas where public input would be valuable to decision makers. To view the results of the traffic analysis, visit the website documents: Technical Memos #7 and #8.

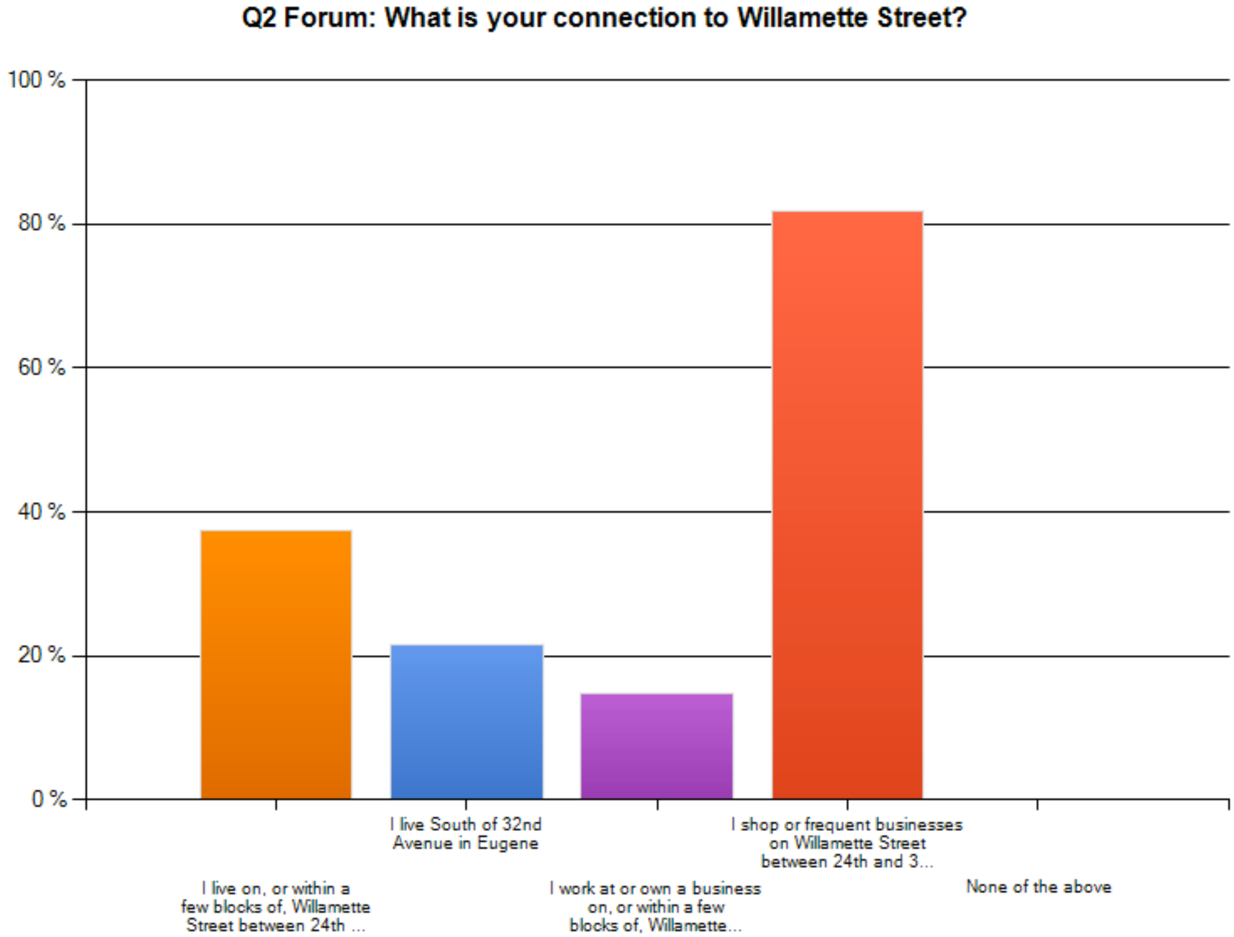
The survey was conducted at both Community Forum #3 on June 11th and online for a 7-day period following the forum. Because some individuals chose to complete the survey at both the forum and online, the results are compiled separately. Out of approximately 275 people who attended Forum #3, 223 completed surveys. 394 surveys were conducted online. Forum participants benefited from a presentation and group discussion, while online participants relied on graphics built into the survey. Survey completion rates were very high: only 4 surveys were incomplete at the forum, and 12 online surveys were incomplete. The surveys are unscientific and the results do not represent the demographics of the community:

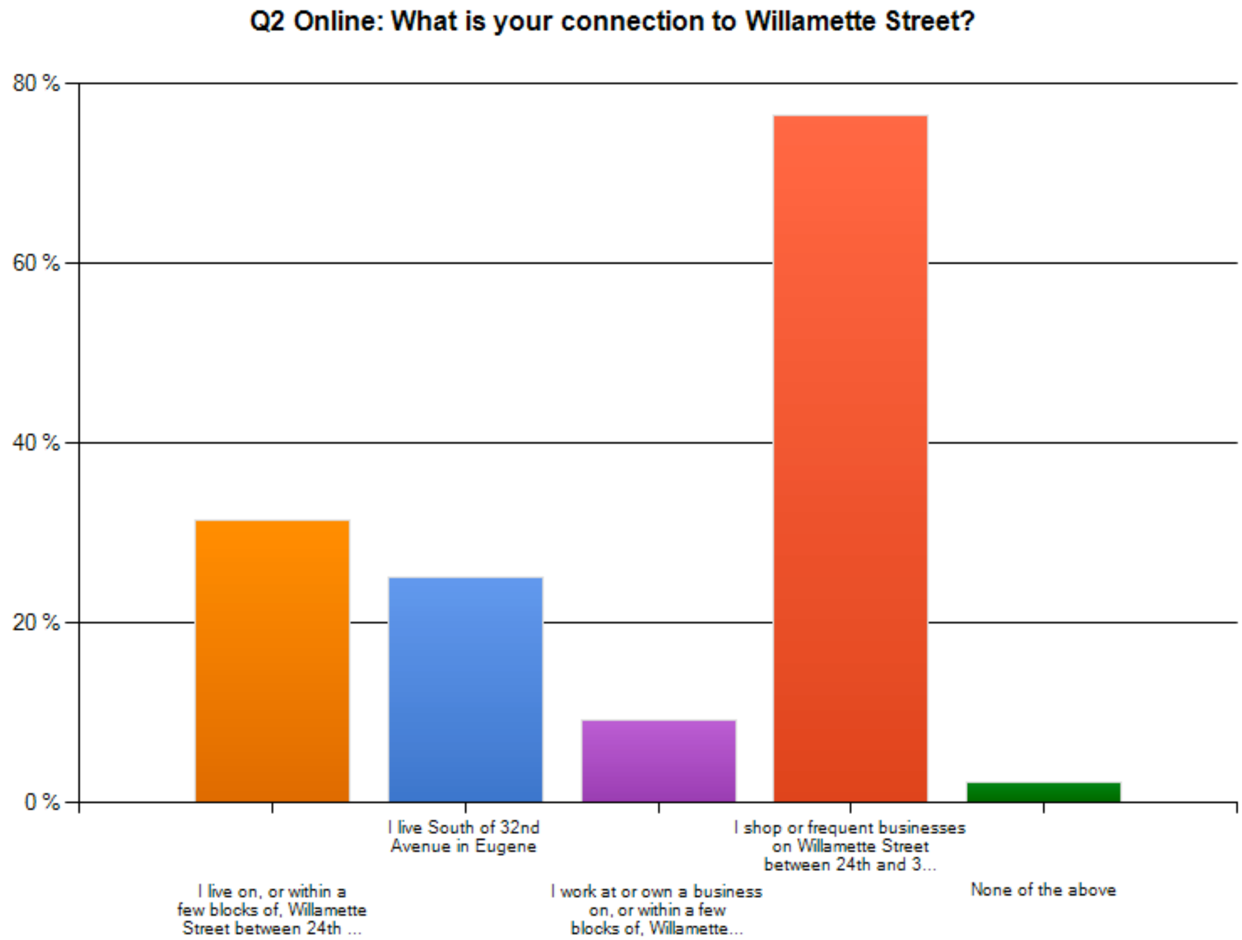
- Both the forum and online respondents were significantly older than the median age in the area and youth were not well represented. According to the City of Eugene Neighborhood Analysis, about 20% of the population in South Eugene is over 60 years old. In contrast, 43% of forum survey respondents were over 60, and 30% of online survey respondents were over 60.
- Both surveys showed strong representation by individuals who shop on Willamette Street, and significant representation by people who live in the immediate area. There was low representation by businesses and individuals who live South of 32nd Avenue: out of 394 online responses, only 36 people who own or work at a business completed the survey.
- Specific questions about traffic signals (Q4), delay (Q5), and traffic shift (Q6) received less support from online participants than forum participants. This could be because the online participants did not benefit from the forum presentation and discussion.

In the following pages, survey results are organized sequentially by question: the first graph shows responses at Forum #3 and the second graph is the response from online participants.

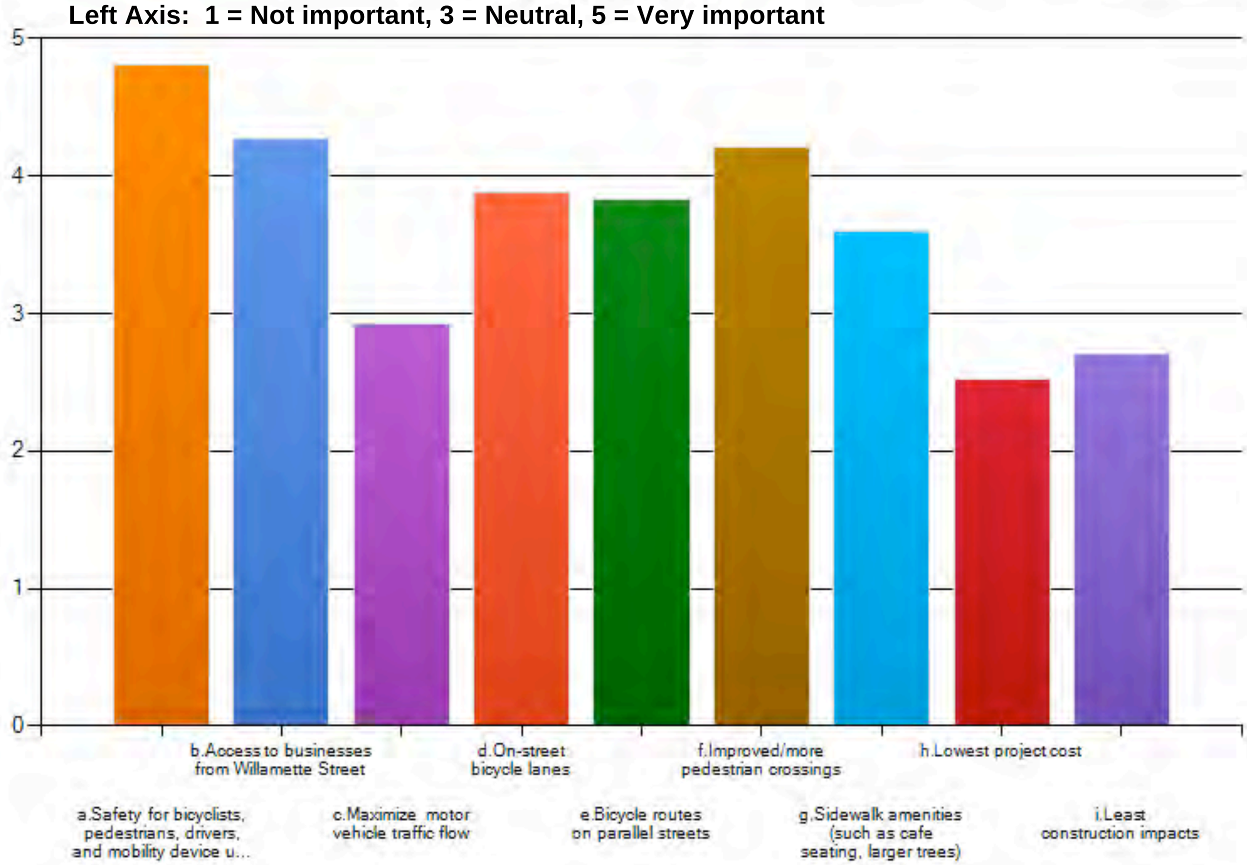

Q1 Forum: How do you currently travel Willamette Street between 24th and 32nd Avenue?
100 %
80 %
60 %
40 %
20 %
0 %
Never
Rarely
Sometimes
Most of the time
All the time
D. Taking the bus
C. Walking or mobility device
B. Riding a bike
A. Driving or riding in a car or truck


Q1 Online: How do you currently travel Willamette Street between 24th and 32nd Avenue?
100 %
80 %
60 %
40 %
20 %
0 %
Never
Rarely
Sometimes
Most of the time
All the time
D. Taking the bus
C. Walking or mobility device
B. Riding a bike
A. Driving or riding in a car or truck

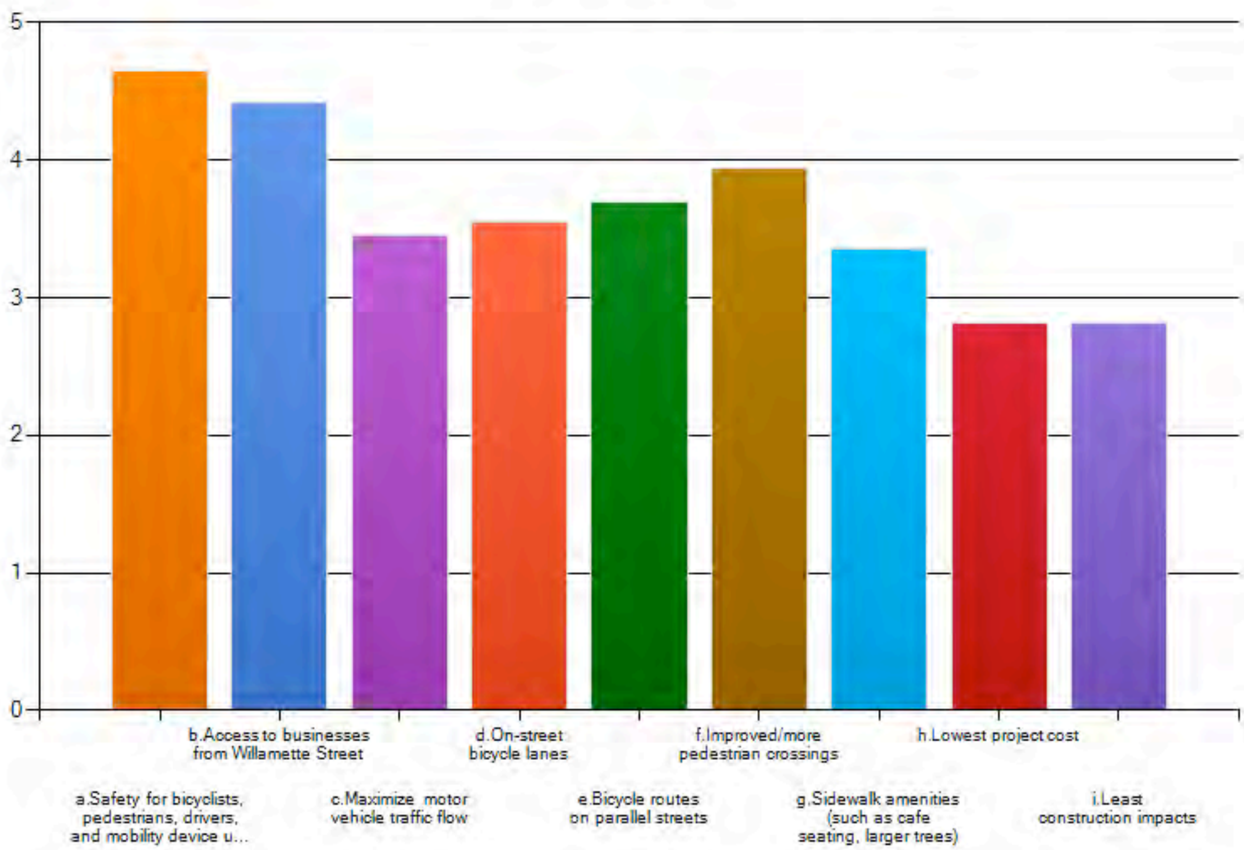

Q2 Forum: What is your connection to Willamette Street?
100 %
80 %
60 %
40 %
20 %
0 %
I live on, or within a few blocks of, Willamette Street between 24th ...
I live South of 32nd Avenue in Eugene
I work at or own a business on, or within a few blocks of, Willamette...
I shop or frequent businesses on Willamette Street between 24th and 3...
None of the above


Q2 Online: What is your connection to Willamette Street?
80 %
60 %
40 %
20 %
0 %
I live on, or within a few blocks of, Willamette Street between 24th ...
I live South of 32nd Avenue in Eugene
I work at or own a business on, or within a few blocks of, Willamette...
I shop or frequent businesses on Willamette Street between 24th and 3...
None of the above

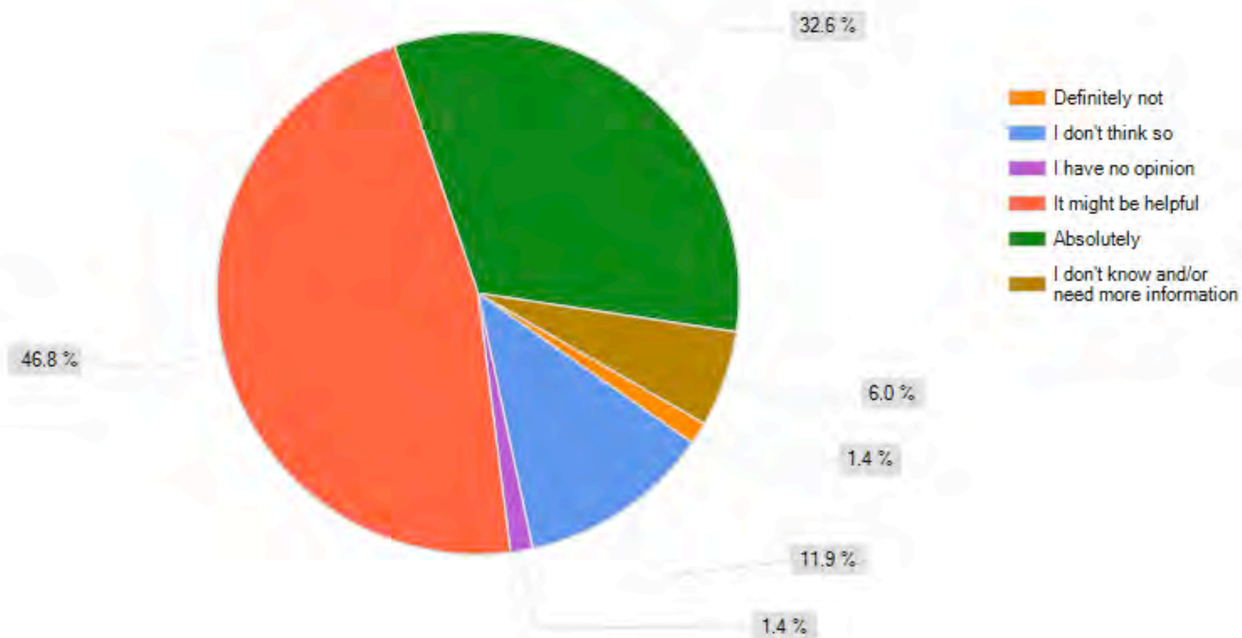
Q3 Forum: In your opinion, how important do you think each element listed below is to the community?



Q3 Online: In your opinion, how important do you think each element listed below is to the community?



Q4 Forum: A new traffic signal on Willamette at the Woodfield Station (Market of Choice) driveway between 28th and 29th Avenue could provide better access for turning vehicles and a safer pedestrian crossing opportunity. This would likely mean closing some business driveways on the east side of Willamette and designing alternative accesses. Should the City install a traffic signal at Woodfield Station and Willamette Street?



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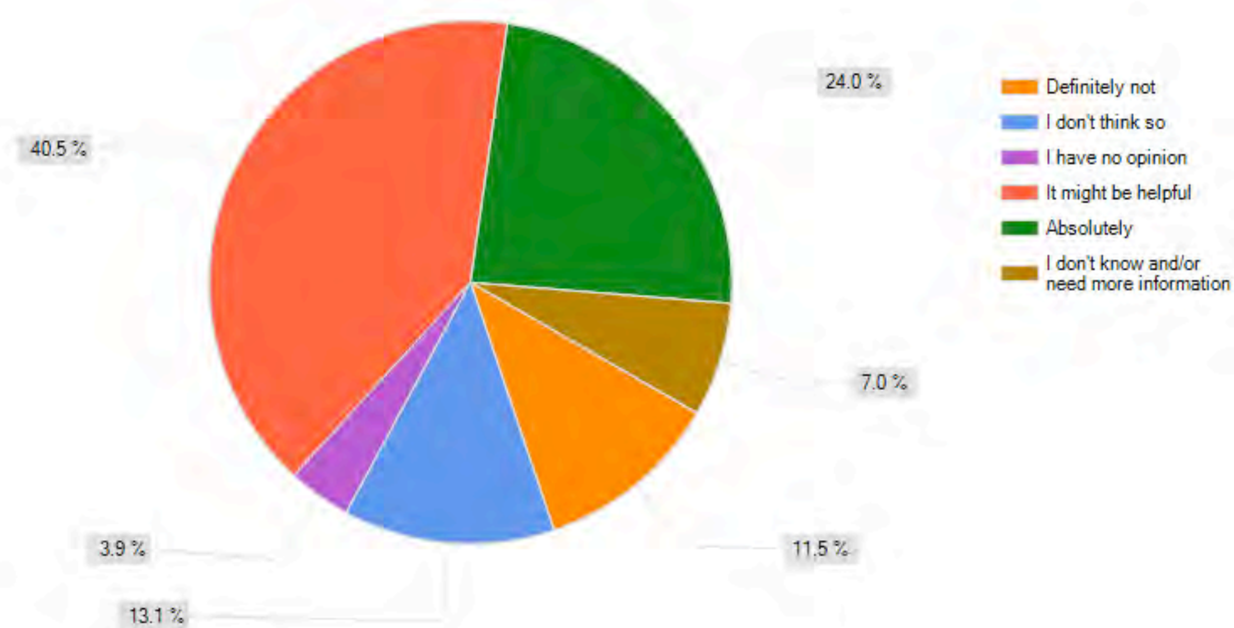
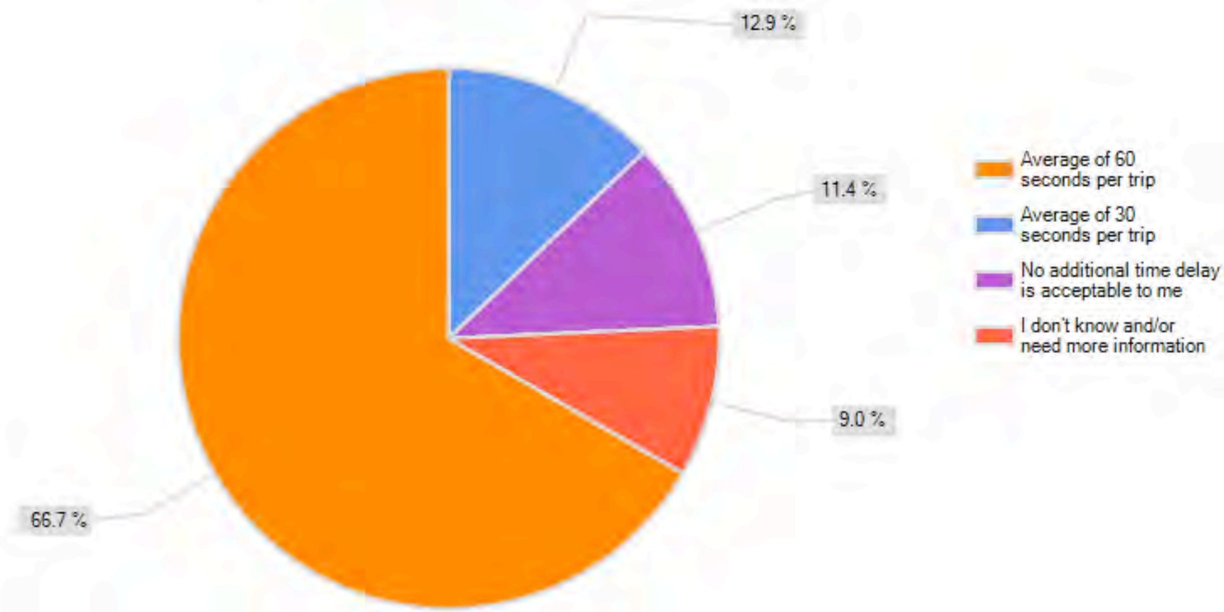


Q5 Forum: Corridor Function: Analysis shows that Alternatives #3 and #5 will increase delay along the corridor. The projected average increase in travel time during evening rush hour in 2018 would be about 30 seconds longer per one-way trip than Alternative #1. When driving Willamette during rush hour, how much additional delay is acceptable to you?



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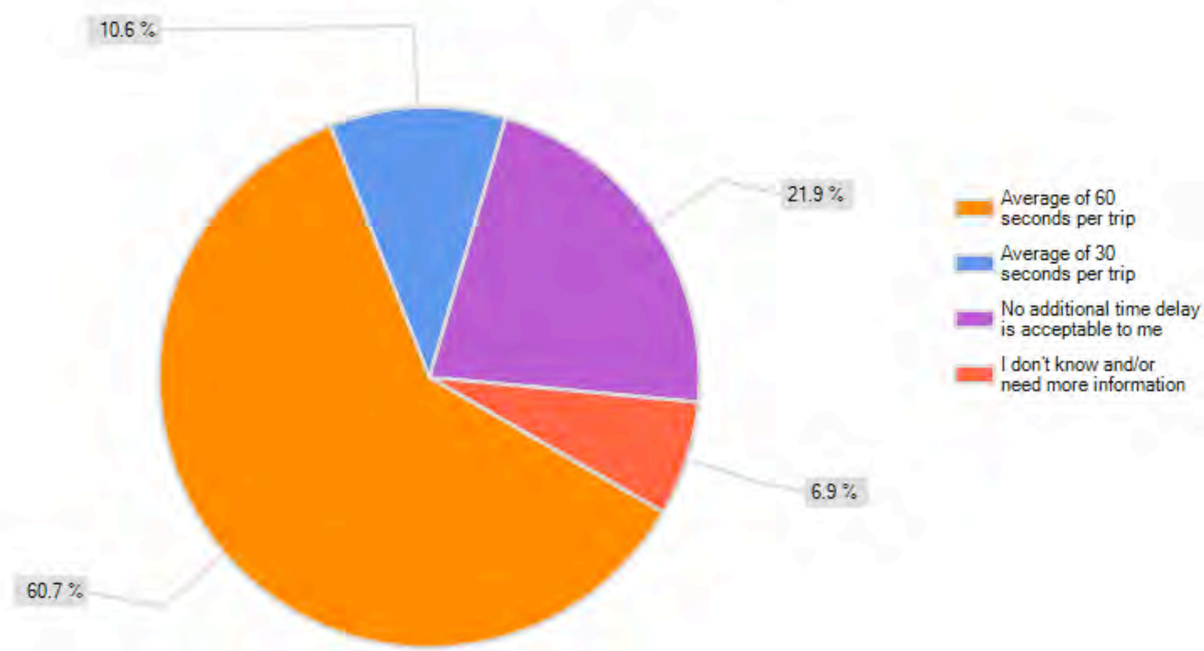
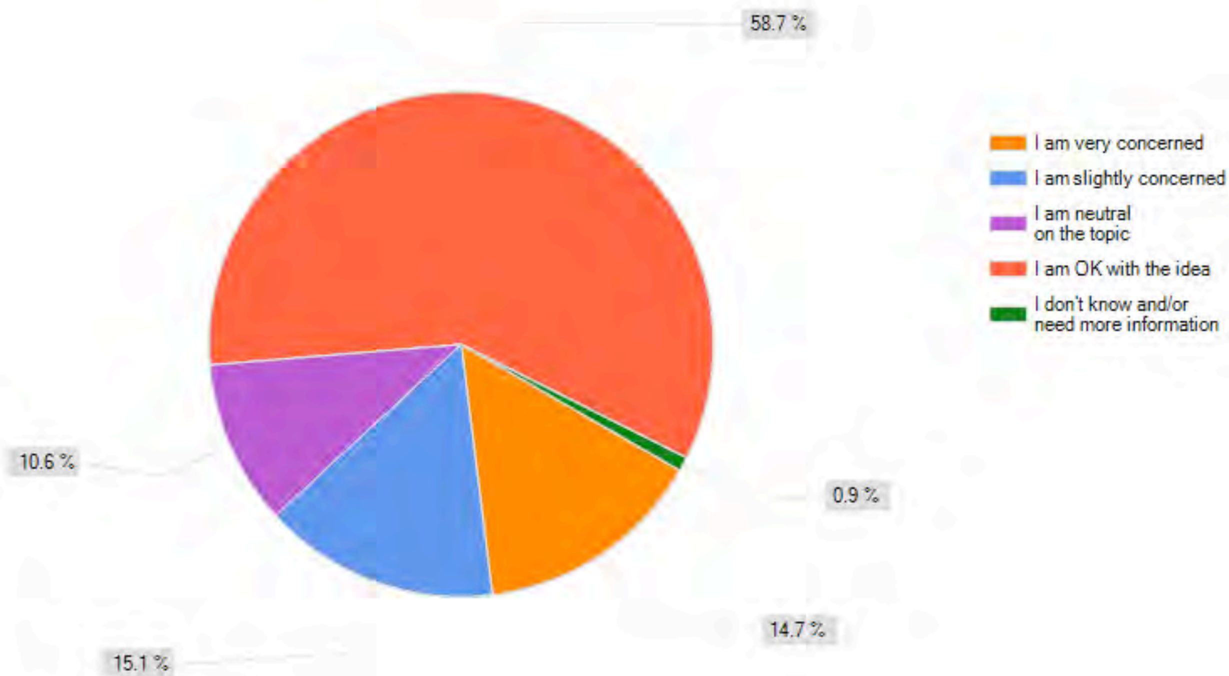
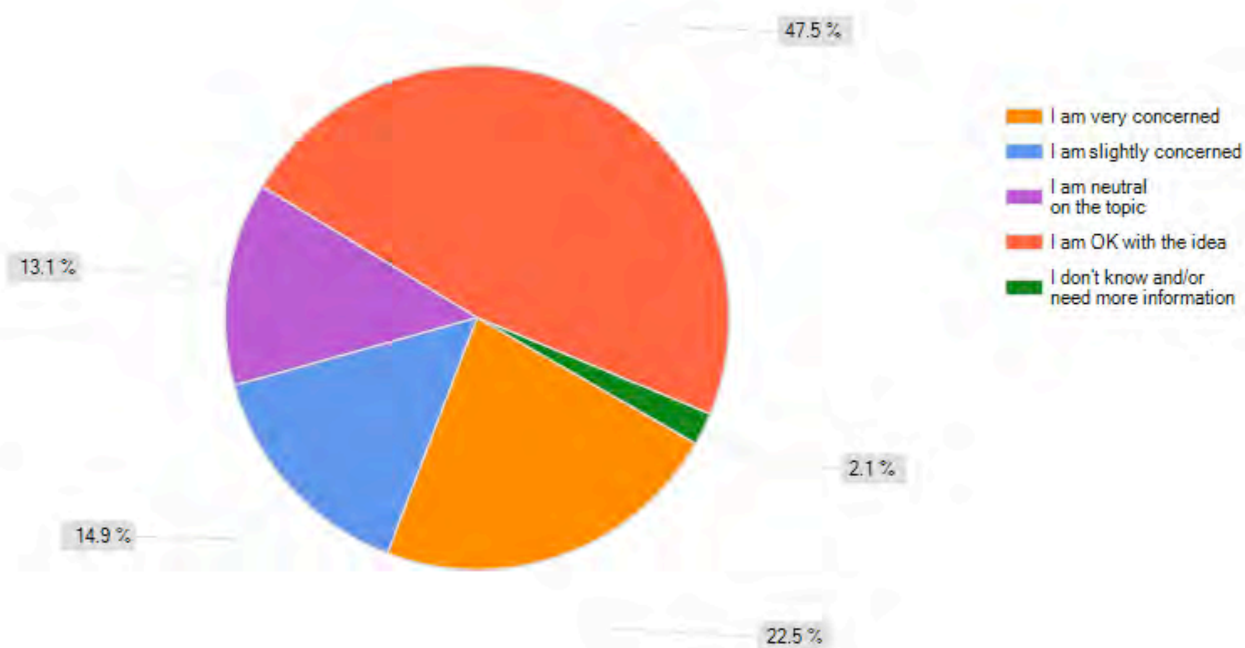


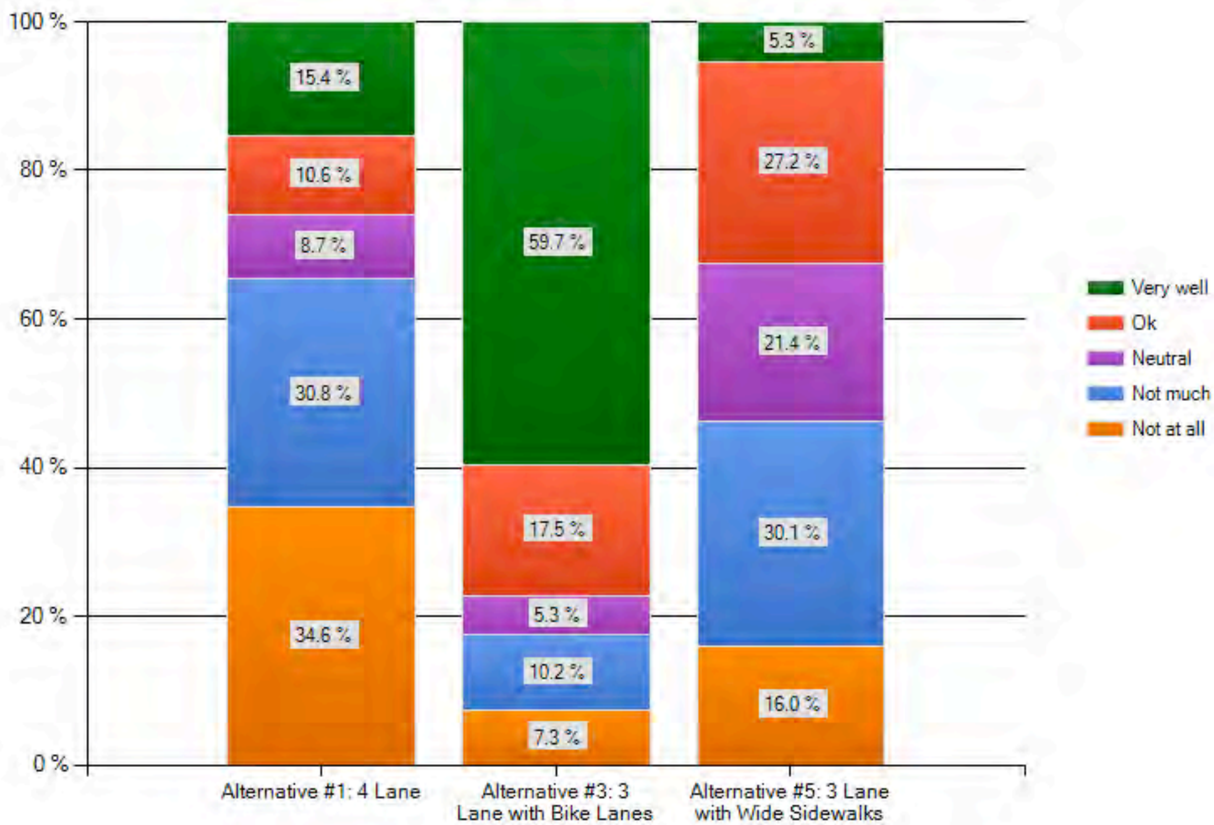
Q6 Forum: Traffic Shift: Alternatives #3 and #5 may shift a small portion of Willamette Street traffic to parallel streets during the busiest hour of the day (4:45 pm-5:45 pm). Of the traffic shifting away: •About two thirds would use to streets east of Willamette, such as Amazon Parkway and Hilyard. •About one third would shift to streets west of Willamette, such as Lincoln, Jefferson, Adams and Polk. How concerned are you about traffic shifting to parallel streets?



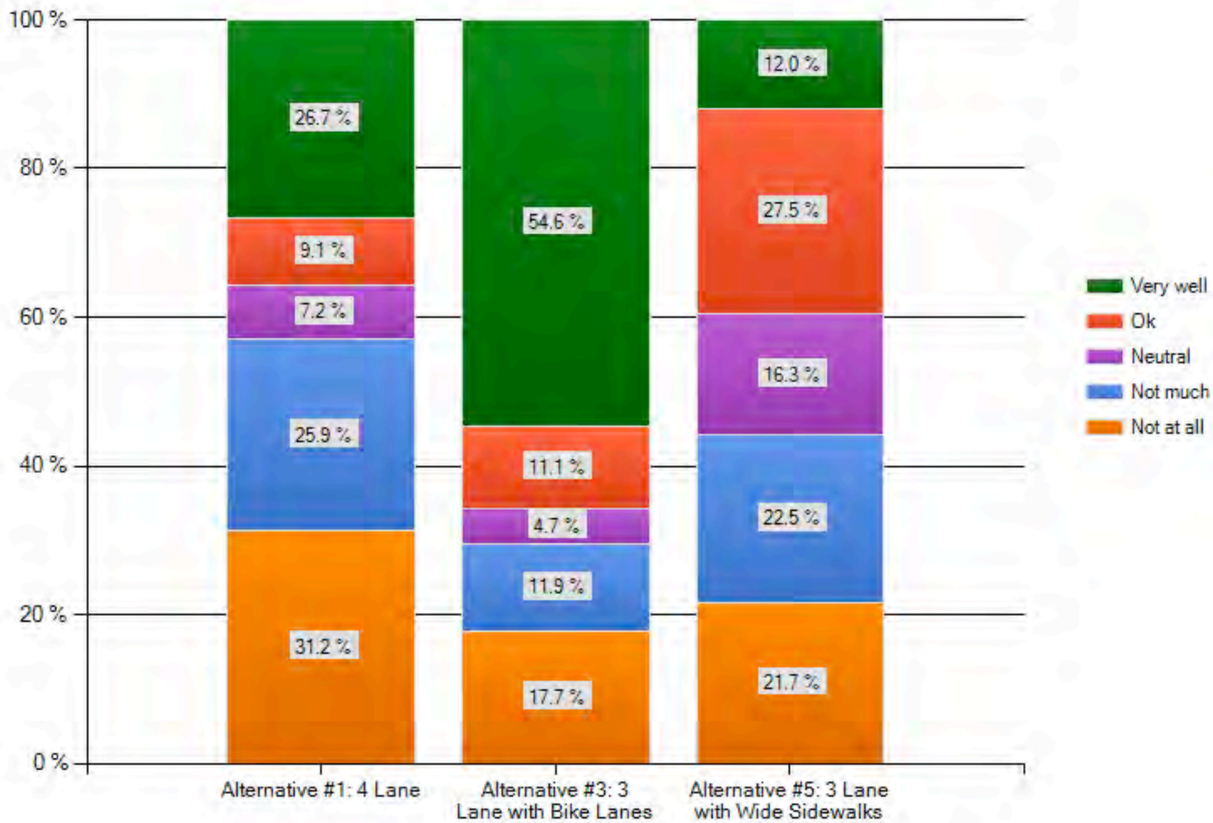
Q6 Online: Traffic Shift: Alternatives #3 and #5 may shift a small portion of Willamette Street traffic to parallel streets during the busiest hour of the day (4:45 pm-5:45 pm). Of the traffic shifting away: •About two thirds would use to streets east of Willamette, such as Amazon Parkway and Hilyard. •About one third would shift to streets west of Willamette, such as Lincoln, Jefferson, Adams and Polk. How concerned are you about traffic shifting to parallel streets?



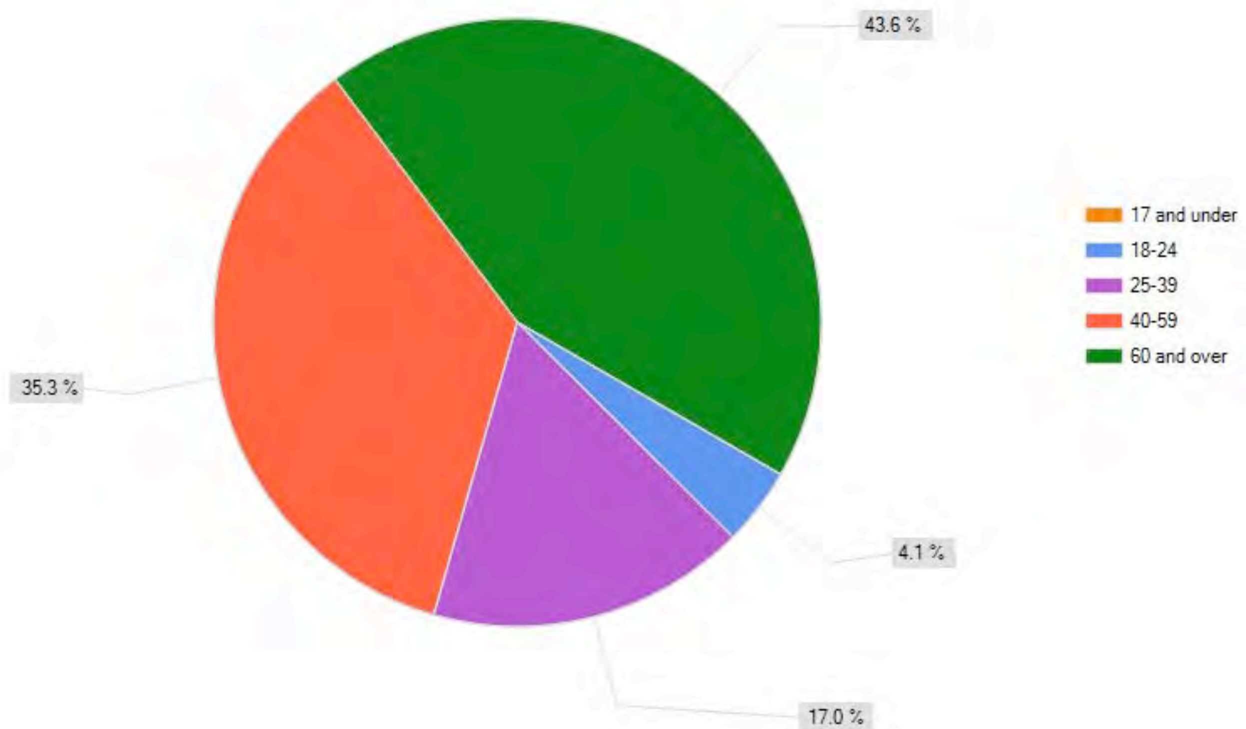
Q7 Forum: Public opinion is one of several factors that the City will consider in the final decision. How well do you think each alternative meets the needs of the community?



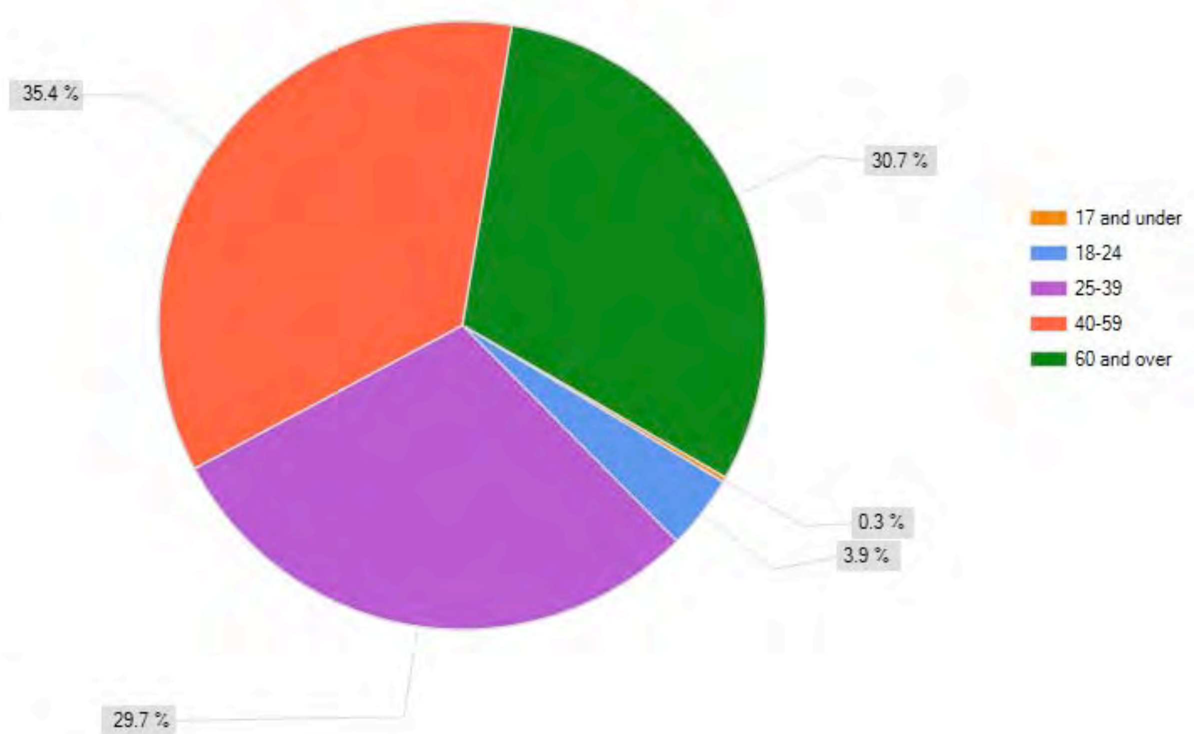
Q7 Online: Public opinion is one of several factors that the City will consider in the final decision. How well do you think each alternative meets the needs of the community?



Q8 Forum: What is your age?



Q8 Online: What is your age?



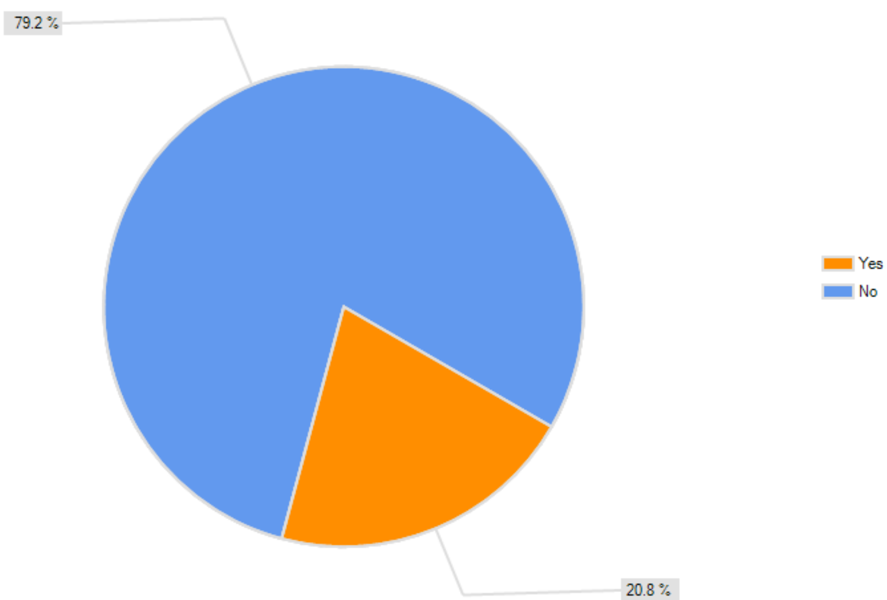
Q9 Forum: What is your gender?

Male	54.2%
Female	45.8%

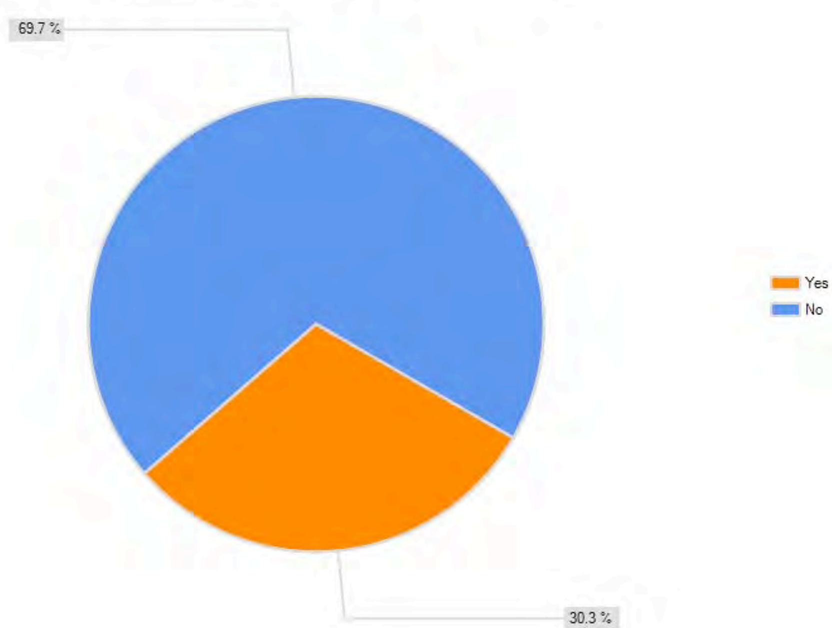
Q9 Online: What is your gender?

Male	50.0%
Female	51.1%

Q10 Forum: Do people under 18 live in your household?



Q10 Online: Do people under 18 live in your household?



SOUTH WILLAMETTE
Street Improvement Plan

The South Willamette Street Improvement Plan will explore options for people to easily and safely walk, bike, take the bus, or drive in an eight-block study area from 24th Avenue to 32nd Avenue. The goal of this study is to help South Willamette Street become a vibrant urban corridor accessible by bicycle, foot, car, and bus. The project developed 6 alternatives for Willamette Street and chose Alternative #1, #3, and #5 for further study. This survey will help the project team understand public opinion about the 3 remaining alternatives.

1. How do you currently travel Willamette Street between 24th and 32nd Avenue?	**Never**	**Rarely**	**Sometimes**	**Most of the time**	**All the time**
A. Driving or riding in a car or truck	☐	☐	☐	☐	☐
B. Riding a bike	☐	☐	☐	☐	☐
C. Walking or mobility device	☐	☐	☐	☐	☐
D. Taking the bus	☐	☐	☐	☐	☐
E. Other:	☐	☐	☐	☐	☐

2. What is your connection to Willamette Street? (check all that apply)
   - ☐ Live on, or within a few blocks of, Willamette Street between 24th and 32nd Ave.
   - ☐ Live south of 32nd Avenue in Eugene
   - ☐ Work at or own a business or commercial property on, or within a few blocks of, Willamette Street between 24th and 32nd Ave.
   - ☐ Shop or frequent businesses on Willamette Street between 24th and 32nd Ave.
   - ☐ None of the above
   - ☐ Other:

3. In your opinion, how important do you think each element listed below is to the community?	Not Important 1	2	Neutral 3	4	Very Important 5
A. Safety for bicyclists, pedestrians, drivers, and mobility device users	☐	☐	☐	☐	☐
B. Access to businesses from Willamette Street	☐	☐	☐	☐	☐
C. Maximize traffic flow	☐	☐	☐	☐	☐
D. On-street bicycle lanes	☐	☐	☐	☐	☐
E. Bicycle routes on parallel streets	☐	☐	☐	☐	☐
F. Improved/more pedestrian crossings	☐	☐	☐	☐	☐
G. Sidewalk amenities	☐	☐	☐	☐	☐
H. Lowest project cost	☐	☐	☐	☐	☐
I. Least construction impacts	☐	☐	☐	☐	☐
J. Other:	☐	☐	☐	☐	☐

4. **A new traffic signal** on Willamette at the Woodfield Station (Market of Choice) driveway between 28th and 29th Avenue could provide better access for turning vehicles and a safer pedestrian crossing opportunity. This would likely mean closing some business driveways on the east side of Willamette and designing alternative accesses. ***Should the City should install a traffic signal at Woodfield Station and Willamette Street*?**

   - ☐ Definitely not
   - ☐ I don't think so
   - ☐ I have no opinion
   - ☐ It might be helpful
   - ☐ Absolutely
   - ☐ I don't know and/or need more information

5. **Corridor Function**: Analysis shows that Alternatives #3 and #5 will increase delay along the corridor. The projected average increase in travel time during evening rush hour in 2018 would be about 30 seconds longer per one-way trip than Alternative #1. ***When driving Willamette during rush hour, how much additional delay is acceptable to you?***
   - ☐ Average of 60 seconds per trip
   - ☐ Average of 30 seconds per trip
   - ☐ No additional time delay is acceptable to me
   - ☐ I don't know and/or need more information

6. **Traffic Shift**: Alternatives #3 and #5 may shift a small portion of Willamette Street traffic to parallel streets during the busiest hour of the day (4:45 pm-5:45 pm). Of the traffic shifting away:
   - About two thirds would use streets east of Willamette, such as Amazon Parkway and Hilyard.
   - About one third would shift to streets west of Willamette, such as Lincoln, Jefferson, Adams and Polk.

   How concerned are you about traffic shifting to parallel streets?
   - ☐ I am very concerned
   - ☐ I am slightly concerned
   - ☐ I am neutral on the topic
   - ☐ I am OK with the idea
   - ☐ I don't know and/or need more information

7. Public opinion is one of several factors that the City will consider in the final decision. How well do you think each alternative meets the needs of the community?	**Not at all**	**Not much**	**Neutral**	**Ok**	**Very well**
A. Alternative #1: 4 Lane	☐	☐	☐	☐	☐
B. Alternative #3: 3 Lane with Bike Lanes	☐	☐	☐	☐	☐
C. Alternative #5: 3 Lane with Wide Sidewalk	☐	☐	☐	☐	☐

8. What is your age?
   - ☐ 17 and under
   - ☐ 18 – 24
   - ☐ 25 – 39
   - ☐ 40 – 59
   - ☐ 60 and over

9. What is your gender?
   - ☐ Male
   - ☐ Female

10. Do people under 18 live in your household?
    - ☐ Yes
    - ☐ No

11. You are welcome to share additional comments or questions. Please be concise and to the point.

Please turn in survey before you leave the meeting. If you need to turn it in later, deliver it to Chris Henry, City of Eugene Public Works, 99 E. Broadway, Eugene, OR.

SOUTH WILLAMETTE Street Improvement Plan

Community Forum #3 Discussion Notes

GENERAL QUESTIONS

Audience member: *You were discussing the queuing that happens when people are turning. So if we have the alternative designs that include the designated turn lane (Alt 3 and 5), how will that increase flow, as opposed to the long period of time waiting in the queuing as we wait for someone to turn?*
Chris Henry: *Well it depends, if you are turning left- the alternatives 3 and 5 provide a turning lane and you have a place to be out of the travel lane to do so. The queuing in a lane, as referred to in the presentation, is when the traffic signal turns red, how many cars stack up. And in alternatives 3 and 5, you can expect the length of those queues to double over what it is currently. You have two lanes of cars that would be going into one lane.*
Audience member: *(Follow up question) This would be at the signals, not turning at the signals?*
Chris Henry: *You will have a left turn lane to turn from and to.*

Audience member: *Have you considered placing the bus stops so there is no left turn adjacent to the bus stops, so it would be much easier for people to move into the center turn lane to get around the bus?*
Chris Henry: *That is a possibility. We have not yet looked into that level of detail.*

Audience member: *I planted trees along Willamette Street and alternative 1 shows the tree on the outside, next to the street. It's not adequate to do that because of trucks. How are you going to get that tree out there without it losing all of its limbs?*
Chris Henry: *This is just a conceptual drawing; it's not the actual design. The idea is that there will be an opportunity to have trees. Somewhere on the sidewalk we will have the opportunity for trees. That is not an exact location for the tree.*

Audience member: *At the previous community forum, you said that Willamette Street between 24th and 29th experiences about twice as many accidents as one would expect on a street that capacity and volume and traffic. How many fewer accidents do you expect for each of these three alternatives?*
Scott Mansur: *In alternative 3, when you go from a four lane to a three lane, you see a lot of reduced travel speeds. You would expect about a 30% reduction in your crashes along the corridor. And you would see similar reduction in alternative 5 like 3, as compared to alternative 1.*

Audience member: *Regardless of which plan is chosen, is the implementation going to be in 2018 or before that time?*
Chris Henry: *2018 is the projected year that we would get bond funding for the preservation project.*

***Audience member**: 18th Avenue is a 3 lane with a center turn lane, so what's the traffic count on that street compared to Willamette, and has the city looked into how the two compare?*
***Chris Henry**: The volumes on 18th Ave. are higher. We have just over 16,000 vehicles a day on Willamette St. while 18th Ave, depending on where you look, is about 20,000 vehicles per day.*

***Audience member**: Research shows that when you have a more controlled environment with vehicles, there tends to be more access by pedestrians and bicyclists, which reduces the amount of traffic by 10-20%. Which of these figures did you use?*
***Scott Mansur**: All of the traffic volume evaluations are based on the LCOG model traffic assumptions. We applied those and saw some traffic diversion but we are going to still see some growth on Willamette St. Not a lot, but we were not seeing the reduction.*
***Audience member**: How many people have told you that they choose not to walk along Willamette St. now because the sidewalks aren't wide enough?*
[Audience laughs]
***Chris Henry**: We've heard that concern, its very inhospitable for pedestrians. You can walk there but if you encounter bicyclists, it is uncomfortable.*

***Audience member**: Back to the vehicle queuing slide, did you account for cars that were turning left or did you say just assume that the lines are going to double?*
***Chris Henry**: It is based on how many vehicles are trying to go through the signal and the light turns red, everybody stops. That's what the queuing was based on, its not so much about left turns.*

***Audience member**: As usually being a pedestrian, I realize that no one enforces the 25 MPH limit. When I called about it, they said, 'Well, no one is really going much over 30 [MPH].' You really do notice the difference in the sound of vehicles and the feeling that I should belong here or I don't belong here. Are the people who run these things going to enforce 25 [MPH] as a limit in any of these plans or are they going to tolerate the 5 miles over?*
***Chris Henry**: Law enforcement is a conversation to have with the Eugene Police Department [EPD] or with their funding by the Eugene City Council. There is a traffic enforcement unit. The speed limit is 25 MPH. In alternatives 3 and 5, compared to the existing condition, the most prudent driver on the road sets the speed. We expect speeds to drop because of that.*

***Audience member**: With the sidewalk being widened in all the alternatives, are you intending that cyclists and pedestrians be using the sidewalks together in alternatives 1 and 5?*
***Scott Mansur**: By city ordinance, you are allowed to ride bikes on sidewalks. It's not something we are real excited about, having cyclists on the sidewalks.*
***Chris Henry**: We do not encourage people to ride bicycles on the sidewalks. In fact, in the downtown the Eugene code prohibits it. When we talked about widening sidewalks, alt 5 is the one with real widening opportunity to go from 9 ft. to 13 ft. The potential in alt 1 and 3, the existing condition is to realize the full width – 9ft. In many cases, that has already been built- in other cases, it has not.*

***Audience member**: Can you walk us thorough the historical ADT? I guess you guys have been studying it. Has there been a drop in the ADT? I guess through the last five or six years throughout the city and state they have been seeing drops. So I'm just*

wondering what your reasoning and what you have been using as the average annual increase.
***Ellen Teninty**: Can you say what ADT stands for?*
***Chris Henry**: The Average Daily Traffic volume, the number of vehicles traveling on the street in a 24-hour period. This data was collected in 2011 as a part of our transportation system plan. It was factored up to 2013 and 2018 for this analysis. With a modest growth based on Lane Council of Government Metropolitan Transportation Model, the volumes have been relatively flat since 2008. We haven't seen the amount of growth we have seen in decades past.*

***Audience member**: Now I am concerned about the walking on Willamette Street. I do that all the time and it's perfectly easy to walk down to 24th street. It's that as soon as you go north of 24th, you risk life and limb. Bikes do come barreling down that walkway. And I really don't understand how you think you can keep bikes from riding on the sidewalks and being a threat to pedestrians.*
***Chris Henry**: Well we are not prohibiting bicyclists from riding on the sidewalk.*

***Audience member**: The city council adopted a goal to reduce fossil fuel use by 50% by 2030. And one would assume that alternatives 3 and 5 would lead to a decrease in fossil fuel use by encouraging pedestrians and bicyclists. Is that being taken into consideration in making this decision, this goal?*
***Chris Henry**: Yes, that is part of the policy context that the Eugene City Council needs to consider in making this decision here. Creating a balanced multimodal transportation system provides people opportunities to walk, bike, and ride the bus in addition to motor vehicles. It helps achieve that goal.*
***Scott Mansur**: Just to add to that, we are using that in the criteria that we are using to evaluate the alternatives.*

***Audience member**: I wonder if you could elaborate on the impact of wide sidewalks on businesses along Willamette. I'm thinking of like Turtles, Eugene Hardware, and Down to Earth. That their parking lots are awfully close to the streets and I would imagine that increasing the width of the sidewalk would impact those businesses.*
***Chris Henry**: The sidewalk in front of Eugene Hardware is a full 9 ft.*
***Audience member**: (clarification) Well alternative 5…*
***Chris Henry**: It is towards the center of the roadway, not outward. There are other locations, like in front of Turtles where people are parking in the public right of way now. Increasing the sidewalk width over there would mean that the cars would be parked on the sidewalk or they wouldn't park in those two adjacent spaces.*

***Audience member**: Hey, I have a question about safety. So I am a mom and I ride my bike with my two young sons on Willamette Street to go to businesses. As I am looking at alternative 5, I am wondering what would you say to someone who is biking with young kids where it is safe to bike on Willamette, in that scenario. Is it the sidewalk? Is it the road? That's something I would consider and want your input on.*
***Chris Henry**: If you absolutely had to ride your bicycle on the sidewalk on Willamette St, I would encourage you to ride in the direction of traffic. Otherwise, I would suggest that you ride on parallel streets and then move laterally to Willamette St. Riding a bicycle on the sidewalk is not a safe activity. There are many conflicts with motorists that aren't looking for bicyclists moving at that speed. They might be looking for pedestrians, but they're not typically looking for or able to see cyclists. The alternative 5 is offered*

because some people said, 'Well, why don't you just widen the sidewalks and bikes can share that space.' It's not something we recommend.

***Audience member**: First I was wondering if there are currently 16 to 18,000 cars a day using that corridor, how many bicycles do you expect to use it once the bike lanes are in place?*
***Chris Henry**: I can't answer that question directly. There is certainly some demand now for cycling on Willamette St. We did count bicyclists and pedestrians at the intersections during two-hour periods in the morning, day, and evening. But we didn't predict what the future demand would be.*

***Audience member**: It was stated in the presentation that alternative 5 would be best for pedestrians. I understand that's kind of the quick presentation. But given the curb will still be right up against the sidewalk in this alternative. And there will be lots and lots of bicyclists in both directions in alternative 5, and that all those bicyclists would essentially create a 8 or 9 ft. space for pedestrians. And there is even talk of adding a bikeways or lanes onto the sidewalk as a potential down the road. I am wondering how is it that then this is the best alternative for pedestrians?*
***Scott Mansur**: That was applying a national standard for multimodal level of service. So when you apply that multimodal level of service based on that width, it says that this will provide the best level of service for pedestrians. But this didn't really take into account the limitations that come with that. So take that with a grain of salt.*

***Audience member**: You mentioned that it would take up to 30 seconds longer to go up 29th Ave. Does that take into considerations left turns on the 4 lane alternative? I've been stuck behind cars many times waiting to turn, and that very often adds more than 30 seconds of wait time.*
***Scott Mansur**: Yes this does for all the alternatives.*
***Audience member**: (Follow up) Then a different question is, on 27th Ave. the slide you showed, showed only one car making a left turn to get on to 27th in the alternative 3. It seems to me that there is more than one car at any particular time waiting to make a left turn.*
***Scott Mansur**: That was just to show the queues, it wasn't the number of vehicles represented in that figure.*
***Audience member**: (Follow up) Well, it seems to me if there are more cars waiting to make a left turn that would make the queues shorter.*
***Scott Mansur**: That's true and the left turns were removed and left out of the queuing evaluation.*

***Audience member**: Thank you for providing the multimodal level of service. It seems like we are using some different terms though. In the results that you found, you noted you found increased speeds in alternative one for motorists, and increased comfort for bicyclists in alternative three. And I missed what was mentioned for alternative five. So one question is, is there increased comfort for motorists and is there increased speed for bicyclists and pedestrians in these alternatives. So specifically I am thinking, like pedestrians crossing a five-lane road versus a three lane road. Is there increased delay on someone on a bicycle using the alternative routes versus using Willamette St?*
***Scott Mansur**: So unfortunately, there is not a great tool for measuring travel times for bicyclists and pedestrians on this corridor, especially when there are no bike lanes there today to measure where we are.*

***Peter Coffey**: I think that it would be fair to assume for through cyclists that having bike lanes from 32nd to 24th on Willamette St. will be the fastest route but we have simply not quantified that. Did that answer all your questions?*
***Audience member**: (Follow up) Also in terms of pedestrians you know in the delays for crossing wider streets? Just so that we know the distinction of the terms using delays and comfort.*
***Peter Coffey**: Right, and the crossing differences is not in the lengths, the distance is the same in alternative 1 and 3. We haven't widened the cross section.*
***Chris Henry**: The multimodal level of service tool is to gauge the user comfort in the corridor. And for automobiles, this is based on delay. So its not apples to apples for all these comparisons and it has its limitations.*

***Audience member**: So did your study project the price of gasoline in the year 2018?*
***Chris Henry**: We did not.*

***Audience member**: My understanding is that level of service, the letter grades don't actually mean good or bad. It depends on what is happening in the corridor. So the level of service with a letter grade D, doesn't necessarily mean nearly failing, it just means it's slower. The merchants are getting businesses because the traffic is moving slower to see the businesses. Is that right?*
***Chris Henry**: That is perhaps a subjective interpretation. What it does represent is a range; each letter grade represents a range of so many seconds of delay for motor vehicles. From the user perspective of pedestrians or bicyclists, and transit riders, it would be similar to their comfort level in the corridor.*

***Audience member**: Twice in the presentation alternative 5 is more comfortable for pedestrians. I wonder if that takes into account that bicyclists will most likely be using the sidewalk in that alternative. As a person who walks down that street daily that is not comfortable for me. So I was just wondering if that was taken into consideration.*
***Scott Mansur**: It was initially clarified that when we looked at the pedestrian multimodal level of service was the result that it provided and I know that is one of the limitations in the software is that it doesn't account for the fact that there is no bike lanes there. So the conflicts that would be created between bicyclists and pedestrians weren't part of that equation. It's a tool we used but as we go through the process, it is going to have to be updated because we saw a lot of limitations through that.*
***Chris Henry**: This is an opportunity for me to say something here, I forgot at the beginning of the meeting to mention that in regards to sidewalks, and what happens the curb-line and back. Later this summer, separate from this process and more related to land use, will be another community meeting, not scheduled yet, but the discussion will be about what we do as the area grows regarding public right of way next to the businesses and properties.*

***Audience member**: You talked a lot about the different alternatives and their analysis at their level of service. But I am wondering if you could speak to the analysis of safety?*
***Scott Mansur**: If you remember at the last community forum, we said that this Willamette St. corridor has about 50% more collisions when compared to other similar facilities and streets like this in Oregon. Alternative 1 would keep it similar to what we have today. Alternatives 3 and 5, by removing the two travel lanes we reduce the corridor speed as well as providing other amenities. Studies have shown if we were to implement alternatives 3 or 5, you would typically see a range of reduction in collisions of 10-30%. So over the last 3 years of data, there were 72 collisions within our study*

area and 26 of those were at private driveways. In alternative one, you will see lots of rear ending collisions because of conflicts between left turning vehicles and driveways and through traffic. Alternatives 3 and 5 would provide the most improvement in safety as you look at reducing the collisions along the corridor.

***Audience member**: I heard your bring up the alternatives 3 and 5 which I think you were talking about the alternative routes the cars would be taking because of the slowed street, over to Hilyard, Lincoln, or Jefferson in either direction. You were just talking about the cars and the change in vehicle traffic. Did you bring up or did you look at the increase in revenue the bicyclists or pedestrians would bring to Willamette, were there to be alternative 3 or 5?*
***Chris Henry**: Not necessarily. There have been recent studies that bicyclists and pedestrians do spend more than motorists at the businesses but you really need to get down to the details of those studies to get to what they really mean. What we did look at was where would vehicles divert to in cases of increased traffic or congestion. Those results came from the LCOG Transportation Model.*

***Audience member**: I'm curious how much detail has been given to the alternative bike routes into the making of these maps. Some of these have some tricky things here. I think some of these were hail marys in the bike/ped master plan because of a lack of a corridor route along Willamette. The worst of the intersections is on 29th and Oak, especially if you are on 29th and taking a left turn on Oak…the question is, what are you going to do for the improvements for those crossings and then still get us to the businesses?*
***Chris Henry**: There is more work to do for the development of the parallel routes. They have been identified in the Pedestrian and Bicycle Master Plan but they have not been prioritized for re-development yet. The next steps are to identify traffic, way-finding signs, and lane markings in the pavement. Also we are looking into some kind of crossing treatment, could be a pedestrian hybrid beacon which is a flashing red signal like what was shown on 29th place. We just haven't gotten to that level of detail.*

***Audience member**: So you mentioned a question about safety. You mentioned that plan 1 would be similar in safety as to what we have today. And it seems like that is not taking into consideration for the parallel bike lanes on Oak, potential for roundabouts-25th for example, and extra lanes at 29th. Couldn't there be gains in safety there that you are not looking at? I mean do you see what I am saying?*
***Chris Henry**: Alternative 1 doesn't add extra lanes at 29th. There are already extra lanes there. 5 travel lanes. One of the most problematic issues with Willamette St., Scott mentioned it, is the driveway accesses. Many of the collisions that happen are because of the numerous driveway accesses. So one of the ways to improve safety in the corridor, regardless of which alternative is ultimately selected, is to really consider the changes to accesses, driveways to be eliminated or consolidated to improve safety.*
***Audience member**: (Follow up) And you mention that an extra light could free up some of the problems and increase safety in plan 1.*
***Chris Henry**: Yes and the traffic signal in front of Woodfield Station could regulate left turns more safely and for pedestrians to cross more safely.*

***Audience member**: The city is planning building quite a bit of apartment buildings along 24th and 29th. What is the amount of anticipated residence in that area and how much more crowded will it get? Not just for the next 4 years but for the next 10 or 15 years.*

You are also considering a roundabout- is it going to be the standard size or super size. That area is so crowded right now, would a roundabout handle the irregular traffic?
Chris Henry*: I think the anticipated growth is just a few hundred new dwelling units. Those new residences are included in the modeling for the transportation. So they are accounted for in this analysis. As far as roundabouts on 29th Ave, in order to accommodate the volume of traffic there, it would have to be a multi-lane or a two-lane roundabout. It would have an effect on all the corner properties so we are suggesting not doing that, although it could be done.*

Audience member*: In your presentation you talk about the impact on EMS so models 3 and 5, did you study that? And how will that impact the emergency system?*
Chris Henry*: Alternatives 1 and 3 had the same curb distance of 42 feet. Talking with the fire chief, they're concerned that motorists will not pull into the bike lane to get out of the way. Alternative 5 does narrow the roadway and that does cause some concern for not only emergency vehicles but also for Lane Transit District.*

Audience member*: Speaking of safety, wouldn't front-end collisions increase with alternatives 3 and 5 with people turning in the middle lanes both ways?*
Chris Henry*: Perhaps, but the data doesn't support that. It shows a reduction of collisions between 10-30%.*

SURVEY DISCUSSION

Question 3 regarding what is most important to you

Audience member*: So in 3C, you say, "maximize traffic flow." Is your definition of "traffic" just cars or does it include human beings that might be walking or bicycling?*
Ellen Teninty*: There are other questions for biking and walking. This one is about cars.*

Audience member*: So same question, 3b. Access to businesses--Is that for car drivers or everybody? Or…bikes?*
Chris Henry*: Motor Vehicle access.*

Audience member*: Could you define sidewalk amenities?*
Chris Henry*: Sidewalk amenities could include decorative street light poles to illuminate the street. You might consider the removal of the overhead lines, relocating the utilities out of the corridor. Planting street trees could be an amenity. Including a bicycle rack in the sidewalk. Benches. Green storm water treatment that filter the water. Vegetation. Landscaping.*

Audience member*: My primary concern with this route is for the cyclists coming through Willamette St. from 18th Ave. I'm looking at the bicycle routes on parallel streets and I know that taking Oak street involves going through at least two more traffic lights and taking a significant detour as a cyclist. And Portland St. is not a through street that offers any useful ability commute northbound from this area. So I am curious, are there any substantial improvements to those bike routes that will improve my experience as a cyclist commuting between Willamette St. and 18th?*
Chris Henry*: The Eugene Pedestrian and Bicycle Master Plan identified bike lanes on Willamette St. but not how to do that. And that is in part why we are here. The parallel routes were identified in the map as bicycle boulevards. Those treatments could include traffic calming, way finding signs, and shared lane markings. It's a bike symbol with two*

chevron signs so bike share the road with motor vehicles, indicating to both drivers and cyclists that both will be in the lane at the same time.

***Audience member**: Shouldn't the bike lanes be considered pedestrian amenities?*
***Chris Henry**: They could be, the bike lanes would create more separation between pedestrians and the motor vehicle traffic. Unfortunately the multimodal level of service model doesn't factor in that separation, interestingly.*

***Audience member**: 3B, where it says to rate the bicycle routes on parallel streets from very important to not important… I am wondering why that's on there and wouldn't there also be a place on this list for car lanes or automobile lanes on Willamette St. as not important or very important? I say that because the automobile lanes exist on Willamette St. and they will be on Willamette St. and that's a given. These parallel routes for bicycles that we are talking about exist already. And they are there now, and they have been there for the 23 years I've lived in Eugene, and they will be there for another 23 years. So we are not talking about something that is not important or very important, it just exists. I want to make sure that everyone knows that. We are not talking about some new amenity that will preclude the need for a bike lane on Willamette St. This is not that. This is something that already exists and does not work to get you where you want to go on Willamette St. And the question is, you can just stretch it out because it really makes no difference to the topic.*
***Chris Henry**: To respond to the earlier part, 3C, maximize traffic flow, lets you express the importance of traffic flow.*

***Audience member**: One more comment, presuming that we go ahead with option 1, with 4 lanes of traffic. How likely is it that, 15 years from now that we go through this process to develop bike lanes? How expensive would it be, at that time?*
***Chris Henry**: If we don't make a change on Willamette St. now, we've made a statement about how we like it as it is and want it to stay the way it is for some indeterminate amount of time until we ask the question again. I can't predict when that might be.*

***Audience member**: I didn't understand on 29th and Willamette when you are talking about extra turn lanes, does that mean you will have sidewalks or bike lanes or not?*
***Chris Henry**: At 29th there are two southbound travel lanes and a left turn lane and one northbound travel lane. And bike lanes in alternative 3 or wide sidewalks in alternative 5.*
***Audience member**: (Follow up) So you would remove a sidewalk?*
***Chris Henry**: No, we would remove a travel lane. There are currently 5, and we would go down to 4.*

***Audience member**: I am neutral about three or four lanes at this point. Because I own a business there and that business will be closed by the time this occurs. What I am very concerned about is why nothing is being done about it right now. I am hearing that as of the year 2010, we had 50% more accidents than the state rate. I lowered the speed limit 12-14 years from 45 MPH TO 35 MPH by getting people to sign a statement. Then I easily got a $250,000 stoplight put up there on 25th. Why are we not talking at all about how we can slow traffic right now? Is that impossible? Is that outside the realm of this? Is that outside the realm of the city? Why have we not been in stakeholder meetings or in one discussion about how we can slow traffic, and how we can make it more livable if we can make people go 25 MPH, which IS the speed limit? Anyone here not know right now that is the speed limit? It's changed quite a bit. People are now starting to know. If we can do that, we can have a clean slate to see what the possibilities are. Pardon me, but* *let's wait five years to do that? I've had to pick two people up off of the street. I am ready to get out there right now. If you have a business on Willamette or if you use Willamette, call the police right now and demand that they are out there taking care of the traffic. If we are going to have bicycles on Willamette, the bicycle cops stop at 18! But when I talk to Pete Kerns or Kitty Piercy, the next day, they are out here. I am just one person. I make seven bucks an hour running my business. I don't want to wait another five years. Pardon me for being a little radical about that, but you pull a kid out from underneath a car in front of your business… you do that one of these times. I'm asking everyone here, let's be community about slowing it down. You got a business on Willamette, put a red 25 MPH speed limit up. So do something so there is a downturn in the collision rate in our town. Put that up. Let's make it a nice place right now. It will make it easy to be a bicycle friendly place in five years.*

***Audience member**: One thing that helps make decisions is knowing the impact this has on our community's health. One thing that this helps is the impact and just coming for a sustainable and holistic approach. And how the street can help our local economy and community.*

***Audience member**: Regarding the buses, you are not going to do pull outs. So the thing to do is to stagger the bus stops. We have enough of a center lane there and people are allowed to go around the busses like the police said you could. And you put on the back of the bus, a signage that says, 'When this bus stops, you are allowed to go around the bus using the center lane.' So use the staggered bus stops and driveways. That's what you ought to do!*
***Chris Henry**: The challenge is that there are many driveways and it's hard to find a place without one. 18th Ave. is the same situation with fewer turning and driveway accesses but the same situation otherwise.*

***Audience member**: Any businessperson will tell you that they first need potential customers then after that, actual customers. This is often calculated by the amount of cars passing by during the day. If we survive the construction process, and if Willamette St. is reduced from 4 to 2 lanes, and if anybody says 3 lanes, there are only 2 traffic lanes. Potential customers will find other avenues and loss of business might occur. Loss of business equals less potential rent, which makes property values stagnant. If the city wants more money from property tax, they should support the alternative that has less cost to property values increasing. We hope that if we build it, they will come. From an economic standpoint, this is far from true. I don't believe that for one instant. We have built it, and it has four lanes and it's thriving.*

***Audience member**: Eugene kind of prides itself as an environmentally progressive city. We even have a climate action plan. I know that we take steps to be more sustainable. And it is just kind of perplexing to me, that given this culture, it is so difficult to even get bike lanes on a major street and encourage people to get out of their cars and bike more.*

***Audience member**: It comes from the perspective of being an older person who unfortunately, because of physical conditions cannot ride a bike anymore. So I do the best I can by bussing and using a Prius. But what its all about in my mind, is looking to the future. And if we don't understand, global warming on a personal level, as well as larger corporations, we are missing something extremely important, especially for our younger people. As someone who can't take advantage necessarily of a bike lane, I am looking to little children and their families and I want safe places for those kids to be. I* *don't want all those wonderful businesses to suffer but I think the people who love those businesses will still going to be there. But please let's think about what the consequences are, that are maybe to some people are way out there. But we are already seeing some now and we need to make change.*

Audience member*: Scott, when you came to our table we asked you a question to explain some similar situations. I just ask you to reiterate some of those experiences and some of the concerns that business owners in other cities involved in similar projects and their reactions?*
Scott Mansur*: One of those projects I worked on, was a similar project on E Street in Washougal, Washington. The volumes were much smaller about 9 to 10 thousand. There were a lot of concern from businesses and property owners. We got a lot of feedback. We went to city council and shared our findings. Council supported that project and we got a lot of positive feedback since that project was done. Businesses had actually been pleased with the results. Emergency services had been very concerned but they were now very happy with the way things were operating and movement of travel. And the police chief shared a comment that they rarely write a ticket on E street and they rarely have to go deal with accidents on that corridor. Another example in Oregon City had a higher volume with 19,500 vehicles and they were also very pleased with those results over there.*

Question 4 regarding a traffic signal at the Woodfield Station driveway.

Audience member*: So I have a question for you guys. Are you only considering only a traffic signal at that intersection or are you considering some other form of control that would enable pedestrians to cross more safely?*
Scott Mansur*: Both. Both would be considered.*
Audience member*: (Follow up) How do we answer this question? Do you want us to assume that both would be considered? Because I will definitely say, not for one thing, and absolutely for another.*
Scott Mansur*: The intent is, what we have heard, from a motor vehicle standpoint, pedestrian/bike traffic signal would be desired. If we were able to look through the design, we need more detailed analysis is going to be needed to determine what the signal would be needed.*

Audience member*: So, if you put a traffic signal in there, would it be activated by cars? By pedestrians? Could it be synced to other traffic lights that are so close to it so that it doesn't automatically go off and make sense from other angles?*
Scott Mansur*: Yes, 100% would it be coordinated with other traffic signals along 29th so that as a pedestrian you could push it and you would wait and the lights would be synchronized with Willamette St. and side streets. It would be served simultaneously to help serve traffic.*

Audience member*: The projected volume of the street, whatever it was, how do you factor in a traffic light at Woodfield station anyway? Do you have estimated interruptions into the traffic flow down Willamette? How do we figure that into traffic flow?*
Scott Mansur*: So we have a traffic model that was created with existing signals and we've provided an analysis with a signal at Woodfield station and analyzed the flow with that signal.*

***Audience member**: (follow up) So the current delay in these options up and down Willamette in the current model, that factors in at the Woodfield Station light, or does it not?*
***Scott Mansur**: It does in each of the alternatives though. Each of the alternatives, when we talk about the travel time delay, each of those alternatives has a traffic light at Woodfield station assumed so it would be equally impacted.*

***Audience member**: I think my question was just answered. You've already studied this and it is a possibility. Because when Woodfield Station went in, we discussed it with the traffic department and a light being there and they said it was impossible to do. Is it now been studied enough that we know for sure that it can go in?*
***Scott Mansur**: There are a lot of different variables. We have done preliminary evaluation but we will need a more detailed evaluation. That still needs to take place. Part of our process is to install a traffic signal you actually have to meet national standards. There are a few more steps in the process to confirm if the signal is a viable option at this point.*
***Audience member**: (follow up) So it's a maybe now?*
***Scott Mansur**: It's a maybe.*

***Audience member**: Is it possible to have a temporary light there and study it and see how it works before we do it permanently?*
***Chris Henry**: A lot of things are possible. We have considered that as a possibility. We are considering the possibility of a trial. But we haven't landed on yes or no.*

***Audience member**: The question says it would be closing some businesses' driveways on the east side of Willamette. Why does it say that?*
***Chris Henry**: Typically you don't want driveways immediately adjacent to the signal, it's harder to control the traffic that way. Ideally, we would eliminate driveways. While we haven't gotten to the level of detail yet, we have identified it as a concern.*

***Audience member**: Have you considered that the traffic might back up into the intersection of 29th and Willamette?*
***Peter Coffey**: Yes, that is a significant concern. We are still looking at howo to make it work effectively. So it's still a work in progress.*

***Audience member**: Did you ever think of just closing the driveway to the shopping center and just keeping the one on 29th open?*
***Chris Henry**: Typically, that is not popular. A lot of things are possible but businesses are entitled to give their customers access. How they achieve that access is a matter of discussion.*

***Audience member**: To me this turn out of that access onto Willamette is quite scary, particularly when traffic is busy. So if this is the best alternative to come out with, I think it is absolutely necessary to do something, so I support it.*
***Chris Henry**: It's scary for pedestrians and that's where the signal comes into play and provides opportunity for pedestrians to cross safely.*

***Audience member**: I have a quick question about measuring delay. Is that for peak hours only?*
***Chris Henry**: Yes, during the PM Peak hour.*

***Audience member**: (Follow up) So what is the change in the delay in the rest of the day for 23 hours?*
***Chris Henry**: This is something DKS is working on to be able to describe what the other times of the day will look like, off peak and how it changes throughout the day.*

***Audience member**: You know there is a bank or something that is a little north of Woodfield entrance. Technically it is connected to that parking lot. Is it possible to make the light further north?*
***Chris Henry**: We looked at that, we talked with the people who owned the Woodfield Station property and managers of Market of Choice and some businesses. Ideally, it would be help and it would be nice to move the intersection up north. However, we have no firmed up plans and it would take work and talk with more multiple property owners.*

***Audience member**: Would it be possible to have the traffic light there but only operate at peak traffic times?*
***Chris Henry**: You could do that but traffic operations like predictability. And things that aren't always working aren't always noticed and that reduces the effectiveness for the users.*

Question 5 regarding motor vehicle delays in alternatives 3 and 5.

***Audience member**: Is there any data on the new redesign on 29th, going west and the impact that has had on the traffic delay?*
***Chris Henry**: The operation of the signal as it is today, is included in this analysis.*
***Audience member**: (Follow up) How did that change from a year and a half ago when you put it in?*
***Chris Henry**: We have bike lanes now and its different for motorists. It's the consequence of creating options for mobility in the corridor. The consequence for adding bike lanes is, that it has made it a little bit more difficult for motorists moving east and west through 29th.*

***Audience member**: As I understand the level of service and delay times, those are all concerning the 1-hour peak PM flow. Any idea what happens the rest of the 23 hours of the day?*
***Chris Henry**: That is what we are working on. DKS is in the midst of doing that analysis and looking at off-peak effects to help answer that question an describe what it might be like on other times of the day. Right now we are showing the worst-case scenario here. And as 29th Ave. in alternatives 3 and 5, show Level of Service E, that is 1 second of average delay past the threshold. That is a policy question for the Eugene City Council, whether or not they want to accept higher levels of congestion along the corridor. And they can do that like they have in the downtown core. It's a very small amount of delay.*

***Audience member**: I would like to see an additional box here say that, "Delay not a problem for such short distances." We are not queuing on a turnpike for 10 miles. We are going through a six-block section. For me, when I drive, I expect delays there. I expect delays in this very short, congested section. I would love to see this as an alternative.*

***Audience member**: With options 3 and 5, you talked about a 30% decrease in traffic accidents. Does that take into account the slowed down speed into the picture?*

***Chris Henry**: The operational models don't consider the crashes effecting mobility. That is something you might consider for recurring congestion on a freeway but not for this model.*
***Scott Mansur**: A lot of the case studies used for the 30% reduction all showed reductions in corridor speeds, which is a lot of the relationship to having fewer collisions, especially in the severity in injuries. Slower speeds reduce life-altering crashes.*

***Audience member**: I am noticing that for this question, especially in the impact on commute time for cars, I am wondering if you had considered what the commute time will be for cyclists?*
***Scott Mansur**: That's not something we have looked at, at this time.*
***Chris Henry**: As Scott said earlier, the multimodal level of service tool is relatively new, hasn't been used yet- until now in the City of Eugene. It has some limitations and one of them is that it doesn't predict some of those things.*

***Audience member**: Just a quick opinion, and that is that the 30 seconds delay equals safer working roadway for most people and less – because things are slower- less accidents, I think that would make a lot of sense. And if I am really in a hurry, I would choose a different way to go.*

***Audience member**: Since a very large number of people in this audience here are people who either do or choose to ride a bicycle through there if they had that opportunity, and the current delay on the street is a 20 year average for most of the people if they think about bicycle riding. It seems like there should at least be a discussion on the question- even though I understand that you might not have all the tools to do the multimodal level of access study…there's gotta be some consistence, constant recognition of how bad it is for pedestrians and bicyclists right now. And that could improve tremendously. If we are talking about a 30 second delay for automobiles, the increase in speed in which bicyclists and pedestrians could get through there could quadruple. So my question is will you be able to include information along those lines about what it does for everybody when you present this to City Council and when you put it out there on the web?*
***Chris Henry**: Not much more beyond what we have already said. We have said that alternative 1 is good for transit and motor vehicles, alternative 3 is good for cyclists, and alternative 5 is good for pedestrians. Saying much more than that is guesswork.*

***Audience member**: I understand that I am talking to people that are focused on traffic engineering, not city planning, urban planning, or community development. I understand that's what the focus is. If all of us visit other cities and look at areas that we find desirable that are enjoyable to spend time. We don't focus in on the speed of the traffic on a street. We focus on the sense of place and the activity within a street. And typically, that means the traffic flow is very slow. So I would contend that an objective associated with trying to increase the speed of traffic maybe counter to the object of creating a sense of place and creating community associated with the street. Now here's the question: as you were engaged in this assignment, was there a focus or an intention behind that assignment? You know like, what was the problem you were given that you were supposed to solve. Because sometimes that defines how you look at the problem in the first place.*
***Chris Henry**: To clarify, our objective is not to improve the speed for motorists through the corridor. We are simply here reporting the facts of the analysis. Our charge here was to support the land use development and planning work with the transportation system.*

The current system isn't working very well for most users and we are exploring options on how to do that. The plan is to be: supportive of the existing businesses, support the area's vitality, create balanced multimodal transportation system- so you can walk, bike, ride the bus, or drive to further land use work for opportunities for infill and redevelopment, and create a well informed community supportive of the plan. Those are our goals.

***Audience member**: I just had one question regarding the accident rate, we are making a supposition that we are going to have a 30% drop in the rate. I've driven that street twice a day since 1967 till about 5 years ago when I retired. So I saw very little accidents during rush hour. I am wondering when we compare the accident rates, what hours are they occurring? Are they occurring between 10 pm and 4 am? Do we have other factors causing accidents Have you also looked at where the severity of the accidents?*
***Chris Henry**: The crash rates you describe looks at a lot of different factors. It is independent of the time of day. This includes the total number of crashes divided by the total number of vehicles traveling on the roadway for a three-year period. What we saw was, the crash rate that was about twice what we would expect for similar streets in the state of Oregon. The reduction figure that was quoted earlier was expecting anywhere between 10-30% reduction in the number of crashes. Many of those crashes, when we talk about locality are associated with driveway accesses and intersections. People turning create conflicts for pedestrians, bicyclists, and motorists alike.*

***Audience member**: I would like to know if the option of no left turn from Woodfield Station, heading east onto Willamette has been considered. I think that a pedestrian crossing would be very helpful. An example of one I see is on Chambers, for the pedestrian to push the button and change the light. I do travel that stretch a lot and I see traffic hung up because of cars trying to get out of Woodfield Station and head north on Willamette. So I think I would opt for a "no left turn" at that point.*

***Audience member**: I am not quite sure why the question phrased only about traffic delay. It's kind of a biased question.*
***Chris Henry**: You are right.*
***Peter Coffey**: This question is phrased about traffic because we were focused on that alternative and it is geared to measure your sensitivity on traffic delay.*

***Audience member**: My thought is that sure maybe 30 seconds or maybe 1 minute of delay could happen. But it is far more hazardous to pedestrians and bicyclists. People could get into accidents three times more likely according to statistics. That's far more concerning than any traffic delay. I can't see any downside to making it more user-friendly to bikes and pedestrians.*

***Audience member**: I have a question about driveway modification but not getting much detail. Because that would eliminate some of the delays from turning and I am curious about what your thoughts are. What do you want to do about it? Do you want to remove some of them? Have you talked to stakeholders about this as an option for them?*
***Chris Henry**: Modifying driveways for access to properties or businesses demand a one-on-one conversation with each of those effected parties. Some of them are dependent on which alternative is selected. We have looked at best practices of what potential modifications might be recommended. More conversations need to be had to prioritize them. We are at a very high concept level here and we will move to the detail and engineer design next.*

***Audience member**: One of the things I have noticed in my completely unscientific observation is that people seem to speed a lot down Willamette. Does the time difference take into account maybe people actually going the speed limit or assuming it will be like the times now where people continue to speed?*
***Chris Henry**: The travel times considered were based on the current conditions, providing an average speed. In alternatives 3 or 5, there is no opportunity to pass other vehicles, so you have to drive at the speed of the most prudent driver on the street. And particularly, speeds are lowered in alternatives 3 and 5 than alternative 1.*

***Audience member**: You talked a little bit about turning at the different intersections. I am curious about how the different alternatives stack up when you are turning left at an intersection. So for example, as a car making a left turn into a driveway, is it going to be easier from one alternative to another to access those businesses?*
***Peter Coffey**: I think there are two ways to look at it. If you are turning left in alternative 3 and 5 you will have the center turn lane to pull into. The other way to look at it though, is when you get in that center turning lane, you will have to yield to on-coming traffic. Today there are two lanes of on-coming traffic, but in alternatives 3 and 5, you only have one. Those would be the two perceptions I have about turning into a driveway.*

***Audience member**: Can you elaborate about what you mean by 'bus pull outs' and the potential for bus pullouts? Because I really hate being stuck behind a bus putting a bicycle on.*
***Chris Henry**: We've heard interest in bus pullouts and shared these views with Lane Transit District. We will need to look very closely for opportunities for them. It effects their operations and their preference is to stay in the lane of traffic or the traffic stream because they have difficulty getting back into traffic. Motorists don't typically yield to them.*
***Audience member**: (Follow up) Well, what is a bus pull out?*
***Chris Henry**: A bus pull out is, instead of parking in the travel lane to let people on and off, they pull into the sidewalk space, which would require more space. There are very few opportunities where we could incorporate that without effecting adjacent properties.*

***Audience member**: This is a question for Peter, Peter you said something about in the center turn lane some people worry about collisions. Do you have any statistics on that?*
***Peter Coffey**: What we see generally in facilities like this is an overall reduction in the collision rate when we reduce the number of travel lanes. And that's a combination of different types of collisions.*

***Audience member**: I'm going to ask the question from a different aspect. How much funding is in place at the present time to implement any portions of this overall project?*
***Chris Henry**: Funding is in place thanks to voters passing the preservation bonds to fix streets and bikeways. That's just for the driving surface between the curbs, intersections, and wheelchair ramps. There is a portion of that funding set aside for pedestrian and bike improvements but they are not prioritized. There's about $500,000 a year over the five years of the bond that hasn't been allocated for this project. Nor has funding for storm water improvements or sidewalk improvements or utility relocation out of the corridor. So we need to first define what the project is that we want. And then we can find the money to realize our goal.*

Question 6 regarding traffic shifts

Audience member: *So I just had a comment and an observation really. It would seem to me that people who are concerned about the delay are those who are using Willamette as a through route and not intending to stop at the businesses.*

Audience member: *Amazon parkway was an original road that was supposed to connect to the south instead of all of it going to the east. It was designed with the idea to take traffic away from Willamette St. So shouldn't there be an alternative here saying that it is a good idea to move some of the traffic off Willamette Street instead of the fact that it is only okay?*
Chris Henry: *The businesses might disagree.*

Audience member: *So I would like to add to that, I really think that this question should be two parts. Part 1, is about the residential neighborhood streets. Do we think its okay to have cut through traffic in the single-family residential neighborhoods? Part 2, would be the question of, is it okay to divert some traffic to streets that are designated as arterials and intended for that. I think this is difficult to answer as a single question.*

Audience member: *Eugenians don't change their habits that easily. They still go home for lunch. They did 46 years ago when I moved there, they are doing it now. They're not going to quit going to businesses on Willamette St. just because of some change. They'll complain; they won't change.*

Audience member: *I just wanted to make note. I didn't know if there was any traffic shift in mode choice. So by adding bike lanes on Willamette St. does that make some people feel safe enough to bike on them or if you widen the sidewalks are people who used to drive going to walk because they feel safer? So what is the traffic shift in our modes?*
Chris Henry: *We'd like to know that too, but we don't.*

Audience member: *I just wanted to point out the biased nature of the wording question that is only referring to the shift of people away from Willamette by car rather than the potential of people shifting onto Willamette by bike.*

Audience member: *So I was thinking that it requires you to make an educated guess. If there is a traffic shift from 25 to 100 cars at the peak hour, wouldn't it stand to reason that by creating a balance in allowing modes of transportation, you would make up for that the rest of the day?*
Chris Henry: *How much you make up for that is undetermined. What we do know from other studies is that bike lanes will increase bicycle use by about 30%.*

Audience member: *The graphic showed that traffic will increase on Willamette St. under the status quo. Is traffic going to shift anyway because people don't want to sit in traffic?*
Chris Henry: *Perhaps in the long run, people will want to. Generally, everyone's response to congestion and delay is that you find an easier route. But once all the easy routes are gone, they will use the roads.*

Audience member: *As the population increases and traffic increases, people are going to seek alternative routes in their vehicles. From a bicyclist's standpoint, this is something I practice myself. I seek the flattest routes and Reed says that's what*

everyone does pretty much. As vehicles move away, bicycles are going to move in because Willamette has the flattest route. I'm not going to ride my bike over a hill if I don't have to.
Chris Henry*: Perhaps rethinking that earlier response that people go through easy routes. People also travel at different times of the day and people will travel at times of less congestion.*

Audience member*: So earlier, someone asked the question about 18th Ave and the diversion of traffic. I am also curious about the diversion of traffic onto Amazon. Do you know what the shift will be to Amazon? Can you share the numbers for 18th and Willamette and compare them?*
Chris Henry*: 18th Ave. ranges from 12,000 to 20,000 vehicles a day. Willamette St. averages 16,300 (in 2011). Amazon Pkwy, if I guess around 11,000 cars per day, 9,200 cars per day, and 17,000 cars per day both ways at different intersections.*

Audience member*: I am not concerned at all. The reason why is, because people who want to businesses on Willamette St. will continue to go there. I think that a lot of what Willamette St. offers is great businesses. We should select a design that supports those businesses. I think that a design that supports people going through is not going to benefit the area.*

Forum Survey Question 3: In your opinion, how important do you think each element listed below is to the community? The following are suggested important elements:
bicycle traffic flow
Economic Impact to Business on Willamette
consolidate driveways
Family friendly infrastructure
increasing access for humans and human traffic as opposed to just cars
Movement of people
Other (please specify)
protect residential neighborhoods
reducing number of driveways
reducing number of driveways
sense of community
sense of place
slowing traffic to create a sense of place
"maximizing traffic flow" should include the increase in bicycle and pedestrian travel due to improved conditions (potentially) along the corridor. Not just maximizing AUTO traffic.
cut throughs in residential areas between W.S; Jefferson
middle turn lane
Option for future round abouts
Bus, trolly street car, EMX
better lighting
take down utility poles
Tree canopy
Utilities Underground (Very Important)
Utility Undergrounding
what improvements would happen to oak and portland st?
Online Survey Question 3: In your opinion, how important do you think each element listed below is to the community? The following are suggested important elements:
Add bus stop pull-out areas, if two travel lanes are eliminated.
Bicycles should be able to use the wider sidewalks even if bike lanes get put on Willamette St.
Bike routes on parallel streets make sense IF they have a smooth connection at each end to bike arterials
bike safety, trees, trees, trees
I would bike instead of car if I felt safe. Bikes on sidewalk aren't safe for cyclists oor pedis.
Not clear to me if bikes can ride on the wider sidewalks of the second option.
There are other alternatives for bicyclists; they don't need a specific lane on Willamette Street
We seriously need bike lanes. People bike there already and it's scary for cars and riders
Make Woodfield Station business contribute to the cost of the new traffic light/access changes
Make it easier to get in and out of businesses
changes that are appropriate to each individual situation.
I would like to see a wonderful urban walking corridor began here

I would love large beautiful trees on Willamette Street but don't care for the cafe seating so much. I see most sidewalk amenities at encouraging bikes to zip through the pedesterian traffic helter skleter over the sidewalk. Bicycles are vehicles. If you want to truely encourage people to walk, create a very safe walking space like we have downtown with bikes walked on the sidewalk and skate boards in hand. #3 Even a longer delay than 120 seconds is AOK with me - it would give folks a few moments to look around and "see" the hood vs. zipping through it. #4 Amazon Parkway and Hilyard are meant to tak the traffic - so putting extra traffic on them is no big deal. The other streets that you listed are NOT meant to take the traffic. Beefing up the traffic calming on them SHOULD be part of the project.
I'm not sure what C means. Does it mean to make Willamette Street more efficient for the amount of traffic already there, or does it mean expanding to accommodate more motor vehicles than currently use the street? I'm all for efficiency, safety, and inclusiveness for all who use the street and businesses on Willamette Street.
Other (please specify)
Please note these are my perceptions of the community. They do not reflect the importance as I see them.
Protected bicycle lanes, utilities out of sidewalks, roundabouts, and access management
Questions "a" and "j" are ridiculous in their presentation.
Reducing number of driveways.
Replace lights with ones that include a left hand turn for vehicles like by Roosevelt Middle Sch
The aesthetics of this area are very important. It is currently one of the uglier areas in South Eugene. Beautification of this area is a high priority to me as a property owner who lives nearby.
there's no straight across the board possibility, as the sidewalks differ in width and trees and businesses need to be considered. There no need for a straight-line approach.
Transforming this section of Willamette to become a unique and diverse place to shop, eat, drink, have fun, where pedestrian and cycling access modes are as important as vehicle modes.
Willamette is THE main N-S spine of the city. Leave it alone!
Bikes and pedestrians are an after thought with existing design-they should be considered important
Improvements that will make it welcoming to non-car/truck modes of transportation
Pedestrian and bicyclist safety most important! They are most vulnerable. Other considerations secondary.
To encourage walking, biking, bus use through infrastructure changes is vital but uncomfortable.

As a resident reliant upon the Willamette Street corridor and a former long time commuter biker--I think it's important to balance development with an eye toward realizing bikes don't get the whole city. I can't drive my car on Amazon bikepath or along the river bike path; bikes also don't get every major artery. However, I realize here in Eugene we like to argue things to death. One critical thing that has not been brought up is that of emergency evacuation in case of catastrophic dam failure. At this time, Willamette Street is one of the arteries that could provide citizens with a route to higher ground--deciding to reduce Willamette to 1 travel lane either direction does not take disaster preparedness in mind. If "the big one" earthquake hits, and the dams break, are you going to ride your bike to higher ground or your car? People are going to be in cars and buses because it's most efficient. That's just one example of what is wrong with attempting to take a functional street artery and attempting to clog it by decreasing ease of use for cars.
Feel it would be very unsafe to have bicycle lanes with lg number of driveways/businesses
How many accidents and injuries have there been in the last two years? And on comparable streets?
Ensure vehicle don't move to neighborhoods. Our area does not have sidewalks and already narrow streets
I see few people walking along Willamette 24th - 30th--it is noisy with vehicle emissions--I don't think it is realistic to make sidewalks wider becaue they won't be heavily used. That street is busy enough now and requires enough vigilance driving that to add bike lanes increases the hazards. I'm convinced reduced vehicle lanes would slow traffic flow more than engineers have predicted. have calculated.
Nothing should be done to impede vehicular traffic on Willamette Street. It is already very congested.
VERY IMPORTANT--How is new "improved/controlled" traffic flow (vehicles, peds, & bikes) on Willamette going to affect traffic on other north-south arteries in South Eugene that run through residential areas??
convenient public transportation
Need bus pull outs to avoid blocking traffic.
Need to consider LTD buses blocking traffic and emergency vehicles traveling to South Eugene.
bury overhead power lines on east side and remove poles for aesthetic, safety, and circulation purposes
hide the power lines
Underground utilities
Forum Survey Question 11: You are welcome to share additional comments or questions. Please be concise and to the point.
Alt #1 does nothing to serve people the corridor currently does not serve.
Alternative #1 is not a change except for improved sidewalk. It does not create a multi-model; it does not create an appealing destination to shop and eat and meet fellow community members.
I am a truck driver and I don't believe bikes should be anywhere near a truck. Trucks sometimes need to stop in a lane of traffic (pet supply on Willamette) to load or unload. This is only possible in 4 lanes.
#3 would make me feel better walking with my daughter with bike lane. Now we drive 4 blocs to go to restaurants because of speeding close to us

1. Alternative 3 was stated to be safest (decreases current accidents), and also adds bicycle lanes as well as has the potential to improve sidewalk conditions. This is the obvious choice. 2. I live on 30th, a few blocks from Willamette. I have a small child and a growing family. I currently do not access the 24th - 29th corridor using any mode of transportation due to inhospitability/safety (biking/walking), and congested turning into business driveways. I do now, and will be always choosing biking/walking over car travel. I would like to see alternative 3 built. If it is, I see myself accessing the businesses much more.
A good point was made about alternative 5 tonight. It seems like the ideal option for pedestrians at first glance, but realistically there will likely be issues with pedestrian-cyclist conflicts on the sidewalk, making alternative 3 realistically safer for both cyclists and pedestrians
Alternative #3 with bike lanes will ease access to business driveways and not back up traffic when making a left turn
Alternative 3: I would surrender 1 foot from sidewalk to add 1 foot to outside traffic lanes.
Alternative one maintains the status quo, which I don't think is acceptable, mostly from a safety standpoint. Alt 5. will be too restrictive to traffic, given inadequate room for buses and emergency vehicles. Only alt 3. will clam traffic, increase safety, and maintain reasonable access. It provides the BEST BALANCE for the whole community.
As a non-biking pedestrian, and sometime driver, I strongly support option 3 with bike lanes. A 30 second delay is not too much for increased safety for both pedestrians and bikes (and bike lanes increase pedestrian safety by keeping bikes off the sidewalk).
As a pedestrain, I actually prefer alt. #3. For mobility impared individuals, sidewalk cafes, etc. can actually be hazards/obstacles i.e. make being a ped harder. For "abled" (no disability) individuals, alt. 3 is fine + adequet for peds.
At several points tonight it was mentioned that the city wanted to follow a complete streets program. Option 3 seems to be the only one that meets this criteria
Currently, using a bike to access businesses on willamette is not a pleasant commute experience. I remain committed to supporting Alt #3
Dont't forget about kids crossing 24th to get to Roosevelt. Don't forget how hard it is already to cross 24th on oak even in midday. I'm not fond of bikes on willamette. I'd prefer most to use parallel routes. But the fact that bike lanes buffer pedestrians and allow for buses to stop without blocking traffic helps me be more comfortable with Alt #3
Given the goals of this project, the best alternative is alternative 3. Goals: Support Economic Development Balanced transportation share compact development complies with goals of ped/bike master plan
I am strongly in favor of Option #3. We need to be planning for increased pedestrian and bike traffic in order to reduce fossil fuel use and reduce greenhouse emissions. Create more equality for those who cant afford to drive and are choosing bike or walk
I presently drive alternate streets to avoid willamette. Too much weaving between lanes. I would use willamette if we had option 3
I think we missed a great opportunity to create an innovative design. The best option for cyclists, Alternative 3, is much like the current design on 18th. This is adequate for confident cyclists but intimidating for less experienced cyclists. If the city of Eugene is serious about improving the quality of living and adhering to its Climate Action Plan, we need to think outside the box and aim bigger.
I want to decrease the amount of traffic, I want cleaner air and a healthy community and healthy environment. I go for alternative 3.
I would favor alternative #3 if the bike lanes were removed.

I would like to see alternative 3 implemented with a speed limit of 25 MPH strictly enforced or lower it to 20 MPH!
I would love to know how a fire truck and bus could make it through alternative #3 with regular traffic including delivery trucks. How many bikes are expecting on Willamette?
Im very much in favor of option #3.
Option 3 has lot of potential for all concerned. Like it! If there were some means to alert drivers upon infringing into bike lane i.e. raised divide, bumps on line dividing bike lane would add another safety comforts! Thanks for great job.
Re Pedestrian comfort - #3 is best since there will be no bicycles on the sidewalk and the bike lane will provide a buffer from the auto traffic, providing pedestrian comfort will increase pedestrian use leading to greater utilizing of Willamette ave. shops.
Although I'm over 60, (and i also own a vehicle), I find that i enjoy riding my bicycle whenever i can i.e. to work, shopping, pleasure, etc.
As a cyclist who would like the option to frequent willamette st and the businesses there, I am very partial to option #2, as I think most of the community is as well. It is the only option that is inclusionary to all users of the area.
Bike options MUST be apart of any realistic plan for the future of Eugene (and the Planet).
Eugene represents eco friendly options anything with out a bike lane would be unexceptable and not representing Eugene's bike friendly demeanor that it is known for around the country.
I avoid riding a bike on willamette. I will use designated bike lanes on side streets, then cross to willamette at a cross light. I usually access businesses by walking and then only if the weather is good. I welcome greater accessibility for bikes including bike racks.
I like bike lanes as in option #3 but I have concerns about the comfort of this stye of bike lanes - it woud be more comfortable to have a buffer of some sort between cars and bikes, also I am concerned about buses stopping in bike lane, safety wise as a cyclist.
I patronize businesses in this corridor very often and am a bike rider. The current street configuration makes my visits VERY stressful. Bike lanes would make it more likely that i would visit these businesses
I would love for my children to access Willamette St. businesses by foot or bike on their own, but I absolutely won't allow it with the current design. Plus, Oregon law requires bike lanes. If sewers and utility work will be included, state law requires bike lanes.
I'd prefer a 2-way bike lane on sidewalks on east side of street.
If the alternative bike routes worked there would not be so many cyclists here begging to ride on Willamette. They don't the geography can't be fixed to make them work.
on a bicycle, it works well to use Oak St. to access one business, and cut over to Willamette when appropriate. However, when accessing more than one business, one must ride on the sidewalk currently.
Please put in bike lanes!!
Provide better access for bicycles to use oak and the street next to amazon. No plan is great, there just is not enough space along willamette. I worry about reducing lane width for buses and trucks. The younger generation may feel safe using willamette on a bike, I do not. I have encountered bikes on the sidewalks even where lane is available so I think many of them dont like to ride next to a car.
The city is knowingly breaking state law on a technicality by not providing a bike lane.
There is no way to make bike riding on Willamette safe or pleasant. I will never use them (bike lanes). I will always take side streets.

We need to make the decision now to create bike lanes- we won't have this chance again - #1 does not solve any of the problems that are plaguing the street now - its time to stir the pot!
Aren't there statistics regarding the number of people that won't turn into a business because of traffic flow (alternative 1)? Doesn't having a dedicated turn lane increase business?
The business and property owners need people driving cars to have easy access to their businesses to thrive. Economic concerns for the corridor should be uppermost in the minds of all decision makers. Keep the area vital economically by keeping the 4 lanes for cars
You failed to list business access in your final consideration. That is a huge mistake.
In the future, please include information on economic impact (property values, retail sales, health care costs)of active transportation (bike, bus, walk) and health impact of increased physical activity from active transportation. Thanks!!
It would be useful to know how sensitive the model is to increasing fuel prices.
The price of gas will increase in the future due to peak oil. This means fewer motor vehicles on the road. Need to design for alternative transportation now. (e.g. bikes, bus)
1. Rather then a traffic signal on willamette at woodfield station, I would prefer a traffic signal along 29th by the Rite Aid. 2. Chris Henry answered a question about the affect of option 3 on bicycle transit rates through the corridor by suggesting such projections amount only to "guess work". Are there really no data available on cycling rates on sidewalks vs streets?
As the city reduces fossil fuel use, what will be the impact on commute times for cyclists and bus passengers in the corridor?
Focus on building community and avoid making a decision based on a focus of vehicular traffic flows and ADT numbers
For option #5 the wide sidewalk is of doubtful value if there aren't also bike lanes to buffer the adjacent 30 mph car traffic
Good Presentation, Well organized. Enjoyed comments from community, too. Because of bus routes and emergency vehicle use i prefer 4 lanes.
I am concerned about any decreasing width of car lanes that would impact firetruck, ambulance, and bus access. I believe the businesses in Willamette are unique and should not lose business with any of these changes. There should be a major push to have bikes use parallel streets.
I am torn between Alternatives 3 and 5 as one addresses bicycle concerns at the cost of pedestrian concerns and vice-versa. I wish that there was an alternative that did not put theses two concerns at odds.
i like to see information and statistics on the number of people (motorists/bikers/bussers) who commute through this corridor vs. the number who shop, work, or live along the corridor and the potential benefit to having fewer/slower vehicles commuting through.
I own a business and much of our busiest hours are the "Home-ward Bound" shoppers. I also sell 20lb bags of birdseed and my customers largely MUST drive to do business with us! Am torn: I want my business to get busier...but i also DO support Bike/Ped improvements too! So if the 3 (with bike lanes) happens, I'll need a business on the side delivering birdseed to our customers!
I was glad to hear 18th has higher ADT levels than willamette. 18th works well with three lanes and bike lanes. This means willamette would work as well. The increased delay is a tradeoff for improved bicycle and pedestrian environments. It is a delay we should accept.
I would like 3 lanes but no bike lanes. Route them near by on less busy streets. Keep cars moving slowly but moving. Turning lanes are very importent

If we can shift the mindset to wanting to be there and having it not just a pass through feeling.
Increases in delays on Willamette will do 2 things: 1) Encourage economic development - as shown in many oregon communitites! 2) Encourage more people to use alternative modes - reduce "VMT"! Both align with the city of Eugene's goals!
It might be helpful to see a short video of the area in question during these presentations, so we are all aware of the blocks in question here.
Let's think not just the needs for the day, we need a a vision for the next 20 years. Cost/Traffic/Safety = all important. Making the right choices for the next generation, even more important.
Open-Ended Response
Please consider possibilities beyond the right of way although this is potentially litigious, on the east side there is a relatively open corridor that could work!
Please double-side print and make smaller -> less paper! :)
Please include human beings i your definition of traffic. Please provide data on increased safety with 3 lanes In delay please note amazon parkway is faster for cars right now with 1000s of comments willamette is clearly a top priority. Fix it sooner then five years from now!!
Really like the way this forum was run. I feel better informed and that I am partnering with the solution were cycle tracks considered on willamette for two way bicycle similar to what is on alder st in the university.
S. Willamette is one of only two major arterials to points beyond S. Eugene. Improvements to parallel streets and the existing bike path should be more than adequate for bicycles with access to shops from backside entrances.
Thanks for a good public process
The acceptance of speeding is difficult for me to live with happily. I think police and planners are 1. Male 2. Drive, dont't walk or bus
The city adopted plans and strategies for complete streets. Now is the chance to see these plans through!
The city should present a comparison study between the proposed alternatives #3 & #5, and 18th avenue, with number of cars, number of driveways, accident rate etc. so that we can see whether the three lane has worked historically
The way things are worded in this survey reflects biased assumptions that "traffic" and "travel" = cars only. Bikes are traffic- I personally do not own a car and bike everywhere. We seriously need bike lanes
There is no way to estimate how many fewer cars will use willamette under #3 and #5. the idea that traffic will only be delayed 30 secs between #1 and #3 seems really too little
There needs to be a stated, up front "understanding" that each proposal will benefit some and "harm" others (proportionally)- with each proposal having a different mix of those who end "up" and those who end "down." There can be no one size fits all.
This project would benefit from more examples of similar projects around the country where lanes were eliminated. Also, an operations model instead of a regional model run would be useful.
Vibrant urban corridors should not focus or prioritize auto flow in its study. It should focus on improving the vibrancy which no urban mayor or business owner would ask for fast, rapid auto flow. Option 1 will get you no where and truly makes this practice a waste of community time if it were choosen.
Would it be possible to have 5' bike lanes and 11' through lanes?

You are welcome to share additional comments or questions. Please be concise and to the point.
1. Reduce number of opportunities for left turns, both entering and leaving willamette. 2. Restrict pedestrian crossings, possibly with posts and claims as on agate at student housing crossing
Bike and Peds are a very important part of the street. The Effects of the 3 lane design will only make the street safer to all. "Traffic Shift" will only happen with people who don't care about the business on the street. they only use it as a through street. Bike and Peds will only continue to increase
I feel that if Willamette is more friendly to bikes and peds, then there will less need for drive along the (small section) of Willamette. Five blocks is NOT a lot. On major cities people walk much longer distances. If we CHANGE so will people. In Eugene, because distances are so short, people drive. Please make it easy for people to walk and BIKE.
I want to be encouraged and supported to ride bike and walk to t these establishments on Willamette St. I want a progressive decision on this issue- to help our community to become more healthy.
I'm a strong advocate for increasing alternative modes of transportation. I much prefer to ride my bike to shop and for recreating but don't feel safe with the current configuration on Willamette street. I would imagine that pedestrian and bike travel and shopping would improve if safety modifications were made.
My goal for improving willamette corridor is to reduce the emphasis on car travel and access and increase focus on multi-use and a sense of place! We'll want to come there if traffic is slowed........make it a shopping area
Slowing traffic and adding bike lane, making sidewalk better for peds ----> likely to increase business revenue. Alternative #3 best option to serve model
Slowing traffic and allowing safe movement for bicycles and pedestrians will improve the True economy - the sustainable, long term economy!
Will anyone seriously track 24hr/1wk # of bike, peds, wheelchair etc. on sidewalk and streets plus 3 of buses on/off
1. Bigger/wider sidewalks are not needed. We have at present an aging population. These people do not walk on willamette. 2. Have you studied at three different daily hours the number of people walking?
Shared 13' sidewalk works well on path around river and through amazon park, although I strongly prefer to continue the current configuration with improved sidewalks and 4 lanes
- slow it down - focus on quality of the street and the sidewalk; not on quantity of cars passing through the corridor
Do something to make street safe now, not 4-5 years from now.
I am concerned with Safety and it is not acceptable to rebuild what we know is an unsafe design for pedestrians and bicyclists.
I really think that it is important to talk more about the safety when talking about this project with the community, since this was ane of the major concerns of community members.
It is scary and very unsafe for pedestrians (especially walking w/ my two young kids). It is unsafe and frustrating to drive on Willamette when people stop to turn left. It is also unsafe to walk on sidewalks when bikes are on the sidewalks. You have to be crazy to bike in the street as is and you have to be rude to bike on the sidewalk. If parallel routes are "selected" for bikes, they will still travel on Willamette. Might as well make room for them.
reducing injuries and fatalities is the most important criteria for design.
Safe access to businesses trumps fast traffic flow for the good of the city.

Safety first! Alt 1 and 5 will continue to have bikes ride on the sidewalk, which is an unsafe place to ride. Alt. 3 works for pedestrians, bicycles and gets cars down the road safely.
Safety for young people and elders should be a top priority. Reducing vehicular carbon emissions is also critical We need livable communities where it is safe to bike and walk
safety is priority #1
Safety should be a deciding point. The design that increases safety for all modes is #3. Also, the only option that allows for ALL MODES to use street is #3. It is important to me that we design the street to MOVE PEOPLE no matter]how they are traveling - bike, walk, drive.
Safety should trump wait time!
The fact that alt 3 + 5 could reduce collisions by 10-30 % was not in the presentation of options. This is a significant omission and a fact the community should be aware of.
The safety aspect of options 3 & 5 reducing accidents by up to 30% far out weigh a 30 second delay for automobile traffic.
Amazon, Oak, Hillyard, Jefferson seem to have much more capacity than Willamette. please consider using civic stadium to connect downtown to amazon
I am quite convinced that a turn lane for left turning cars is a must on this section of the road. Its too heavily travelled to allow stacking in 50% of the road. I'd like to point out also that the assumption has been made in the above questions that all traffic will remain motorized. Given an opportunity to safely walk or cycle, it is likely that traffic may shift that way.
I prefer round abouts. Pedestrian light at 29th and Willamette place (powered by PU) and bike lanes with small barrier.
I would like a super sized round about on 29th and Willamette, taking property from the south side of the intersection only. The intersection traffic is already too much- backing up traffic at this for many blocks. It will get worse - affecting turn off blocks away -
If portland st is an alternate route, please consider a 4 way stop at 25th and portland. Portland is a straight shot now, folks zoom too fast already. Slow down the traffic!! Kitties and human pedestrians are at peril!
No round-abouts please! bus turnouts make sense to me
No roundabouts please!
No roundabouts! Danger to handicapped and elderly. Dont mix bike and walkers. Room for emergency vehicles!!
No roundabouts!! More signing and main crossing
One thing I appreciated is that alternatives 3 and 5 reduced collisions by 10-30%, while only increasing travel time through the orridor by 30 seconds. It seems like a no-brainer!
Right now traffic signals are timed to allow left turns onto willamette from Tsunami Books, Capella, True Value. How would this be affected? I fear negatively
The prediction that traffic would increase by 2018 regardless of the change made seems to multi-gate consensus of the business owners about reduced customers under planes 3 & 5
Traffic flow is quite important. Something to consider is that those future cars, driving down Willamette might be electric or hydrogen powered
YOU MUST ADDRESS putting a signal light by the Chase bank north of the Main entrance to Woodfield. Traffic WILL back up to the main entrance. Change the Chase bank entrance to the main entrance and what is currently the main entrance should be only 2 lanes (entrance and right turn).

All options should integrate measures to deter cut through traffic in adjacent single family neighborhoods. All options should make an effort to encourage efficient use of bigger transportation system, e.g shifting traffic to Hilyard and amazon which are designed to hold more traffic
bus turnouts!!
Concerned about being stuck behind buses on 3 lane options. Bus pullouts would be nice. Like the design modificator if an extra lane at 29th intersection
Aesthetics of the street are very important- plantings, trees, benches, etc. It is not a pleasant place to walk, park, bike, or drive now. Improving this would bring more people to the businesses.
any storm water amenities would be great!
I would lie to see 4 lanes of traffic continue on willamette with drainage improvements, sidewalks widening to 9'. Possibly closing some curb cuts that are doubled up at certain businesses
In the final landscape details, please don't add cutesy, 19th century Americana street lamps as they did in Sammamish, Washington.
Look carefully at multiple driveway consolidations, add planters/street trees with set-back sidewalks, underground the ugly utilities and make it beautiful
Please make it beautiful! Thanks
relocation of utility poles is of great concern to me. Willamette St. will always be ugly until these poles are removed.
Online Survey Question 11: You are welcome to share additional comments or questions. Please be concise and to the point.
Alternatives 3 and 5 are dangerous. Center turn lane likely result is head on accidents and increases the odds of bikes/pedestrians being hit by turning vehicles. 4 lanes with wider sidewalks is better and encouraging parallel streets.
Any alternative other than 4-lanes will result in grid lock and starve local businesses. As an avid cyclist and a shopping motorist, I feel that anything that reduces the flow, ie fewer lanes than 4, will be a detriment to all, particularly when 2 lanes does not allow for stopped buses which will grid it all to a halt. Even with 4 lanes, the lengthy stops made by buses will back traffic up to at least 18th. Amazon as an alternative only works for through traffic and using streets to the west is not at all practical. John Grant 171 W 52 nd Ave Eugene, 97405

I personally think that you are dreaming when you say there will only be 30 seconds delay for alternatives 3 and 5. Just look at the picture in the PDF presentation where you have additional vehicle queuing. Just that additional queuing would take probably 60 seconds at least. Also, people turning right (as into Woodfield station) will still have to slow down, especially with bicyclists whizzing by on the right (yeah, right, they aren't supposed to continue on with someone turning, but many of them do continue, so that is what you have to count on), so the whole traffic flow with just one lane will have to wait for that person, which will just add to the vehicle queuing, which will increase the delays even more. Alternative 3 had bike lanes, but wasn't wide enough for buses and trucks. And it would impede traffic flow way more than you think. Alternative 5 had larger sidewalks, but you'd still have the problem with bicyclists going on the sidewalk knocking down pedestrians or going on the one drive through lane and impeding drivers even more than they do now. Alternative 1 is the only sensible alternative - just make sure that you improve the sidewalks and provide parallel bicycle access. I drive daily between Willamette on 23rd (where my mother-in-law lives, to check on her), shop at Capella Market almost daily (26th & Willamette), and go to my house one block on Willamette on East 30th, so I am quite familiar with Willamette Street. Because of my stops, it is the only sensible route to take.
You show pedestrians walking by the 4 lane option in your illustration, There will probably be few pedestrian if you choose the 4 lane option.
Alternative 3 is the only alternative that provides safe conditions for the whole community. Furthermore, it supports the City's key planning goals and policies listed in the Climate and Energy Action Plan, Pedestrian and Bicycle Master Plan and the Eugene Transportation System Plan. Finally, the opposition to to alternative 3 bases their objections on an unsubstantiated fear of dire impacts on area businesses. However, the literature seems to indicate that the opposite might actually be more likely. In case after case where similar lane reconfiguration (two travel lanes and a center two-way-turn-lane) have been implemented, the resulting increases in pedestrian and bicycle access leads to increased retail activity. And it's not hard to imagine why. By creating a welcoming environment for people arriving on foot, by bike, and by car, a pleasant shopping experience is likewise created.
As a consumer, I am more likely to frequent the businesses along the South Willamette corridor if bike lanes were present. I think Option #3 is the only option that best matches the alternative transportation goals for the city of Eugene.
I think Alternative #3 is most viable from 24th to 27th, but from 27th to 29th on Willamette, there are routine bottlenecks and issues with left turns, access to Woodfield Station and Oregon Community Credit Union. This area should remain at four lanes, with clear markings for bicycles to take 27th on alternative southbound routes. Businesses on the east side of Willamette between 27th and 29th do have alternative access from Oak Street. The other issue is the lack of a northbound bike lane between 29th Pl and 29th St on Willamette. Taking 29th for bicycles offers access to Amazon bikepaths, but the long block between 29th Pl and 29th St offers limited safe access for bicycles to Woodfield Station and surroundings.
I'm concerned with the narrowness of the streets for buses & trucks in option 3.
If the goal is really to provide safe access for all modes on Willamette Street and not three blocks away, and not along another, parallel, street, but ON Willamette Street you'll see that Alternative #3 is the clear choice.

Alternative 5 creates a pedestrian friendly district and I think is the best commercial option, with the best commercial gain, as well a creating a safer streetscape. Alternative 1 doesn't solve many problems. Willamette is not the best place for bike lanes and is not a good commuter rout for bikes or cars. I think commuting trafic should be loaded onto Amazon Parkway.
As a bicyclist that frequents the south willamette area businesses regularly, it is amazing to me that there aren't more bicycling design options. Most of the reason why I don't go to the area more often is because of the ridiculously horrible bike access. It's very unsafe and there are no good direct routes at all. If eugene wants to be a bicyclist friendly place, we ned to have more options for both bikes and pedestrians.
Bike lanes are a must. If not, you'll be revisiting this in a couple years.
Bike lanes are the best way to encourage this mode of transportation and the best way to keep motorists, cyclists, and pedestrians safe.
Bike lanes on Willamette street are a necessity. It is dangerous to ride your bike there now. The options that do not include bike lanes are unacceptable.
Bikes need to be in bike lanes not on the sidewalk. The design should provide access for bikes as they are vehicles too. I do not bike to Willamette often because of the dangerous route I am forced to take-on the sidewalk. The sidewalks are too narrow and should be reserved to pedestrians or people in wheelchairs or walkers.
Emphasizing parallel/nearby bicycle access makes more sense than trying to accommodate bikes on Willamette. There are many streets in Eugene which one wouldn't sanely ride a bike on but there is nearby bike access. This works just fine. I am very concerned about slowing emergency vehicles if the street is reduced from 4 lanes of car traffic.
For any alternative that does not include bicycle lanes, a detailed plan for alternative bicycle routes, including access to businesses, is necessary for earning full evaluation of the alternative.
I am a bike commuter to work but will not take Willamette due to safety issues no matter what decision is made. I take the Amazon bike path for safety and because it's much nicer.
I am an avid cyclist. There are ancillary streets I can take. Don't ruin the livelihood of the Willamette Street businesses. Leave the street the way it is.
I believe that the option to increase vehicle throughput and bicycle safety is to remove bicycle lanes from main thoroughfares and turn the next adjacent street into a 'bicycle street', as Alder Street is. Having lived in big and small cities, born and raised in EUG, I have never seen a peaceful solution with bikes and cars on the same road. Alder street is a wonderful example. Bicyclists do not ride on Hilyard/Patterson because they have a safe and pleasant place to be that is not inconvenient to use. Ceeding a small ancillary street to bicycles makes no impact on vehicle traffic.
I commuted by bike along Willamette to the Village School for three years. I was forced to ride on the sidewalk for portions of the trip because there is no room and no visibility on the street. Obviously bikes riding on the sidewalk raises safety concerns. For those of us who are not uphill bike riders, Willamette St. is the only real north-south corridor to So. Eugene. Please add bike lanes to Willamette St.
I don't think biking on Willamette will ever feel safe - even with bike lanes. I don't ever use the lanes on Coburg Rd., for example. So - extra wide sidewalks work best to accommodate a variety of activities; ie. #5. Onward

I live and work in this general area and I can not express to the powers that be how much we need bike lanes on Willamette. We also need to make this thriving area more pedestrian friendly. Although I personally would go farther with more/bigger bike lanes and buffer zones, Alt. #3 at least offers bike lanes. It would be foolish at this current juncture in our history to redesign a major thoroughfare without bike lanes. Honestly, I can't believe 2 of the designs don't include them. Seven generations people!
I love the shops and restaurants on this section of Willamette, however, I don't feel safe riding my bicycle in this stretch of Willamette so I rarely shop/eat in this area, which is unfortunate since I only work a few blocks away. Increasing usability for vehicles without providing bike lanes would not increase my usage of the area. Please provide designated bike lanes.
I must walk due to vision problems. My biggest problem is bicycles that travel at high speed and that do not slow of alert when approaching. Bike lanes will not help unless the riders actually USE them.
I understand that it requires an attitudinal shift for people to consider the importance of bikes and pedestrians, but I believe it is very important that we do so. Eugene has an opportunity to set a standard for livability and bikeability and projects such as the Willamette redesign can help set that trend.and define what we hold important. I strongly urge you to choose a redesign option that includes the needs of pedestrians and cyclists as you move forward, Regards, Robert Ault 541-337-9765
I would be curious about a divider between the bike lane and car lane on alt. 3 - a 7' sidewalk seems acceptable to me at this location. Bike access is really necessary here, since biking on side streets is very different (far more difficult) than car shift to those other streets (an engine makes a big difference. I frequently avoid the area if I'm on bike but it has many businesses I'd visit if it was more friendly. An option that doesn't include bike lanes is very shortsighted.
I would be willing to use parallel streets for bike travel (and already do). However, I frequent businesses on Willamette on my bike that can only be accessed by actually biking on Willamette street itself. I would be willing to support wider sidewalks rather than bike lanes if bikes could safely use the sidewalks as well - if the "design features" did not block bikes travelling on the sidewalks.
I would frequent the businesses on Willamette more often if it were easier to travel by bike on the street and find decent bike parking. Fewer driveways (ex: glenwood, play it again sports, mini pet mart consolidation) would also benefit bike, pedestrian and auto traffic.
I would like to see European-style bike lanes installed, that are curbed and raised a few inches from the car street level, to protect bicyclers from car 'slosh'; and also structurally defined from the pedestrian sidewalk to discourage casual over-lapses. Thanks for making an effort to humanize Willamette Street from its current harshness toward everything but conduiting cars and bigger vehicles.
If cutting Willamette to 2 lanes plus a turn gets you bike lanes and only a 60 second increase in delay, I'd say that's well worth it. More cyclists means fewer cars on the road.
If Eugene prides itself on being a "green" city, we need to do everything we can to encourage biking!
If I could safely ride in a bike lane, I would bike instead of drive to businesses that I frequent along Willamette. If there are fewer cars because folks could safely bike, that would help others who must drive or take buses. If there is a dedicated center turn lane, I would also be more inclined to frequent businesses because I could actually turn into their properties. Now it is not easy to do so.

Ignoring one whole group of users is unacceptable now and totally misguided for future needs. Lets do it right the first time. While cities across the country are prioritizing bike accessibility, Eugene fails to do so, even on bike corridors like Blair. Pathetic!
Not clear if bikes could use the wider sidewalks in Alt#4. If there are no bike lanes on Willamette St, then I would probably prefer to ride on the wider sidewalks than go to a parallel street.
PLEASE ADD BIKE LANES! I'm happy to pay taxes towards this!
Ridiculous to consider any plan that does not include bike lanes! Do you think bicyclists will just disappear? I believe that if the city consciously chooses an option without bike lanes and a cyclist dies in this corridor, you should be held liable.
Very concerned about adding bicyclists to the mix with all of the driveways & drivers crossing lanes of traffic when there is an "opening" especially if only 1 lane in each direction-fewer gaps for people to get into the "flow."- people tend to focus on cars more than they do cyclists (I do cycle). I would like to see cyclists on parallel streets for safety concerns. By rights cyclists should be able to use Willamette. We are dealing with an EXISTING LIMITED amount of space - thinking of SAFETY now. Thanks for being so inclusive in this process.
We have lived and traveled in the Willamette corridor for many years. We feel strongly that Willamette street is too narrow and dangerous for addition of bicycle lanes.Not to mention the danger of cars and bikes sharing the multiple driveways and turns into and out of businesses.When we bicycle we use our city's fantastic bicycle paths and alternative routes with less traffic for our safety and sanity. The amount of people that would convert and use bicycles to shop at Willamette street businesses would be a very small number. We vote for alternative #1 due to above and concern regarding poor traffic flow with alternative #5.
With 4 traffic lanes and narrow sidewalks, walking and biking through this area feels unsafe. As my family travels primarily by bicycle, we sometimes choose to avoid the area. When I am shopping in the area, I often need to travel 4 blocks or less down Willamette. Using parallel streets would double the length of my trip, so I make the choice to take a lane on what feels like a highway (another option is the sidewalks, but cars turn in and pull out without seeing cyclists on so many driveways that it's safer to be seen by drivers and impact traffic out in a lane). A better design than any of these would include protected bike lanes (on the "sidewalk" side of the curb, and separate from a walking path), or at least a slightly elevated grade in the same position as in Design 3.
wide sidewalks could accommodate bicyclists better with signage akin to bike paths to encourage pedestrian traffic to stay right and bicyclists to signal when passing.
As a business owner on the east side of Willamette, I am very concerned about the city's idea of putting up a stop light and immediately affecting the buildings and businesses on the east side. Car and travel access is very important up and down Willamette Street. the 29th area is already a little hidden from the rest of Eugene, and needs the access so that shoppers can get to and fro without a hassel. I am curious to see what the percentage ratio is between drivers and bike riders along this area? I have seen no statistics on this. This HAS to play some kind of part? What are the daily traffic counts here? I bet pretty high? We need to celebrate the businesses along this stretch, not make it hard for them!
I don't think businesses will buy into any plan that closes their driveways on Willamette (that's really not fair to them as there will already be hardships during construction, folks using alternative routes, etc.). I'm guessing that with the turn lane installed we won't need a stoplight at Willamette and the WoodField Station.

I feel businesses on Willamette should have the most say in this, as most are independent businesses and it wouldn't be good to have their business effected in a negative way from this. I would like to see more crosswalks--maybe at 24th Place and between 27th and 30th.
More bicycle and pedestrian access on Willamette St. will improve the neighborhood and I believe businesses will ultimately benefit from this increased access.
Please check out the studies that show that increased bicycle access leads or a rise in business. We need to move away from a car oriented corridor; Businesses should know that reducing cars and providing more pedestrian and bicycle infrastructure here is the best thing for them.
I co-teach an energy science & policy course at UO, and we see further evidence every year that gasoline prices are likely to continue to increase at or above the rate of the past ten years (in which they've approximately tripled). Please help Eugene adapt to this future by giving commuters, shoppers, and businesses a great set of alternatives to car-only transportation! Thanks for all your hard work!
I think doing construction without adding a bike lane is a waste of both time and money. I also think that taking five years to fix a road is way too long. (I am getting this time frame from question three which give statistics for 2018). I don't know too much about construction, but I do know that it should not take that long to fix a road.
• I like #5, if there would be enough breaks in the traffic, that a car could actually turn. I missed the mtg but still am concerned that I'd be in the center lane and not able to turn with all the traffic funneled into 1 lane. • As a bike rider, I am fine carefully sharing the sidewalk if it is wider. That could help pedestrians and bike riders. • I love the idea of more trees. • I like the idea of cafes but having gone to Holy Cow and sat outside many a time, I think Willamette St is way too noisy to enjoy a cafe environment. I may be more sensitive to noise than others * The artists renditions are lovely but don't realistically represent how that street really is with MANY more cars than shown during most of the day and night. * Making a left from Woodfield station onto Willamette is difficult much of the time. I leave via 29th and that helps some.
10' lanes in Alternative 3 are too narrow. Most drivers can not deal with them, and will tend to crowd the bike lanes anyway. In addition, in Alternative 3, when busy, turning movements across the bike lanes is dangerous. Therefore Alternative 5 is better for bikes. Again, there are turning movements, but a lot more time for bikes and cars to react. Alternative 1 is a terrible idea all together.
Are we trying to make Willamette along this stretch into a lingering street (i.e. wide sidewalks) or a better commuter street, or both? I'd hate to roll the dice on nice wide sidewalks that no one uses. If bike lanes were along Willamette, I still wouldn't use them like I don't bike Willamette now, prefering a quieter/less busy street instead, esp. with the narrow travel lanes. Are we considering this street too much in isolation from neighboring parallel street opportunities? Probably not, but poor little Willamette can only do so much. Also, all I can see with a light at Woodfield AND 29th is a major nightmare. And some decent street trees and plantings outside businesses would go a long way towards making things look better. I hope this is in whatever plan.
As a frequent pedestrian, it is dangerous to be sharing narrow sidewalks with fast-moving bicyclists. And it is dangerous for the bicyclists to be in the same lanes as faster-moving cars. They really need bike lanes for everyone's safety. As we plan for the future we should be prioritizing walking, biking and public transportation FAR over individual cars, not only for the sake of the environment but because eventually it will become too expensive to fuel personal cars, and people will end up needing those alternatives.

I don't see how alternative #1 is the best option for vehicles. People drive too fast and everyone knows it's not currently working well. Because of this, I don't go to businesses on S. Willamette very often. I think alternative #3 will not only be better for bicyclists, but also cars and trucks. It will slow traffic down to the speed limit and improve safety for all users. If this is done, I'll be more likely to visit businesses on S. Willamette by both car and bicycle.
I live on Portland St near 26th (the street parallel to and just west of Willamette). We get a ton of bikers, walkers, and runners going by our house and I think a lot of these folks are diverted off Willamette because it's so crappy to bike or walk down. I wish that any south Willamette businesses who oppose bike lanes because they think it will hurt business could see the amount of pedestrian traffic they are missing out on when people take side streets instead. Those who are walking or biking are more likely to notice a new restaurant or see that a store has a sale and actually stop at a business rather than people who are trying to get to their destination quickly in a car. The center turn lane with bikes lanes makes a ton of sense for Willamette. Seems like it works fine for 18th, and it's a lot easier and more pleasant to ride, drive, and get in and out of business on 18th compared to Willamette (which I try to avoid as much as possible using any form of transportation, even though I live right off it). Make it a street that works well for pedestrians, bikes and cars and it will be much better for the businesses located there.
I think it's important to make that section of Willamette more bike and pedestrian friendly, because of the types of business and proximity to schools and neighborhoods. Since it narrows to two lanes anyway, it isn't a great arterial. It would be better to have most through traffic funnel into Amazon.
I travel this area. IF you go three lanes the middle lane must go into city in the AM work travel times and out in the PM times. Any study showing only a 60 second delay at these time cannot be accurate and is a typical misuse of any study.
I was riding the bus along Jefferson Street between 18th and 13th this morning. I noticed that if a truck and the bus came to the same spot in the road and that spot had either a car on each side of the street or a wider vehicle parked on one side of the street, at least one lane of traffic had to stop and make way for the other lane of traffic. At times both lanes stopped to decide just who would go first... So, while I support option #3, I also support the outside lane being a full 11 feet wide to carry the bus & truck traffic load and I support the bike lane being being 1 foot wider also. That would but us back to the 9 foot sidewalks, make the auto/truck/bus lanes safer, and the bike lanes safer. Then, asking bikes & skate boards to have limited access (like it is downtown = walking bikes and carrying skate boards) to the sidewalk is not unreasonable. Everyone gives a little something and everyone gets a little something. WIN/WIN/WIN.
I would have the sidewalk and a bicycle path separate from the street on just one side of the street, make Willamette one way.
I've lived here 38 years and use Willamette all the time. I've never seen an accident, or near accident. I drive Willamette at all different time of the day so I think I can gauge the situation well. I'm a bikerider also. Willamette is not for bike and I know it; so I don't use it for that. If I must use it when on the bike, I use only that part that takes me to where I'm going. Some streets are just not meant for bicycles. As far as peds. are concerned, walking should be an issued if you stop, look and then walk. Willamette St. is a major thoroughfare and the present street configuation shouldn't be dimenished in any way. If we want to keep our taxes lower, we should encourage the use of this street and its businesses not decrease its usage.

I've lived off Willamette at east 39th place for over 31 years, with over 17 of those years as a commuter to downtown Eugene. If we could start from scratch, and if Willamette wasn't such a busy and critical transportation route, then I would be fully supportive of a 3-lane option with wide sidewalks and bike paths. However, with the reality we have it is just not practical or safe to give up the 4 lanes to accommodate those changes. I don't believe the traffic people's estimate of only a 30-second delay if we go to 3 lanes. I agree with many of the points raised in R-G letters to the editor from those who are against the 3-lane options. I also think you would see people using the center turn lane as an extra lane to get around traffic that is backed up. One idea I like that I've seen elsewhere is to have signs at the stoplights saying No Left Turns 4-6 pm (or something along those lines). I believe bicycles should be prohibited from being on the streets on that stretch of Willamette because it is very unsafe both for them and for the drivers, and they clog up the traffic terribly. They should be directed to alternate bike routes as close to Willamette as possible. We have wonderful businesses in that corridor, and the natural downside of that is a lot of in and out traffic. I often do all my errands going no further south than Capella. The businesses in that area have only gotten better and better over the years, and to me it captures the very nature of Eugene, with a wide mix of people and places, conventional and alternative. I love south Eugene very much and don't want to see its vibrancy compromised to accommodate a very small but very vocal group of bike riders. I am sympathetic to their issues but they are a small user group. In all my years of driving Willamette I have also witnessed some very bad bike behavior which has endangered the bikers and the drivers. The one thing that has been extremely important to me for many years but that I haven't officially advocated for is to please, please, please plant large, beautiful trees along that stretch of Willamette (and from Willamette east on 29th to the Parkway also). It has been one of the ugliest roads compared to many others in Eugene and it deserves better! I know just that improvement alone would have a tremendous aesthetic impact and give the area more of a relaxed, neighborhood feel than a concrete/asphalt "hurry through" feel. Thanks for listening!
in all presentations, motor vehicles are the priority and everything else is an afterthought. the plans are disappointing, lack originality and miss the point of creating a go to place for people. every question is based on some aspect of using a car in the area. question 1 pays slight lip service to other concerns but i can't even answer the rest because not being car focused and wishing i could actually drive less, there's not much choice.
Let Woodfield Station traffic enter ONLY from the Willamette entrance (East edge of property) and ALL Traffic exit only on the South boundary onto 29th with timed traffic lights at 29 & Will. North-South and East bound drivers use the exit closest to the old bank and West bound drivers exit nearest Rite Aid. OR...buy the newly abandoned Wendy's, tear it down, grade the property and create an entrance/exit to Woodfield Station there with a light at 28th and Will.
Many residents such as myself travel Willamette Street because they stop to shop. Currently it is already a nightmare with 4 lanes of traffic to try to turn left due to the traffic at peak times, add buses and it's a mess. We really need lights that include opportunities to turn left to not tie up traffic. Trying to get in and out of Oregon Community CU is next to impossible at times already. It concerns me that if the lanes go to 3, there will be traffic both going South and North trying to turn left in that one middle lane increasing risks of accidents. I highly recommend that should the City still think this 3 lane idea is a good one to pre-test it first to get the reality before investing. Crest Drive is a nightmare to drive that someone thought a good idea. Please do not do the same to Willamette Street.

My preference was eliminated from consideration by city staff. The best alternative in my opinion is two lanes southbound, one center left turn lane, and one lane northbound. There is a wonderful north-south bike path in Amazon and Tugman parks that I use when I bike north from my home in south Eugene so bike lanes on Willamette would be redundant. If alternative 3 or 5 are implemented, the businesses on Willamette from 6th to 29th will lose a lot of business because homeowners in south Eugene will no longer travel Willamette street to return home from work and stop to make purchases along the way. Much of that business will go to the Hilyard corridor and Edgewood shopping center. If you further limit motor vehicle accessibility to and from south Eugene you make it a less desirable neighborhood just as reducing bus routes has done. Don't allow Wildish to bid on this project because they ruined the street drainage on Hilyard street and south Willamette the last time they touched it.
Not-to-distant future autos will be smaller, electric, driver-less, and majorly public-owned and shared. Alt 1 and 5 would suffice, Alt 3 will be adequately satisfied with already-planned adjoining-routes.
On the sidewalk on wilammette, right behind the civic stadium is a very pretty two way staircase- on college hill. In Europe such two way staircases are made very charming by putting canopy on it with creepers/climbers on it...very very charming- this one has so much potential to be done like that. I have seen that in India as well, in Hill stations. That should really be considered , right now its been destroyed by grafittis
Please consider the demographics of the people living in South Eugene. I have family members also living in South Eugene and many friends and neighbors who are either retired or approaching retirement. I have no interest biking down the hills (or back up) lugging groceries or just for a leisure trip meeting friends for lunch, etc. I appreciate that bicycle riders want better access, but the reality is, how many are going to use those lanes in downpours, or other inclement weather? They already have other choices. I'm very concerned about fire and ambulance runs blocking traffic or not being able to get through fast enough. Is a 30 - 60 second delay worth it to someone who has an emergency?
Please remember that you only hear from a certain segment of the public. In fact, in vocal minorities often drive decision making in this town.
Question #3 implies I'm in a car. Please stop making that assumption. The commute time via bicycle would be incredibly improved with on-street bike lanes.
Question 3 seems heavily biased and does not take into account Eugene's large number of dedicated commuter cyclists, whose commute times could be cut drastically by alternative 3. Prioritizing through car traffic is a good way to make any street hostile to both cyclists and pedestrians (important to keep in mind that both cyclists and drivers instantly become pedestrians as soon as they leave their vehicles, and that all business patronage occurs when people are operating in this mode).
Really, anything would be an improvement. I am scared to walk with small children on Willamette because the cars are so close to the sidewalk (which is narrow in parts). It would be great to have biking lanes!
Thank you, Chris, for such excellent transparency and communication with the citizenry of S. Eugene!
The idea of alternate streets for bikes and peds does not mention that the sidewalks are not continuous on either Portland or Oak. Also that traffic going west will often go 24th to Portland to 27th which increases the traffic making walking in the street when necessary unsafe. THanks for asking for input.
This is a key chance to improve an area blighted by automobile dominance.

This is a major arterial route to South Eugene. Let's route bike lanes to other areas, and preserve this as is. Let's reinforce the speed limit to reduce accidents, and provide better pedestrian crossings.
This project needs to prepare for the next 25+ years. It's important to keep a vision of a more inviting streetscape, allowing cars to pass through but balancing needs of the other potential users as well. It will also be helpful to provide for users in cars to approach the corridor from each side, park, and walk to multiple destinations. The existing corridor is too narrow to accomodate everyone optimally. It seems bicycles are the most reasonable to displace to parallel streets IF their needs are met with good connecting points.
To me, leaving the current configuration is the only sensible option. Put bike lanes on other parallel streets, let Willamette be for thru car traffic. Thanks. (Do feel it's already a done deal & the city will reduce the traffic lanes) Some questions are "leading" - designed for only 1 desired outcome.
We need to make it safer for people to walk and bike amongst businesses, as well as maintain a smooth flow. I would like to see the utilities put underground to make the whole environment more friendly to restaurants and people. If there are slight delays, more people will use Amazon, which is a good thing.
Your illustrations of the alternatives were pitiful, all of them. You know what the streetscape is; that is what you should have been presenting, not the fanciful pile of rubbish you showed instead. Cars parked parallel to Willamette, right next to the street, I don't think so. Accurate representation of the scale of the buildings, I don't think so. Where is the representation of conflict between drivers from opposite directions both wanting to make left turns? You've shown this area as perfectly flat. The west side of the street is as far from level as you could possibly get. Fantasyland! Those of us who live in this area are going to be greatly affected by these decisions. Your representations of all three of the alternatives all show how disconnected you are from what is actually happening in this neighborhood, and what it actually looks like, and how it actually functions.
Any design that does not provide facility for all transit modes: motor vehicle, bicycle, pedestrian, skateboards, public transit and wheelchairs and electic wheelchairs would be a total failure on the part of the Willamette Street Project.
Anything less than a street that serves all of the citizens who use it is a failure of process.
Thank you to everyone for your hard work and concerted efforts devoted to improving my neighborhood. While I would prefer (in an ideal world) to see bike lanes directly on Willamette St. (as I am a regular bike commuter and use my bike for shopping in this area) I would prefer to share a wide sidewalk (like I do in Amazon Park) so that the buses and trucks would have the 11' lanes they need.
The 30-seconds longer trip figure is highly suspect. The westbound lane reconfiguration a few years ago on 29th between Oak and Willamette added much more than 30 seconds to the transit time for the 29th and Willamette intersection during busy traffic periods. For the proposed #3 and #5, just getting stuck behind a bus stopped for passengers anywhere between 24th and 29th would certainly add more than 30 seconds. I am very much in favor of increased bike lanes, wider pedestrian sidewalks and "design elements" but can't help but think that #3 would slow down vehicle traffic significantly and #5 would do the same but with almost no public benefit. The obvious smart thing to do is a trial of the #3 by just re-striping the existing street without making any other modifications to the route.

The more Eugene can accommodate motor vehicle travel with the needs of pedestrian, bus, and bicycle travel the better. All four modes of transportation are important for the city's quality of life. Currently the city caters to motor vehicle travel more than the other modes of transportation. I am fine with the city diminishing motor vehicle accessibility if it significantly increases the accessibility of the other modes of transportation. The Willamette St. renovation is a great opportunity to significantly increase residents' ability to bus, walk, and bike through the city while only minimally reducing the ease of motor vehicle travel.
This corridor should be more highly considered a destination rather than a through-fare for commuters, and ALL modes should be balanced to maximize the safety and comfort of ALL corridor users. Demote the importance of this corridor meeting typical "Performance" standards for auto flow.
A redesign of southern Willamette St. is not useful or practical in isolation. Without consideration of the one-way portion south of 18th and the connections of Willamette St. with Amazon Parkway, a change in traffic pattern is of little use.
A 30 second delay seems a small price to pay for increased safety. I never bike on Willamette Street because it is just too dangerous, but I would do so frequently if there were bike lanes.
As a resident south of 32nd and a parent I want to stress how important it is for me to have a SAFE access to businesses on Willamette St. for both my son and me. We would bike far more often but because of the current alignment I drive adding to the congestion. Think long term: more people will be biking as the cost of operating a motor vehicle gets more expensive. Build the bike lanes.
I feel it is very unsafe to allow bike riders on Willamette St. if the sidewalks were wider, pedestrians and cyclists could share.
It is not safe for bikes and peds the way it is and it is ugly and has no character, we can do better.
Make it safe and fun for peds and bikes, and discourage people from driving. People will flock there. This worked like a charm in the Pearl District of Portland. Driving in that neighborhood is a nightmare but the businesses are all packed with pedestrian and bicycling customers.
Make this stretch friendly for walkers and cyclists, please!!
Safety first: designated bike and turn lanes. Grew up and currently live on 26th & Willamette since the 80s. Lack of safe bike lanes has been a deterant for me to choose my bike over my car. Bet I'm not the only one.
Safety should be the highest priority issue, please stress the safety aspects of alt 3 & 5.
The only way to make bike riding safe is to have a physical separation between the bike lane and car traffic. That is really the only option that is acceptable to me. It can just be as little as a six inch wide curb.
This section of Willamette is one of the scariest places in the whole city to be on a bike, and I would love to see that change.
Vehicle traffic should be shifted to Amazon Parkway, that was the whole idea of putting in Amazon Parkway and access to Amazon Parkway should be improved. Without bike lanes, Willamette will continue to be unsafe for everyone.
Willamette is miserable to travel by foot, and dangerous by bike...I shop elsewhere on a regular basis to avoid biking with my children on Willamette. Our family loves to walk over to shop, and we'd do this more often if it wasn't such a yucky walk once we got there!
Willamette Street is busy enough that adding bike lanes will DECREASE safety

For "Sidewide amenities" you listed "Cafe Seating"--but there are no restaurants or other establishments abutting the sidewide so that appears to be a completely misleading statement. In addition, if the adopted concept is for bicycles and pedestrians to share the sidewalk, then (a) tables, sandwich boards, and etc. should prohibited because they would interfere, (b) curb cuts should be level (not sloping) to improve safety and (c) something needs to be done to remind vehicles to stop and look before crossing the sidewalk (it is an uncommon practice now).
Alternatives 3 & 5 should only be considered any further if they were subjected to at least a full year of testing. Refusing to test is an admission of their potential for creating grid-lock during times of high traffic volumes: in the morning, around noon, 'school out' and end of conventional work days. Where would the cost of developing 'off-site' improvements - such as pedestrian/bicycle crossings - would come from. Were they identified in the bond prospectus ? Thank you for the opportunity to participate in this survey.
As a long time former commuter and resident of South Eugene (I live at 43rd and Hilyard), I'm appalled by the considerations to potentially reduce Willamette to fewer lanes in order to provide greater access to bikes. As I've mentioned elsewhere--there are sufficient bike paths, protected routes, bike lanes to enable bikers to travel where they need to (and when I was a commuter biker, I utilized these routes of travel just fine). There are not sufficient alternate paths for cars, and the suggested increase in congestion will drive many of us to begin our morning commutes driving through *neighborhoods* seeking a path around the congestion points. Bikers don't get to "have" every functional travel artery reworked simply to cater to that specific lifestyle choice. I don't get to drive my car on the river bike path, the Amazon bike path, nor do I get to short cut to Valley River or Autzen using any of the bike bridges over Willamette. So it should go with major arteries that provide ease of travel and maximum business utility for cars. Willamette is functional as is, and anything that reduces ease of travel for cars seems profoundly short sited as well as wasteful. Additionally, no where in any of these plans do I see discussion of how to include disaster preparedness in these development plans. In event of a catastrophic dam breach, Willamette Street is one of the few travel arteries leading to higher ground. Attempting to reduce car efficiency flies in the face of emergency preparedness--if the "big one" earthquake hit and the dams failed would you be riding your bike to the Butte or would you be trying to drive a car or a busload of citizens to higher ground?
Especially if traffic is to be shifted to Jefferson, it would be nice to have a traffic signal where Jefferson runs into 28th. It can be very hard to turn left (east) from Jefferson. Ideally, it would be a light that is only triggered when a car is there.
I had an accident turning left out of WoodField station, so a stop light would be VERY welcome! I avoid that intersection as result of the accident. I like the idea of wide sidewalks allowing bikers to be removed from traffic lanes. I know that would slow commuter bikers and increase risks to peds, but would certainly encourage casual bikers to use Willamette, and set the basis for an enriched environment for cafe's, etc.
I live on 28th and High St. Many people do and will continue cut through my neighborhood at high speed. I would like this issue to be addressed if lanes are cut from Willamette.

I live on Portland. Currently no stopsigns on Portland between 24th and 27th. Local traffic likely to shift to Portland. Please plan for more Stopsigns on Portland. Your Alt #5 illustrations show the utility poles on the curb edge, when they would remain in place with a curb extended out past them. Please revise drawings. Also put bicyclists in perspective of #5, as they will use the wider sidewalk too presumedly. Please include striped crosswalk at 24th place across Willammette. Slower traffic/congestion could very well mean more opportunities for businesses to catch driver's eyes = more customers! The congestion = loss of business argument just does not hold water...
Most traffic is automobile. Any plan which gives priority to foot, bike traffic is inconsistent with most travelers' priorities.
Motor vehicles comprise the vast majority of users of this corridor. It makes no sense to hinder thousands of drivers to accommodate dozens of alternative users.
On what do you base that Alternatives 3 & 5 would add 30 seconds to the travel time? If a new traffic light is placed at Woodfield Station, many cars coming from the South would wish to turn left there, blocking the "through lane" in Alternative 1. If no light is placed there, it is only a matter of time before a pedestrian will be killed there trying to cross the street.
Please change the three way stop at Olive and 23rd to a 4 way stop. This will slow down traffic in the neighborhood where there are no sidewalks and hopefully keep traffic from moving into the narrow street. Traffic is already going way to fast on Olive.
Question #3 is not well-written. I checked additional delay of "average of 60 seconds" per car trip, but this is not really my limit. AS LONG AS THE TRAFFIC FLOWED SMOOTHLY, I would be fine with a much longer delay (3 minutes? 5 minutes?)
Regressive development is not the answer. Traffic has to move for commercial and residential by automobile not bikes or busses. Maybe a new north double lane street, just below Willamette St would accommodate all aspects of transportation. Thus, Willamette traffic could flow one way south and the new Street would accommodate proper traffic flow north. Bicycles need to go down the Amazon pathway not on highly needed automobile travel routes.
Repaving Willamette with 4 lanes of automobile traffic is not an acceptable alternative.
The traffic on Willamette St in this corridor is already congested and difficult to travel. There are also a lot of really wonderful, oft-frequented businesses there! I cannot IMAGINE having *fewer* lanes for cars. And I think diverting traffic away from those important storefronts would be terrible. I do like to ride my bike, and I never use Willamette St. I am perfectly content to use the lovely bike paths that go through Amazon Park.
This area is a major bottle neck for all N-S traffic . Diverting traffic is not fessible or acceptable. You need to accept that diverting traffic is not acceptable. The best plan for bikes is to let them use the existing lanes and provide alternate routes.
Turning option at Woodfield Station would better consist of signage encouraging right turn only during peak traffic times, and signs directing pedestrians to walk 1/2 block to crosswalks.
Why isn't changing to two-way, the one way block south of 18th part of this master traffic plan? What happened to bus pull-outs. Anything less than 4 lanes makes them manditory. Keep the nikes off the roadway. Put them on a safer, wider sidewalk. Streets between Willamette and Jefferson are too residential to handle through traffic.

Willamette needs a center turn lane to function. Bike lanes make economic and environmental sense in S. Eugene. Willamette isn't as much a commuter street as a destination / shopping area and would be even more of a destination if it were more pedestrian and alt transport friendly - keeping more of our economy local, decreasing distances people travel to shop. Better sidewalks would mean people could park, stroll & shop rather than driving in and out of each business, which creates the awful bottle necks.
Willamette Street needs to remain 4 lanes. Bike lane is already provided on Amazon Parkway. Where are you planning for buses and bus stops and pickups? In the bike lane?? Then bikers will pull into the car lane to go around the buses and this is a recipe for disaster! The multitude will be in cars. Bikers are a few among many. I have used Willamette Street for 40 years. It needs to remain 4 lanes.
Wouldn't that additional signal (Question #2) be way too close to the existing signal? "Through-bikers" can continue to divert over to Amazon Parkway and to the off-street bike path in Amazon Park. The wider sidewalks and outside traffic lanes in Alternative #5 preserve more future options for transit-related improvements (BRT, trolley, etc.)
I lived on Lincoln st during the days of "dragging the gut". It was a nightmare to maneuver Willamette st. during the evenings. I do not want to go back! Put the utilities underground, carve out some more space for bicyclists on the wider sidewalks if they are so determined to use Willamette st. instead of parallel street bike lanes, and leave Willamette with 4 lanes and restrict turns to facilitate flow.

SECTION H

ALTERNATIVES DEVELOPMENT AND TIER 1 SCREENING

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MEMORANDUM #5

DATE: January 17, 2013

TO: **Project Management Team**

FROM: Scott Mansur, P.E., PTOE
Mat Dolata, P.E., PTP
Peter Coffey, P.E.

SUBJECT: **South Willamette Street Improvement Plan**
Alternatives Development and Tier 1 Screening P10086-012

This memorandum summarizes the development of draft alternatives for the South Willamette Street Improvement Plan and includes a preliminary evaluation (Tier 1 Screening) of six proposed alternatives. The analysis is focused on conceptual cross-sections that illustrate alternative uses of the available right-of-way. The memorandum also presents a variety of design treatments for consideration, as the alternatives are further refined.

Overview

The South Willamette Street Improvement Plan will explore options for people to easily and safely walk, bike, take the bus, or drive in an eight-block study area from 24th Avenue to 32nd Avenue. The goal of the study is to help South Willamette Street become a vibrant urban corridor accessible by bicycle, foot, car, and bus. Six conceptual alternatives have been developed to illustrate potential configurations for the available right-of-way. Also identified are alternative design elements that may be incorporated into alternatives as they are further refined in subsequent tasks.

Alternatives will be evaluated using a two-tier process. Tier 1 screening is a qualitative assessment based on criteria and scoring methodology identified in Technical Memorandum #1 (South Willamette Street Improvement Plan – Evaluation Criteria). This screening evaluates community priorities and identifies broad level tradeoffs that exist within a constrained right-of-way. The Tier 1 screening process will be used to identify up to three alternatives to be considered and further evaluated in the Tier 2 screening. Tier 2 screening assessments will include more detailed description and rigorous analysis of the facility design. Traffic analysis and multimodal measures will be included in the Tier 2 screening. Traffic operations will be evaluated for the 2018 horizon year.

Corridor Segments

The study area can be separated into three segments of Willamette Street (Figure 1). The north corridor segment, from 24th Avenue to near 29th Avenue, has a 60 foot right-of-way consisting of four travel lanes and no dedicated bike lanes. The "transition zone" is a short segment near 29th Avenue where the right-of-way widens to 75 feet. This segment currently has five travel lanes to accommodate left-turn lanes at the 29th Avenue intersection, and no dedicated bike lanes. The south corridor segment begins south of 29th Avenue. The right-of-way returns to approximately 60 feet, with three travel lanes and bike lanes available in both directions. Figures 2a, 2b, and 2c illustrate the existing cross-sections for the three Willamette Street segments.

Figure 1 – Study Corridor Segments

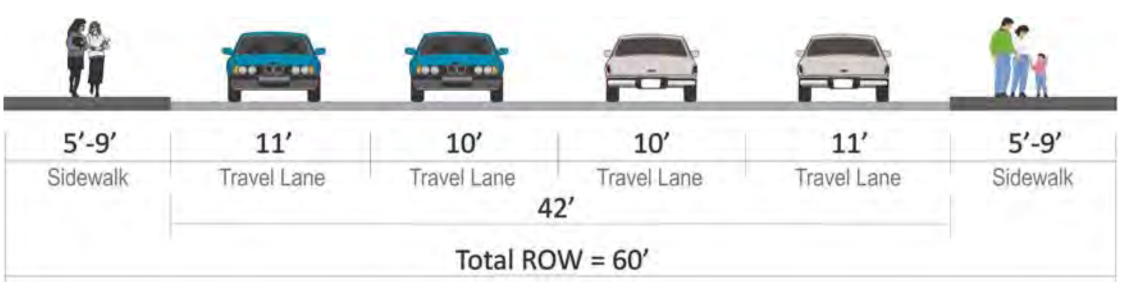

Figure 2a: 4-Lane Cross-section (north corridor segment)

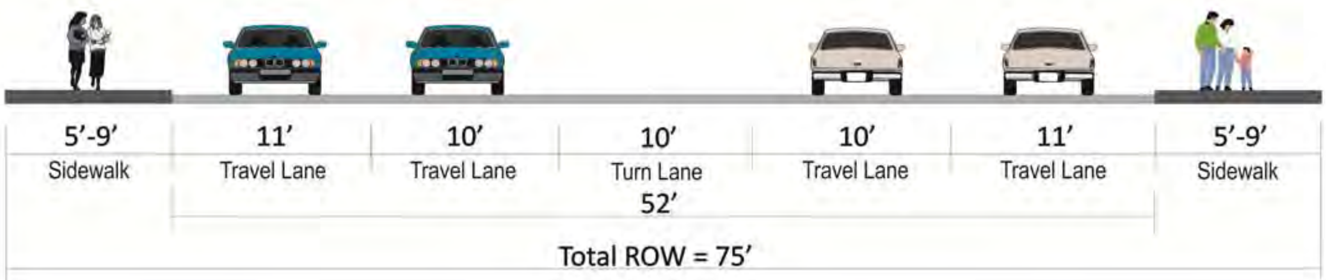

Figure 2b: 5-Lane Cross-section (transition zone)

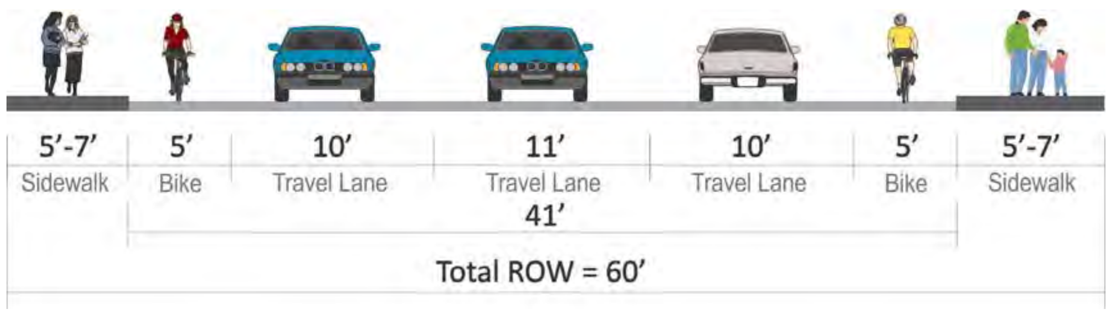

Figure 2c: 3-Lane Cross-section (south corridor segment)

Alternative Cross-Sections

The six proposed alternatives are illustrated via conceptual cross-sections and overhead plan views (Figures 3 through 9). Although the three study corridor segments differ in existing design and surrounding land use characteristics, the alternative cross-section concepts attempt to create a foundation for a continuous and cohesive corridor while balancing needs and broad objectives.

The north segment of the corridor has the widest variety of possible configurations and the most influence on the overall corridor design due to length, proximity to commercial areas, and the availability of parallel travel routes. While all six alternatives may be considered for the north corridor segment, Alternatives 1, 2, and 5 would not apply to the south corridor segment because they do not included any dedicated bicycle facilities and no parallel facilities are available near Willamette Street, south of 30th Avenue.

The transition segment near 29th Avenue will be designed to be as consistent as possible with the north and south sections, while taking into consideration multi-modal needs across the corridor. Differences may exist in roadway configurations in the north segment and south segment for alternatives. The north corridor segment generally has a 42 foot curb-to-curb width, while the south corridor segment is 41 feet wide, resulting in some differences in how space may be allocated, particularly if curbs are not reconstructed as part of the alternative. Each corridor segment will be further detailed in the Tier 2 screening process for selected facility design alternatives.

The proposed alternatives are focused on developing a design for short term improvements; while also supporting a long-term corridor vision. To facilitate development of a design plan that can be adopted and implemented in the short-term, an effort was made to minimize the costs related to right-of-way acquisition and curb reconstruction. Because any alternative that maintains the existing right-of-way cannot provide optimal facilities for all modes and design for all elements, priorities and tradeoffs must be carefully considered in selecting how space is allocated. Each of the conceptual cross-sections maintains existing right-of-way and only two of the six cross-sections would require curbs to be relocated.

Other design treatments identified later in this memorandum may include curb relocation and right-of-way expansion. These general design treatments are not associated with specific alternative cross-sections, but may be incorporated into their final design, as alternatives are refined. Right-of-way expansions may require property acquisition. Property acquisition and construction costs should be considered as part of the tradeoffs and priorities associated with each of the alternatives considered. The following section identifies each of the six proposed cross-section alternatives along with alternative-specific considerations for key elements of the facility design.

Alternative 1: 4-Lane

Alternative 1 maintains the existing (curb-to-curb) roadway configuration for the north corridor segment (Figure 3). Sidewalks would be expanded to their maximum width (approximately nine feet) within the existing right-of-way. Alternative 1 is not being considered for the south corridor segment because it does not include any dedicated bicycle facilities and no parallel facilities are available near Willamette Street, south of 30th Avenue.

Alternative 1 Considerations	
Motor Vehicle Mobility	• Maintains existing four travel lanes • Left-turning vehicles block travel lanes
Walkability	• Consistent nine-foot sidewalks • Sidewalks narrower than ten-foot standard width[1] • Sidewalk width is not sufficient to support active commercial streetscape[2]
Bicycle Facilities	• No on-street bike lanes • Improved bike access would occur via parallel route improvements and crossing enhancements (see Figure 10) • Bike sharrows possible on curbside lanes
Transit Service	• Maintains eleven-foot outside travel lane for buses
Cost	• Relatively low cost to maintain current cross-section

[1] Minimum width defined for curbside sidewalks in pedestrian-oriented commercial areas.
Design Standards and Guidelines for Eugene Streets, Sidewalks, Bikeways and Accessways, City of Eugene, November 1999.
[2] A concept for the "Heart of the Walkable Business District" characterized by a "Safe, Attractive Pedestrian Experience for Business, Shopping and Entertainment" was identified in the *South Willamette Area Draft Concept Plan*, City of Eugene, October 2012.

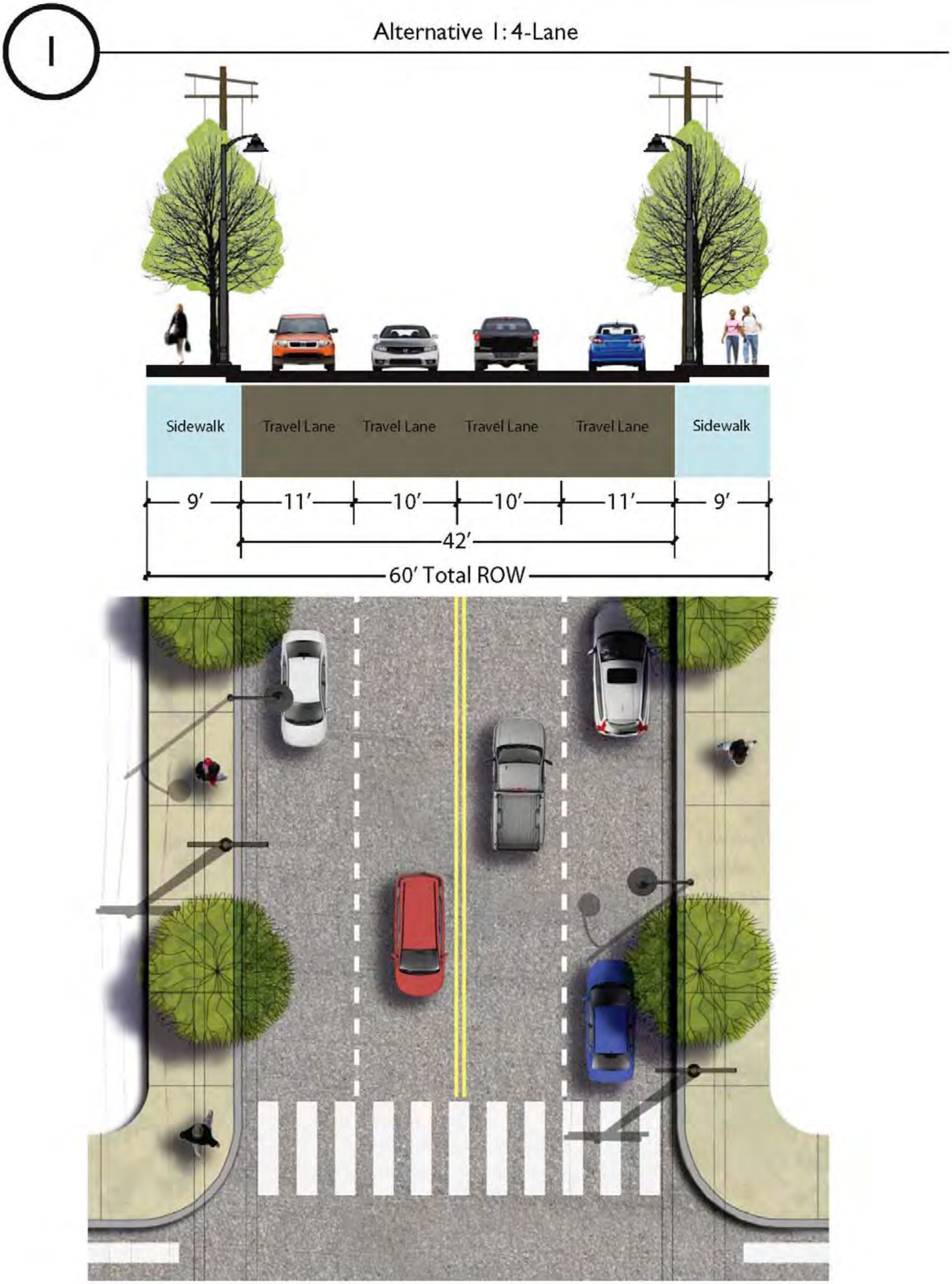

Figure 3 – Alternative 1 Concept

Alternative 2: 4-Lane with Center Left-turn Lane

Alternative 2 maintains four travel lanes in the north corridor segment, with one of the northbound lanes converted to a two-way center left-turn lane (Figure 4). The roadway would include two southbound through lanes, one northbound through lane, and a two-way center left-turn lane.

Sidewalks would be expanded to their maximum width (approximately nine feet) within the existing right-of-way. Alternative 2 is not being considered for the south corridor segment because it does not include any dedicated bicycle facilities and no parallel facilities are available near Willamette Street, south of 30th Avenue.

Alternative 2 Considerations	
Motor Vehicle Mobility	• Four total travel lanes maintained (2 Southbound, 1 Northbound, and 1 center turn lane) • Provides center left-turn lane • Southbound capacity increased • Northbound capacity reduced • Northbound buses stopped in a single through lane will have impact on northbound travel
Walkability	• Consistent nine-foot sidewalks • Sidewalks narrower than ten-foot standard width[3] • Sidewalk width is not sufficient to support active commercial streetscape[4]
Bicycle Facilities	• No on-street bike lanes • Improved bike access would occur via parallel route improvements and crossing enhancements (see Figure 10) • Bike sharrows possible on curbside lanes
Transit Service	• Maintains eleven-foot outside travel lane for buses
Business Accessibility	• Improves motor vehicle access during PM period, when commercial traffic is highest • Center turn lane improves access for turning vehicles • Does not significantly change accessibility for transit and bicycle modes
Cost	• Relatively low cost to convert lane direction north of 29th Avenue • Intersections and traffic signals would need to be reconfigured north of 29th Avenue

[3] Minimum width defined for curbside sidewalks in pedestrian-oriented commercial areas.
Design Standards and Guidelines for Eugene Streets, Sidewalks, Bikeways and Accessways, City of Eugene, November 1999.
[4] A concept for the "Heart of the Walkable Business District" characterized by a "Safe, Attractive Pedestrian Experience for Business, Shopping and Entertainment" was identified in the *South Willamette Area Draft Concept Plan*, City of Eugene, October 2012.

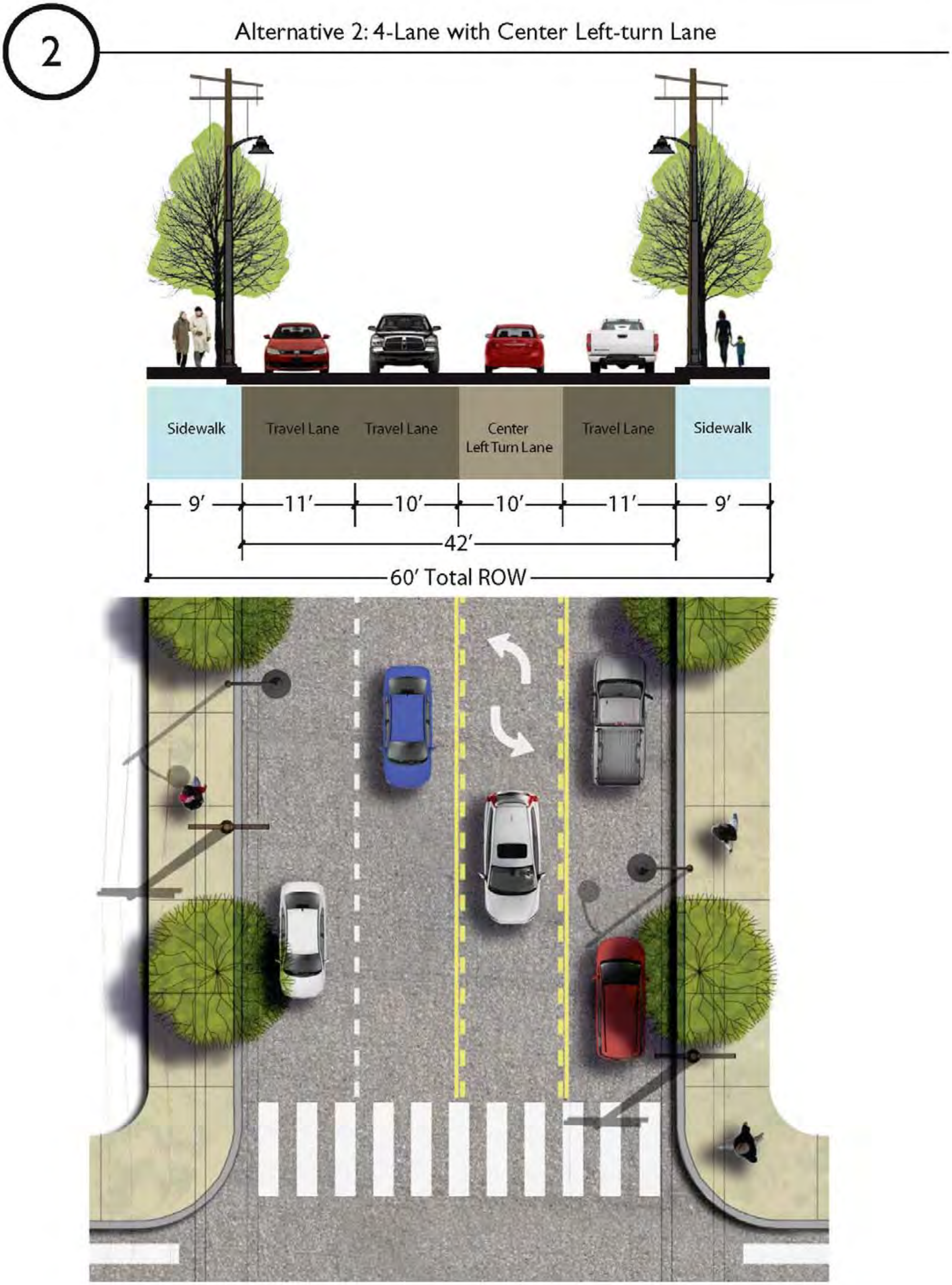

Figure 4 – Alternative 2 Concept

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Alternative 3: 3-Lane with Bike Lanes

Alternative 3 would provide one northbound through lane, one southbound through lane, a two-way center left-turn lane, and a bike lane in each direction (Figure 5). This configuration would convert the north corridor segment from four motor vehicle lanes to three, while adding two bike lanes. Three travel lanes would be maintained in the south segment of the corridor with one of the southbound lanes converted to a two-way center left-turn lane.

Sidewalks would be expanded to the maximum available width within the remaining right-of-way. Sidewalk and lane widths may vary across the corridor depending on the existing curb-to-curb width.

Alternative 3 Considerations	
Motor Vehicle Mobility	• Reduces number of travel lanes from four to three, north of 29th Avenue • Capacity reduced and travel time increased for through-traveling vehicles • Ten-foot travel lanes are narrow for trucks and less than the eleven-foot standard width[5]
Walkability	• Consistent nine-foot sidewalks • Sidewalks narrower than ten-foot standard width[6] • Bike lanes provide separation from motor vehicle lanes • Sidewalk width is not sufficient to support active commercial streetscape[7]
Bicycle Facilities	• Includes six-foot bike lanes
Transit Service	• Ten-foot travel lanes are narrow for buses • Potential conflicts with bike lanes
Business Accessibility	• Center turn lane improves access for turning vehicles • Improved bicycle access
Cost	• Moderate cost to provide center left-turn lane and bike lanes • Intersections and traffic signals would need to be reconfigured

[5] Minimum travel lane width on Minor Arterials is 11 feet
Design Standards and Guidelines for Eugene Streets, Sidewalks, Bikeways and Accessways, City of Eugene, November 1999
[6] Minimum width defined for curbside sidewalks in pedestrian-oriented commercial areas.
Design Standards and Guidelines for Eugene Streets, Sidewalks, Bikeways and Accessways, City of Eugene, November 1999.
[7] A concept for the “Heart of the Walkable Business District” characterized by a “Safe, Attractive Pedestrian Experience for Business, Shopping and Entertainment” was identified in the *South Willamette Area Draft Concept Plan*, City of Eugene, October 2012.

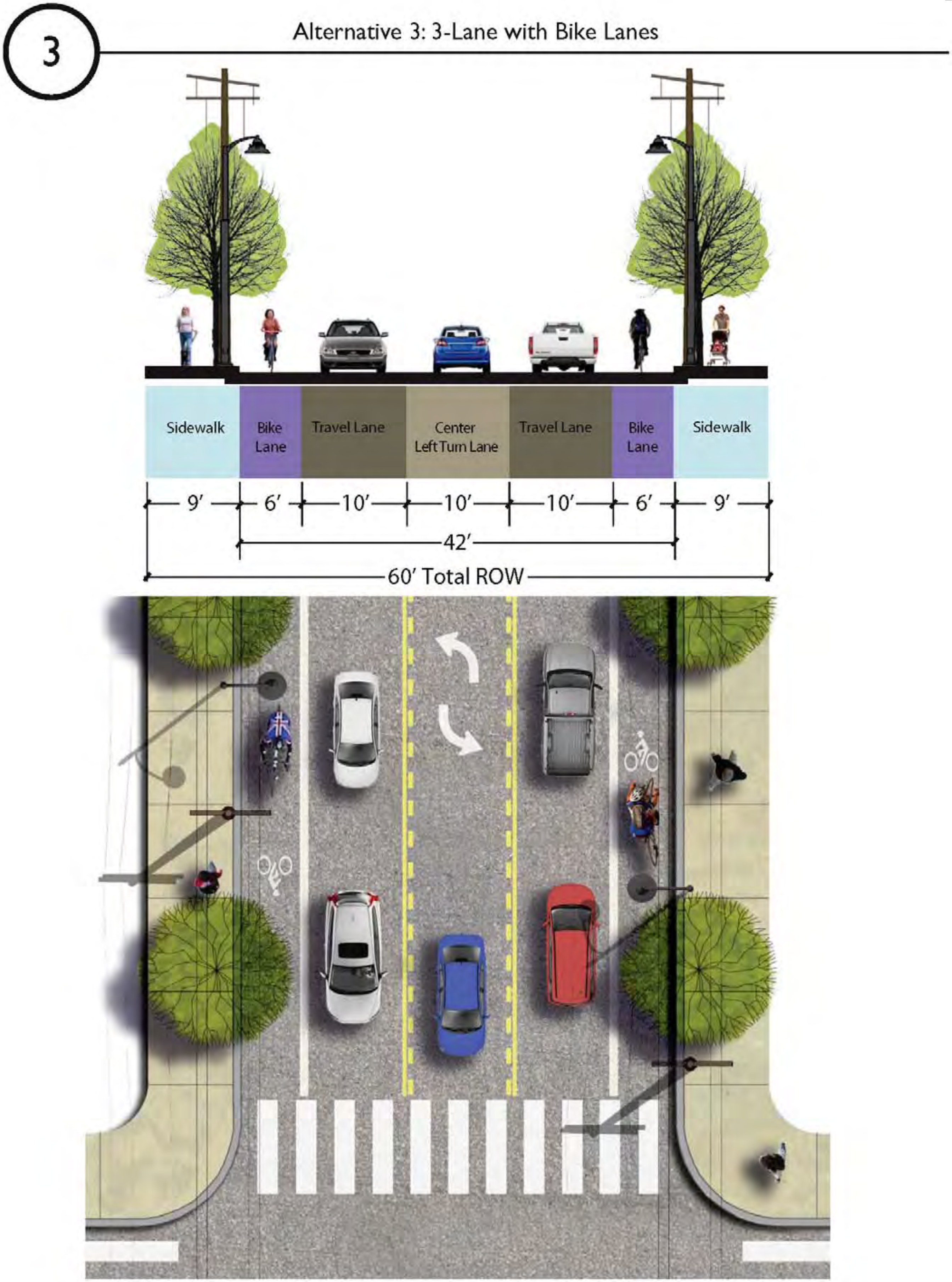

Figure 5 – Alternative 3 Concept

Alternative 4: 3-Lane with Buffered Bike Lanes

Alternative 4 would include one northbound through lane, one southbound through lane, a two-way center left-turn lane, and a buffered bike lane in each direction (Figure 6). The roadway would need to be reconstructed to expand curb-to-curb width to 47 feet. The alternative may apply to the north and/or south corridor segment.

Sidewalks would be expanded to the maximum available width within the remaining right-of-way. However, with the 47 foot curb-to-curb width, sidewalk width would be limited to approximately six and one-half feet on both sides of the street, unless additional right-of-way is acquired.

Alternative 4 Considerations	
Motor Vehicle Mobility	• Reduces number of travel lanes from four to three, north of 29th Avenue • Capacity reduced and travel time increased for through-traveling vehicles • Maintains eleven-foot outside travel lanes
Walkability	• Sidewalks only 6.5 foot in width • Curbside sidewalks far narrower than ten-foot standard width[8] • Buffered Bike lanes provide separation from motor vehicle lanes • Sidewalk width is not sufficient to support active commercial streetscape[9]
Bicycle Facilities	• Includes five-foot bike lanes with two-foot buffers • Bike lanes painted green to distinguish from motor vehicle lanes
Transit Service	• Maintains eleven-foot travel lanes for buses • Potential conflicts with bike lanes
Business Accessibility	• Center turn lane improves access for turning vehicles • Improved bicycle access
Cost	• Higher cost for reconstruction to expand existing curb-to-curb width • With reconstruction, utilities should be relocated for ADA compliance • Intersections and traffic signals would need to be reconfigured
Other	• Center left-turn lane offers opportunities for design elements including raised median treatments (e.g., landscaping, pedestrian refuge, access management) • Sidewalk and right-of-way width may be widened with redevelopment (i.e., as a condition of development approval) • Narrow width limits sidewalk design treatments (e.g., landscaping, lighting)

[8] Minimum width defined for curbside sidewalks in pedestrian-oriented commercial areas.
Design Standards and Guidelines for Eugene Streets, Sidewalks, Bikeways and Accessways, City of Eugene, November 1999.
[9] A concept for the "Heart of the Walkable Business District" characterized by a "Safe, Attractive Pedestrian Experience for Business, Shopping and Entertainment" was identified in the *South Willamette Area Draft Concept Plan*, City of Eugene, October 2012.

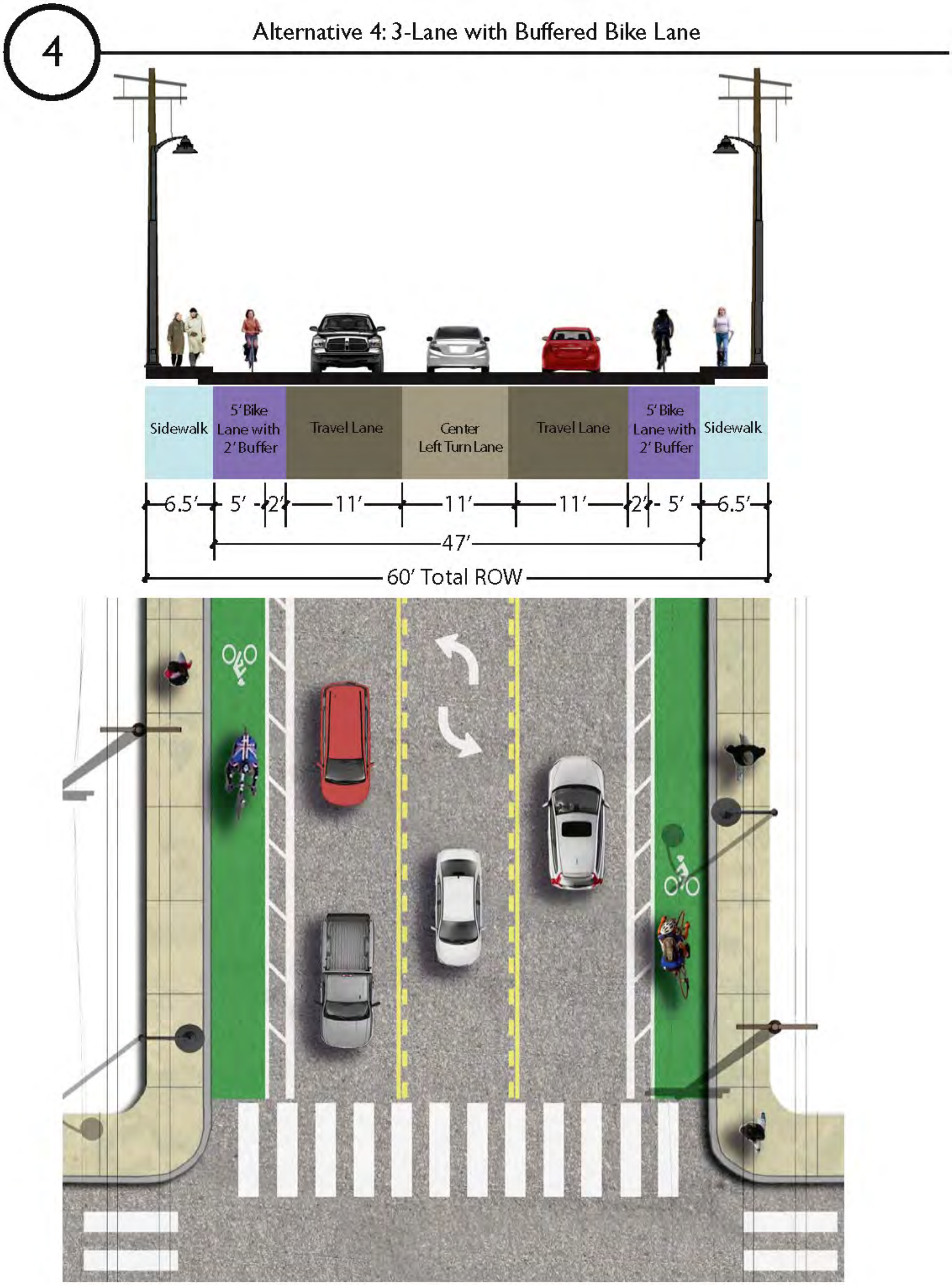

Figure 6 – Alternative 4 Concept

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Alternative 5: 3-Lane with Wide Sidewalks

Alternative 5 would convert the roadway from four motor vehicle lanes to three, north of 29th Avenue (Figure 7). The roadway would be reconstructed to expand sidewalks, resulting in a narrower curb-to-curb width (34 feet instead of the current 41 to 42 foot width.) No new bike lanes would be included on Willamette Street.

Sidewalks would be expanded to the maximum available width within the remaining right-of-way. With the 34-foot curb-to-curb width, sidewalks could be extended up to 13-feet. Alternative 5 is not being considered for the south corridor segment because it does not include any dedicated bicycle facilities and no parallel facilities are available near Willamette Street, south of 30th Avenue.

Alternative 5 Considerations	
Motor Vehicle Mobility	• Reduces number of travel lanes from four to three, north of 29th Avenue • Capacity reduced and travel time increased for through-traveling vehicles • Maintains eleven-foot outside travel lanes
Walkability	• Provides wide (13-foot) sidewalks to facilitate a transformative pedestrian environment including design treatments (e.g., storefront displays, café seating, landscaping)
Bicycle Facilities	• No on-street bike lanes • Improved bike access would occur via parallel route improvements and crossing enhancements (see Figure 10) • Bike sharrows possible on curbside lanes • Potential to provide raised bike facility if additional right-of-way acquired for sidewalk widening and reconstruction
Transit Service	• Maintains eleven-foot travel lanes for buses
Business Accessibility	• Center turn lane improves access for turning vehicles • Wide sidewalks provide opportunities for design treatments to support commercial development, aesthetic treatments, and walkability
Cost	• Higher cost to reconstruct curbs to expand/reconstruct sidewalks • Intersections and traffic signals would need to be reconfigured
Other	• Center left-turn lane offers opportunities for design elements including raised median treatments (e.g., landscaping, pedestrian refuge, access management) • Wide sidewalks support “Green Street” design treatments

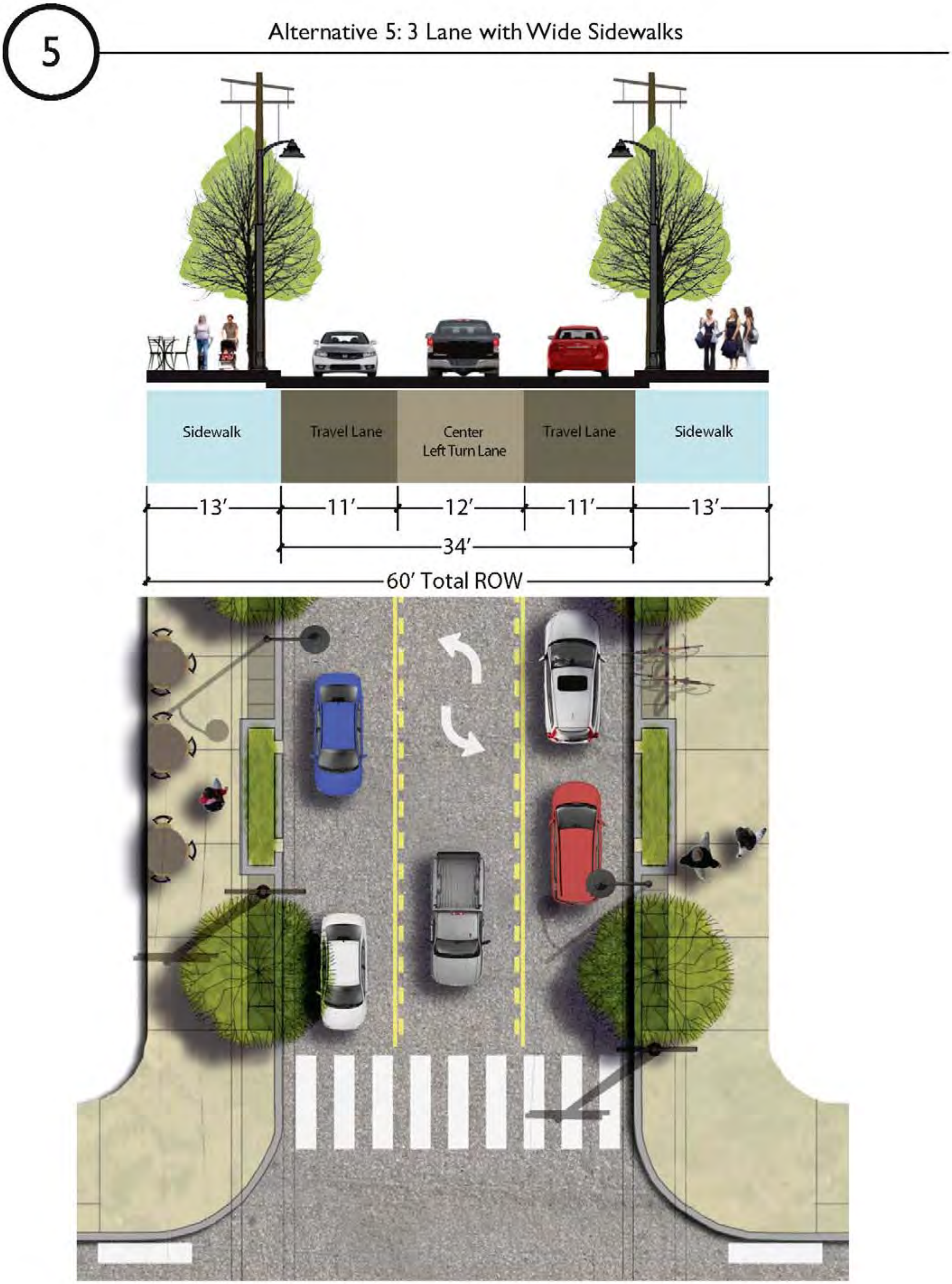

Figure 7 – Alternative 5 Concept

Alternative 6: 2-Lane with Bike Lanes, Median & Roundabouts

Alternative 6 would convert the corridor to two motor vehicle lanes with bike lanes in each direction (Figure 8). A raised median would be constructed in the middle of the roadway, with roundabouts at intersections. The curb-to-curb roadway width would not need to be modified outside of intersections. Sidewalks would be expanded to the maximum available width within the remaining right-of-way. Sidewalk and lane widths may vary across the corridor depending on the existing curb-to-curb width.

Alternative 6 Considerations	
Motor Vehicle Mobility	• Reduces number of travel lanes from four (or three) to two • Capacity reduced and travel time increased for through-traveling vehicles • Median would restrict turns at many driveways to right-in-right-out • Intersections with roundabouts would provide opportunities for U-turns • Maintains eleven-foot outside travel lanes • Medians and roundabouts would greatly improve corridor safety
Walkability	• Consistent nine-foot sidewalks • Sidewalks narrower than ten-foot standard width[10] • Bike lanes provide separation from motor vehicle lanes • Wide median provides opportunities for pedestrian crossing refuges • Sidewalk width is not sufficient to support active commercial streetscape[11]
Bicycle Facilities	• Includes six-foot bike lanes
Transit Service	• Maintains eleven-foot travel lanes for buses • Potential conflicts with bike lanes
Business Accessibility	• Right-in-right-out limits motor vehicle access to driveways • Improved bicycle access
Cost	• Very high cost to construct medians and roundabouts • Property acquisition needed to construct appropriately-sized roundabouts
Other	• Raised median offers opportunities for streetscape design elements (e.g., landscaping, pedestrian refuge, access management) • Impact on properties near intersections due to constructing roundabouts • More consistent cross-section throughout the corridor

Potential right-of-way expansions may be necessary to construct roundabouts at intersections on Willamette Street. The potential impacts would be most significant at 29th Avenue, which has traffic volumes that would likely necessitate a multi-lane roundabout. At other key intersections (e.g., 24th Avenue, 25th Avenue), single lane roundabouts may provide effective traffic control, however the right-of-way impacts of the roundabouts has yet to be determined. Due to concerns regarding right-of-way impacts, the 29th Avenue intersection could be traffic signal controlled, while roundabouts could be provided at other key intersections. The appendix includes a report [12] excerpt that provides illustrations and a general discussion of roundabout types.

[10] Minimum width defined for curbside sidewalks in pedestrian-oriented commercial areas.
Design Standards and Guidelines for Eugene Streets, Sidewalks, Bikeways and Accessways, City of Eugene, November 1999.
[11] A concept for the "Heart of the Walkable Business District" characterized by a "Safe, Attractive Pedestrian Experience for Business, Shopping and Entertainment" was identified in the *South Willamette Area Draft Concept Plan*, City of Eugene, October 2012.
[12] NCHRP Report 672 - Roundabouts: An Informational Guide, 2nd Edition, National Cooperative Highway Research Program, 2010.

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Alternative 6: 2-Lane with Bike Lanes, Median & Roundabouts

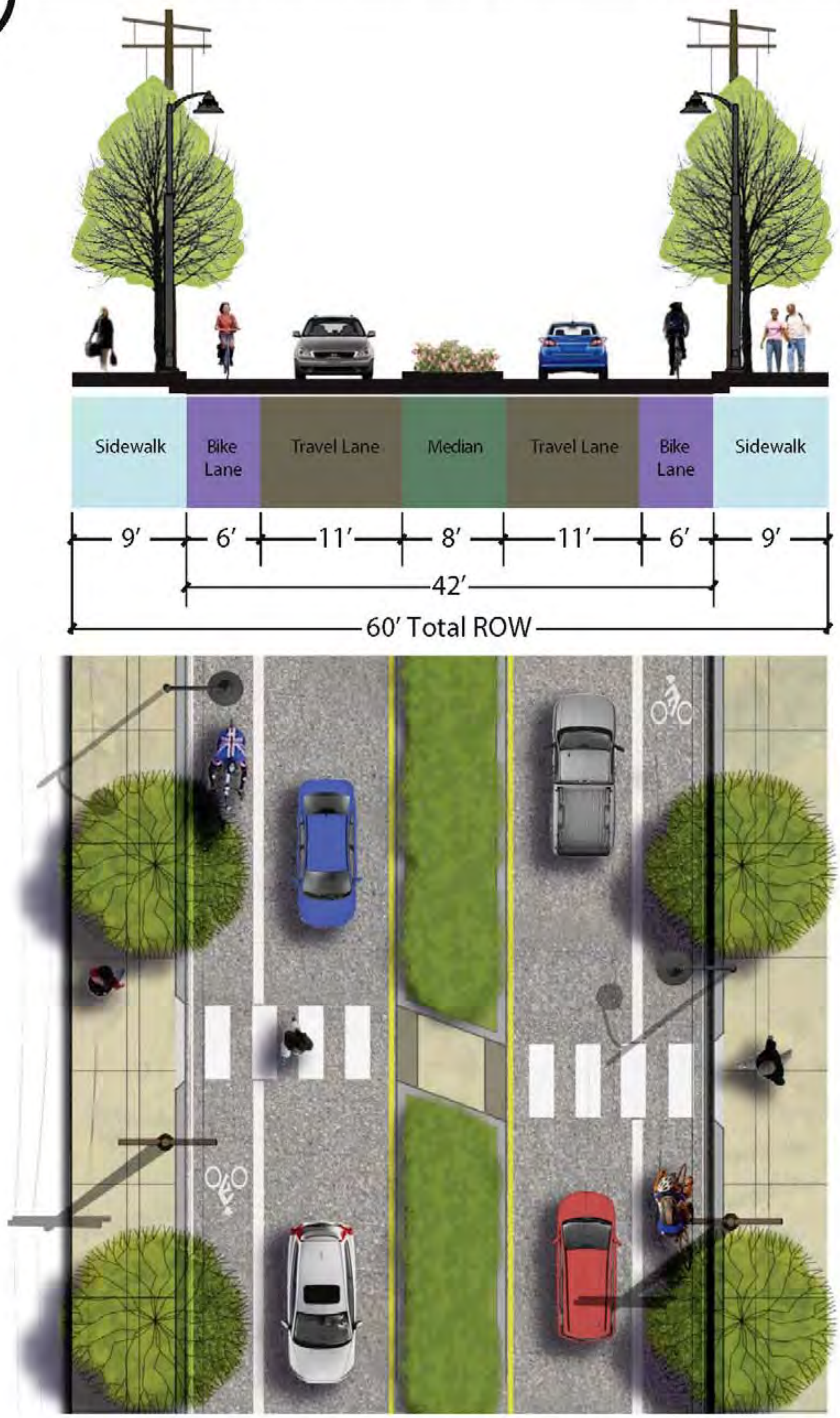

Figure 8 – Alternative 6 Concept

Alternative Facility Design Treatments

This section describes design concepts that can be incorporated into many or all of the six conceptual cross-section alternatives previously described. The design concepts are intended to better balance comfort, safety, and appeal for all users. The design elements aim to improve service for cars, trucks, buses, bikes and/or pedestrians.

Bike Facilities

Figure 9 illustrates potential bicycle facility improvements nearby, connecting to, and crossing Willamette Street. These improvements may be combined with bike lanes on Willamette Street or considered independently. The improvements could include improved bicycle access on local streets, with a variety of bike boulevard treatments applied. Crossing improvements could be provided such as intersection priority areas (i.e., "Green Boxes") or rider-activated push-button signals for crossing at intersections with traffic signals.

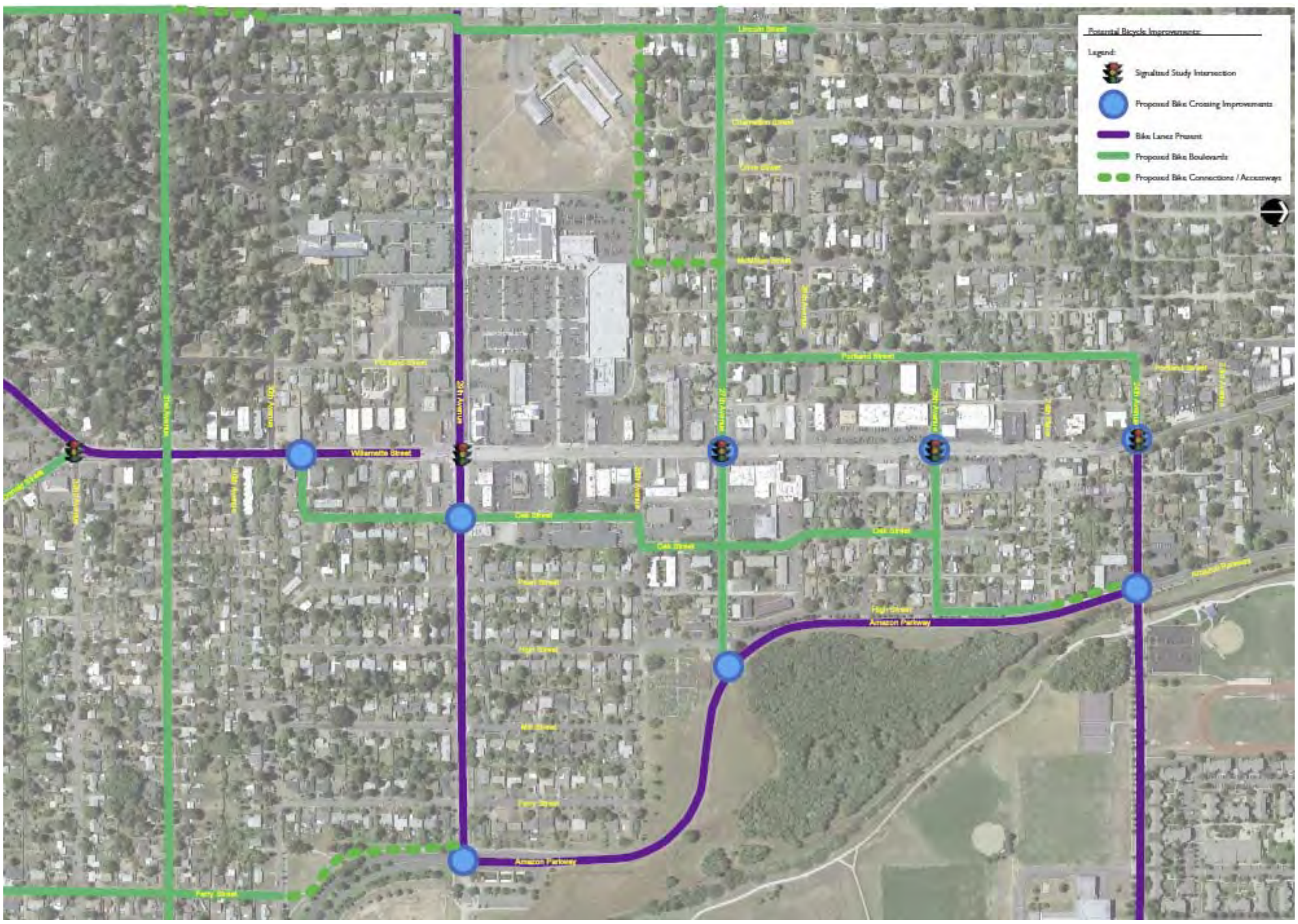

Figure 9 – Bicycle Facility Improvements

Sidewalk Widening

Existing sidewalks on Willamette Street are generally narrow with numerous obstructions and no separation from travel lanes. Each of the alternatives presented assumes sidewalks will be widened to construct the maximum allowable width within the existing right-of-way. Wider sidewalks that extend beyond the existing right-of-way may be constructed incrementally as properties redevelop.

Widening sidewalks will provide a more comfortable pedestrian environment that is accessible to more users and offers substantially greater support for the success of future businesses as the area redevelops. Wider sidewalks may also provide opportunities for landscaping, vegetation, storm water/drainage elements (e.g., bioswales), café seating, overhead signing, decorative lighting, bike parking, etc.

Figure 10 – Bioswales
Source: OTAK

Figure 11 – Vegetation/Landscaping
Source: OTAK

Figure 12– Decorative Lighting

Figure 13 – Café Seating
Source: OTAK

Utility Relocation

Utilities (poles, hydrants, pedestals, etc.) currently located along the sidewalks result in an inconsistent and obstructed pedestrian environment. Relocating the utilities underground would improve the sidewalk environment by removing some barriers to pedestrian access and making the corridor more aesthetically pleasing. Similar opportunities, as were identified for widened sidewalks, would become available with utility relocation, since the available sidewalk space would be increased.

Figure 14 – Utilities In Sidewalk Example

Pedestrian Crossings

A variety of design treatments can be implemented to enhance the pedestrian environment for crossings along Willamette Street.

- **Signing and striping**: pedestrian accessibility may be emphasized through signing or striping near intersections
- **Modified pavement surface**: physical differences such as raised pavement or textured crosswalks provide a visual signal to drivers to watch for pedestrians.
- **Median pedestrian crossing refuges** (i.e., island): pedestrians may cross a roadway in stages when a median pedestrian refuge is available. This is especially beneficial for users who require more time for crossings.

Figure 15 – Median Pedestrian Crossing Refuge

- **Leading pedestrian interval**: pedestrians at signalized intersections could be provided with a three- to four-second head start for entering into the crossing, before parallel traffic is given a green light. Leading pedestrian intervals allow for pedestrians to be more visible to turning vehicles.

- **Mid-block crossings**: Opportunities for pedestrian crossings outside of existing intersections may be provided at mid-block crossing locations. Mid-block crossings improve pedestrian access by decreasing the distance between destinations that require crossing the roadway. A variety of design treatments exist for mid-block crossings including rectangular rapid flashing beacons and overhead flashing beacons.

Figure 16 – Overhead Flashing Beacon

Figure 17 – Rectangular Rapid Flashing Beacon

Driveway Consolidation

There are currently over 70 driveways on Willamette Street from 24th Avenue to 32nd Avenue. This creates numerous conflict points for motor vehicles, pedestrians and bicyclists. Managing access points along the corridor requires finding an appropriate balance between safety, mobility, and access. Consolidating driveway access points will be considered as part of each alternative if there are safety benefits that result. Reducing conflict points is likely to result in fewer accidents along the corridor. Those alternatives where a raised median may be included will need to carefully consider interaction between driveway access and the roadway design.

On-Street Parking

On-street parallel parking provides convenient access for adjacent businesses and a buffer between pedestrians and motor vehicles. On-street parking would likely have a very favorable benefit to the pedestrian environment. On-street parking may have a small impact to roadway capacity as parking maneuvers occur.

To provide on-street parking along Willamette Street, either travel lanes will need to be eliminated, or the right-of-way will need to be expanded to relocate sidewalks further from the roadway travel lanes. On-street parallel parking spots are typically eight feet wide. Figure 18 illustrates one concept regarding how on-street parking may be incorporated into the corridor. The concept effectively swaps off-street private parking for on-street public parking. This strategy may be applied along the length of the corridor or along individual blocks.

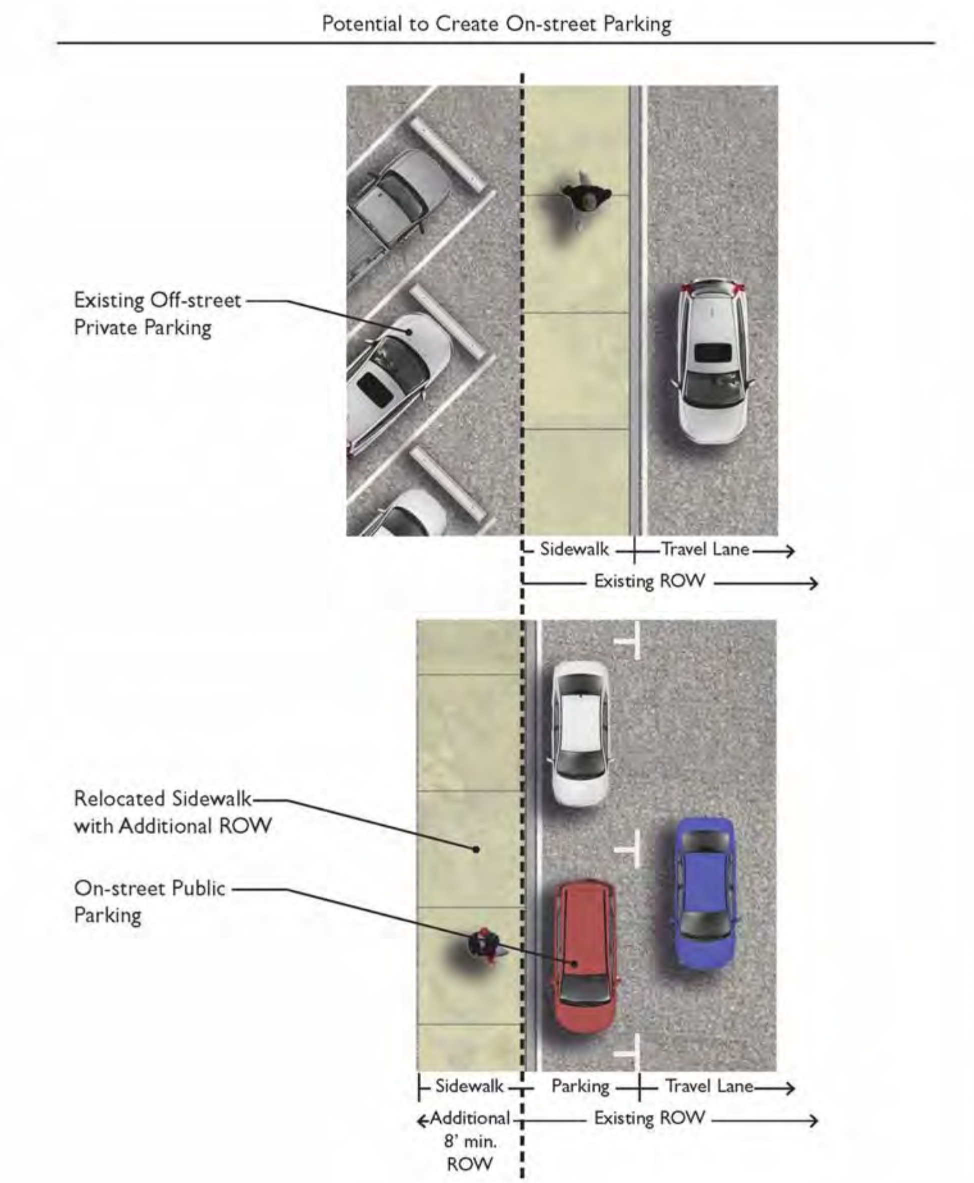

Figure 18 – Conceptual Illustration of On-Street Parking on Willamette Street

Bus Stops

Two bus routes currently provide service along Willamette Street. Improving bicycle and pedestrian access to transit stops would support transit usage along the corridor. If sidewalks are expanded there may be space available for improved bus stop amenities such as covered benches (shelters), real-time arrival information, or other transit stop amenities.

Buses currently stop on the street and block the curbside travel lane during passenger boardings. Constructing bus pullouts would remove stopped vehicles from travel lanes, but would likely require right-of-way acquisition and would also require buses in the pullouts to pull back into the traffic stream.

Figure 19 – Bus Shelter

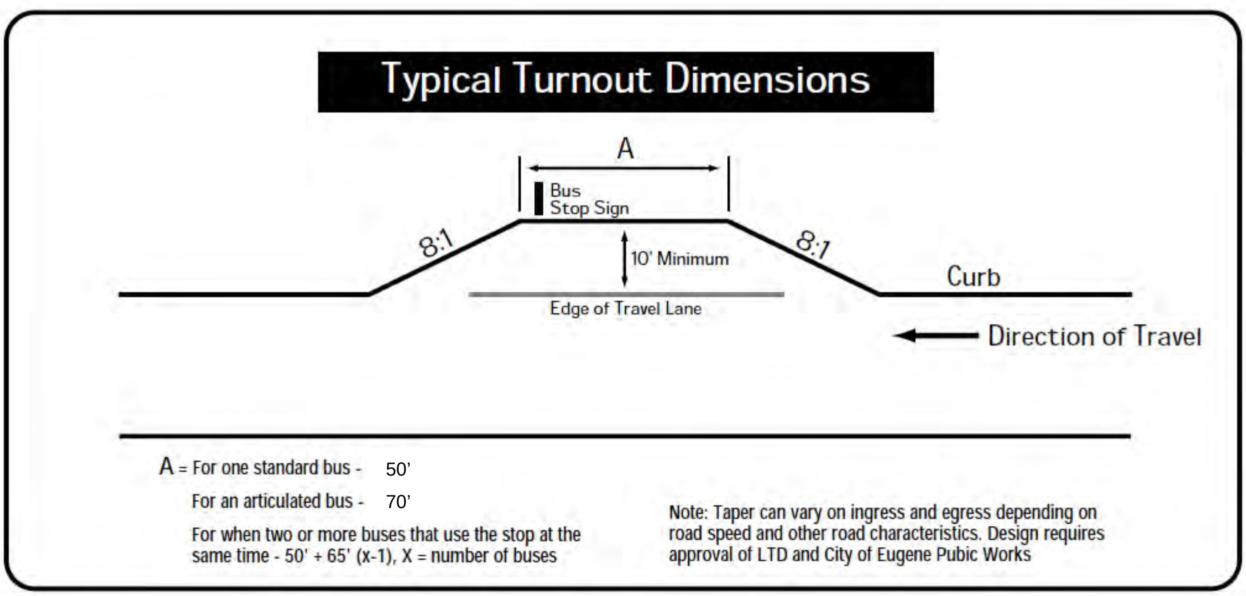

Figure 20 – Bus Pullout Illustration

Source: LTD Standards and Design

Evaluation of Alternatives

The following section provides Tier 1 screening evaluation of the six proposed alternative cross-section concepts. The alternatives were scored using the evaluation criteria and methodology previously detailed in Technical Memorandum #1 (South Willamette Street Improvement Plan – Evaluation Criteria). Evaluation criteria were established to assess the potential of alternatives to best meet the transportation needs of the users of Willamette Street. The criteria are based on the goals and objectives in the Draft Eugene Transportation System Plan.

Individual criteria were scored as 1, 0, or -1 representing improvement, no change, or degradation, respectively. The scoring weighs all criteria equally, with the total evaluation score representing the sum of the individual criteria scores. Figure 21 documents the results of the scoring evaluation. Alternatives 3 and 7 provide the two highest scores while Alternatives 1 and 2 have the lowest scores. The same result occurs whether equal weighting is given to the eight goal categories or the 23 individual criteria. Criteria and scoring for each alternative are further detailed in the appendix.

Next Steps

The preliminary evaluation of alternatives (Tier 1 screening) and all information included in this memorandum will be distributed to project stakeholders and presented to the community. The Tier 1 screening process will be used to identify up to three alternatives to be considered and further evaluated in the Tier 2 screening. Tier 2 screening assessments will include more detailed description and rigorous analysis of the facility design.

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Alternative	Access & Mobility				Safety & Health			Social Equity		Economic Benefit				Cost Effectiveness		Climate & Energy				Ecological Function		Community Context		TOTAL
	Reliability	Neighborhood Connectivity	Motor Vehicle Travel Time	Alternative Mode Travel Time	Safety	Security	Emergency Access	Equity	Economic Access	Freight Mobility	Walkable/Bikeable Business District	Business Vitality	Fundability	Asset Management	Project Benefits	Reduce Vehicle Miles Traveled	Pedestrian Facilities	Bicycle Facilities	Transit Facilities	Storm water Design	Landscape Design	Community Vision and Land Use	Transportation Planning Compatibility	
Alternative 1 - 4-Lane	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	**3**
Alternative 2 - 4-Lane with Center Left-turn Lane	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	**3**
Alternative 3 - 3-Lane with Bike Lanes	0	1	-1	1	1	1	-1	1	1	-1	1	0	0	1	1	0	0	1	0	0	0	0	0	**7**
Alternative 4 - 3-Lane with Buffered Bike Lanes	0	1	-1	1	1	1	-1	1	1	-1	1	0	-1	1	1	0	-1	1	0	0	0	-1	0	**4**
Alternative 5 - 3-Lane with Wide Sidewalks	0	0	-1	0	0	1	-1	1	1	-1	1	0	-1	1	1	0	1	0	1	0	0	1	0	**5**
Alternative 6 - 2-Lane with Bike Lanes, Median & Roundabouts	0	1	-1	1	1	1	-1	1	1	-1	1	-1	-1	1	1	0	0	1	0	0	0	0	0	**5**

FIGURE 21 – Evaluation Criteria Scoring

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Item A.

South Willamette Street Improvement Plan – Tier 1 Screening Evaluation Notes

P10086-012

This document describes the evaluation criteria and scoring approach used to analyze the alternatives developed for the South Willamette Street Improvement Plan. A point-based rating methodology is used to evaluate how well proposed design alternatives meet measure of effectiveness criteria. In this way, a consistent method is used to evaluate and rank the alternatives based on how well they meet identified goals and objectives. The ranking informs the Technical Advisory Committee, stakeholders and appointed and elected officials; however, the final recommended alternative will be based on feedback and direction from these parties.

The goals and objectives in the Draft TSP provided a basis for the development of the evaluation criteria, which are intended to assess an alternative's potential to meet the needs of the people using Willamette Street. The evaluation criteria were refined based on a review of planning documents more specific to the study area, such as the South Willamette Concept Plan. The criteria are summarized in Table 1 according to the broad goal category they support.

Criteria scoring could differ for the south and north corridor segments due to differences in existing configurations (e.g., 4 lanes in north compared to 3 in south). For clarity in comparing scoring across all alternatives, the scoring was focused on changes relative to the existing configuration on the north segment of the corridor. The north corridor applies to all scenarios, makes up the longest segment in the corridor, and may be considered the most critical segment due to the surrounding commercial land uses.

The overall evaluation approach assumes an equal weight for each criterion. The evaluation scores for all criteria are summed to determine the overall evaluation score. This method allows a goal category with more supporting criteria to have a larger influence on the overall score.

The scoring methodology may be modified (or combined) to be applied in different ways. Two alternative methodologies:

1. **Equal weight for each goal category**– Each of the eight categories receives an equal weight. In this method, evaluation scores for each criterion under a particular goal category would be averaged to determine one score for each goal category. They would then be summed to arrive at an overall evaluation score.
2. **Stakeholder feedback to determine weight**– Feedback from stakeholders would be solicited to help determine the weight of each goal category. Criteria scores for a particular category would be averaged and the weight would then be applied.

Table 1 summarizes the criteria, describes the evaluation score and notes how the scoring was applied to the seven alternatives considered in the Tier 1 screening.

Table 1: Evaluation Criteria and Scoring

Criteria	Evaluation Score	Scoring Notes
Access and Mobility		
Reliability Improves trip reliability, consistency, comfort and convenience for all modes (walk, bike, transit, cars).	+1. Improves trip reliability 0. No change -1. Reduces trip reliability	Each alternative represents tradeoffs within limited space. No alternative improves or degrades all modes.
Neighborhood Connectivity Increases the number of households that can safely walk, bike, or use transit services to meet basic (non-work) daily needs.	+1. Increases # of connected households 0. No change -1. Decreases # of connected households	Alternatives that provide bike lanes were considered to represent improvement. Sidewalk width was not considered to significantly affect number of connected households.
Motor Vehicle Travel Time Reduces travel time between key origins and destinations for motor vehicles.	+1. Decreases travel time for motor vehicles 0. No change -1. Increases travel time for motor vehicles	Alternatives with less than 4 motor vehicle lanes where scored '-1' due to reduced capacity.
Alternative Mode Travel Time Reduces travel time between key origins and destinations for alternative modes.	+1. Decreases travel time for alternative modes 0. No change -1. Increases travel time for alternative modes	Alternatives that provide bike lanes were considered to represent improvement. Sidewalk width was not considered to significantly affect travel time.
Safety and Health		
Safety Improve safety and security for all users, especially for the most vulnerable; strive for zero fatalities.	+1. Improves safety for all modes 0. No change -1. Reduces safety for all modes	Alternatives with 3 vehicle lanes are expected to lower vehicle speeds. Bike lanes provide a dedicated facility and a buffer for pedestrians. Safety impacts of wider sidewalks without bike lanes (Alternative 5) are unclear.
Security Improve actual and perceived sense of security (i.e. Safe driving, getting to and riding transit, walking and biking).	+1. Improves sense of security 0. No change -1. Decreases sense of security	Wider sidewalks and bike lanes provide a buffer between motor vehicle lanes, improving sense of security for users.

Table Continued on next page.

(Continued) Table 1: Evaluation Criteria and Scoring

Criteria	Evaluation Score	Scoring Notes
Emergency Access Improves or maintains emergency response times within and through the corridor.	+1. Improves emergency response times 0. No change -1. Reduces emergency response times	Alternatives with less than 4 motor vehicle lanes where scored '-1' due to narrower space for vehicle lanes and greater likelihood of vehicle blockage/congestion.
Social Equity		
Equity Contributes to closing the transportation access gap between the general user and populations with limited choices, such as the elderly, low income, minority populations, and people with disabilities.	+1. Specifically benefits populations with limited choices 0. No Change -1. Negatively impacts populations with limited choices	Alternatives that provide dedicated bike lanes or sidewalks beyond 10' are considered to benefit users with limited choices.
Economic Access Improves access from residences to employment and neighborhood centers within a 20-minute walk, bike, or transit trip.	+1. Improves employment access 0. No change -1. Decreases employment access	Alternatives that provide dedicated bike lanes or sidewalks beyond 10' are considered to improve access within 20-minute walk, bike, or transit trip.
Economic Benefit		
Freight Mobility Provides safe, efficient, and continuous motor vehicle operation to allow timely freight movement along Willamette Street.	+1. Improves corridor's freight movement 0. No Change -1. Negative impact on freight movement	Alternatives with less than 4 motor vehicle lanes where scored '-1' due to reduced capacity.
Walkable/Bikeable Business District Promotes a "Safe, Attractive Pedestrian Experience for Business, Shopping and Entertainment."	+1. Improves business district pedestrian and bicycle experience 0. No change -1. Reduces business district pedestrian and bicycle experience	Alternatives that provide dedicated bike lanes or wider sidewalks are considered to improve experience for pedestrians and people on bikes.
Business Vitality Supports access and visibility of businesses that rely on drive-by traffic by balancing congestion with economic vitality	+1. Supports economic vitality 0. No change -1. Negative impact on economic vitality	Adding a center turn lane is a benefit to business traffic. Reducing lanes is considered negative. Doing both is neutral.

Table Continued on next page.

(Continued) Table 1: Evaluation Criteria and Scoring

Criteria	Evaluation Score	Scoring Notes
Fundability Available funding sources exist to implement projects in a timely fashion.	+1. Funding sources are available 0. Feasible costs, but no identified funding -1. High costs and no funding expected	Available funding for maintaining existing alignment (Alt 1. Maintaining curb-to-curb width is considered feasible. Moving curbs is considered high cost.
Cost Effectiveness		
Asset Management Favors the enhancement and maintenance of existing systems over system expansion.	+1. Enhances existing transportation system 0. Minimal enhancement or expansion -1. Expands transportation system	All alternatives are considered enhancements of the existing transportation system.
Project Benefits Optimizes benefits relative to public, private and social costs over the life-cycle of the project	+1. Provides maximum benefits 0. Minimal benefits -1. Provides no benefits	Each alternative provides benefits, but reflects tradeoffs necessary within limited space.
Climate and Energy		
Reduce Vehicle Miles Traveled (VMT) Improves the corridor as an attractive area without having to drive. Increases mode share for walk, bike, and transit thus reducing greenhouse gases and fossil fuel consumption.	+1. Reduces VMT 0. No change -1. Increases VMT	VMT impacts are unclear. Bike lanes may reduce VMT. Fewer lanes may result in out-of-direction travel. VMT Impact of median and roundabout is also unclear.
Pedestrian Facilities Adds sidewalks and crosswalks that fill in system gaps, improve system connectivity, removes obstructions and are accessible to all users.	+1. Improves pedestrian facilities 0. No change -1. Negative impact on pedestrian facilities	Pedestrian improvements are expected to be included in each scenario due to widening of sidewalks and other design treatments. Therefore, criterion is applied relative to change from “baseline” enhanced 9’ sidewalk.

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(Continued) Table 1: Evaluation Criteria and Scoring

Criteria	Evaluation Score	Scoring Notes
Bicycle Facilities Adds bikeways that fill in system gaps, improve system connectivity, and are accessible to all users.	+1. Improves bicycle facilities, including bike lanes 0. No change -1. Negative impact on bicycle facilities	Alternatives that provide dedicated bike lanes are considered '+1', otherwise '0'.
Transit Facilities Improves transit facilities and accessibility to transit stops (for all users) along and near the corridor.	+1. Improves transit facilities 0. No change -1. Negative impact on transit facilities	Wider sidewalk (Alt 5) is only alternative considered to have a significant benefit to transit stop accessibility
Ecological Function		
Stormwater Design Transportation improvements lower the rate of storm water runoff and improve water quality.	+1. Minimizes storm water runoff 0. No change -1. Increases storm water runoff	No storm water runoff impacts have been identified.
Ecological Function (continued)		
Landscape Design Reduces the urban heat island through landscape design, less pavement, and increased tree canopy.	+1. Reduces heat island 0. No change -1. Increases heat island	No landscape design impacts have been identified.
Community Context		
Community Vision and Land Use Supports implementation of Envision Eugene land use and growth management goals and A *Community Climate and Energy Action Plan for Eugene*.	+1. Supports Envision Eugene 0. No change -1. Conflicts with Envision Eugene	Criterion is applied based on sidewalk width (relative to "baseline" enhanced 9' sidewalk).
Transportation Planning Compatibility Compatible with City's transportation plans (TSP, Long Range Transit Plan, and Pedestrian and Bicycle Master Plan [PBMP])	+1. Compatible with City transportation plans 0. Has little or no impact (or has offset impacts) -1. Not compatible with City transportation plans	Each alternative represents tradeoffs within limited space. No alternative is considered to significantly differ in overall compatibility.

Item A.

NCHRP

REPORT 672

NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

Roundabouts: An Informational Guide

Second Edition

In Cooperation with

U.S. Department of Transportation

Federal Highway Administration

TRANSPORTATION RESEARCH BOARD

OF THE NATIONAL ACADEMIES

Exhibit 1-9
Roundabout Category Comparison

Design characteristics of the three roundabout categories.

Design Element	Mini-Roundabout	Single-Lane Roundabout	Multilane Roundabout
Desirable maximum entry design speed	15 to 20 mph (25 to 30 km/h)	20 to 25 mph (30 to 40 km/h)	25 to 30 mph (40 to 50 km/h)
Maximum number of entering lanes per approach	1	1	2+
Typical inscribed circle diameter	45 to 90 ft (13 to 27 m)	90 to 180 ft (27 to 55 m)	150 to 300 ft (46 to 91 m)
Central island treatment	Fully traversable	Raised (may have traversable apron)	Raised (may have traversable apron)
Typical daily service volumes on 4-leg roundabout below which may be expected to operate without requiring a detailed capacity analysis (veh/day)*	Up to approximately 15,000	Up to approximately 25,000	Up to approximately 45,000 for two-lane roundabout

*Operational analysis needed to verify upper limit for specific applications or for roundabouts with more than two lanes or four legs.

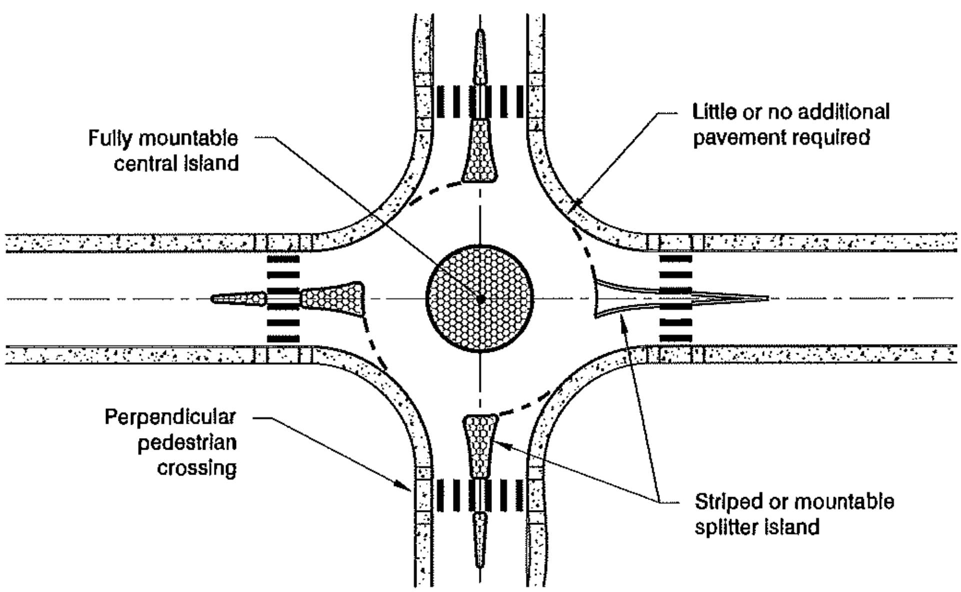
In most cases, roundabouts in all three categories are designed with pedestrian and bicycle facilities; however, in some instances a jurisdiction may choose to not provide these features if these types of users are not anticipated or can be better served in another location.

1.3.1 MINI-ROUNDABOUTS

Mini-roundabouts can be useful in low-speed urban environments with right-of-way constraints.

Mini-roundabouts are small roundabouts with a fully traversable central island. They are most commonly used in low-speed urban environments with average operating speeds of 30 mph (50 km/h) or less. Exhibit 1-10 shows the features of typical mini-roundabouts, and Exhibit 1-11 provides an example. They can be useful in such environments where conventional roundabout design

Exhibit 1-10
Features of Typical Mini-Roundabout



Dimondale, Michigan

Exhibit 1-11
Example of Mini-Roundabout

is precluded by right-of-way constraints. In retrofit applications, mini-roundabouts are relatively inexpensive because they typically require minimal additional pavement at the intersecting roads and minor widening at the corner curbs. They are mostly recommended when there is insufficient right-of-way to accommodate the design vehicle with a traditional single-lane roundabout. Because they are small, mini-roundabouts are perceived as pedestrian-friendly with short crossing distances and very low vehicle speeds on approaches and exits.

A fully traversable central island is provided to accommodate large vehicles and serves one of the distinguishing features of a mini-roundabout. The mini-roundabout is designed to accommodate passenger cars without requiring them to traverse over the central island. The overall design of a mini-roundabout should align vehicles at entry to guide drivers to the intended path and minimize running over of the central island to the extent possible.

1.3.2 SINGLE-LANE ROUNDABOUTS

This type of roundabout is characterized as having a single-lane entry at all legs and one circulatory lane. Exhibit 1-12 shows the features of typical single-lane roundabouts, and Exhibit 1-13 provides examples. They are distinguished from mini-roundabouts by their larger inscribed circle diameters and non-traversable central islands. Their design allows slightly higher speeds at the entry, on the circulatory roadway, and at the exit. The geometric design typically includes raised splitter islands, a non-traversable central island, crosswalks, and a truck apron. The size of the roundabout is largely influenced by the choice of design vehicle and available right-of-way.

1.3.3 MULTILANE ROUNDABOUTS

Multilane roundabouts have at least one entry with two or more lanes. In some cases, the roundabout may have a different number of lanes on one or

Item A.

Exhibit 1-12
Features of Typical Single-Lane Roundabout

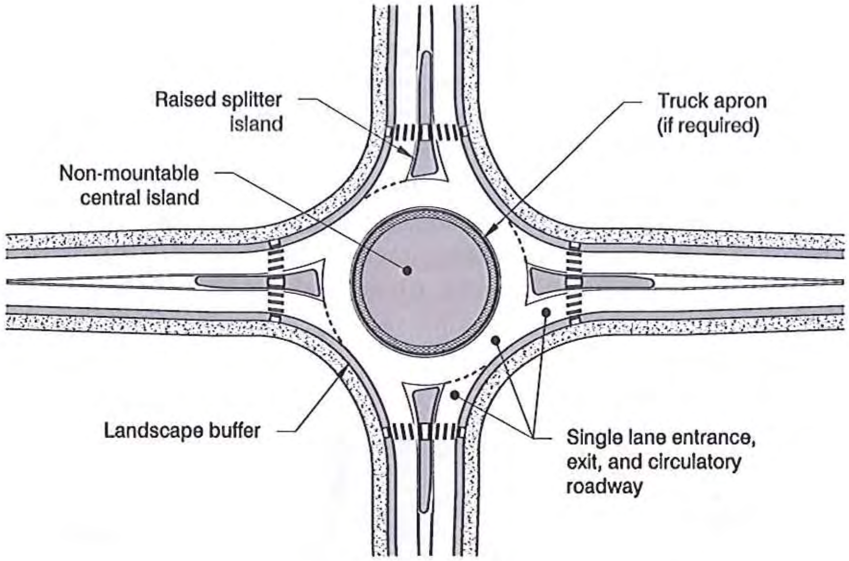


Exhibit 1-13
Examples of Single-Lane Roundabouts

(a) Dublin, Ohio

(b) Skagit County, Washington

more approaches (e.g., two-lane entries on the major street and one-lane entries on the minor street). They also include roundabouts with entries on one or more approaches that flare from one to two or more lanes. These require wider circulatory roadways to accommodate more than one vehicle traveling side by side. Exhibit 1-14 through Exhibit 1-16 provide examples of typical multilane roundabouts. The speeds at the entry, on the circulatory roadway, and at the exit are similar or may be slightly higher than those for the single-lane roundabouts. The geometric design will include raised splitter islands, truck apron, a non-traversable central island, and appropriate entry path deflection.

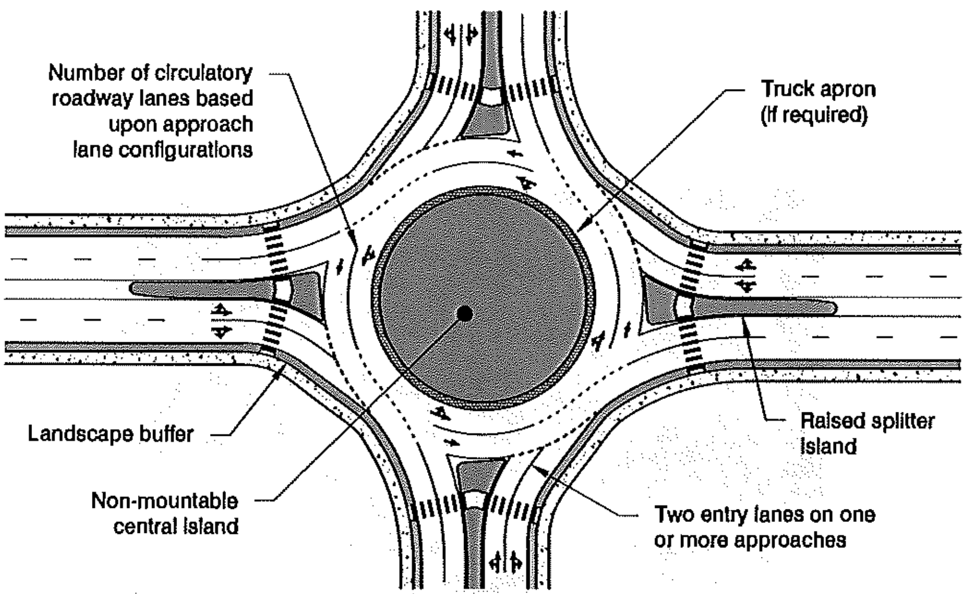


Exhibit 1-14
Features of Typical Two-Lane Roundabout

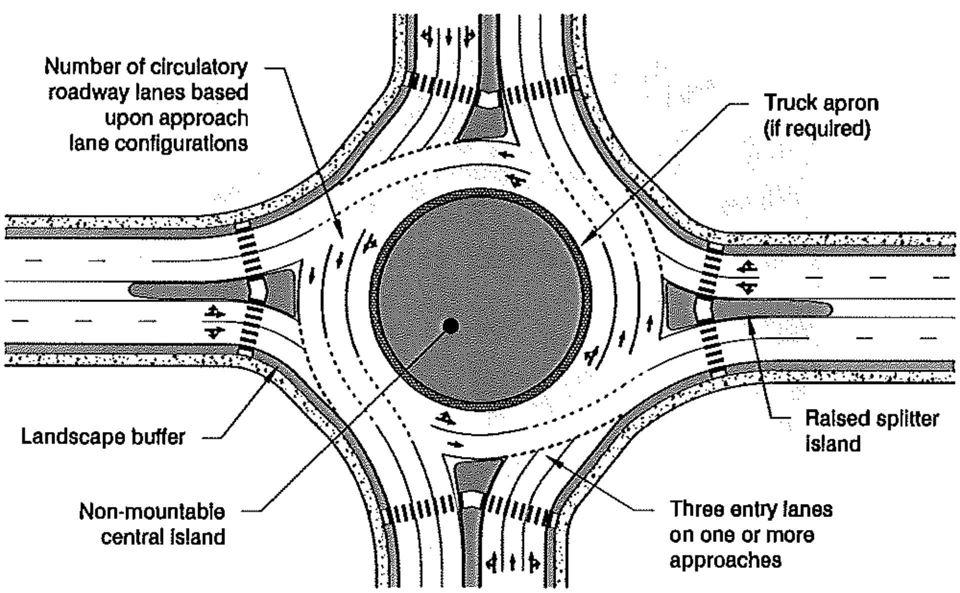


Exhibit 1-15
Features of Typical Three-Lane Roundabout

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SECTION I

FACILTY DESIGN ALTERNATIVES

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MEMORANDUM #7

DATE: June 12, 2013

TO: **Project Management Team**

FROM: Scott Mansur, Mat Dolata and Peter Coffey - DKS Associates
Tom Litster and Kaitlin North - OTAK

SUBJECT: **South Willamette Street Improvement Plan**
Facility Design Alternatives

P10086-012

This memorandum summarizes facility design options for three alternatives advanced for the South Willamette Street Improvement Plan. The alternative configurations are illustrated through cross-section diagrams and overhead plan views that show configurations for travel lanes, bike lanes, sidewalks, and other roadway elements. The memorandum also presents the (Tier 2) screening evaluation results of three alternatives, as well as cost estimates and discussion of streetscape elements, bicycle and pedestrian connections to the corridor, and other design considerations.

Overview

The South Willamette Street Improvement Plan will explore options for people to easily and safely walk, bike, take transit, or drive in an eight-block study area from 24th Avenue to 32nd Avenue. The goal of the study is to help South Willamette Street become a vibrant urban corridor accessible by bicycle, foot, car, and bus. Seven conceptual alternatives have been refined to three based on direction from the City of Eugene staff after receiving community input and reviewing the results of the Tier 1 Screening.

The Tier 1 screening evaluated community priorities and identified broad level tradeoffs that exist within a constrained right-of-way. The screening provided a qualitative assessment for each alternative based on criteria and scoring methodology identified in Technical Memorandum #1 (South Willamette Street Improvement Plan – Evaluation Criteria).

A broad level of public involvement was vital to the screening process. Public input was received through letters, phone calls, emails, and in-person at stakeholder outreach meetings, focus groups, meetings with Planning Commission and City Council, and two community forums. Community Forum #2 (February 27th, 2013) was attended by more than 300 people, who provided input on the seven initial alternative concepts and facility design elements.

The three alternative configurations advanced to the next screening phase are a 4-lane (Alternative 1), 3-lane with bike lanes (Alternative 3) and 3-lane with wide sidewalks (Alternative 5.) This memorandum, together with Technical Memorandum #8 (Traffic Analysis for Roadway Alternatives), provides the more detailed description and rigorous analysis of the facility design needed to perform the next level (Tier 2) screening.

With the information presented in these memorandums and the Tier 2 screening results, this process will progress toward a selected design for the corridor.

Alternative Cross-Sections

The three alternatives are illustrated via cross-sections and overhead views (Figures 1 through 3). Plan views for the entire corridor (from 24th Avenue to 32nd Avenue) are included in the appendix. Most significant differences among the alternatives occur in the corridor segment between 29th Avenue and 24th Avenue.

Summary of Potential Changes by Segment

Some planned improvements are desired throughout the corridor and will be assumed for each alternative. These improvements include new pavement, improved drainage, wider sidewalks, and enhancements to pedestrian and bicycle access around Willamette Streets. Other improvements may vary depending on the location and alternative configuration. The following section describes an overview of potential differences by roadway segment.

24th Avenue to 28th Avenue Roadway Configuration: The cross-sections and overhead views in Figures 1 to 3 represent the roadway configuration between 24th Avenue and near 28th Avenue. Alternative 1 maintains the existing 4-lane roadway. Alternative 3 illustrates a 3-lane roadway (two travel lanes and a continuous center turn lane) and continuous bike lanes. Alternative 5 is also a 3-lane alternative, but with widened sidewalks rather than continuous bike lanes.

24th Avenue to 28th Avenue Sidewalk Configuration: All three alternatives attempt to maximize the sidewalk width within the existing right-of-way. For Alternative 1 and Alternative 3, the sidewalks would be reconstructed to approximately 9-feet wide. For Alternative 5, the sidewalk widths would expand to approximately 13-feet wide by replacing the bike lanes illustrated for Alternative 3 with additional sidewalk space.

28th Avenue to 30th Avenue Roadway Configuration: This section is a "transition area" from the proposed cross-sections identified for each conceptual alternative, through the 29th Avenue intersection to near 30th Avenue. Alternative 1 would maintain the existing roadway configuration, which widens from one northbound motor vehicle lane to two (and a left-turn pocket at 29th Avenue) and widens between the Woodfield Station Driveway and 29th Avenue to add a southbound left-turn pocket to the two existing southbound motor vehicle through lanes. The northbound bike lane would end at 29th Place and the southbound bike lane would begin south of 29th Avenue, as currently configured.

In Alternative 3, the existing bike lanes would be extended northward through the 29th Avenue intersection in order to provide continuous bike lanes between 32nd Avenue and 24th Avenue. Adding bike lanes would require either expanding the curb-to-curb width of the roadway or removing a motor vehicle lane. Widening the curb-to-curb width would likely require narrower sidewalks or additional right-of-way near the 29th Avenue intersection. A proposed design modification presented for Alternative 3 (and Alternative 5) would add a second southbound travel lane just north of the Woodfield Station Driveway, but not include a second northbound through travel lane (included in Alternative 1).

The configuration of travel lanes for Alternative 5 would be similar to Alternative 1 for bike lanes and Alternative 5 for motor vehicle lanes. Bike lanes would begin (southbound) and end (northbound) south of the 29th Avenue intersection. A single northbound motor vehicle through lane would be included, instead of the two existing lanes. The additional space made available by potentially not including a second northbound travel lane in this section would accommodate wider sidewalk space rather than the bike lanes provided in Alternative 3.

28th Avenue to 30th Avenue Sidewalk Configuration: Sidewalk widths in this "transition area" could vary depending on the specific design of motor vehicle lanes, turn pocket lengths, bike lanes, etc. In general, Alternative 5 provides the narrowest curb-to-curb width and therefore the most space for sidewalks and pedestrian amenities within the existing right-of-way.

29th Place to 32nd Avenue Roadway Configuration: No changes to the existing travel and bike lane configurations are proposed in any alternative between 32nd Avenue and near 29th Place (where the existing northbound bike lane ends).

29th Place to 32nd Avenue Sidewalk Configuration: All three alternatives would expand sidewalk widths to approximately 8.5 feet, or the maximum available within the existing right-of-way.

The following sections provide illustrations and a descriptive overview of each alternative configuration.

Alternative 1: 4-Lane (No-Build)

Alternative 1 maintains the existing (curb-to-curb) roadway configuration. Sidewalks would be expanded to their maximum width (approximately nine feet) within the existing right-of-way. The cross-section illustration shown for Alternative 1 is not being considered for the south corridor segment because it does not include any dedicated bicycle facilities and no parallel facilities are available near Willamette Street, south of 30th Avenue. Plan views for the entire corridor (from 24th Avenue to 32nd Avenue) are included in the appendix.

Alternative 1 Considerations	
Motor Vehicle Mobility	• Maintains existing four travel lanes • Left-turning vehicles block travel lanes
Walkability	• Consistent nine-foot sidewalks • Sidewalks narrower than ten-foot standard width[1] • Sidewalk width is not sufficient to support active commercial streetscape[2]
Bicycle Facilities	• No on-street bike lanes • Improved bike access would occur via parallel route improvements and crossing enhancements (see Figure 5) • Bike sharrows possible on curbside lanes
Transit Service	• Maintains eleven-foot outside travel lane for buses
Cost	• Relatively low cost to maintain current cross-section

[1] Minimum width defined for curbside sidewalks in pedestrian-oriented commercial areas.
Design Standards and Guidelines for Eugene Streets, Sidewalks, Bikeways and Accessways, City of Eugene, November 1999.
[2] A concept for the "Heart of the Walkable Business District" characterized by a "Safe, Attractive Pedestrian Experience for Business, Shopping and Entertainment" was identified in the *South Willamette Area Draft Concept Plan*, City of Eugene, October 2012.

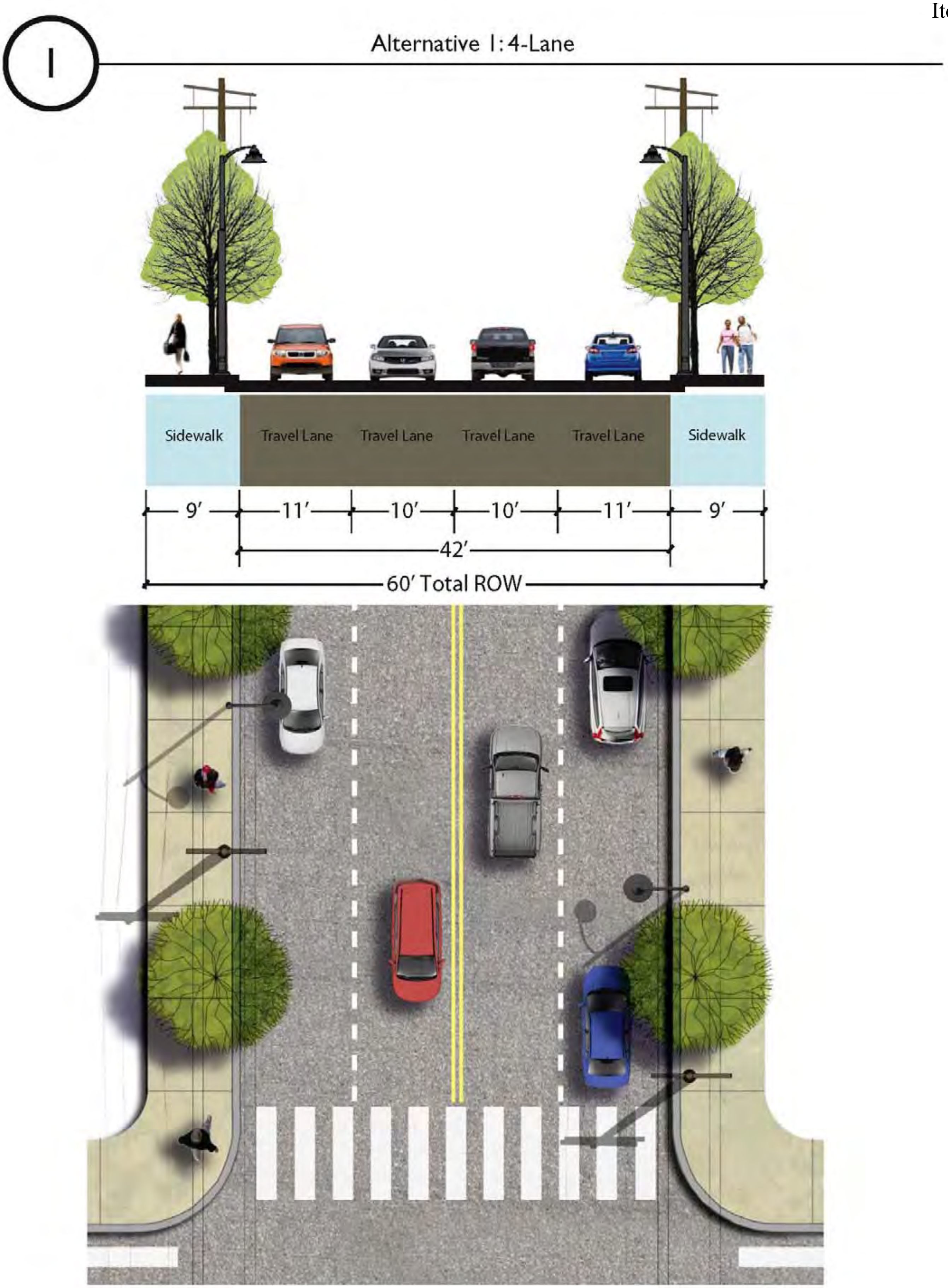


Figure 1 – Alternative 1 Concept

Alternative 3: 3-Lane with Bike Lanes

Alternative 3 would provide one northbound through lane, one southbound through lane, a two-way center left-turn lane, and a bike lane in each direction (Figure 2). This configuration would convert most of the segment north of 29th Avenue from four motor vehicle lanes to three, while adding two bike lanes. Plan views for the entire corridor (from 24th Avenue to 32nd Avenue) are included in the appendix.

Sidewalks would be expanded to the maximum available width within the remaining right-of-way. Sidewalk and lane widths may vary across the corridor depending on the existing curb-to-curb width.

Alternative 3 Considerations	
Motor Vehicle Mobility	• Reduces number of travel lanes from four to three, north of 28th Avenue • Capacity reduced and travel time increased for through-traveling vehicles • Ten-foot travel lanes are narrow for trucks and less than the eleven-foot standard width[3]
Walkability	• Consistent nine-foot sidewalks • Sidewalks narrower than ten-foot standard width[4] • Bike lanes provide separation from motor vehicle lanes • Sidewalk width is not sufficient to support active commercial streetscape[5]
Bicycle Facilities	• Includes six-foot bike lanes
Transit Service	• Ten-foot travel lanes are narrow for buses • Potential conflicts with bike lanes
Business Accessibility	• Center turn lane improves access for turning vehicles • Improved bicycle access
Cost	• Moderate cost to provide center left turn lane and bike lanes • Intersections and traffic signals would need to be reconfigured
Other	• Center turn lane offers opportunities for design elements including median treatments (e.g., landscaping, pedestrian refuge, access management)

[3] Minimum travel lane width on Minor Arterials is 11 feet
Design Standards and Guidelines for Eugene Streets, Sidewalks, Bikeways and Accessways, City of Eugene, November 1999
[4] Minimum width defined for curbside sidewalks in pedestrian-oriented commercial areas.
Design Standards and Guidelines for Eugene Streets, Sidewalks, Bikeways and Accessways, City of Eugene, November 1999.
[5] A concept for the “Heart of the Walkable Business District” characterized by a “Safe, Attractive Pedestrian Experience for Business, Shopping and Entertainment” was identified in the *South Willamette Area Draft Concept Plan*, City of Eugene, October 2012.

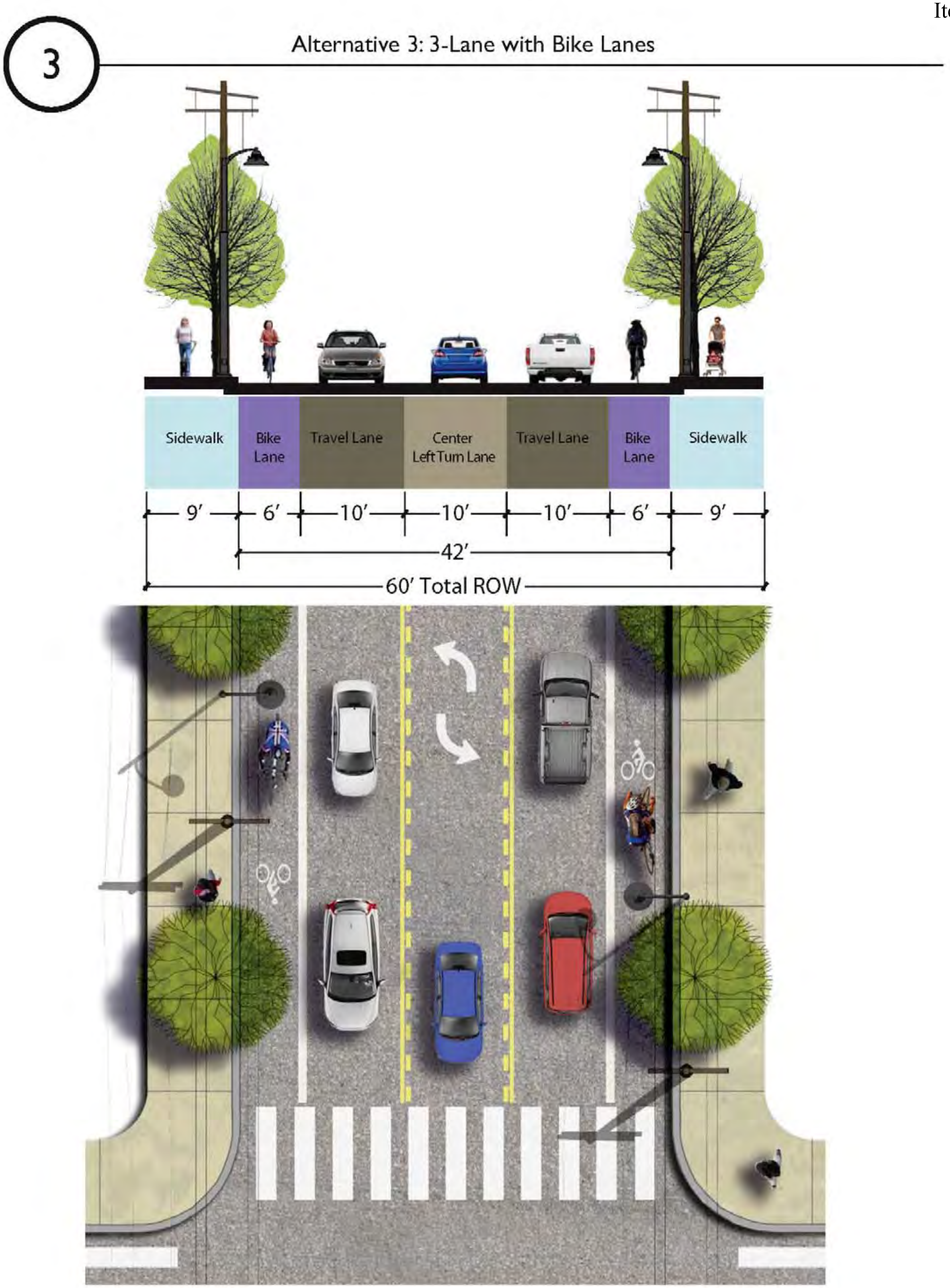


Figure 2 – Alternative 3 Concept

Alternative 5: 3-Lane with Wide Sidewalks

Alternative 5 would convert most of the roadway segment north of 29th Avenue from four motor vehicle lanes to three (Figure 3). The roadway would be reconstructed to expand sidewalks, resulting in a narrower curb-to-curb width (34 feet instead of the current 41 to 42 foot width.) No new bike lanes would be included on Willamette Street. Plan views for the entire corridor (from 24th Avenue to 32nd Avenue) are included in the appendix.

Sidewalks would be expanded to the maximum available width within the remaining right-of-way. With the 34-foot curb-to-curb width, sidewalks could be extended up to 13-feet. Alternative 5 would not result in any changes to roadway configuration south of 30th Avenue because it does not include any dedicated bicycle facilities and no parallel facilities are available near Willamette Street, south of 30th Avenue.

Alternative 5 Considerations	
Motor Vehicle Mobility	• Reduces number of travel lanes from four to three, north of 28th Avenue • Capacity reduced and travel time increased for through-traveling vehicles • Maintains eleven-foot outside travel lanes
Walkability	• Provides wide (13-foot) sidewalks to facilitate a transformative pedestrian environment including design treatments (e.g., storefront displays, café seating, landscaping)
Bicycle Facilities	• No on-street bike lanes • Improved bike access would occur via parallel route improvements and crossing enhancements (see Figure 5) • Bike sharrows possible on curbside lanes • Potential to provide raised bike facility if additional right-of-way acquired for sidewalk widening and reconstruction
Transit Service	• Maintains eleven-foot travel lanes for buses
Business Accessibility	• Center turn lane improves access for turning vehicles • Wide sidewalks provide opportunities for design treatments to support commercial development, aesthetic treatments, and walkability
Cost	• Higher cost to reconstruct curbs to expand/reconstruct sidewalks • Intersections and traffic signals would need to be reconfigured
Other	• Center turn lane offers opportunities for design elements including median treatments (e.g., landscaping, pedestrian refuge, access management) • Wide sidewalks support "Green Street" design treatments

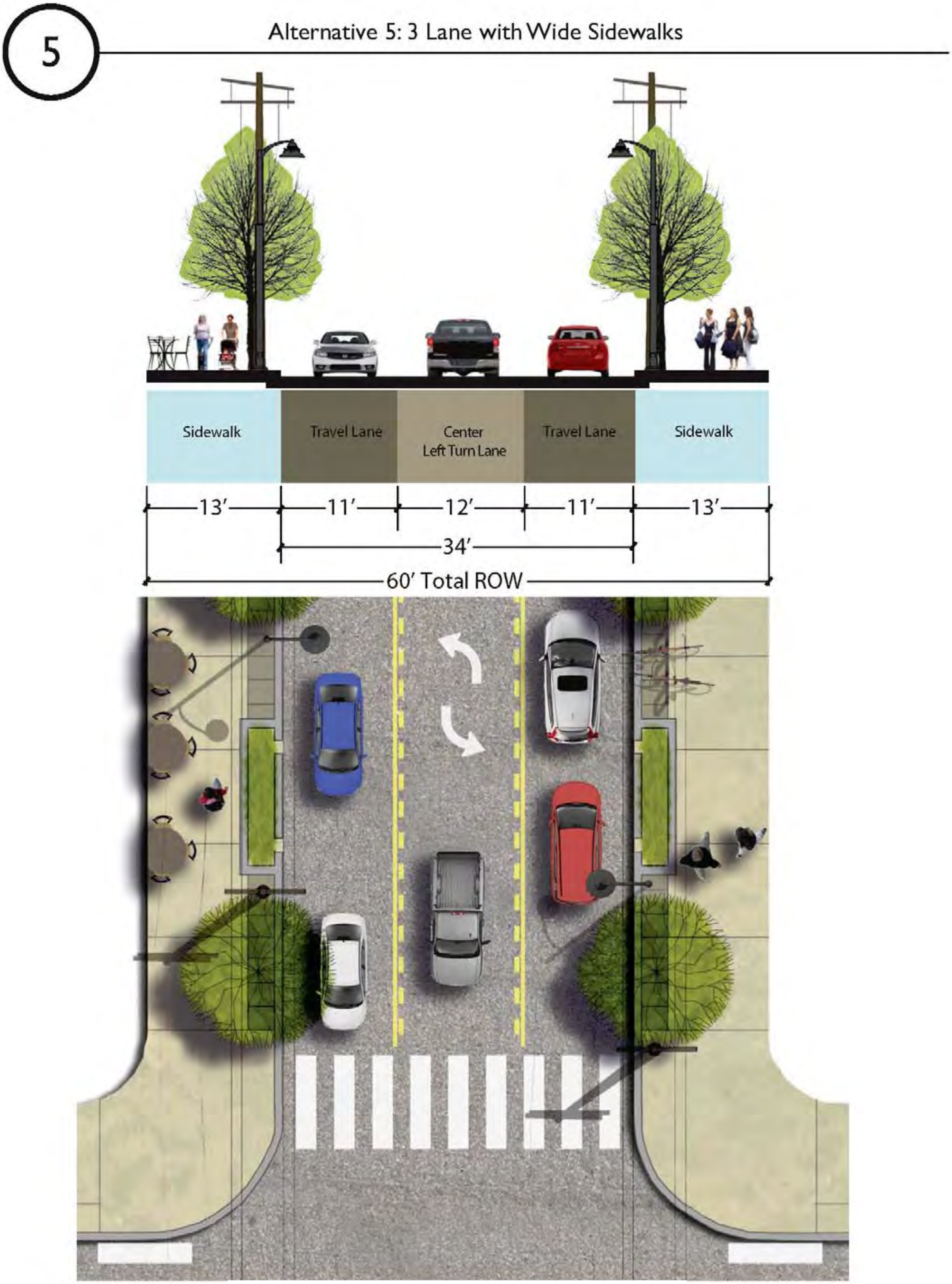


Figure 3 – Alternative 5 Concept

Street Intersection Impacts

The following section describes how each alternative would be accommodated at the study intersections. Plan views displaying intersection configurations for each alternative are included in the appendix. Traffic analysis showing intersection operations for each alternative is included in Technical Memorandum #8 (Traffic Analysis for Roadway Alternatives).

24th Avenue Intersection: No changes to right-of-way or curb-to-curb width are proposed at the intersection in Alternatives 1 or 3. In Alternative 5, the south leg of Willamette Street would be reconstructed with curb-to-curb width narrowed to accommodate wider sidewalks. In Alternative 3 and Alternative 5, the south leg of Willamette Street would be reconfigured from four travel lanes to three lanes (one lane in each direction with a center left turn lane in the middle). The space gained from removing one of the four travel lanes would be used for either bicycle lanes (Alternative 3) or wider sidewalks (Alternative 5). The north leg of Willamette Street would convert from two through lanes to one through lane and a dedicated left turn lane. The traffic signal would also need to be modified in Alternatives 3 and 5. No changes to right-of-way are proposed at the intersection in any alternative.

25th Avenue Intersection & 27th Avenue Intersection: The configuration of these intersections would appear as depicted in the overhead views shown in Figures 1-3. No changes to right-of-way or curb-to-curb width are proposed in Alternatives 1 or 3, while sidewalks are expanded in Alternative 5. Traffic signals would need to be reconfigured to accommodate the 3-lane configuration identified in Alternative 3 and Alternative 5. No changes are identified for 25th Avenue or 27th Avenue approaches at Willamette Street.

Woodfield Station Driveway Intersection: It is recommended that a traffic signal at this intersection be considered as a design option in all alternatives. A traffic signal would provide better access for turning vehicles and an additional pedestrian crossing opportunity. No changes to the existing lane configuration would be needed in Alternative 1. In Alternative 3 and Alternative 5, there would be a left turn lane on the northbound approach, and a single northbound through travel lane. Southbound, one travel lane would widen to two approximately 100 feet north of the intersection. Driveway modifications would likely be necessary on the east side of Willamette Street, across from the Woodfield Station Driveway. No right-of-way changes are anticipated in any of the alternatives. Sidewalks will be extended within the existing right-of-way.

29th Avenue Intersection: Compared to other study intersections, 29th Avenue has significantly higher traffic volumes (see Table 1). To adequately serve the traffic demand at the intersection and meet City of Eugene traffic operations performance standards, the Willamette Street approaches require more than a single through lane on each approach. The plan view figure for Alternative 1 illustrates a 5-lane cross-section at 29th Street, as exists currently. For Alternative 3 and 5, the proposed design option would include a 4-lane cross-section at 29th Avenue including a single northbound travel lane. Removing one of the two existing northbound travel lanes may be considered to accommodate bike lanes or wider sidewalks, respectively. Without reducing the number of vehicle lanes, additional right-of-way would be required to provide bike lanes or wider sidewalks. Further discussion of the alternative configurations at 29th Avenue is included in Technical Memorandum #8 (Traffic Analysis for Roadway Alternatives).

32nd Avenue Intersection: No changes are proposed in any alternative to this intersection.

Table 1: Intersection Traffic Volume (2012 p.m. peak hour)

Intersection	Traffic Entering Volume
Willamette Street/24th Avenue	1,834
Willamette Street/25th Avenue	1,668
Willamette Street/27th Avenue	1,914
Willamette Street/Woodfield Station Driveway	1,706
Willamette Street/29th Avenue	2,732
Willamette Street/32nd Avenue	1,613

Roundabout Compatibility

Roundabouts can improve traffic flow and reduce overall delay at many roadway intersections. Roundabouts generally reduce the number of overall collisions and fatalities when they are installed and are less expensive to operate and maintain compared to traffic signals. However, emergency vehicle and freight users may be opposed to roundabouts in sensitive areas.

Roundabouts would need to be constructed with multiple lanes to serve the four travel lines included in Alternative 1. The three-lane configurations (Alternatives 3 and 5) could be constructed with single lane roundabouts; however, the traffic analysis results (shown in Technical Memorandum #8) indicate that single lane roundabouts may not comfortably accommodate peak hour traffic demand at several intersections. Multi-lane roundabouts could be considered but would require a larger intersection configuration.

These larger configurations would require property acquisition to provide the right-of-way needed to construct the appropriately-sized roundabouts. Right-of-way acquisition can have significant costs and impacts to adjacent properties, particularly in a developed commercial area. Figure 4 illustrates an example, showing a potential layout for the intersection of 29th Avenue and Willamette Street with a multi-lane roundabout. While other intersections on Willamette Street could be configured with smaller layouts, the impacts and costs for the corridor may be significant even if the 29th Avenue intersection remained as currently configured. Roundabouts are not explicitly included in the facility design of any alternative but may be considered further as potential design refinements.

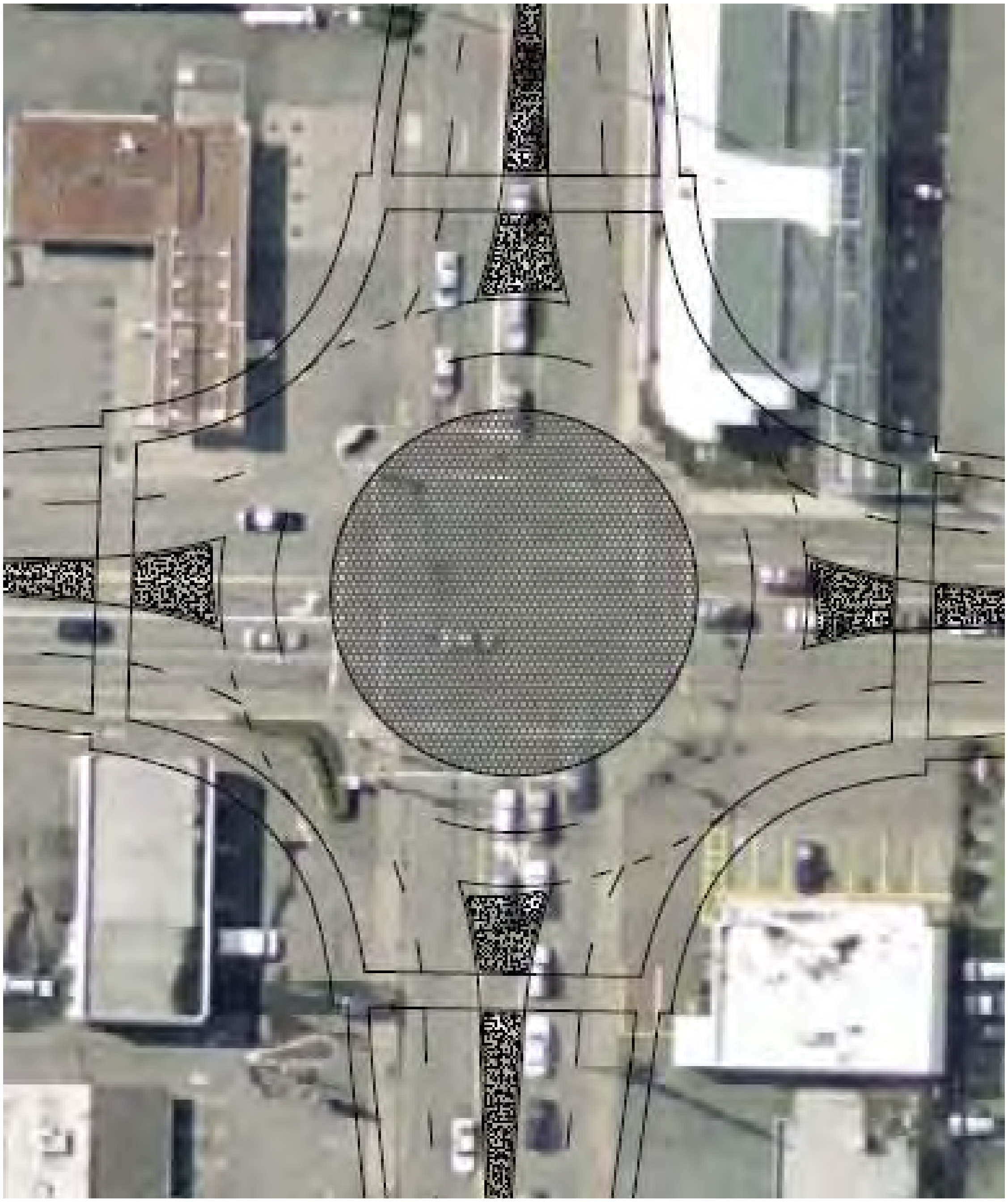


Figure 4 – Potential Roundabout Configuration at 29th Avenue and Willamette Street

Public and Private Approaches/Access Management Strategies

There are currently over 70 driveways on Willamette Street from 24th Avenue to 32nd Avenue. This creates numerous conflict points for motor vehicles, pedestrians and bicyclists. Reducing conflict points is likely to result in fewer accidents and increased capacity along the corridor. Managing access points along the corridor requires finding an appropriate balance between safety, mobility, and access. Consolidating driveway access points will be considered as part of each alternative, particularly where specific safety benefits would result.

The following strategies should be considered for the Willamette Street corridor:

- Consider removing and consolidating access points to existing businesses
- Consider shared accesses between adjacent property owners
- Implement turn lanes at driveways

Enhanced Bicycle Connections

Figure 5 illustrates potential bicycle facility improvements nearby, connecting to, and crossing Willamette Street. These improvements may be combined with any of the Willamette Street alternatives or considered independently. The improvements could improve bicycle access on local streets with a variety of bike boulevard treatments applied. Crossing improvements could be provided such as intersection priority areas (i.e., “Green Boxes”) or rider-activated push-button signals for crossing at intersections with traffic signals.

To support development of the surrounding bicycle network as well as improving bicycle access to the corridor, two crossing improvements are proposed for the alternatives:

- **Combined bike/turn lane on 24th Avenue**: a bike lane would be striped with a dashed line within the inside portion of the existing right turn lane. Signage would be used to identify the combined lane and guide users toward the proper positioning. This would extend the existing bike lane on 24th Avenue (which currently drops away) and improve comfort for some riders who wish to travel through to the proposed Bike Boulevard on Portland Street. A local example of this configuration is located on 13th Avenue at Patterson Street. For Alternative 3 (which includes bike lanes on Willamette Street) a green bike box may be added to improve access for bicycle riders making a left turn from 24th Avenue to Willamette Street.

- **Crosswalk with Pedestrian Hybrid Beacon at 29th Place**: a Pedestrian Hybrid Beacon is a traffic control device that stops roadway traffic to allow pedestrians or bicycles to cross safely. The beacon is activated only when a pedestrian or bicyclist pushes the button to cross. By locating a safe crossing where the current northbound bike lane ends north of 30th Avenue (at the driveway/path connecting to 29th Place), safe access will be provided for southbound bicycle riders wishing to connect to Willamette Street from Oak Street, via 29th Place. The beacon would be most beneficial in Alternatives 1 and 5, where there are no continuous bike lanes on Willamette Street, but may also be considered as part of Alternative 3.

These improvements are illustrated in the plan view drawings included in the appendix.

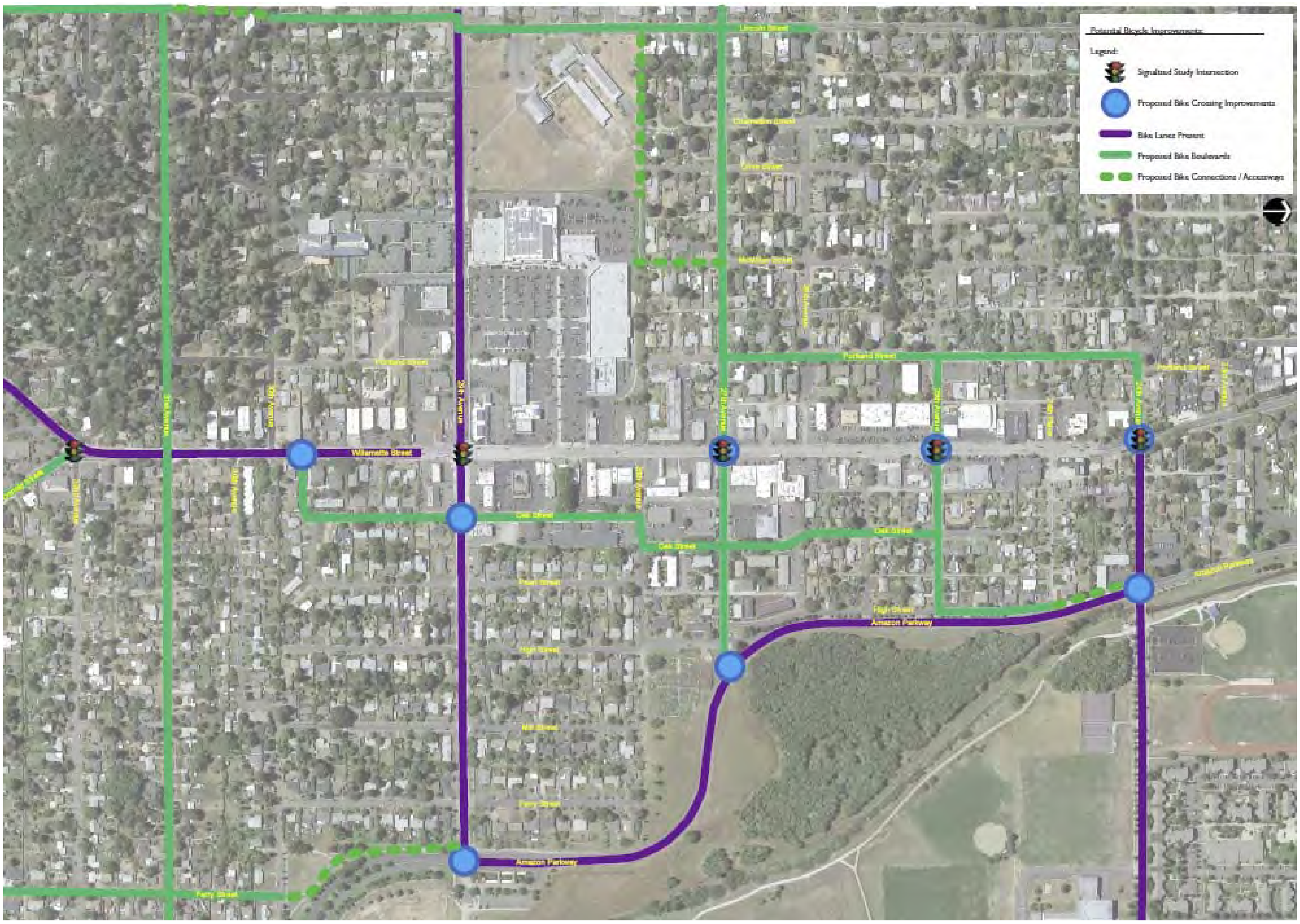


Figure 5 – Bicycle Facility Improvements

Enhanced Pedestrian Connections

The pedestrian environment on Willamette Street will be improved with wider sidewalks that are included in each alternative. To further enhance the pedestrian experience, crossing opportunities should be improved along Willamette Street. Currently the two largest distances between signalized crossings on the corridor are over 1400 feet (between 32nd Avenue to 29th Avenue) and over 900 feet (between 29th Avenue and 27th Avenue.) Two crossing improvements are proposed for the corridor:

- **Traffic signal with crosswalks at Woodfield Station Driveway**: a traffic signal at this location would provide a safe crossing for pedestrians between commercial areas and transit stops on both sides of the street. The intersection could be designed with a median pedestrian crossing refuges (i.e., island) on the north crosswalk in Alternatives 3 and 5, which include a center turn lane. The median refuge allows pedestrians to cross a roadway in stages, which is especially beneficial for users who require more time for crossings.

- **Crosswalk with Pedestrian Hybrid Beacon at 29th Place**: a Pedestrian Hybrid Beacon could be located south of 29th Avenue to provide a safe crossing for both pedestrians and bicycle riders. The signal would be most beneficial in Alternatives 1 and 5, where there are no continuous bike lanes on Willamette Street, but may also be considered as part of Alternative 3.

These improvements are illustrated in the plan view drawings included in the appendix.

Streetscape Elements

Travel lanes, sidewalks, bike lanes, intersection design and transit stops are fundamental facility design elements. Each has a function and must provide safety and comfort for the intended users. The configuration of these elements will play a part in the streetscape design of Willamette Street, as the perceptions of ease of travel and the sense of safety and comfort may change for different users with each alternative. The experiences of all users of the street as a place to be are affected by the facility design and streetscape. It is important that the facility design alternatives (1-3) and the potential elements of a unified streetscape design be considered together and not as separate evaluations.

Most of the right-of-way design elements that will be experienced and appreciated as a streetscape occur within the sidewalk corridor. The sidewalk corridor is defined by the roadway curbs and the back of sidewalks. When that corridor has been well-designed, it accommodates three primary functions, with design treatments to support those functions. Figure 6 illustrates conceptual sidewalk corridors and how the streetscape elements and the pedestrian experience may be affected.

Through Pedestrian Zone: Comfortable and unobstructed walking is the primary function of the sidewalk corridor. Draft federal guidelines developed by the Public Rights-of-Way Access and Advisory Committee (PROWAAC), require a minimum width of 4-feet and a preferred width of 5-feet. A useful urban design standard is the ability of two people to walk comfortably side-by-side, which typically requires at least 6-feet.

Furnishings Zone: Accommodates streetscape elements such as utility poles, street lights, planters, trees, benches, bike racks and bus shelters. It may also accommodate Low-Impact Development (LID) features such as flow-through stormwater planters. Pedestrian activities include transit boarding at designated stops, access to bike racks and access to on-street parking. The minimum desired width is 4-feet, with preferred widths of 5-feet to 7-feet.

Building Front Zone: For streets that support a significant amount of pedestrian-oriented retail, with buildings set close to sidewalks, an additional 1-foot to 2-feet is desirable to support storefront displays and window shopping.

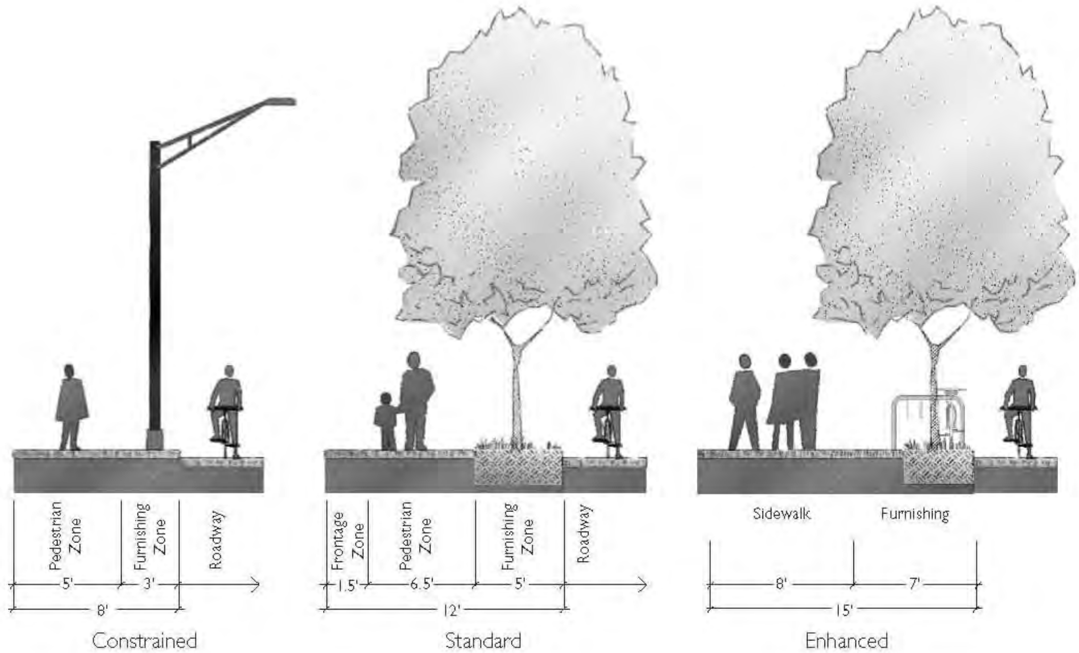


Figure 6 – Sidewalk Corridor Design

Developing a Design Theme for Willamette Street

Potential elements of a streetscape design theme for Willamette Street are described in the following section. Graphic representations of the potential elements are included in the appendix.

<u>Unifying Streetscape Elements</u>

Typical unifying elements of a streetscape are texture, color and form, along with other distinctive elements that create a unique functional or art-based character. Each of these elements can play an important role in the eventual transformation of Willamette into a signature street for the district.

Texture: Texture can be a unifying element by using a consistent palette of materials such as paving, walls, columns and railings. Opportunities for Willamette Street include sidewalk reconstruction and textured crosswalks at intersections, formalized mid-block pedestrian crossings or distinctive pavements for bike lanes.

Color: Color is a unifying element visually linked to texture. Colors can tie together places separated by distance and by function. Opportunities include any of the above elements that have special textures, as well as street furnishings such as bike racks, benches and bus shelters, and landscape materials with distinctive flowers or foliage colors.

Form: Form can provide both visual unity and visual distinction. Both unity and distinction have a place in a well-designed streetscape. Form also provides a sensed of orientation within the public realm and can provide visual landmarks for the district. Opportunities include site furnishings, pedestrian-scale lighting, signage and bus shelters.

Additional Distinctive Elements — Green Street

Green Streets are primarily thought of as innovative facilities to treat and manage stormwater within the right-of-way. Those facilities create an ecological function for our streets, in addition to the traditional mobility and access functions. There are a number of Green Street facilities for stormwater. The selection of one or more facilities for Willamette Street will require detailed engineering analysis and consistency with existing City of Eugene stormwater standards. The choice of techniques will also be affected by the width of the sidewalk corridor in a preferred alternative. Typical facilities include the following:

Flow-Through Planters: Flow-through stormwater planters are a common bioretention facility in urban areas. They provide a distinctive architectural feature for the sidewalks of an urban Green Street where sidewalk widths are 12 feet or greater, with a minimum 5-foot furnishing zone available. The design and location of planters should consider other sidewalk uses, such as outdoor seating storefront displays, as well as maintenance of adequate passenger loading/unloading space for on-street parking.

Figure 7 – Flow-Through Planters

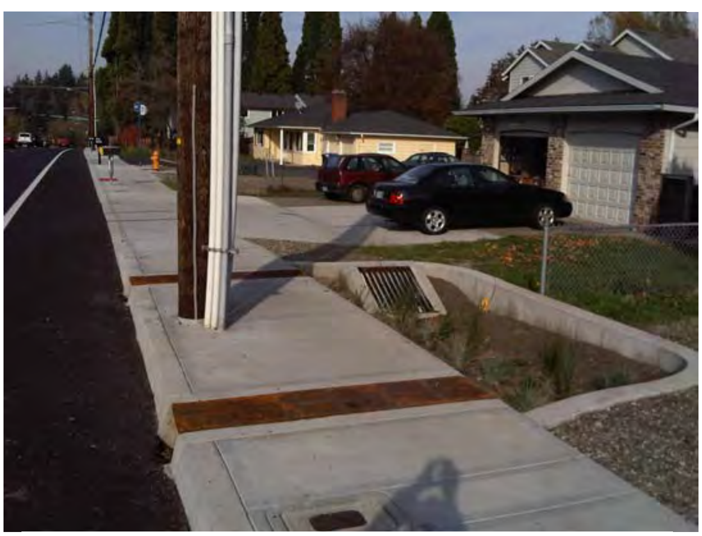


Figure 8 – Basins

Basins: Because of their larger size, basins are usually located behind the sidewalk. They are an alternative to planters in the furnishing zone if the sidewalk width is too constrained to accommodate both the planter and a comfortable walking space for pedestrians. In those instances, the overall street right-of-way need may be greater, or a stormwater management easement required since the width of a basin is greater than a planter due to side slopes.

Filterras: Proprietary devices that treat stormwater through a physical process using amended soil and bioretention media combined with small street tree or a shrub. These devices can fit within the furnishing zone of a sidewalk corridor of 12-feet or greater in width.

Figure 9 – Filterras

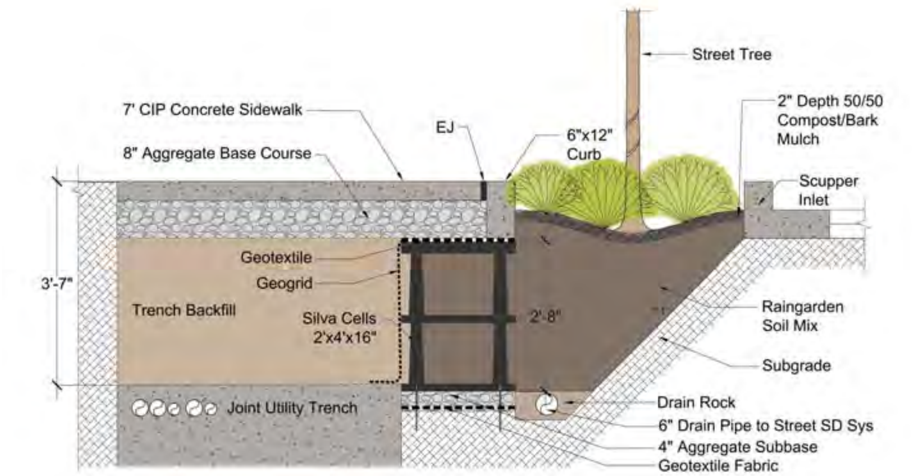


Figure 10 – Sidewalk Silva Cells

Sidewalk Silva Cells: This technique creates a sidewalk rain garden along the roadway and partially under the sidewalk. Rain falls directly on permeable pavers and planters. The silva cells extend the rain garden underneath the sidewalk and into a soil media that treats stormwater and nurtures the landscaping.

Permeable Paving: Many of the impermeable surfaces within the sidewalk corridor could be constructed using permeable paving material such as landscape planting, permeable concrete or porous paving blocks. This requires well-draining native soil. The disadvantages of permeable paving include difficulties with maintenance and repair, higher cost, and limited infiltration effectiveness of streets with a gradient over five percent. Permeable pavement can be used in conjunction with other Green Street features and will help reduce the required size of these facilities by lessening the amount of runoff coming off the paved surface.

Figure 11 – Permeable Paving

It should be noted that Green Street principles are not limited to stormwater management. Other key elements of a Green Street are:

- Safe and appealing pedestrian environment
- Multimodal travel choices
- Maximizing opportunities for trees and landscaping
- Visual and physical connections to public spaces and open spaces
- Renewable energy for public signs and lighting

Additional Distinctive Elements — Public Art

Public art becomes another means for people to interact with each other and with the urban context. Creating a lively public realm with intrigues, challenges and inspires us as it becomes part of our larger goal of improving the quality if civic life. Within the unifying elements of streetscape, it is also another opportunity to explore texture, color and form. Implementing a public art program should include assessing the potential for city and regional funding support and coordination with local businesses. Examples of public art within or along a street right-of-way have been included in the appendix.

Streetscape Design Matrix

Figure 12 provides a summary matrix of how easily some of the typical amenities of a streetscape can be accommodated within the sidewalk corridors depicted in the alternatives. It is based on design principles described in the Streetscape Design Basics for Willamette Street Figure (included in the appendix) and the accompanying narrative.

Willamette Street Amenities Matrix

	Alterative 1	Alterative 3	Alterative 5
Bus Stop Amenities			
Enhanced Bus Shelters	⊗	⊗	●
Sidewalk Character			
Wide Sidewalks (10' or greater)	⊗	⊗	●
Paved furnishing zone	●	●	●
Planter strip	●	●	●
Outdoor seating/retail focus	⊗	⊗	●
Textured Crosswalk	●	●	●
Sidewalk Furnishings			
Bike Racks	⊗	⊗	●
Benches	⊗	⊗	●
Trash receptacles	●	●	●
Lighting			
Pedestrian scale (18' tall or shorter)	●	●	●
Landscaping			
Deciduous tree canopy	⊗	⊗	●
Street corner planting	⊗	⊗	●
Landscaped tree wells	●	●	●
Stormwater facilities	⊗	⊗	●

Key	
Comfortably Accommodated	●
Constrained	⊗

Figure 12 – Amenities Matrix

Utility Relocation

Relocating the utilities underground would improve the sidewalk environment by removing some barriers to pedestrian access and making the corridor more aesthetically pleasing. Utilities (poles, hydrants, pedestals, etc.) currently located along the sidewalks result in an inconsistent and obstructed pedestrian environment. Alternative 1 and Alternative 3 have the most constrained sidewalk conditions (approximately 9-feet width with reconstruction). Even minor adjustments of utility poles locations to be fully within the Furnishings Zone represents a significant cost, but would increase the Through Pedestrian Zone to minimum widths. Reconstruction of the sidewalk corridor to 13-feet in Alternative 5 would require relocation of all above-ground utilities to the new Furnishings Zone location created by moving the curb lines into the current roadway area. In this scenario, ample pedestrian circulation space would be available.

The planning-level cost estimate for utility relocation on Willamette Street between 24th Avenue and 32nd Avenue is $2.6 Million[6].

On-Street Parking

On-street parallel parking provides convenient access for adjacent businesses and a buffer between pedestrians and motor vehicles. On-street parking would likely have a very favorable benefit to the pedestrian environment, however, given the constrained right-of-way and community priorities, on-street parking is not considered in any of the three design alternatives. On-street parking may be reconsidered as part of long-term enhancements to the corridor.

Bus Stops

Two Lane Transit District (LTD) bus routes currently provide service along Willamette Street. Buses currently stop on the street and block the curbside travel lane during passenger boardings. Constructing bus pullouts would remove stopped vehicles from travel lanes, but would likely require right-of-way acquisition and would also require buses in the pullouts to merge back into the traffic stream. Figure 13 illustrates the dimensions of a potential bus pullout along Willamette Street. The traffic impacts of bus pullouts are further discussed in Technical Memorandum 8.

No bus pullouts are recommended for the corridor given the frequency of bus uses (five per hour south of 29th Avenue and two per hour north of 29th Avenue), right-of-way impacts, and increased delay for merging transit vehicles.

[6] The cost estimate is based on 2013 dollars. The cost shown is a preliminary high-level estimate, subject to change. Estimate was received by email on June 11, 2013 from Mark Oberle, Eugene Water & Electric Board.

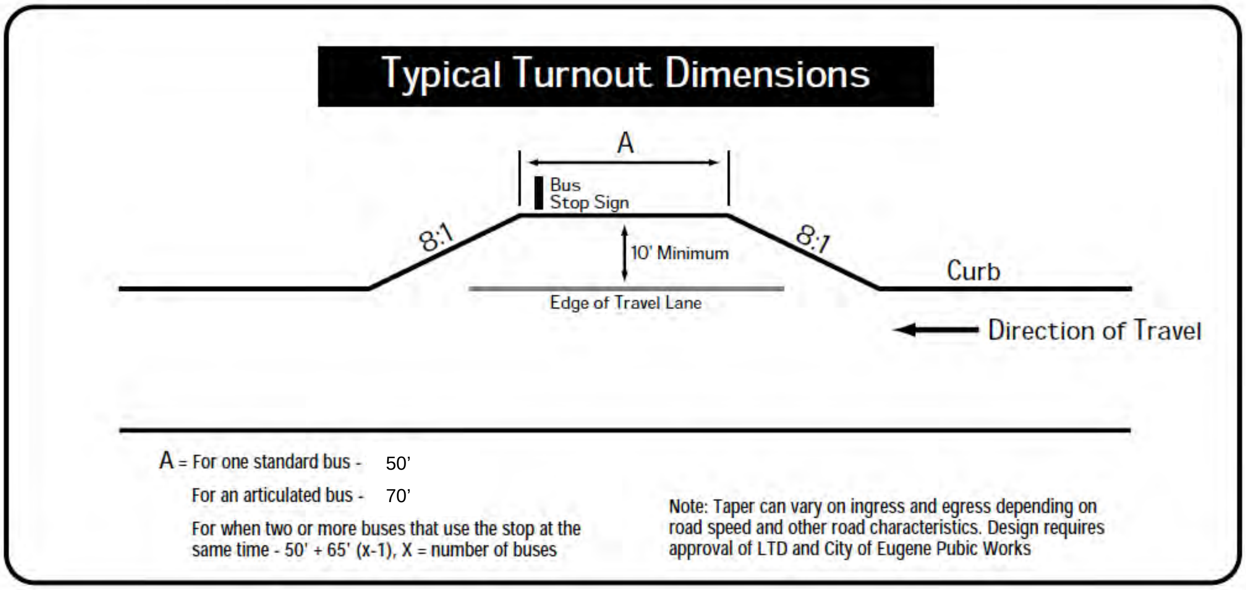


Figure 13 – Bus Pullout Illustration

Source: LTD Standards and Design

Improving bicycle and pedestrian access to transit stops would support transit usage along the corridor. If sidewalks are expanded there may be space available for improved bus stop amenities such as covered benches (shelters), real-time arrival information, or other transit stop amenities. No additional transit stop amenities are suggested for the corridor. Ridership should be monitored to identify potential future improvements as the Willamette Street corridor is redesigned and the surrounding land uses change over time.

Cost Estimates

Planning-level cost estimates were developed for each alternative, with the facility designs specified in this memorandum. The cost estimates are shown in Table 2. All costs shown are planning-level estimates in 2013 dollars and are subject to change. Details and assumptions for the cost estimates are shown in the appendix. The costs listed previously for utility relocation are not included in the estimates shown in Table 2.

Table 2: Planning-Level Cost Estimates (Million Dollars, in 2013 $)

Alternative	Pavement Project	24th to 29th Ave	29th to 32nd Ave	Total
1	$2.1	$1.7	$0.3	$4.1
2	$2.1	$1.8	$0.3	$4.2
3	$2.1	$2.4	$0.3	$4.8

Pavement Project – City of Eugene project is planned to include paving, ADA accessibility, and stormwater improvements from 24th to 29th Avenue
24th to 29th Avenue – Additional costs vary by alternative
29th to 32nd Avenue – Additional costs same for all alternatives
*All costs are planning-level estimates subject to change

Evaluation of Alternatives

The following section provides Tier 2 screening evaluation of the three proposed alternatives. The alternatives were scored using the evaluation criteria and methodology previously detailed in Technical Memorandum #1 (South Willamette Street Improvement Plan – Evaluation Criteria). Evaluation criteria were established to assess the potential of alternatives to best meet the transportation needs of the users of Willamette Street. The criteria are based on the goals and objectives in the Draft Eugene Transportation System Plan.

Individual criteria were scored as 1, 0, or -1 representing improvement, no change, or degradation, respectively. The scoring weighs all criteria equally, with the total evaluation score representing the sum of the individual criteria scores. Figure 14 documents the results of the scoring evaluation which rate Alternative 3 as the highest scoring and Alternative 1 the lowest. An explanation for the criteria and scoring for each alternative are further detailed in the appendix.

Alternative	Access & Mobility				Safety & Health			Social Equity		Economic Benefit			Cost Effectiveness			Climate & Energy				Ecological Function		Community Context		TOTAL
	Reliability (For All Modes)	Neighborhood Connectivity	Motor Vehicle Travel Time	Active Mode Travel Time	Safety	Security	Emergency Response	Equity	Economic Access	Freight Mobility	Walkable/Bikeable Business District	Business Vitality	Fundability	Asset Management	Project Benefits	Reduce Vehicle Miles Traveled	Pedestrian Facilities	Bicycle Facilities	Transit Facilities	Storm water Design	Landscape Design	Community Vision and Land Use	Transportation Planning Compatibility	
Alternative 1 - 4-Lane	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	**3**
Alternative 3 - 3-Lane with Bike Lanes	0	1	-1	1	1	1	-1	1	1	-1	1	0	0	1	1	0	0	1	0	0	0	0	0	**7**
Alternative 5 - 3-Lane with Wide Sidewalks	0	0	-1	0	1	1	-1	1	1	-1	1	0	-1	1	1	0	1	0	1	0	0	1	0	**6**

FIGURE 14 – Evaluation Criteria Scoring

S. Willamette Street Improvements - Cost Estimates

Cost Estimates for Alternative Concepts

Alternative 1 (24th to 29th Avenue)

4-Lane, 9' Sidewalk	Qty	Unit	Unit Cost	Total Cost	Notes
Demolition and Clearing	1	LS	$32,329	$32,329	3% of Total Construction Cost
Mobilization and Erosion Control	1	LS	$129,317	$129,317	12% of Total Construction Cost
Construction Survey	1	LS	$21,553	$21,553	2% of Total Construction Cost
Temporary Traffic Control	1	LS	$32,329	$32,329	3% of Total Construction Cost
Concrete Sidewalks, 9' width	33,250	SF	$8	$266,000	Includes agg base
Concrete Driveways, 9' width	12,100	SF	$12	$145,200	Includes agg base
Driveway transitions	2,689	SF	$5	$13,444	Includes agg base, 2' beyond driveway
Street Trees	80	EA	$600	$48,000	2.5" caliper, includes root barrier, irrig
Street Lights Ornamental	40	EA	$8,000	$320,000	
Drainage and Utility Adjustment Allowance	1	LS	$10,000	$10,000	Assumes use of existing system, Adj sidewalk utility boxes, Rel bus stops
Traffic Signal Modifications (ADA Ped Poles)	3	EA	$25,000	$75,000	Assumes Three Signal Modifications for new ADA pedestrian push buttons
Traffic Signals	1	EA	$200,000	$200,000	Assumes Woodfield Station Signal
			Total:	$1,293,173	
			Construction Contingency 30%:	$387,952	
			Alt 1 Total:	**$1,681,125**	

Alternative 3 (24th to 29th Avenue)

3-Lane with Bike Lanes, 9' Sidewalks	Qty	Unit	Unit Cost	Total Cost	Notes
Demolition and Clearing	1	LS	$35,119	$35,119	3% of Total Construction Cost
Mobilization and Erosion Control	1	LS	$140,477	$140,477	12% of Total Construction Cost
Construction Survey	1	LS	$23,413	$23,413	2% of Total Construction Cost
Temporary Traffic Control	1	LS	$35,119	$35,119	3% of Total Construction Cost
Concrete Sidewalks, 9' width	33,250	SF	$8	$266,000	Includes agg base
Concrete Driveways, 9' width	12,100	SF	$12	$145,200	Includes agg base
Driveway transitions	2,689	SF	$5	$13,444	Includes agg base, 2' beyond driveway
Street Trees	80	EA	$600	$48,000	2.5" caliper, includes root barrier, irrig
Street Lights Ornamental	40	EA	$8,000	$320,000	
Drainage and Utility Adjustment Allowance	1	LS	$10,000	$10,000	Assumes use of existing system, Adj sidewalk utility boxes, Rel bus stops
Traffic Signal Modifications (ADA Ped Poles)	3	EA	$50,000	$150,000	Assumes Three Signal Modifications (left turn phasing) for new ADA pedestrian push buttons
Traffic Signals	1	EA	$200,000	$200,000	Assumes Woodfield Station Signal
Mid-block Pedestrian Crossing	450	SF	$40	$18,000	45' long by 10' wide, concrete in median
			Total:	$1,404,773	
			Construction Contingency 30%:	$421,432	
			Alt 3 Total:	**$1,826,205**	

Alternative 5 (24th to 29th Avenue)

3-Lane, 13' Sidewalks, Storm water planters	Qty	Unit	Unit Cost	Total Cost	Notes
Demolition and Clearing	1	LS	$59,978	$59,978	4% of Total Construction Cost
Mobilization and Erosion Control	1	LS	$179,933	$179,933	12% of Total Construction Cost
Construction Survey	1	LS	$37,486	$37,486	2.5% of Total Construction Cost
Temporary Traffic Control	1	LS	$74,972	$74,972	5% of Total Construction Cost
Concrete Sidewalks, 13' width	45,000	SF	$8	$360,000	Includes agg base
Concrete Driveways, 13' width	18,250	SF	$12	$219,000	Includes agg base
Driveway Transitions	2,808	SF	$5	$14,038	Includes agg base, 2' beyond driveway
Street Trees	80	EA	$600	$48,000	2.5" caliper, includes root barrier, irrig
Stormwater Treatment Planters	4,680	SF	$30	$140,400	Assume 5' width with curbs, treat 6% of half street plus sidewalk
Street Lights Ornamental	40	EA	$8,000	$320,000	

Drainage and Utility Adjustment Allowance	1	LS	$30,000	$30,000	Assumes recon of storm inlets only, Adj sidewalk utility boxes, Rel bus stops
Traffic Signal Modifications (ADA Ped Poles)	3	EA	$50,000	$150,000	Assumes Three Signal Modifications (left turn phasing) for new ADA pedestrian push buttons
Traffic Signals	1	EA	$200,000	$200,000	Assumes Woodfield Station Signal
Mid-block Pedestrian Crossing	450	SF	$40	$18,000	45' long by 10' wide, concrete in median
			Total:	$1,851,807	
		Construction Contingency 30%:		$555,542	
			Alt 5 Total:	**$2,407,348**	

29th to 32nd Avenue

	Qty	Unit	Unit Cost	Total Cost	Notes
Demolition and Clearing	1	LS	$4,800	$4,800	3% of Total Construction Cost
Mobilization and Erosion Control	1	LS	$19,200	$19,200	12% of Total Construction Cost
Construction Survey	1	LS	$3,200	$3,200	2% of Total Construction Cost
Temporary Traffic Control	1	LS	$4,800	$4,800	3% of Total Construction Cost
Signing and Striping	1	LS	$10,000	$10,000	Estimated from ODOT values
HAWK Signal	1	EA	$150,000	$150,000	Includes cross walk striping
			Total:	$192,000	
		Construction Contingency 30%:		$57,600	
			29th to 32nd Tot	**$249,600**	

Assumptions

Demolition and Clearing	Includes removal of structures, obstructions, tree removal
Mobilization and Erosion Control	Includes ERC materials, plan, and patrol
Temporary Traffic Control	Includes signage, barrels, barricades, and patrol
Roadway Excavation and Subgrade	Excavation includes surfacing removal, rock/soil base excavation
Roadway Surface	Pavement is all PCC and not being reconstructed or repaired
Curb and Gutter	Includes aggregate, Demolition and replacement due to poor condition
Concrete Sidewalks	Sidewalk cost includes aggregate
Concrete Pavers	Pavement is all PCC, pavers installed on op of PCC Recon
Street Trees	Includes root barrier and irrigation
Stormwater Treatment Facilities	Includes curbing, soil media, plantings, edge treatment
Street Lights	Includes pole, lamp, ballast, conduit
Signing and Striping	Includes lane striping, parking stalls/ticks, signage
Drainage and Utility Adjustment Allowance	Estimates new pipe connections, structures

South Willamette Street Improvement Plan – Tier 2 Screening Evaluation Notes

P10086-012

This document describes the evaluation criteria and scoring approach used to analyze the alternatives developed for the South Willamette Street Improvement Plan. A point-based rating methodology is used to evaluate how well proposed design alternatives meet measure of effectiveness criteria. In this way, a consistent method is used to evaluate and rank the alternatives based on how well they meet identified goals and objectives. The ranking informs the Technical Advisory Committee, stakeholders and appointed and elected officials; however, the final recommended alternative will be based on feedback and direction from these parties.

The goals and objectives in the Draft TSP provided a basis for the development of the evaluation criteria, which are intended to assess each alternative's potential to meet the needs of the people using Willamette Street. The evaluation criteria were refined based on a review of planning documents more specific to the study area, such as the South Willamette Concept Plan. The criteria are summarized in Table 1 according to the broad goal category they support.

The primary intent of the scoring is to provide a relative comparison between alternatives. Criteria scoring could differ for different segments within the corridor (i.e., north of 29th Avenue compared to south of 29th Avenue) due to differences in existing configurations and surrounding land uses. For clarity in comparing scoring across all alternatives, the scoring was generally focused on changes relative to the existing configuration and primarily on the north segment of the corridor. The north corridor makes up the longest segment in the corridor, has the most relative change between alternatives, and may be considered the most critical segment due to the surrounding commercial land uses.

The overall evaluation approach assumes an equal weight for each criterion. The evaluation scores for all criteria are summed to determine the overall evaluation score. This method allows a goal category with more supporting criteria to have a larger influence on the overall score.

Table 1 summarizes the criteria, describes the evaluation score and notes how the scoring was applied to the three alternatives considered in the Tier 2 screening.

Table 1: Evaluation Criteria and Scoring

Criteria	Evaluation Score	Scoring Notes
Access and Mobility		
Reliability (For All Modes) Improves trip reliability, consistency, comfort and convenience for all modes (walk, bike, transit, cars).	+1. Improves trip reliability 0. No change -1. Reduces trip reliability	Each alternative represents tradeoffs within limited space. No alternative improves or degrades all modes.
Neighborhood Connectivity Increases the number of households that can safely walk, bike, or use transit services to meet basic (non-work) daily needs.	+1. Increases # of connected households 0. No change -1. Decreases # of connected households	Alternatives that provide bike lanes were considered to represent improvement. Sidewalk width was not considered to significantly affect number of connected households.
Motor Vehicle Travel Time Reduces travel time between key origins and destinations for motor vehicles.	+1. Decreases travel time for motor vehicles 0. No change -1. Increases travel time for motor vehicles	Alternatives that reduced motor vehicle lanes where scored '-1' due to reduced through-capacity.
Active Mode Travel Time Reduces travel time between key origins and destinations for active modes (pedestrian and bicycle).	+1. Decreases travel time for alternative modes 0. No change -1. Increases travel time for alternative modes	Alternatives that provide bike lanes were considered to represent improvement. Sidewalk width was not considered to significantly affect travel time.
Safety and Health		
Safety Improve safety and security for all users, especially for the most vulnerable; strive for zero fatalities.	+1. Improves safety for all modes 0. No change -1. Reduces safety for all modes	Alternatives with 3 vehicle lanes are expected to improve safety by lowering vehicle speeds and reducing some types of collisions. Bike lanes provide a dedicated facility and a buffer for pedestrians.
Security Improve actual and perceived sense of security (i.e. Safe driving, getting to and riding transit, walking and biking).	+1. Improves sense of security 0. No change -1. Decreases sense of security	Wider sidewalks and bike lanes provide a buffer between motor vehicle lanes, improving sense of security for users.

Table Continued on next page.

(Continued) Table 1: Evaluation Criteria and Scoring

Criteria	Evaluation Score	Scoring Notes
Emergency Response Improves or maintains emergency response times within and through the corridor.	+1. Improves emergency response times 0. No change -1. Reduces emergency response times	Alternatives with less than 4 motor vehicle lanes where scored '-1' due to narrower space for vehicle lanes and greater likelihood of vehicle blockage/congestion.
Social Equity		
Equity Contributes to closing the transportation access gap between the general user and populations with limited choices, such as the elderly, low income, minority populations, and people with disabilities.	+1. Specifically benefits populations with limited choices 0. No Change -1. Negatively impacts populations with limited choices	Alternatives that provide dedicated bike lanes or sidewalks beyond 10' are considered to benefit users with limited choices.
Economic Access Improves access from residences to employment and neighborhood centers within a 20-minute walk, bike, or transit trip.	+1. Improves employment access 0. No change -1. Decreases employment access	Alternatives that provide dedicated bike lanes or sidewalks beyond 10' are considered to improve access within 20-minute walk, bike, or transit trip.
Economic Benefit		
Freight Mobility Provides safe, efficient, and continuous motor vehicle operation to allow timely freight movement along Willamette Street.	+1. Improves corridor's freight movement 0. No Change -1. Negative impact on freight movement	Alternatives with less than 4 motor vehicle lanes where scored '-1' due to reduced capacity.
Walkable/Bikeable Business District Promotes a "Safe, Attractive Pedestrian Experience for Business, Shopping and Entertainment."	+1. Improves business district pedestrian and bicycle experience 0. No change -1. Reduces business district pedestrian and bicycle experience	Alternatives that provide dedicated bike lanes or wider sidewalks are considered to improve experience for pedestrians and people on bikes.
Business Vitality Supports access and visibility of businesses that rely on drive-by traffic by balancing congestion with economic vitality	+1. Supports economic vitality 0. No change -1. Negative impact on economic vitality	Adding a center turn lane is a benefit to business traffic. Reducing lanes is considered negative. Doing both is neutral.

Table Continued on next page.

(Continued) Table 1: Evaluation Criteria and Scoring

Criteria	Evaluation Score	Scoring Notes
Cost Effectiveness		
Fundability Available funding sources exist to implement projects in a timely fashion.	+1. Funding sources are available 0. Feasible costs, but no identified funding -1. High costs and no funding expected	Funding for maintaining existing alignment (Alt. 1) and curb-to-curb width is considered feasible. Moving curbs (Alt. 5) is considered high cost.
Asset Management Favors the enhancement and maintenance of existing systems over system expansion.	+1. Enhances existing transportation system 0. Minimal enhancement or expansion -1. Expands transportation system	All alternatives are considered enhancements of the existing transportation system.
Project Benefits Optimizes benefits relative to public, private and social costs over the life-cycle of the project	+1. Provides maximum benefits 0. Minimal benefits -1. Provides no benefits	Each alternative provides benefits, but reflects tradeoffs necessary within limited space.
Climate and Energy		
Reduce Vehicle Miles Traveled (VMT) Improves the corridor as an attractive area without having to drive. Increases mode share for walk, bike, and transit thus reducing greenhouse gases and fossil fuel consumption.	+1. Reduces VMT 0. No change -1. Increases VMT	VMT impacts are unclear. Bike lanes may reduce VMT. Fewer lanes may result in out-of-direction travel.
Pedestrian Facilities Adds sidewalks and crosswalks that fill in system gaps, improve system connectivity, removes obstructions and are accessible to all users.	+1. Improves pedestrian facilities 0. No change -1. Negative impact on pedestrian facilities	Pedestrian improvements are expected to be included in each scenario due to widening of sidewalks and other design treatments. Therefore, criterion is applied relative to change from “baseline” enhanced 9’ sidewalk.

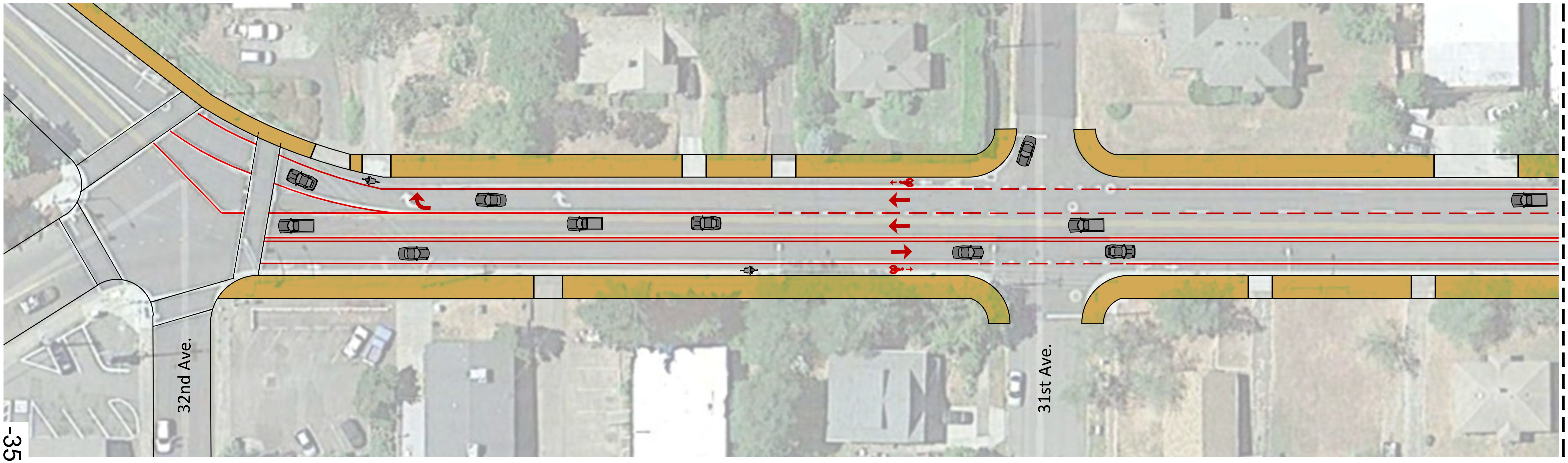
(Continued) Table 1: Evaluation Criteria and Scoring

Criteria	Evaluation Score	Scoring Notes
Bicycle Facilities Adds bikeways that fill in system gaps, improve system connectivity, and are accessible to all users.	+1. Improves bicycle facilities, including bike lanes 0. No change -1. Negative impact on bicycle facilities	Alternatives that provide dedicated bike lanes are considered '+1', otherwise '0'.
Transit Facilities Improves transit facilities and accessibility to transit stops (for all users) along and near the corridor.	+1. Improves transit facilities 0. No change -1. Negative impact on transit facilities	Wider sidewalk (Alt 5) is only alternative considered to have a significant benefit to transit stop accessibility
Ecological Function		
Stormwater Design Transportation improvements lower the rate of storm water runoff and improve water quality.	+1. Minimizes storm water runoff 0. No change -1. Increases storm water runoff	No storm water runoff impacts have been identified.
Landscape Design Reduces the urban heat island through landscape design, less pavement, and increased tree canopy.	+1. Reduces heat island 0. No change -1. Increases heat island	No landscape design impacts have been identified.
Community Context		
Community Vision and Land Use Supports implementation of Envision Eugene land use and growth management goals and A *Community Climate and Energy Action Plan for Eugene*.	+1. Supports Envision Eugene 0. No change -1. Conflicts with Envision Eugene	Criterion is applied based on sidewalk width (relative to "baseline" enhanced 9' sidewalk).
Transportation Planning Compatibility Compatible with City's transportation plans (TSP, Long Range Transit Plan, and Pedestrian and Bicycle Master Plan [PBMP])	+1. Compatible with City transportation plans 0. Has little or no impact (or has offset impacts) -1. Not compatible with City transportation plans	Each alternative represents tradeoffs within limited space. No alternative is considered to significantly differ in overall compatibility.

Alternative 1

Alternative 3

Alternative 5



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Alternative 1: 4-Lane

Legend

Travel & Turn Lanes

Pedestrian Crossing at Intersection

Bicycle Lane

Driveway

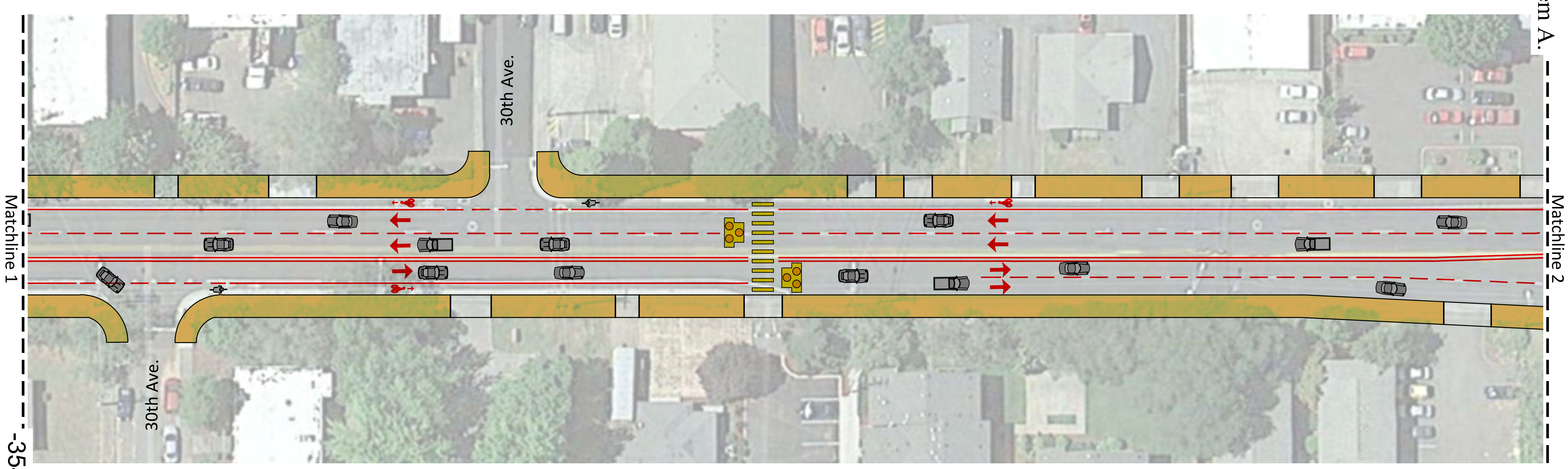
Sidewalk Corridor

Crosswalk and
Pedestrian Hybrid Beacon

0' 10' 20' 40'

Sheet 1 c

Item A.



Alternative 1: 4-Lane

Legend

Travel & Turn Lanes

Pedestrian Crossing at Intersection

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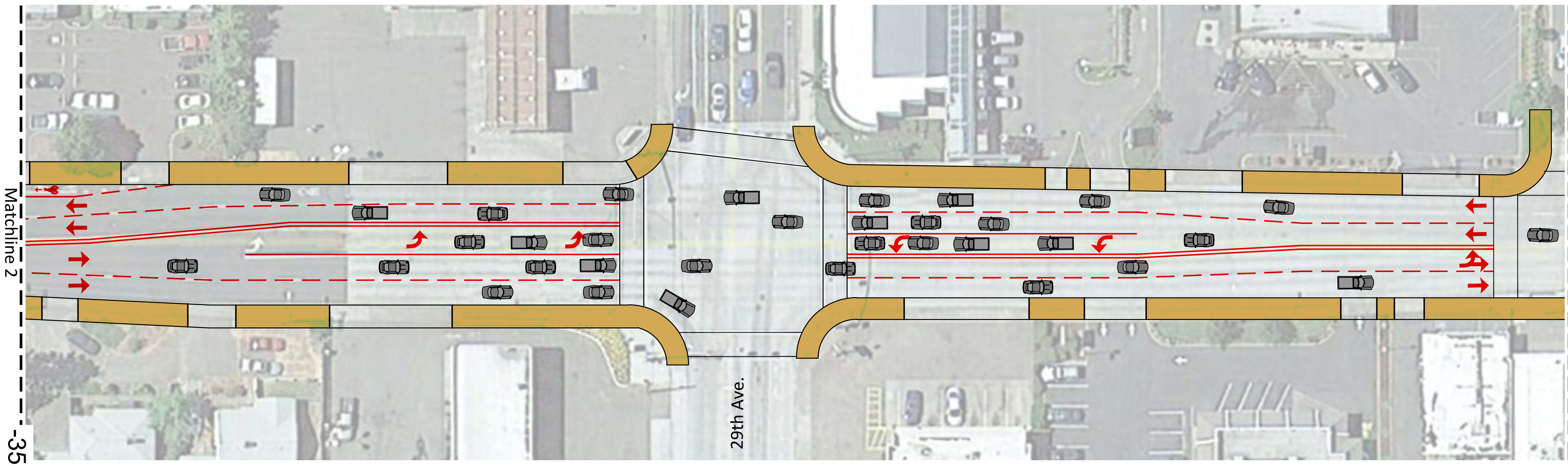
0' 10' 20' 40'



Alternative 1: 4-Lane

Legend

Travel & Turn Lanes

Pedestrian Crossing at Intersection

Bicycle Lane

Driveway

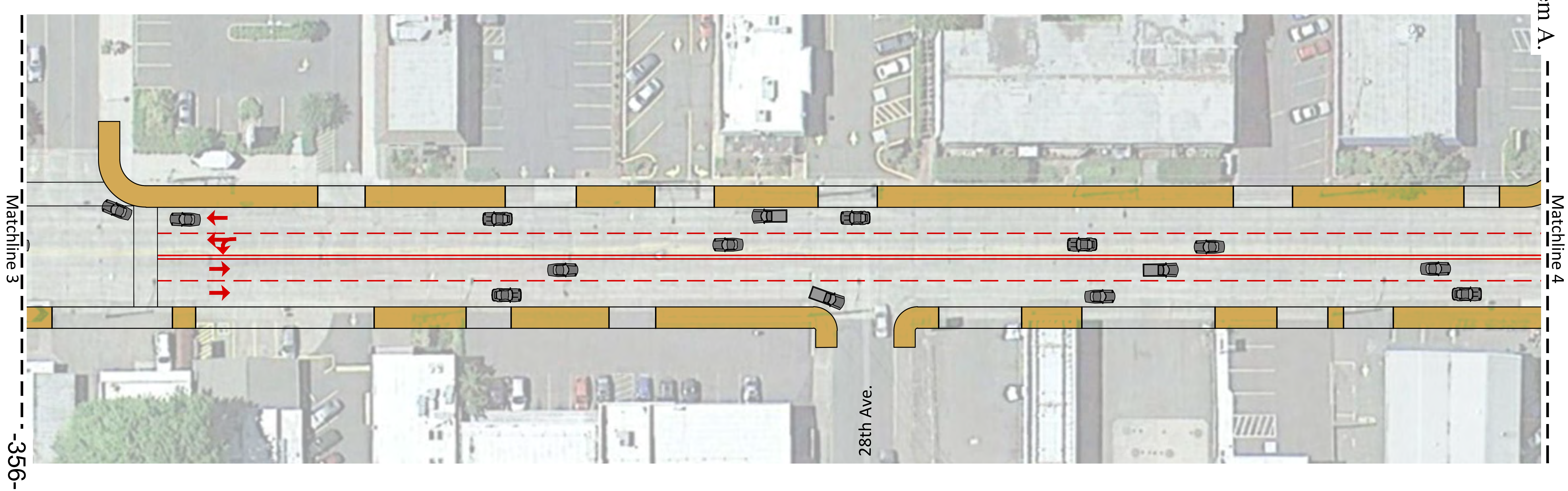
Sidewalk Corridor

Crosswalk and Pedestrian Hybrid Beacon

0' 10' 20' 40'

Sheet 3 c

Item A.



Alternative 1: 4-Lane

Legend

Travel & Turn Lanes

Pedestrian Crossing at Intersection

Bicycle Lane

Driveway

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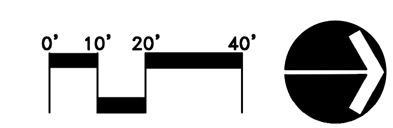
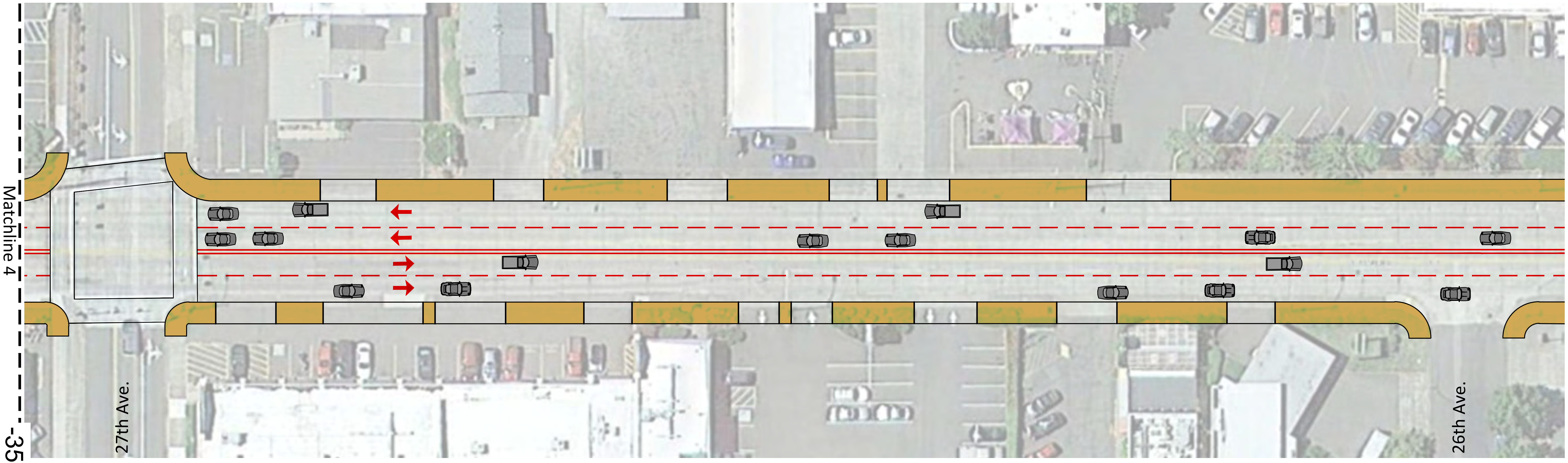
Crosswalk and
Pedestrian Hybrid Beacon



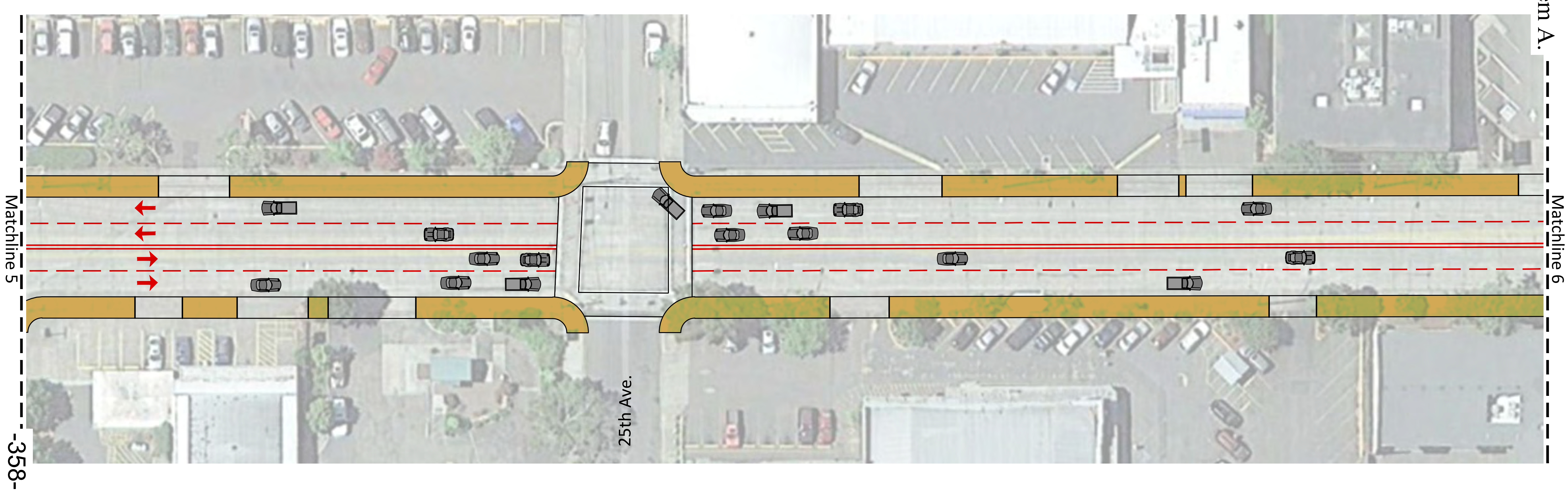


-357-

Alternative 1: 4-Lane

Legend

Item A.



Alternative 1: 4-Lane

Legend

Travel & Turn Lanes

Pedestrian Crossing at Intersection

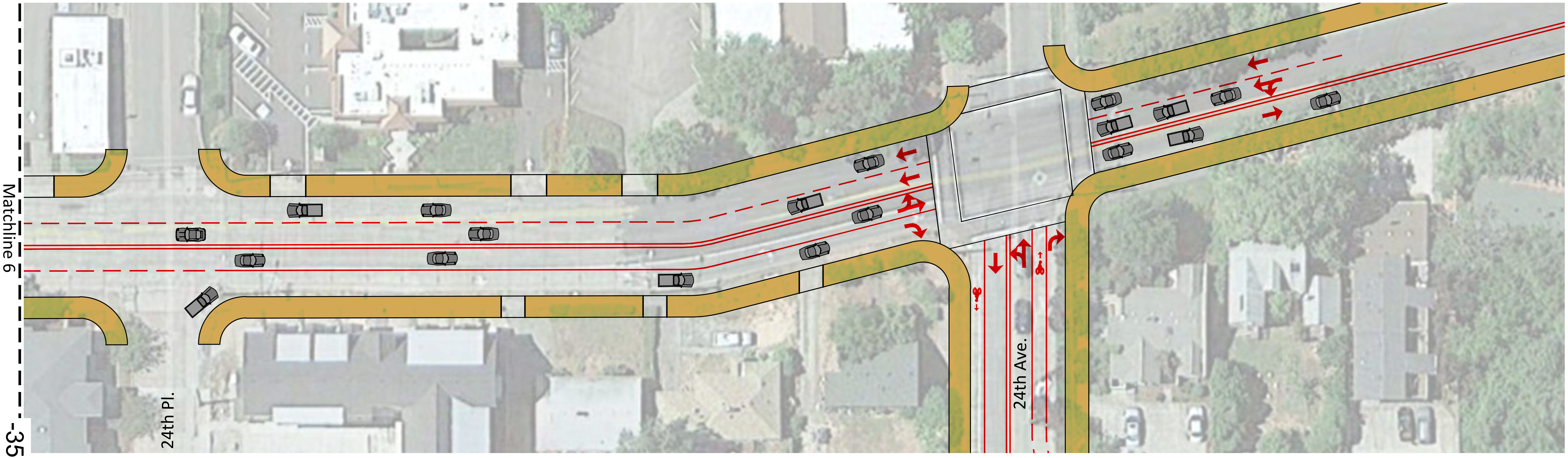
Bicycle Lane

Driveway

Sidewalk Corridor

Crosswalk and Pedestrian Hybrid Beacon

0' 10' 20' 40'



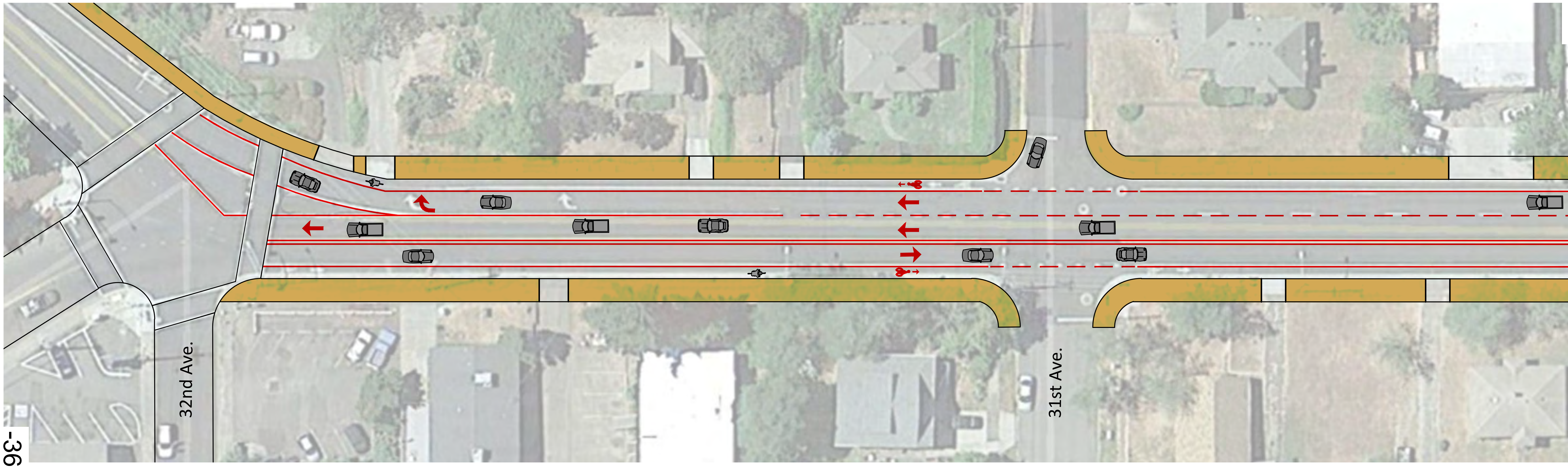
Alternative 1: 4-Lane

Legend

- Travel & Turn Lanes
- Pedestrian Crossing at Intersection
- Bicycle Lane
- Driveway
- Sidewalk Corridor
- Crosswalk and Pedestrian Hybrid Beacon

0' 10' 20' 40'

Sheet 7 c



Alternative 3: 3-Lane with Bike Lanes

Legend

Travel & Turn Lanes

Pedestrian Crossing at Intersection

Bicycle Lane

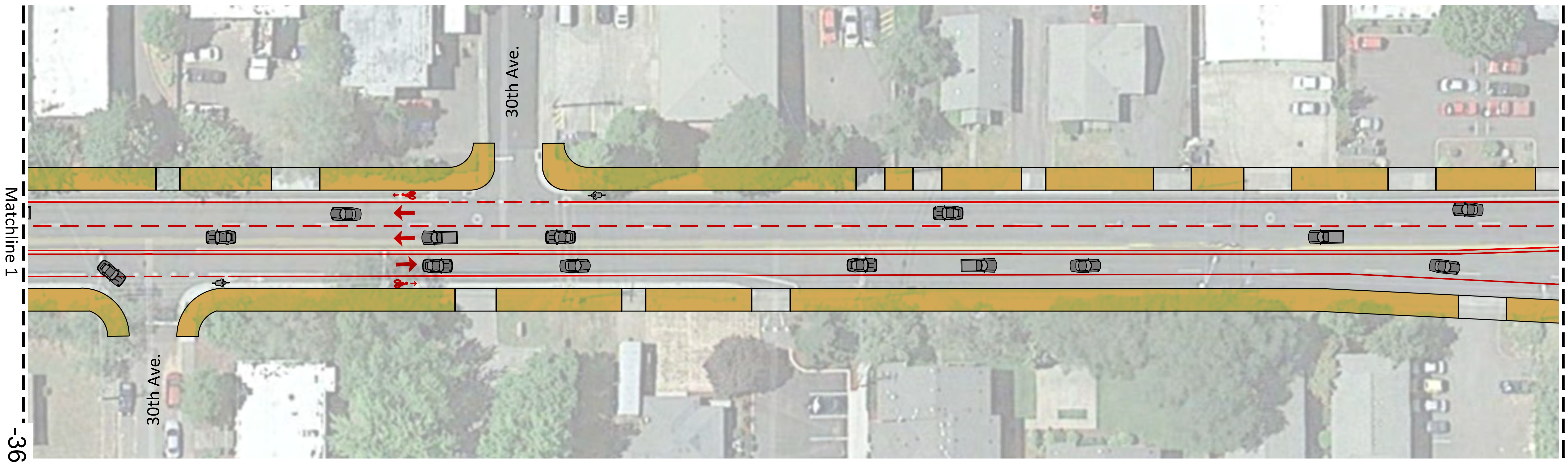
Driveway

Raised Pedestrian Island

Sidewalk Corridor

0' 10' 20' 40'

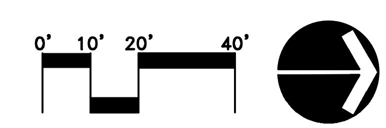
Sheet 1 of 7



Alternative 3: 3-Lane with Bike Lanes

Legend

- Travel & Turn Lanes
- Pedestrian Crossing at Intersection
- Bicycle Lane
- Driveway
- Raised Pedestrian Island
- Sidewalk Corridor



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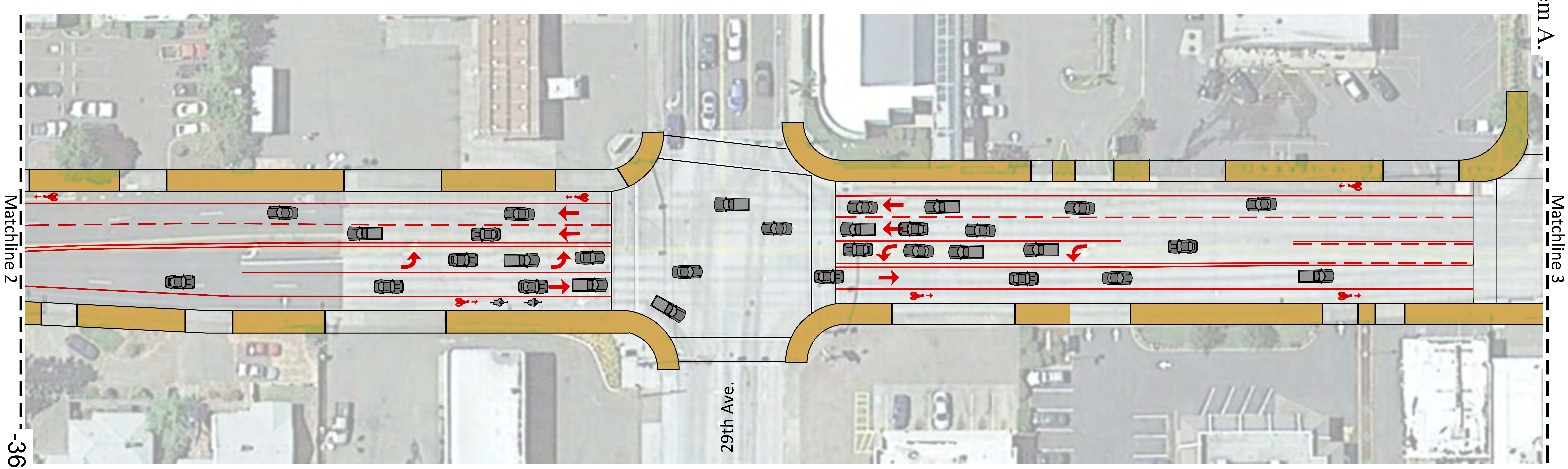
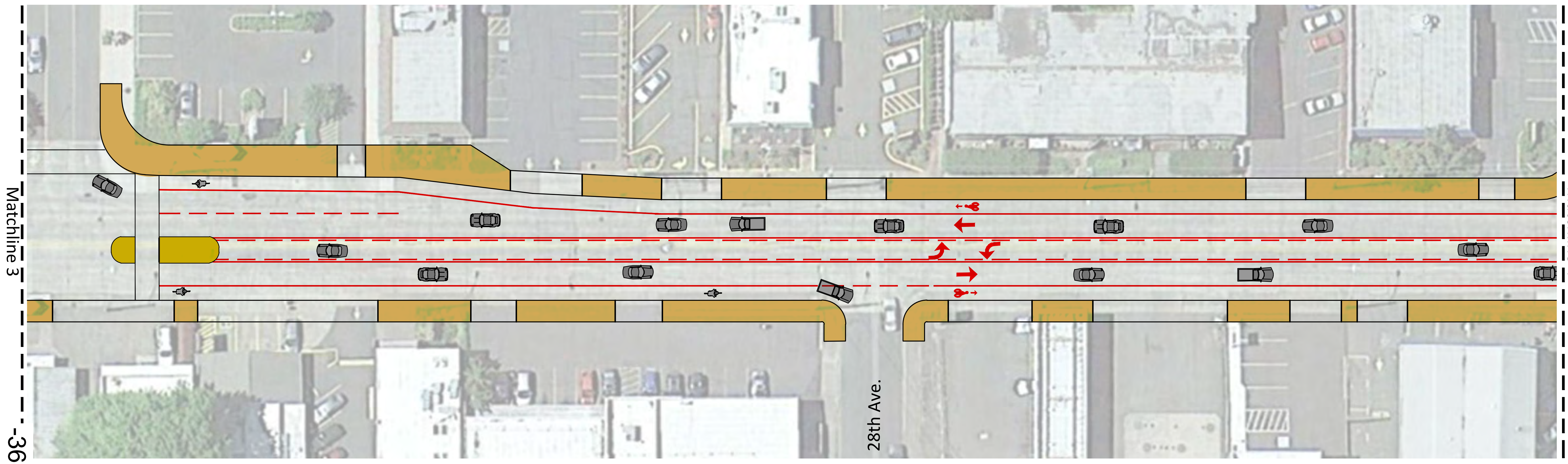


Alternative 3: 3-Lane with Bike Lanes

Legend

- Travel & Turn Lanes
- Pedestrian Crossing at Intersection
- Bicycle Lane
- Driveway
- Raised Pedestrian Island
- Sidewalk Corridor

0' 10' 20' 40'



Alternative 3: 3-Lane with Bike Lanes

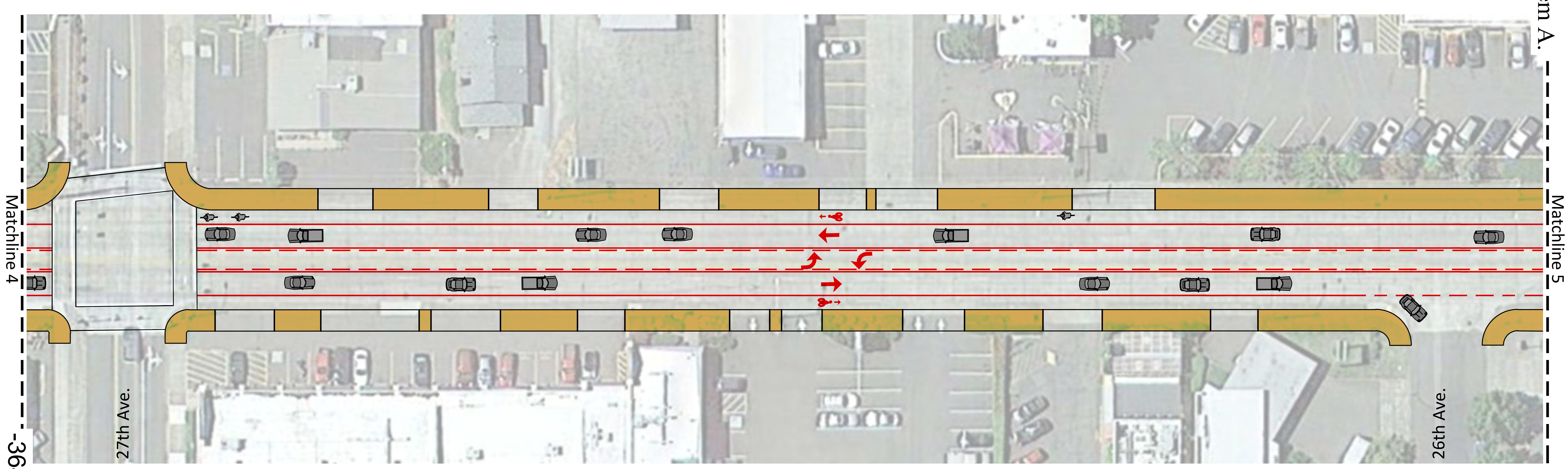
Legend

- Travel & Turn Lanes
- Pedestrian Crossing at Intersection
- Bicycle Lane
- Driveway
- Raised Pedestrian Island
- Sidewalk Corridor

0' 10' 20' 40'

Sheet 4 c

Item A.



Alternative 3: 3-Lane with Bike Lanes

Legend

Travel & Turn Lanes

Pedestrian Crossing at Intersection

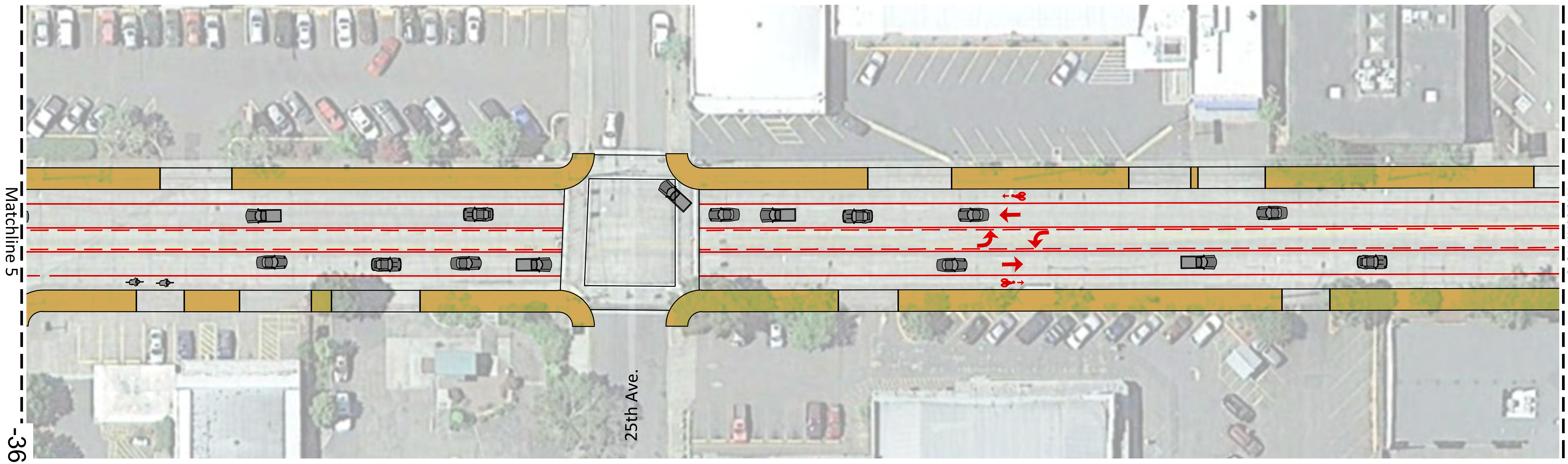
Bicycle Lane

Driveway

Raised Pedestrian Island

Sidewalk Corridor

0' 10' 20' 40'



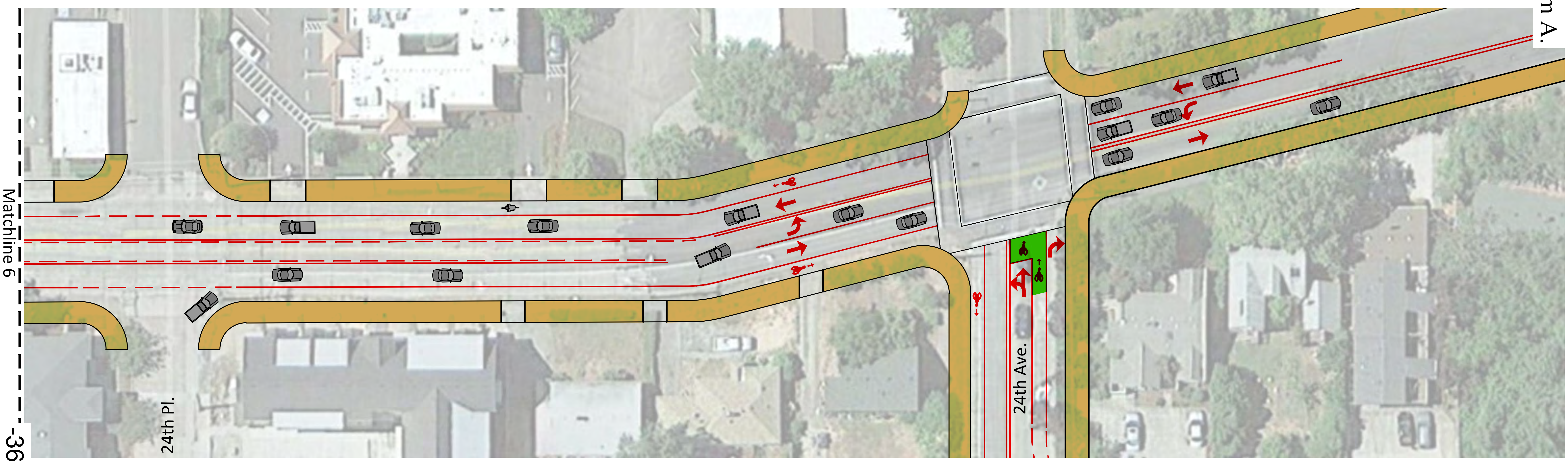
Alternative 3: 3-Lane with Bike Lanes

Legend

- Travel & Turn Lanes
- Pedestrian Crossing at Intersection
- Bicycle Lane
- Driveway
- Raised Pedestrian Island
- Sidewalk Corridor

0' 10' 20' 40'

Sheet 6 c

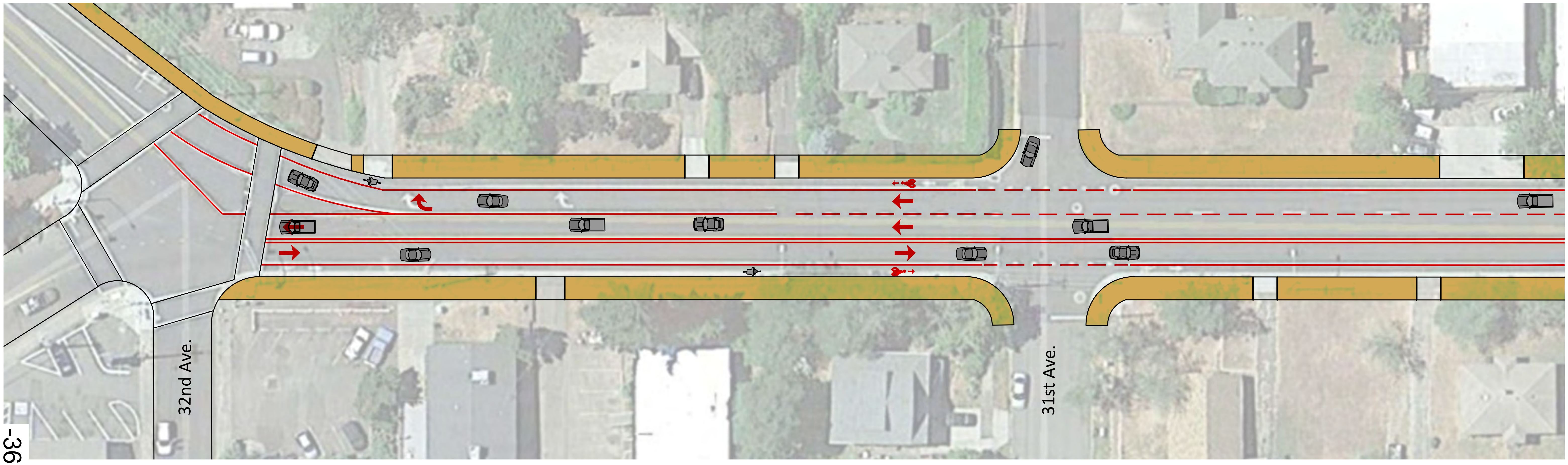


Alternative 3: 3-Lane with Bike Lanes

Legend

- Travel & Turn Lanes
- Pedestrian Crossing at Intersection
- Bicycle Lane
- Driveway
- Raised Pedestrian Island
- Sidewalk Corridor

0' 10' 20' 40'



-367-

Alternative 5: 3-Lane with Wide Sidewalks

Legend

Travel & Turn Lanes

Pedestrian Crossing at Intersection

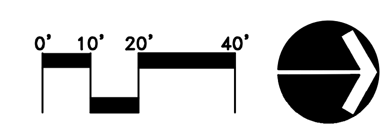
Bicycle Lane

Driveway

Raised Pedestrian Island

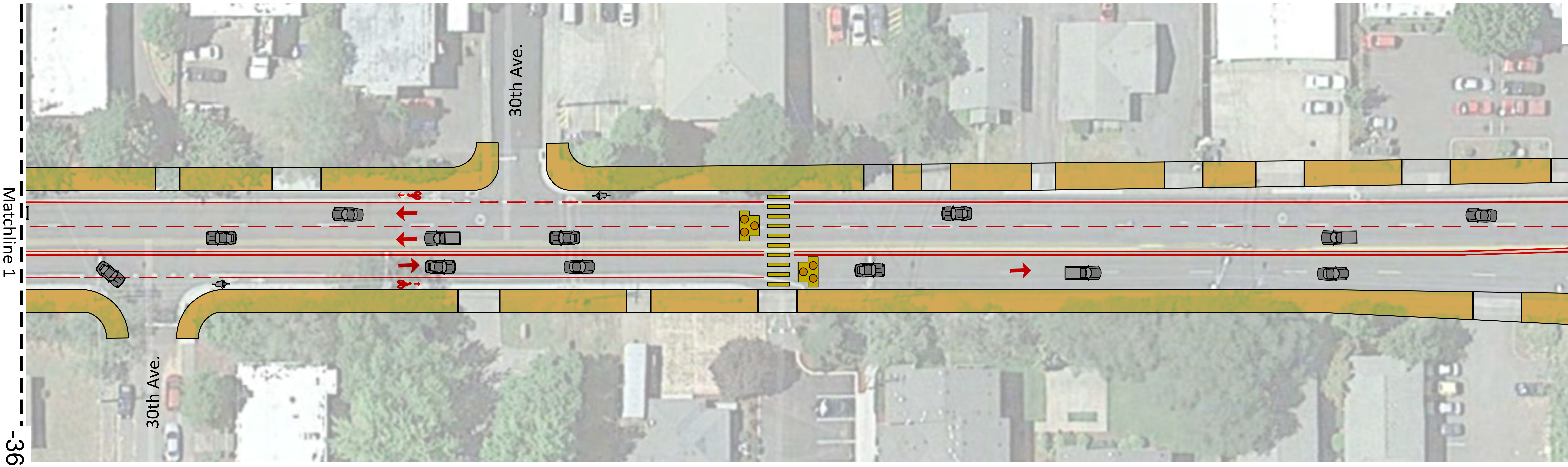
Sidewalk Corridor

Crosswalk and Pedestrian Hybrid Beacon



Sheet 1 c

Item A.



Alternative 5: 3-Lane with Wide Sidewalks

Legend

Travel & Turn Lanes

Pedestrian Crossing at Intersection

Bicycle Lane

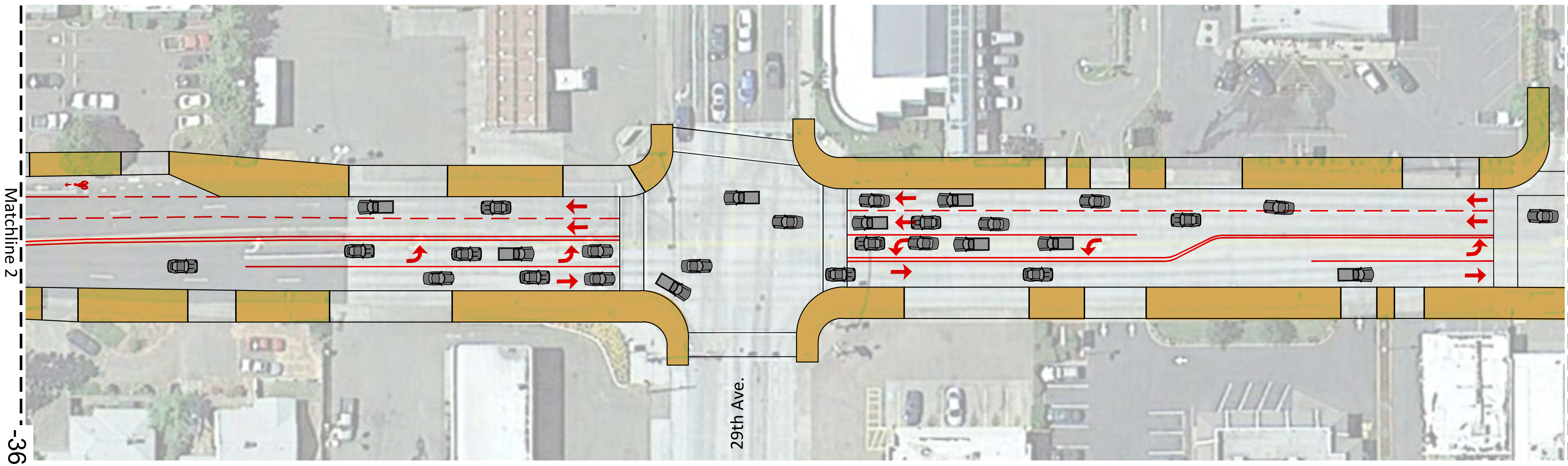
Driveway

Raised Pedestrian Island

Sidewalk Corridor

Crosswalk and HAWK Signal
Pedestrian Hybrid Beacon

0' 10' 20' 40'



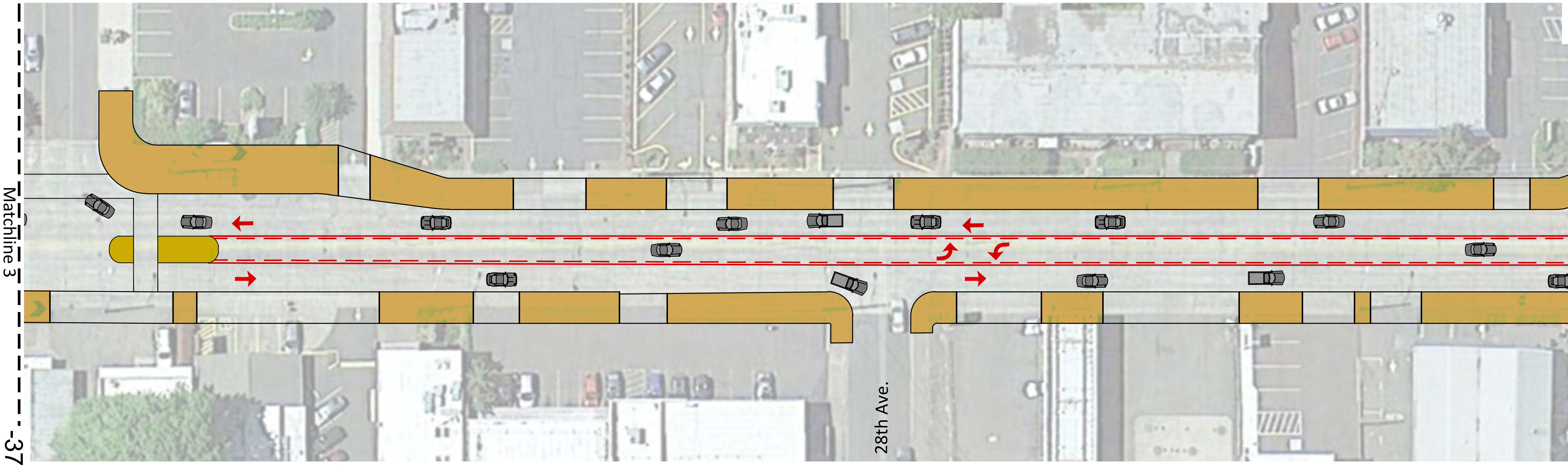
Alternative 5: 3-Lane with Wide Sidewalks

Legend

- Travel & Turn Lanes
- Pedestrian Crossing at Intersection
- Bicycle Lane
- Driveway
- Raised Pedestrian Island
- Sidewalk Corridor
- Crosswalk and HAWK Signal Pedestrian Hybrid Beacon

0' 10' 20' 40'

Sheet 3 c



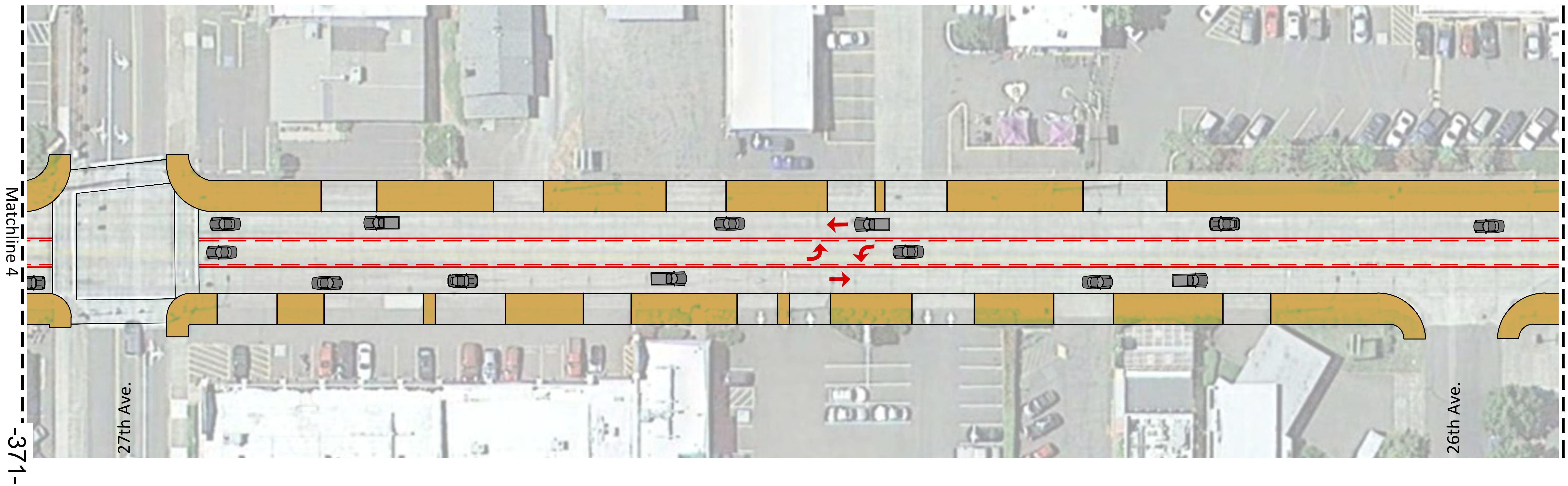
Alternative 5: 3-Lane with Wide Sidewalks

Legend

- Travel & Turn Lanes
- Pedestrian Crossing at Intersection
- Bicycle Lane
- Driveway
- Raised Pedestrian Island
- Sidewalk Corridor
- Crosswalk and HAWK Signal
- Pedestrian Hybrid Beacon

0' 10' 20' 40'

Sheet 4 of 7



Alternative 5: 3-Lane with Wide Sidewalks

Legend

Travel & Turn Lanes

Pedestrian Crossing at Intersection

Bicycle Lane

Driveway

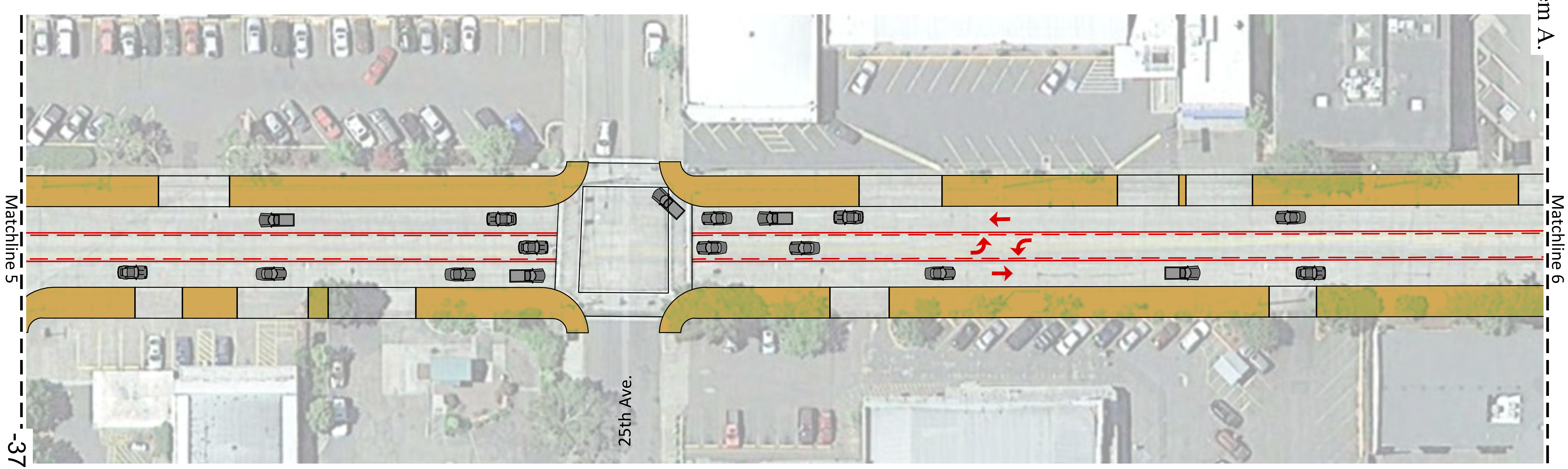
Raised Pedestrian Island

Sidewalk Corridor

Crosswalk and HAWK Signal
Pedestrian Hybrid Beacon

0' 10' 20' 40'

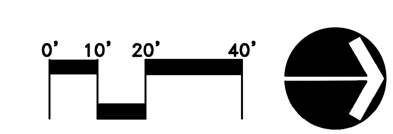
Sheet 5 c

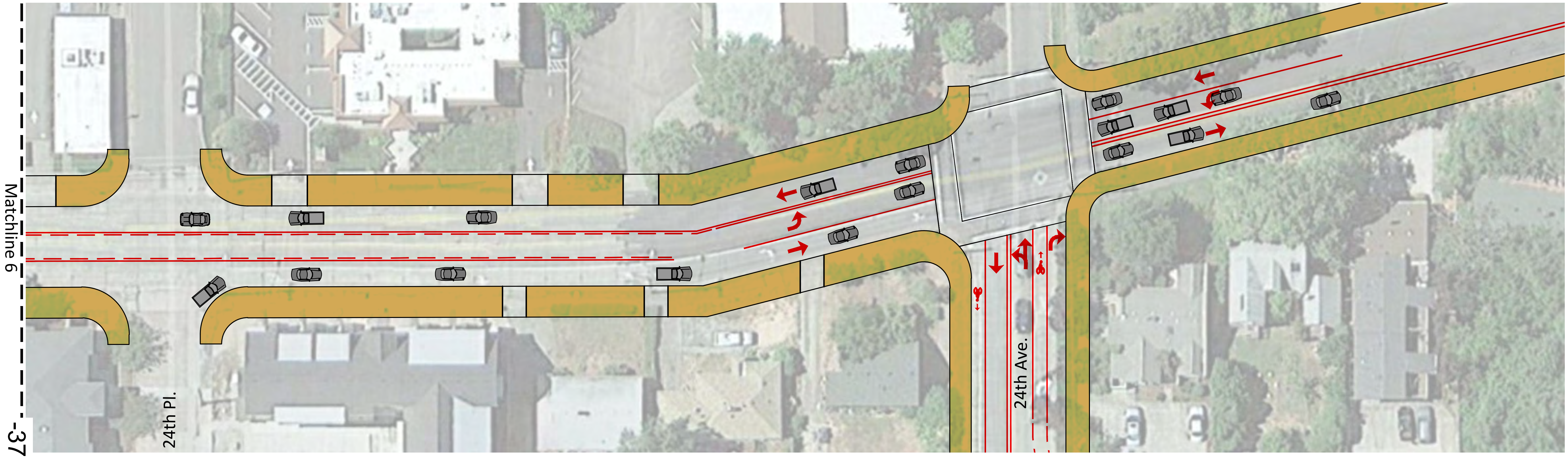


Alternative 5: 3-Lane with Wide Sidewalks

Legend

- Travel & Turn Lanes
- Pedestrian Crossing at Intersection
- Bicycle Lane
- Driveway
- Raised Pedestrian Island
- Sidewalk Corridor
- Crosswalk and HAWK Signal Pedestrian Hybrid Beacon





Alternative 5: 3-Lane with Wide Sidewalks

Legend

- Travel & Turn Lanes
- Pedestrian Crossing at Intersection
- Bicycle Lane
- Driveway
- Raised Pedestrian Island
- Sidewalk Corridor
- Crosswalk and HAWK Signal
- Pedestrian Hybrid Beacon

0' 10' 20' 40'

Sheet 7 c

Item A.

Streetscape Design Basics for Willamette Street

Unifying Elements

Unifying a palette of colors, textures and forms helps assemble a family of streetscape furnishings for Wilamette Street.

Color

Color is a visually unifying element linked to textural materials. Colors can tie together spaces separated by distance and functions.

Texture

Texture can be a unifying element through a simple and consistent palette of materials. The material may be used in varying combinations as part of streetscape designs.

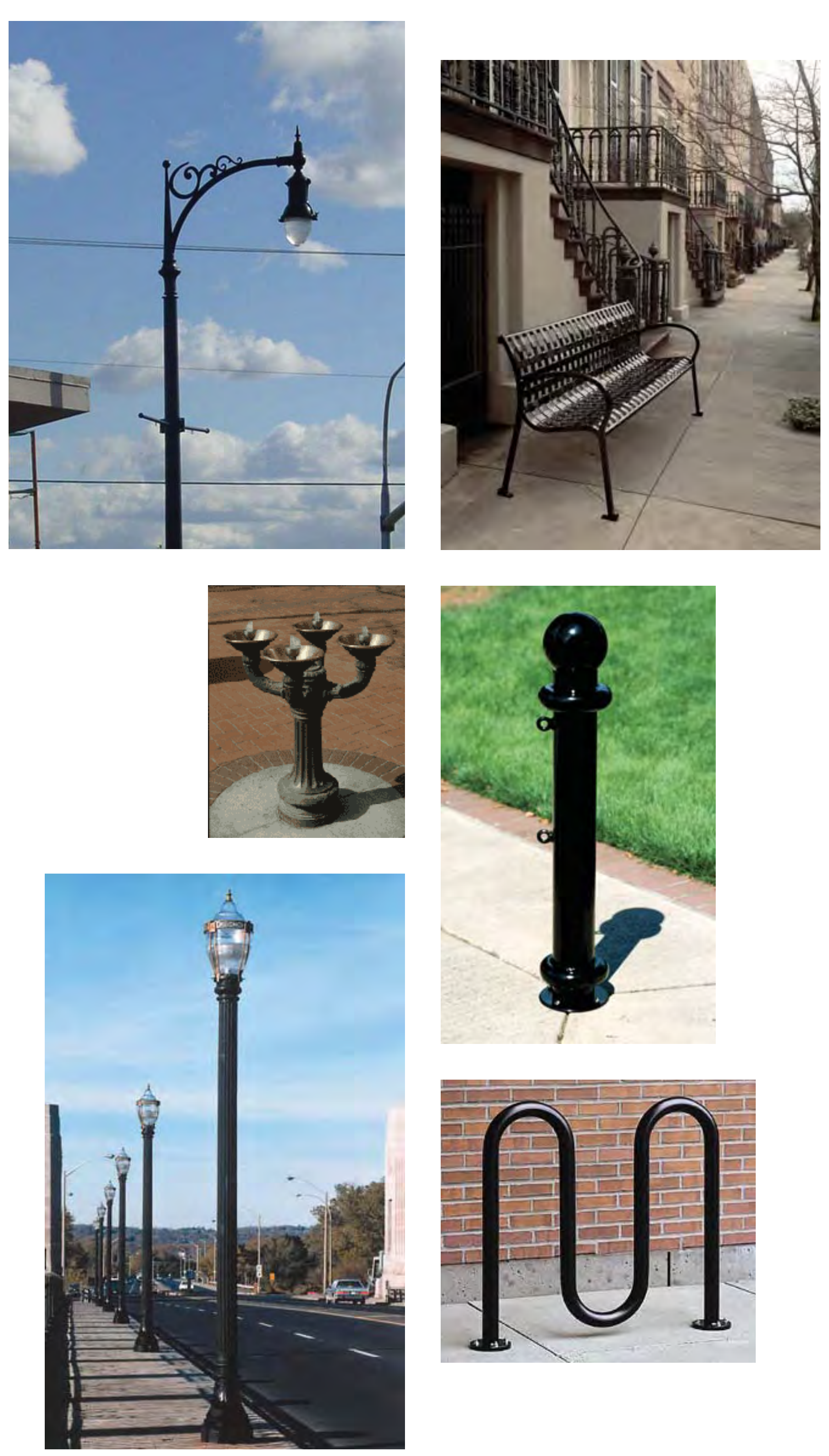
Form

Form can provide both visual unity and interesting visual distinction.

Streetscape Furnishing Themes

Streetscape furnishings are the finishing touches to give Wilamette Street a cohesive sense of place. The emphasis on selecting one unified theme provides a sense of arrival and orientation and provides a human scale connection to the streetscape. Selecting a complementary family of furnishings will provide a thematic consistency that can be applied to the entire corridor.

Traditional



Natural

Contemporary

Streetscape Design Basics for Willamette Street

Public Art

Public art is an opportunity to link us to both the site and our community. Lively public spaces can impact the entire corridor and public art can play an important role in improving the quality of civic life.





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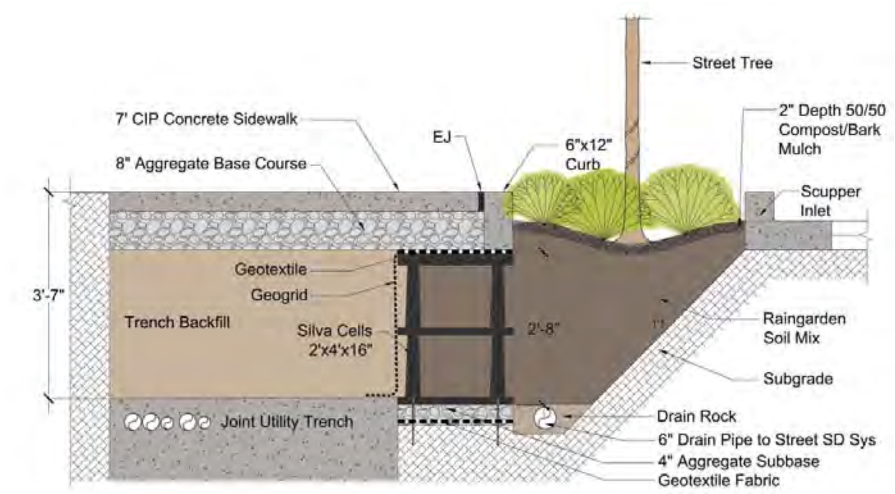
Green Street Opportunities

A Green Street is an opportunity to build a relationship between natural systems and the urban environment. Green Street elements are not only limited to techniques for the management of stormwater within the street right-of-way, they can also maximize opportunities for trees and landscaping.


Stormwater Treatment -Filterra


Stormwater Tretment -Flow Through Planter




Stormwater Treatment -Silva Cells


Energy Conservation -Solar Panels on Bus Stop

Item A.

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SECTION J

TRAFFIC ANALYSIS FOR ROADWAY ALTERNATIVES

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117 Commercial Street NE
Suite 310
Salem, OR 97301
503.391.8773
www.dksassociates.com

MEMORANDUM #8

DATE: June 12, 2013

TO: **Project Management Team**

FROM: Scott Mansur, P.E., PTOE
Mat Dolata, P.E., PTP
Peter Coffey, P.E.

SUBJECT: **South Willamette Street Improvement Plan**
Traffic Analysis for Roadway Alternatives P10086-012

This memorandum summarizes the traffic analysis comparisons of the three alternatives advanced for the South Willamette Street Improvement Plan. The traffic analysis results include estimates of intersection operations, delay, vehicle queuing, travel time, neighborhood traffic shift and multi-modal system performance for bicycles, pedestrians and transit. The configurations of travel lanes, bike lanes, sidewalks, and other roadway elements for each alternative are detailed in Technical Memorandum #7 (Facility Design Alternatives).

Overview

The South Willamette Street Improvement Plan will explore options for people to easily and safely walk, bike, take transit, or drive in an eight-block study area from 24th Avenue to 32nd Avenue. The goal of the study is to help South Willamette Street become a vibrant urban corridor accessible by bicycle, foot, car, and bus. Seven conceptual alternatives have been refined to three based on direction from the City of Eugene staff after receiving community input and reviewing the results of the Tier 1 Screening.

The three alternative configurations advanced to the next screening phase are a 4-lane (Alternative 1), 3-lane with bike lanes (Alternative 3) and 3-lane with wide sidewalks (Alternative 5.) This memorandum, together with Technical Memorandum #7 (Facility Design Alternatives), provides the more detailed description and rigorous analysis of the facility design needed to perform the next level (Tier 2) screening and progress toward a selected design for the corridor.

Traffic Volume Forecasts

Future year travel volume forecasts were developed using the regional travel demand model developed by the Lane Council of Governments (LCOG). The LCOG model provides land use and transportation estimates for base year 2011 and future year 2035. Traffic volumes for 2018 were developed by scaling between traffic counts taken in 2012 and future year 2035 forecasts. Existing conditions and 2035 forecasts are documented in Technical Memorandum #2 (Existing Conditions, Forecast Conditions, and Planned Improvements.) The future year 2018 p.m. peak hour motor vehicle volumes at each study intersection are illustrated in Figure 1 and were used to represent the expected short-term build conditions.

The LCOG travel demand model was also used to evaluate the potential for traffic shifts resulting from modifying portions of Willamette Street from four motor vehicle travel lanes (in Alternative 1) to three (in Alternatives 3 and 5). Due to the anticipated traffic shift of 25 to 100 vehicles in the 2018 p.m. peak hour, the traffic volume forecasts for Alternative 1 differ slightly from the forecasts for Alternatives 3 and 5[1], as shown in Figure 1. The estimates and location of traffic shifts are discussed further in a later section.

Traffic Operations

This section provides a summary of future year (2018) motor vehicle traffic operations based on the traffic volume forecasts developed for 2018.

Peak Hour Intersection Operations

Traffic operations analysis is based on applying *2000 Highway Capacity Manual* methodology[2] for isolated intersections. The estimated average delay, level of service (LOS), and volume to capacity (v/c) ratio of each study intersection is included.

Table 1 compares traffic operations for existing conditions (2012) and future year (2018) conditions for the existing configuration of Willamette Street. As shown, all of the study intersections are anticipated to meet the minimum performance standard of LOS "D" operations. However, more delay is anticipated in 2018 as a result of expected growth in motor vehicle traffic volumes.

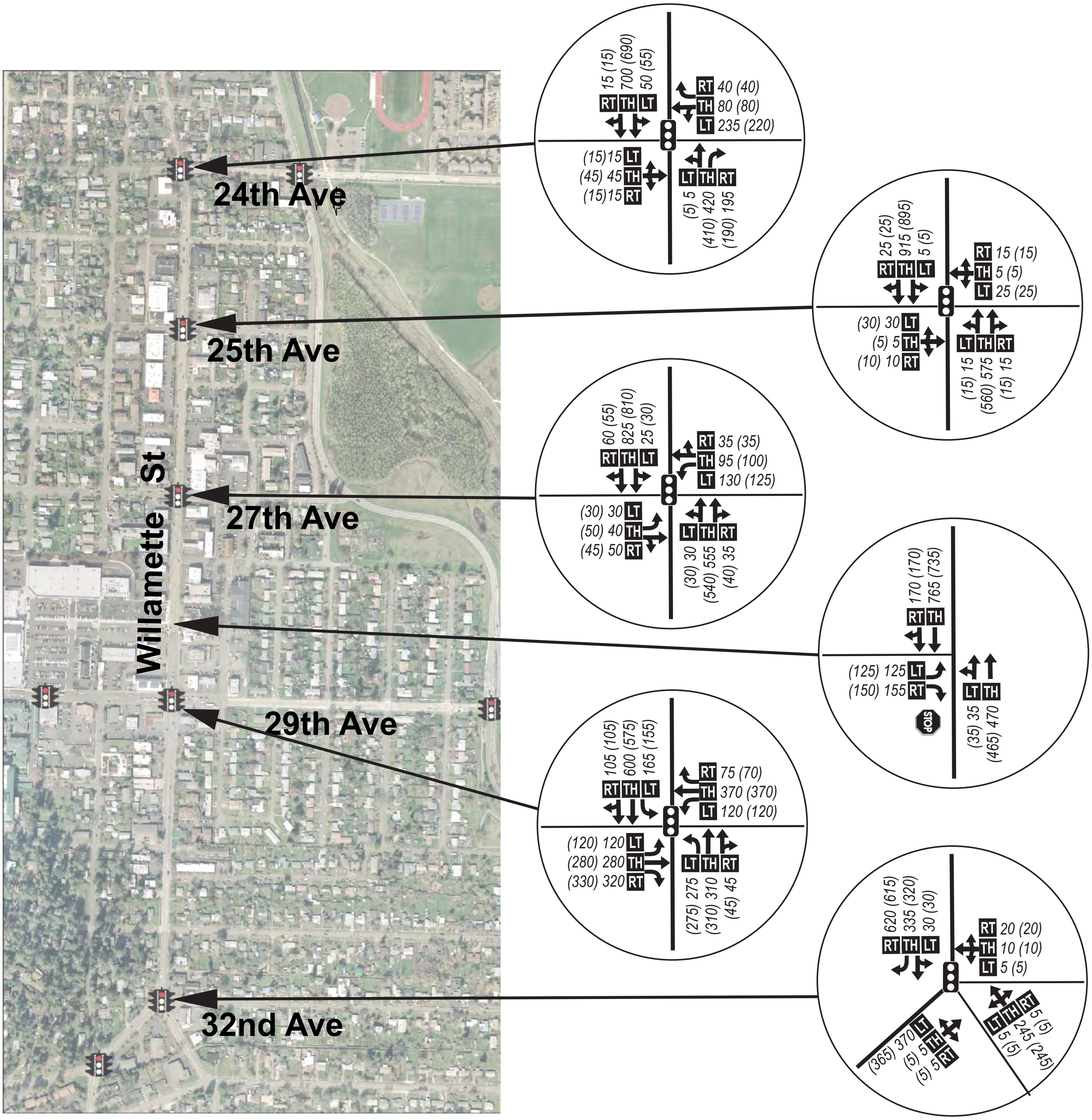
Table 1: Intersection Operations – Existing (2012) and Future No-Build (2018)

Intersection	Operating Standard	Existing P.M. Peak Hour			2018 P.M. Peak Hour		
		Delay	*LOS*	*V/C*	*Delay*	*LOS*	*V/C*
Signalized							
Willamette Street/24th Avenue	LOS D	12.4	B	0.61 (0.74)	12.5	B	0.62 (0.72)
Willamette Street/25th Avenue	LOS D	10.9	B	0.39 (0.50)	11.7	B	0.40 (0.51)
Willamette Street/27th Avenue	LOS D	8.6	A	0.47 (0.50)	9.5	A	0.51 (0.53)
Willamette Street/29th Avenue	LOS D	40.7	D	0.83 (0.85)	46.8	D	0.88 (0.90)
Willamette Street/32nd Avenue	LOS D	6.1	A	0.63 (0.63)	6.6	A	0.64 (0.64)
Unsignalized							
Willamette Street/Woodfield Station Driveway	N/A	4.7	A/D	0.58	4.7	A/D	0.59

Signalized Intersections:
LOS = Level of Service of Intersection
V/C = Volume-to-Capacity Ratio of Intersection (Critical Movement)

Unsignalized Intersections:
LOS = Level of Service of Major Street/Minor Street
V/C = Volume-to-Capacity Ratio of Worst Movement

[1] Although Alternatives 3 and 5 present different corridor configurations, the differences in motor vehicle traffic forecasts are considered to be negligible due to the similarity in motor vehicle capacity through the corridor.
[2] *2000 Highway Capacity Manual*, Transportation Research Board, Washington DC, 2000.



LEGEND

- Stop Sign
- Traffic Signal
- Lane Configuration

000 - **Alternative 1** - PM Peak Hour Traffic Volumes

(000) - **Alternatives 3 & 5** - PM Peak Hour Traffic Volumes

LT TH RT (Left•Thru•Right) - Volume Turn Movement

DKS

No Scale

Figure 1

2018 PM PEAK HOUR TRAFFIC VOLUMES

Table 2 compares 2018 p.m. peak hour traffic operations for Alternatives 1, 3, and 5[3]. Alternatives 3 and 5 are considered to be the same for motor vehicle traffic operations. The design and configuration of each alternative is further detailed in Technical Memorandum #7 (Facility Design Alternatives). Key facility design assumptions affecting traffic operations are listed below:

- Applying the proposed 3-lane facility design (for Alternatives 3 and 5) on Willamette Street at the 29th Avenue would result in failing operations (LOS F) with traffic demand reaching capacity (v/c of 1.0). Therefore, a modified design including both of the existing southbound through travel lanes (and a left turn pocket) at 29th Avenue is proposed for Alternatives 3 and 5. In this configuration there would be one southbound travel lane at 24th Avenue through 27th Avenue, with the second southbound lane added approximately 100 feet north of the Woodfield Station Driveway and continuing southward to the 32nd Avenue intersection. Through iterative testing of traffic operations at the 29th Avenue intersection, it was determined that adding a second lane at this distance (approximately 450 feet from 29th Avenue) would approximately match the southbound capacity of the intersection in Alternative 1.
- For northbound travel through the 29th Avenue intersection, there are two travel lanes on Willamette Street included in Alternative 1 and one in Alternatives 3 and 5. The existing second northbound travel lane would be replaced by bike lanes (Alternative 3) or wider sidewalks (Alternative 5).
- A traffic signal at the Woodfield Station Driveway intersection is assumed to be constructed in each alternative. The signal provides a pedestrian crossing and improved turning opportunities for motor vehicle traffic.
- The Willamette Street approaches at 24th Avenue, 25th Avenue, and 27th Avenue intersections each have one through lane and a center left turn lane (with permissive left turn signal phasing assumed) in Alternatives 3 and 5.

Table 2: Intersection Operations for Alternatives - Future Year 2018 P.M. Peak Hour

Intersection	Operating Standard	Alternative 1			Alternative 3 and 5		
		Delay	*LOS*	*V/C*	*Delay*	*LOS*	*V/C*
Willamette Street/24th Avenue	LOS D	13.2	B	0.63 (0.75)	22.4	C	0.80 (0.81)
Willamette Street/25th Avenue	LOS D	11.8	B	0.40 (0.51)	17.4	B	0.69 (0.91)
Willamette Street/27th Avenue	LOS D	10.7	B	0.51 (0.53)	13.9	B	0.82 (0.94)
Willamette Street/Woodfield Station Driveway	LOS D	12.0	B	0.41 (0.46)	16.2	B	0.45 (0.50)
Willamette Street/29th Avenue[4]	LOS D	48.5	D	0.87 (0.90)	56.3	E	0.90 (0.94)
Willamette Street/32nd Avenue	LOS D	6.6	A	0.64 (0.64)	6.4	A	0.63 (0.63)

Signalized Intersections:
LOS = Level of Service of Intersection
V/C = Volume-to-Capacity Ratio of Intersection (Critical Movement)

[3] The 2018 traffic analysis of alternatives assumes bus service frequency is doubled compared to existing service. Pedestrian crossing volumes at study intersections are also assumed to approximately double.
[4] The saturation flow rate for the northbound approach was reduced by approximately 15% to reflect simulation results showing lanes being blocked in Alternatives 3 and 5.

For most study intersections, more delay is anticipated in Alternatives 3 and 5 due to the reduction of travel lanes for motor vehicles. However, all of the study intersections are anticipated to meet the minimum performance standard of LOS "D" operations in all alternatives, with the exception of Willamette Street at 29th Avenue in Alternative 3 or 5.

At the intersection of Willamette Street and 29th Avenue, the southbound capacity is maintained (two southbound travel lanes and a left turn pocket) to serve the peak direction of travel (critical movement) resulting in no significant change in traffic delay in the southbound direction. However, the northbound approach has one fewer travel lanes and motor vehicle delay would increase for northbound travel. Furthermore, the northbound left turn lane may regularly exceed the available storage length of 155 feet. In the existing configuration (and Alternative 1), through traveling vehicles may use the right lane to get around when the left lane is blocked by the full left turn lane. With one through travel lane (Alternatives 3 and 5), the second lane will not be available and therefore through traveling vehicles will be blocked. This situation may be mitigated by modifying signal timing to provide more green time to the northbound left turn (which requires increasing delay for other movements) or widening to extend the storage length of the northbound left turn pocket.

Off-Peak Intersection Operations

The following section identifies intersection operations in 2018 during three periods outside of the p.m. peak hour: the a.m. peak hour (8-9 a.m.), the mid-day peak hour (12-1 p.m.), and the p.m. peak shoulder (4-5 p.m.). Traffic volume forecasts for each period were based on the traffic counts and the growth rate identified for the p.m. peak hour[5]. No differences in traffic volumes (shifts in traffic patterns) are assumed to occur between alternatives during the off-peak periods due to lower overall congestion and delay. The results of the off-peak intersection operations analysis, comparing Alternative 1 to Alternatives 3 and 5, are shown in Table 3.

A.M. Peak Hour

The a.m. peak hour has heavier traffic volumes in the northbound direction, mirroring the higher southbound traffic volumes observed during the p.m. peak hour. Overall traffic volumes are lower in the a.m. peak hour than the p.m. peak hour. The existing traffic patterns on Willamette Street are further detailed in Technical Memorandum #2 (Existing Conditions, Forecast Conditions, and Planned Improvements).

As shown in Table 3, for most study intersections, more delay is anticipated in Alternatives 3 and 5 due to the reduction of travel lanes for motor vehicles. However, all of the study intersections are anticipated to meet the minimum performance standard of LOS "D" operations in all alternatives for the a.m. peak hour, with the exception of Willamette Street at 29th Avenue in Alternative 3 or 5.

Compared to the p.m. peak hour, there is generally less average delay during the a.m. peak at Willamette Street intersections between 24th Avenue and the Woodfield Station Driveway. However, due to the directional characteristics of the a.m. traffic volume, delay on northbound approaches is higher in the a.m. peak.

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[5] The 2018 p.m. peak hour growth rate for each intersection was applied to the traffic counts taken for the a.m. peak hour and p.m. peak shoulder to estimate the 2018 turn movement volumes. Although intersection traffic counts were not available for the mid-day peak hour, 24-hour bidirectional counts taken on Willamette Street (south of 27th Avenue) were used together with the p.m. peak hour intersection traffic counts to estimate the intersection turn movements from 12-1 p.m.

Table 3: Intersection Operations for Alternatives – Future Year 2018 Off-Peak Hours

Intersection	Operating Standard	Alternative 1			Alternative 3 and 5		
		Delay	*LOS*	*V/C*	*Delay*	*LOS*	*V/C*
A.M. Peak Hour							
Willamette Street/24th Avenue	LOS D	8.9	A	0.55 (0.56)	12.5	B	0.73 (0.86)
Willamette Street/25th Avenue	LOS D	6.6	A	0.36 (0.48)	12.0	B	0.62 (0.85)
Willamette Street/27th Avenue	LOS D	8.1	A	0.39 (0.45)	15.8	B	0.69 (0.85)
Willamette Street/Woodfield Station Driveway	LOS D	5.4	A	0.32 (0.37)	6.9	A	0.55 (0.50)
Willamette Street/29th Avenue	LOS D	44.6	D	0.80 (0.90)	58.9	E	0.97 (0.97)
Willamette Street/32nd Avenue	LOS D	14.3	B	0.81 (0.83)	14.3	B	0.81(0.83)
Mid-day Peak Hour							
Willamette Street/24th Avenue	LOS D	10.1	B	0.58 (0.65)	17.4	B	0.72 (0.72)
Willamette Street/25th Avenue	LOS D	10.0	A	0.31 (0.39)	14.0	B	0.54 (0.70)
Willamette Street/27th Avenue	LOS D	8.4	A	0.40 (0.42)	12.1	B	0.67 (0.76)
Willamette Street/Woodfield Station Driveway	LOS D	10.2	B	0.32 (0.36)	11.9	B	0.51 (0.53)
Willamette Street/29th Avenue	LOS D	42.6	D	0.68 (0.86)	48.3	D	0.80 (0.88)
Willamette Street/32nd Avenue	LOS D	7.0	A	0.67 (0.67)	7.0	A	0.67 (0.67)
P.M. Peak Shoulder Hour							
Willamette Street/24th Avenue	LOS D	10.6	B	0.56 (0.64)	19.5	B	0.69 (0.72)
Willamette Street/25th Avenue	LOS D	9.1	A	0.38 (0.48)	16.3	B	0.66 (0.85)
Willamette Street/27th Avenue	LOS D	10.6	B	0.52 (0.55)	15.7	B	0.84 (0.95)
Willamette Street/Woodfield Station Driveway	LOS D	11.1	B	0.38 (0.43)	15.2	B	0.43 (0.46)
Willamette Street/29th Avenue	LOS D	48.3	D	0.81 (0.91)	53.9	D	0.87 (0.93)
Willamette Street/32nd Avenue	LOS D	6.8	A	0.62 (0.62)	6.8	A	0.62 (0.62)

Signalized Intersections:
LOS = Level of Service of Intersection
V/C = Volume-to-Capacity Ratio of Intersection (Critical Movement)

The intersection at 29th Avenue would have higher overall average delay in Alternative 3 and 5 during the a.m. peak hour compared to the p.m. peak hour. Alternative 3 and 5 provide one northbound through lane (compared to two in Alternative 1). The northbound approach volumes would come close to the available capacity during the 2018 a.m. peak, resulting in slightly higher overall delay compared to the p.m. peak hour. As in the p.m. peak hour, the intersection operations for Alternative 3 and 5 would be LOS "E" at the 29th Avenue intersection, exceeding the existing minimum performance standard for operations.

Mid-day Peak Hour

Overall traffic volumes in the mid-day peak hour are expected to be lower than in either the a.m. or p.m. peak hours. The mid-day peak hour has relatively balanced traffic volumes in the southbound and northbound directions. As shown in Table 3, all of the study intersections are anticipated to meet the minimum performance standard of LOS “D” operations in all alternatives for the mid-day peak hour. For most study intersections, more delay is anticipated in Alternatives 3 and 5 due to the reduction of travel lanes for motor vehicles.

P.M. Peak Shoulder Hour

The p.m. peak “shoulder” hour is the period that precedes the p.m. peak hour, when overall traffic volumes are slightly lower. Overall traffic volumes during the p.m. peak shoulder are higher than the a.m. or mid-day peak hours. All of the study intersections are anticipated to meet the minimum performance standard of LOS “D” operations in all alternatives, with more delay anticipated in Alternatives 3 and 5 due to the reduction of travel lanes for motor vehicles.

Vehicle Queuing

The following section describes the differences in estimated p.m. peak hour vehicle queuing between alternatives. Traffic simulations were performed for the 2018 p.m. peak hour to estimate expected vehicle queuing. The simulation results including vehicle queuing for all lane movements are detailed in the appendix. The key changes between alternatives to northbound and southbound queues are shown Table 4. Vehicle queue lengths on side streets would be generally unaffected by the proposed changes on Willamette Street for Alternatives 3 and 5.

The results of the p.m. peak hour vehicle queuing comparison between Alternative 1 and Alternatives 3 and 5 indicate that vehicle queuing increases most significantly for southbound through travel between 24th Avenue and 27th Avenue and northbound through travel at 29th Avenue. Average southbound vehicle queues between 24th and 27th Avenue may increase by 50 to 150 feet (or approximately 2-6 car lengths) at these intersections. However, with dedicated left turn lanes present, vehicle queues for left turns would decrease.

At 29th Avenue, removing one of the two northbound through travel lanes would increase northbound vehicle queues by up to 200 feet (or approximately 8 car lengths). As a result, access to the northbound left turn lane may be blocked more frequently during peak hours.

Table 4: Estimated Vehicle Queuing Comparison for Alternatives - Future Year 2018 P.M. Peak Hour

Intersection	Movement/ Direction	Alternative 1		Alternative 3 or 5	
		Average	*95th*	Average	*95th*
Willamette Street/ 24th Avenue	Southbound	180	*290*	250	*430*
	Northbound	100	*170*	180	*260*
	Comment: The existing lane configurations include two shared through/turn lanes southbound and a shared through/left lane with a dedicated right turn lane northbound. This configuration would be modified in Alternatives 3 and 5 to include a shared right/through lane with a dedicated left turn lane in both directions. As a result, operational efficiency would decrease and northbound and southbound vehicle queues would increase by 70 to 140 feet.				
Willamette Street/ 25th Avenue	Southbound	140	*230*	290	*570*
	Northbound	100	*190*	220	*370*
	Comment: By converting from two through lanes to a single lane (and center left turn lane), the northbound and southbound vehicle queues would be approximately twice as long in Alternatives 3 and 5, increasing by 120 to 340 feet. Vehicle queues on the minor street would be relatively unchanged.				
Willamette Street/ 27th Avenue	Southbound	100	*190*	230	*560*
	Northbound	100	*160*	160	*290*
	Comment: By converting from two through lanes to a single lane (and center left turn lane), the northbound and southbound vehicle queues would be approximately twice as long in Alternatives 3 and 5, increasing by 60 to 370 feet. Vehicle queues on the minor street would be relatively unchanged.				
Willamette Street/ Woodfield Station Driveway	Southbound	180	*290*	230	*320*
	Northbound	50	*110*	40	*100*
	Comment: Alternatives 3 and 5 would modify the existing northbound configuration from two shared through/turn lanes to one lane with a dedicated left turn lane into the Woodfield Station Driveway. The northbound left would provide protected left turn phasing at the intersection. Southbound, one of the two travel lanes would begin 100 feet north of the intersection, therefore storage for queuing vehicles would decrease and longer queues may increase by approximately 50 feet in Alternatives 3 and 4. Vehicle queues on the Woodfield Station Driveway would be relatively unchanged.				
Willamette Street/ 29th Avenue	Southbound	220	*300*	220	*300*
	Northbound (Through/Right)	140	*300*	310	*530*
	Northbound (Left)	190	*270*	220	*300*
	Comment: Southbound vehicle queue lengths would not significantly change in Alternatives 3 and 5 (assuming the two southbound lanes are retained as described previously). The proposed northbound lane reduction (from 2 to 1 for through travel) would result in vehicle queues increasing by approximately 200 feet. In addition, when the 155 foot-long northbound left turn lane fills up, through traveling vehicles will not have a second lane available to pass the left-turn queue. As a result, the 29th Avenue intersection may operate less efficiently during peak times.				
Willamette Street/ 32nd Avenue	Comment: There are no changes to lane configurations at this intersection. As a result, no significant changes to vehicle queuing were found.				

Average = Average simulation queue length (feet)
95th = Ninety fifth percentile (highest five percent) simulation queue length (feet)

Travel Time

The following section describes the estimated p.m. peak hour travel times for alternatives. Traffic simulations were performed for the 2018 p.m. peak hour to estimate travel time between 24th Avenue and 32nd Avenue in both directions. The base year simulations were calibrated to field-measured travel times. The simulation results including travel times are detailed in the appendix.

The estimated travel times for each alternative are summarized in Table 5. Results of the simulation indicate travel times would increase by approximately 30 seconds in both directions for Alternatives 3 and 5. In addition, the reliability of travel time may be better in Alternative 1, as simulation results for Alternatives 3 and 5 showed increased variance.

Table 5: Estimated Travel Time Comparison for Alternatives - Future Year 2018 P.M. Peak Hour

Direction	Alternative 1	Alternative 3 and 5
Northbound: 32nd Avenue to 24th Avenue	2 minutes 55 seconds – 3 minutes 05 seconds	3 minutes 15 seconds – 3 minutes 45 seconds
Southbound: 24th Avenue to 32nd Avenue	3 minutes 20 seconds – 4 minutes 10 seconds	3 minutes 30 seconds – 4 minutes 50 seconds

Roundabout Evaluation

Roundabouts can improve traffic flow and reduce overall delay at many roadway intersections. Roundabouts generally reduce the number of overall collisions and fatalities when they are installed and are less expensive to operate and maintain compared to traffic signals. However, emergency vehicle and truck operators may be opposed to roundabouts in sensitive areas. Furthermore, there may be significant property acquisition costs to provide the right-of-way needed to construct appropriately-sized roundabouts.

To evaluate the effectiveness of roundabouts on Willamette Street, each of the study intersections was analyzed with a potential roundabout configuration. The assumed size and layout of the roundabouts analyzed are typical for urban environments. The results of the traffic operations analysis for the 2018 p.m. peak hour are summarized in Table 6.

Table 6: Intersection Operations for Roundabouts - Future Year 2018 P.M. Peak Hour

Intersection	Delay	LOS	V/C	Roundabout Layout
Willamette Street/24th Avenue	18.9	B (C)	0.97	Single-lane
Willamette Street/25th Avenue	7.3	A (C)	0.74	Single-lane
Willamette Street/27th Avenue	18.9	B (C)	0.97	Single-lane
Willamette Street/Woodfield Station Driveway	9.2	A (C)	0.67	Single-lane (3-leg)
Willamette Street/29th Avenue	22.4	C (D)	0.89	Multi-lane Roundabout (2-lanes)
Willamette Street/32nd Avenue	10.8	B (B)	0.70	Single-lane

Delay = Average Delay (seconds) on all intersection movements
LOS = Level of service of intersection (and worst approach)
V/C = Volume-to-Capacity Ratio (measured for worst approach)
Note: Operations analysis based on NCHRP 572 capacity model (adopted by ODOT)

The analysis indicates that several intersections would have approaches operating near capacity during the p.m. peak hour if constructed as single lane roundabouts. At the intersection of 24th Avenue, the southbound approach of Willamette Street would be near capacity during the p.m. peak hour, due in part to the volume of southbound vehicles conflicting with westbound left turns from 24th Avenue to Willamette Street. A similar situation would exist at 27th Avenue, where the southbound approach would also be near capacity. Although roundabout operations would adequately serve traffic demand at the 25th Avenue and Woodfield Station Driveway intersections, mixing traffic signals and roundabouts in close proximity along the corridor could present negative outcomes for traffic operations and safety due to driver expectations.

The intersection of Willamette Street and 29th Avenue would need to be constructed as a multi-lane roundabout to sufficiently serve the traffic demand. Constructing such a roundabout would result in significant property acquisition at the intersection, as detailed in Technical Memorandum #7 (Facility Design Alternatives). Due to the roadway slope and sight distance on Willamette Street south of the 32nd Avenue intersection, a potential roundabout at this location may not be appropriate and would require further analysis.

While it is possible for larger roundabouts (with additional lanes) to adequately serve the future peak hour traffic demand, the costs of right-of-way acquisition and impacts to business owners and properties adjacent to these intersections would be significant. Roundabouts are not explicitly included in the facility design of any alternative but may be considered further as potential design refinements.

Bicycle Lanes Effects on Traffic Operations

The bicycle lanes included in Alternative 3 would make Willamette Street a more attractive bike route to many types of riders. The bike lanes would also provide a buffer for pedestrians. Bike lanes make it easier for cars and trucks to maneuver in and out of driveways, compared to a three-lane section with no bike lanes. In addition, buses would stop in bike lanes during passenger boarding, which would provide additional space for motor vehicles to overtake the bus when it is safe to do so.

However, to construct bike lanes either the roadway must be widened or existing travel lanes must be removed. Previous sections of this memorandum have covered the increased motor vehicle delay that results from removing travel lanes (i.e., traffic operations in Alternative 1 compared to Alternatives 3 and 5). This section discusses the differences in traffic operations between Alternative 3 and Alternative 5 (i.e., the effect of bike lines to otherwise identical roadway configurations).

Although bicycle lanes would not have a significant direct effect on motor vehicle operations, higher volumes of bicycles on the roadway may increase delays for turning motor vehicles. The magnitude of potential increase in bicycle traffic is not precisely known. However, to demonstrate potential sensitivity of motor vehicle operation to bike lanes, the intersection operations analysis was repeated with existing bicycle volumes doubled. Traffic operations analysis outputs, with bicycle volumes doubled for Alternative 3 are included in the appendix.

The results of this analysis indicate that doubling bike volumes would increase average delay per motor vehicle by less than half a second at all study intersections. No changes to level of service results were found to result from this sensitivity test. As a result of this analysis, motor vehicle traffic operations for Alternatives 3 and 5 are considered to be the same.

Bus Pullout Effects on Traffic Operations

Bus pullouts provide a dedicated space outside of the primary travel lane for passenger loading and offloading. Where bus pullouts are constructed, buses exit the travel lane for passenger loading and reenter (merge) after loading is complete. The primary benefit of bus pullouts is that motor vehicles avoid delays when the travel lane is blocked by stopped buses. However, bus service would likely incur increased delay and potential conflicts when attempting to merge back into the travel lane. Therefore, transit operators often prefer to locate bus stops within the travel lane. Lane Transit District (LTD) has no official policy on bus pullouts, but would generally prefer to keep curbside transit stops along Willamette Street.[6]

To attempt to quantify the effect of including bus pullouts, p.m. peak hour intersection traffic operations were evaluated with and without bus blockages for Alternatives 3 and 5. The analysis assumed the existing service frequency was doubled (i.e., twice the number of buses on the corridor relative to the existing service which provides two per hour north of 29th Avenue and the five per hour south of 29th Avenue.) Details for intersection operations with bus pullouts are included in the appendix. Bus pullouts are not considered for Alternative 1 due to the presence of two travel lanes for most of the corridor.

Although travel time would likely increase a few times an hour for vehicles delayed behind slower-moving buses, the average effect for the overall p.m. peak hour is negligible. The results of the analysis indicate that bus pullouts would reduce average delay per vehicle by less than one second at all study intersections. No changes to level of service results were found.

Due to the relatively minor differences in travel delay, the right of way impacts if constructed, increased difficulty for bus operations and lack of support from LTD, bus pullouts are not included in any of the alternatives. Constructing bus pullouts may be revaluated with future redevelopment of the corridor or if additional transit services are provided (e.g., increased frequency, routing changes.)

Traffic Shift

Potential changes in traffic patterns could result from modifying portions of Willamette Street from four motor vehicle travel lanes (in Alternative 1) to three (in Alternatives 3 and 5). With increased travel times on Willamette Street estimated for Alternative 3 and 5, some traffic may shift away from Willamette Street to other roadways. Table 9 identifies estimated traffic volumes on Willamette Street for each alternative.

The LCOG travel demand model was used to evaluate the potential traffic shift away from Willamette Street and the relative effects to other roadways. The expected traffic shift was estimated by comparing differences in alternative model[7] traffic volumes for the 2035 p.m. peak hour[8]. The traffic shift is expected to be smaller during off-peak periods, when there is less congestion compared to the p.m. peak hour.

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[6] South Willamette Street Improvement Plan Memorandum from Will Mueller, Lane Transit District, March 12, 2013.
[7] Motor vehicle capacity on Willamette Street between 24th Avenue and 29th Avenue was reduced by approximately 33 percent in the model, to reflect the estimated change for through-traveling vehicles along a three-lane arterial compared to a four-lane arterial. This capacity reduction is based on typical travel demand model assumptions for capacities of urban roadways. For the modified design proposed in Alternatives 3 and 5, the addition of a second southbound travel lane near 29th Avenue would provide more capacity than is represented in the travel demand model. As a result of this simplified assumption, the change in capacity in the models is likely to be overestimated relative to the modified facility design. Therefore, the model traffic shift may be considered a high-end estimate.
[8] The LCOG travel demand models for the 2035 p.m. peak hour indicate that approximately 350 vehicles may shift from traveling via Willamette Street. This represents approximately 20 percent of total estimated traffic volumes for the 2035 p.m. peak hour. Because

Table 9: Willamette Street Traffic Volume Comparison for Alternatives –Future Year 2018

Scenario/Measure	Average Daily	P.M. Peak Hour
Current Year (2012)	16,360	1,550
Alternative 1	17,200	1,625
Alternative 3 & 5	16,700 to 17,100	1,525 to 1,600
Change (compared to Alternative 1)	100 to 500	25 to 100
Percent Change (compared to Alternative 1)	1 to 3%	2 to 6%
Traffic volume estimates are for Willamette Street south of 27th Avenue		

The distribution of traffic shifts rerouting away from Willamette Street was based on analysis of the LCOG regional travel demand model results. Traffic shifting away from Willamette Street would primarily reroute to streets east of Willamette Street. Approximately two thirds of the shift would go to Amazon Parkway and Hilyard Street. Approximately one third of the shift would redistribute to streets west of Willamette Street including Lincoln Street, Jefferson Street, Adams Street and Polk Street. The traffic shift west of Willamette Street would be fairly evenly distributed between those roadways.

Multimodal Level of Service

Auto, pedestrian, bicycle and transit operations along Willamette Street were evaluated using the multi-modal level of service (MMLOS) methodologies outlined in the *Highway Capacity Manual 2010 (HCM2010)*[9]. The MMLOS evaluation assesses how well a facility meets the needs of the traveling community by reporting a LOS grade (A-F) for each mode of transportation. This evaluation is performed for roadway segments and focuses on the users' perceived comfort level as they travel along the corridor.

Using signalized intersections as break points, Willamette Street was divided into four segments for analysis. Analysis was performed based on 2018 p.m. peak hour conditions when the higher traffic volumes would result in the worst case level of service for each mode of transportation. The methodology does not account for intersection operations, which were addressed previously.

Pedestrian LOS is influenced by traffic volumes, vehicle speeds, sidewalk width, and presence of a buffer. Bicycle LOS is influenced by bike lane width, pavement quality, on-street parking, and heavy vehicle percentage. Transit LOS is influenced by service frequency, bus reliability, average passenger load, and transit stop amenities.

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traffic shifts are assumed to occur in proportion to increases in congestion that will occur with anticipated traffic growth, the estimated traffic shift for 2018 is significantly smaller than in 2035. Traffic volume shift estimates for 2018 were developed by proportionally scaling the 2035 traffic shift to forecasted traffic growth in 2018.

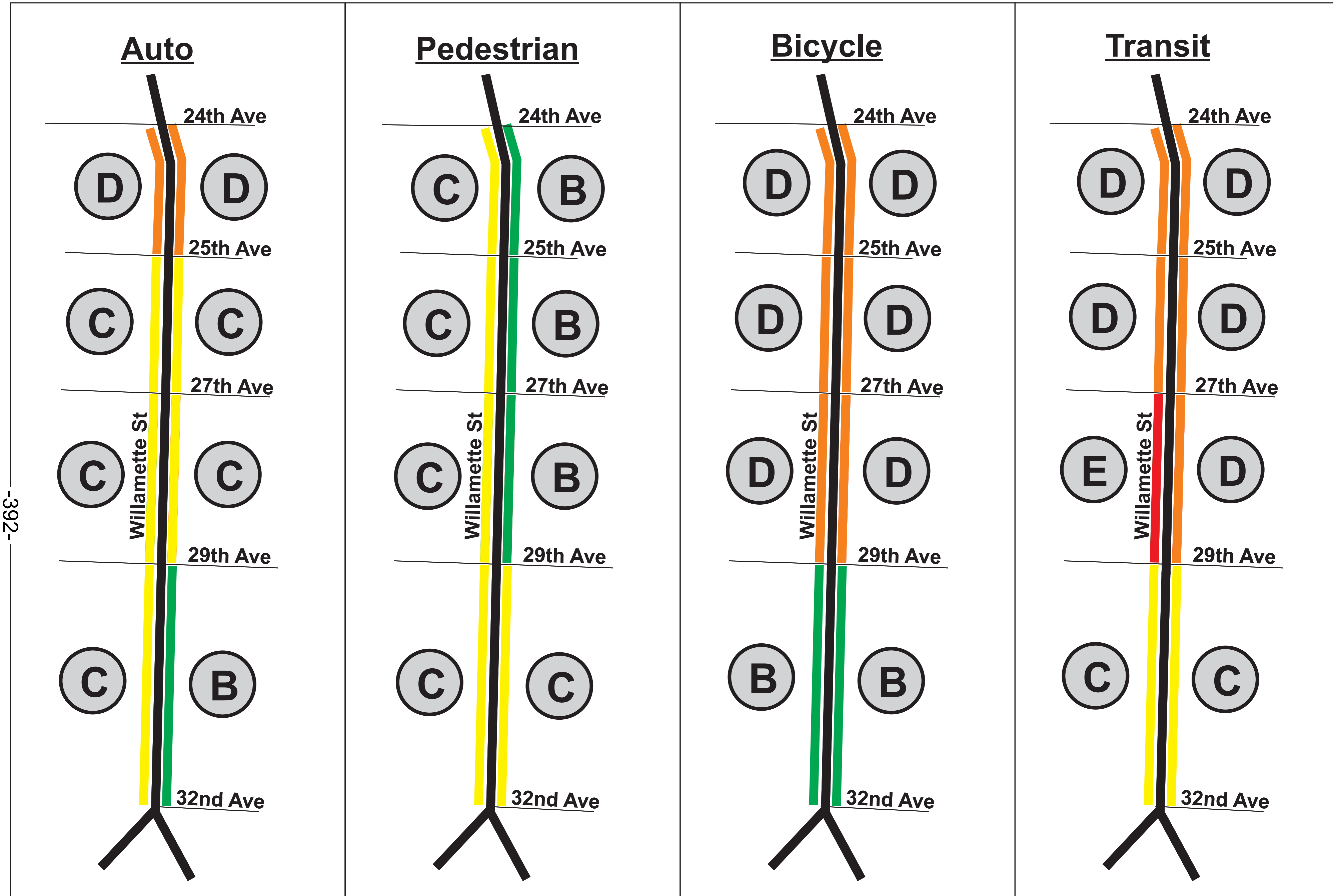
[9] This analysis was performed using the LOS+ software that is a hybrid tool that utilizes two different MMLOS methodologies. The auto LOS component of the analysis is based on NCHRP Project 3-70, while the pedestrian, bicycle, and transit components are based on the HCM2010. While NCHRP 3-70 provided the basis for the MMLOS methodology described in the HCM2010, there were some significant differences. One of the main differences is that the LOS methodology for autos presented in the NCHRP 3-70 report requires less input data and is less intensive computationally. The LOS+ software was developed by Fehr and Peers.

DKS

The limitations of the MMLOS analysis should be noted. For example, the existing facilities on Willamette Street were evaluated as LOS "D" MMLOS operations, a better than expected rating. Based on stakeholder interviews, most bicycle users are not comfortable biking on Willamette Street without bike lanes. Therefore, it is clear that the comfort level of motor vehicles driving on a roadway with LOS "D" conditions is not a suitable comparison to cyclists travelling on a facility with LOS "D" conditions. Despite the limitations, the MMLOS evaluation provides value as an objective comparison between alternatives that consider multiple modes.

The expected MMLOS operations for Willamette Street in the 2018 p.m. peak hour are shown for each Alternative in Figure4. Results are summarized for each mode below:

- The auto mode results indicate the best performance in Alternative 1, with southbound segments from 24th Avenue to 27th Avenue degrading from LOS C or D to LOS F in Alternatives 3 and 5.
- The pedestrian mode results are best for Alternative 5, with several segments improving due to wider sidewalks than Alternative 1 or 3. Alternative 3 results in the lowest pedestrian operations; LOS D southbound between 24th Avenue and 27th Avenue, due to the higher volume of vehicles in the near travel lane. The MMLOS methodology rates pedestrian comfort higher in Alternative 1 than Alternative 3 despite the presence of a bike lane serving as a buffer between cars and pedestrians.
- Bicycle operations would improve from LOS D to LOS B by replacing a motor vehicle lane with continuous bike lanes (Alternative 3). However, bicycle operations would degrade from LOS D to LOS E on some segments if travel lanes are reduced without adding bike lanes (Alternative 5).
- Transit operations are rated slightly higher in Alternative 1 than in Alternatives 3 and 5 due to providing the highest level of mobility (i.e., travel time) for all motor vehicles, including buses.



LEGEND

A Level of Service

Segment Operations

LOS B LOS C LOS D LOS E

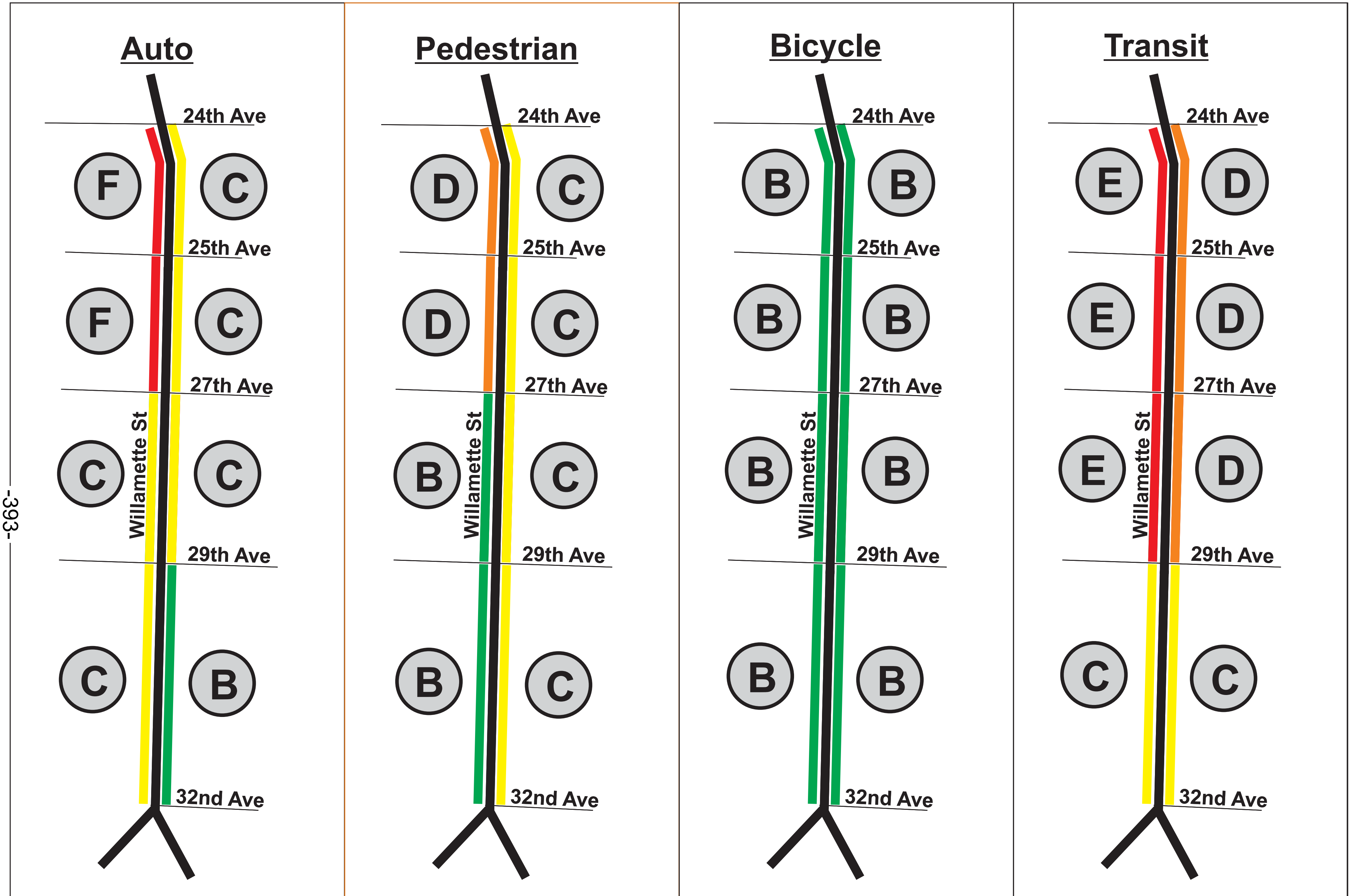
DKS

No Scale

Figure 2

ALT. 1 (2018 PM) MULTI-MODAL LEVEL OF SERVICE (MMLOS)

South Willamette Street Improvement Plan



LEGEND

(A) Level of Service

Segment Operations

LOS B LOS C LOS D LOS E

DKS

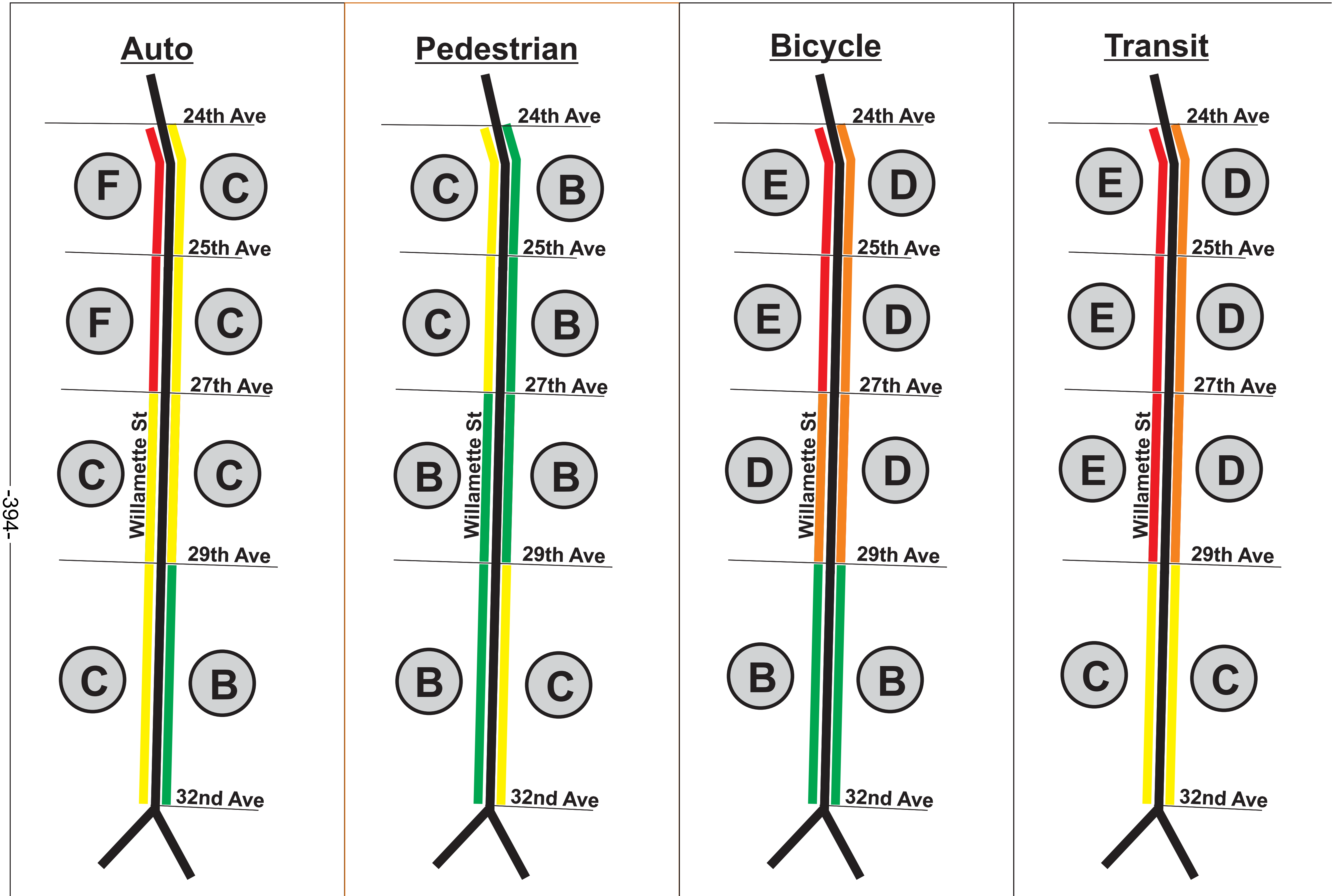
No Scale

Figure 3

ALT. 3 (2018 PM) MULTI-MODAL LEVEL OF SERVICE (MMLOS)

South Willamette Street Improvement Plan

Item A.



LEGEND

(A) Level of Service

Segment Operations

LOS B LOS C LOS D LOS E

DKS

No Scale

Figure 4

ALT. 5 (2018 PM) MULTI-MODAL LEVEL OF SERVICE (MMLOS)

South Willamette Street Improvement Plan

Appendix

– Intersection Operations Analysis, 2018

HCM Signalized Intersection Capacity Analysis
1: Willamette Street/Willamette St & 24th Avenue

S. Willamette Street Corridor
2018 PM Peak - No Build

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	45	15	220	80	40	5	420	195	50	700	15
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	14	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)		4.5			4.5	4.5		4.5	4.5		4.5	
Lane Util. Factor		1.00			1.00	1.00		1.00	1.00		0.95	
Frpb, ped/bikes		0.99			1.00	0.96		1.00	0.96		1.00	
Flpb, ped/bikes		1.00			1.00	1.00		1.00	1.00		1.00	
Frt		0.97			1.00	0.85		1.00	0.85		1.00	
Flt Protected		0.99			0.96	1.00		1.00	1.00		1.00	
Satd. Flow (prot)		1784			1675	1427		1732	1396		3270	
Flt Permitted		0.92			0.74	1.00		0.99	1.00		0.90	
Satd. Flow (perm)		1656			1287	1427		1720	1396		2937	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	16	49	16	242	88	44	5	462	214	55	769	16
RTOR Reduction (vph)	0	10	0	0	0	28	0	0	102	0	1	0
Lane Group Flow (vph)	0	71	0	0	330	16	0	467	112	0	839	0
Confl. Peds. (#/hr)	7		6	6		7	11		6	6		11
Confl. Bikes (#/hr)			26			6			17			11
Heavy Vehicles (%)	0%	0%	0%	0%	1%	0%	0%	1%	1%	0%	1%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	2	0	0	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6		6	8		8	4		
Actuated Green, G (s)		26.9			26.9	26.9		39.1	39.1		39.1	
Effective Green, g (s)		26.9			26.9	26.9		39.1	39.1		39.1	
Actuated g/C Ratio		0.36			0.36	0.36		0.52	0.52		0.52	
Clearance Time (s)		4.5			4.5	4.5		4.5	4.5		4.5	
Vehicle Extension (s)		3.0			3.0	3.0		2.0	2.0		2.0	
Lane Grp Cap (vph)		593			461	511		896	727		1531	
v/s Ratio Prot												
v/s Ratio Perm		0.04			c0.26	0.01		0.27	0.08		c0.29	
v/c Ratio		0.12			0.72	0.03		0.52	0.15		0.55	
Uniform Delay, d1		16.1			20.8	15.6		11.8	9.3		12.0	
Progression Factor		1.00			1.00	1.00		0.30	0.04		1.00	
Incremental Delay, d2		0.1			5.2	0.0		2.1	0.4		1.4	
Delay (s)		16.2			26.0	15.6		5.6	0.8		13.4	
Level of Service		B			C	B		A	A		B	
Approach Delay (s)		16.2			24.8			4.1			13.4	
Approach LOS		B			C			A			B	

Intersection Summary			
HCM 2000 Control Delay	12.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	83.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	5	10	25	5	15	15	575	15	5	915	25
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	14	12	12	14	12	12	12	12	12	12	12
Total Lost time (s)		4.5			4.5			4.5			4.5	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frpb, ped/bikes		0.99			0.99			1.00			1.00	
Flpb, ped/bikes		0.98			0.99			1.00			1.00	
Frt		0.97			0.95			1.00			1.00	
Flt Protected		0.97			0.97			1.00			1.00	
Satd. Flow (prot)		1679			1700			3261			3262	
Flt Permitted		0.83			0.86			0.92			0.95	
Satd. Flow (perm)		1441			1502			3018			3109	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	32	5	11	27	5	16	16	618	16	5	984	27
RTOR Reduction (vph)	0	8	0	0	12	0	0	2	0	0	2	0
Lane Group Flow (vph)	0	40	0	0	36	0	0	648	0	0	1014	0
Confl. Peds. (#/hr)	20		8	8		20	7		5	5		7
Confl. Bikes (#/hr)			6			7			17			17
Heavy Vehicles (%)	3%	0%	0%	0%	0%	0%	0%	1%	0%	0%	1%	0%
Bus Blockages (#/hr)	0	0	2	0	0	2	0	2	0	0	2	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)		18.0			18.0			48.0			48.0	
Effective Green, g (s)		18.0			18.0			48.0			48.0	
Actuated g/C Ratio		0.24			0.24			0.64			0.64	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Vehicle Extension (s)		3.0			3.0			2.0			2.0	
Lane Grp Cap (vph)		345			360			1931			1989	
v/s Ratio Prot												
v/s Ratio Perm		c0.03			0.02			0.21			c0.33	
v/c Ratio		0.11			0.10			0.34			0.51	
Uniform Delay, d1		22.3			22.2			6.2			7.2	
Progression Factor		1.00			1.00			2.07			1.23	
Incremental Delay, d2		0.1			0.1			0.4			0.8	
Delay (s)		22.4			22.3			13.3			9.7	
Level of Service		C			C			B			A	
Approach Delay (s)		22.4			22.3			13.3			9.7	
Approach LOS		C			C			B			A	

Intersection Summary			
HCM 2000 Control Delay	11.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	54.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Willamette Street & 27th Avenue

S. Willamette Street Corridor
2018 PM Peak - No Build

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	40	50	130	95	35	30	555	35	25	825	60
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frpb, ped/bikes	1.00	0.98		1.00	0.99			1.00			1.00	
Flpb, ped/bikes	0.97	1.00		0.98	1.00			1.00			1.00	
Frt	1.00	0.92		1.00	0.96			0.99			0.99	
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)	1614	1551		1621	1621			3002			3028	
Flt Permitted	0.67	1.00		0.70	1.00			0.89			0.93	
Satd. Flow (perm)	1138	1551		1189	1621			2664			2816	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	31	41	52	134	98	36	31	572	36	26	851	62
RTOR Reduction (vph)	0	39	0	0	23	0	0	4	0	0	5	0
Lane Group Flow (vph)	31	54	0	134	111	0	0	635	0	0	934	0
Confl. Peds. (#/hr)	28		14	14		28	9		14	14		9
Confl. Bikes (#/hr)			7			4			15			13
Heavy Vehicles (%)	0%	3%	0%	1%	3%	0%	0%	2%	3%	5%	1%	0%
Bus Blockages (#/hr)	0	0	2	0	0	2	0	2	0	0	2	0
Parking (#/hr)							5	5	5	5	5	5
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	18.6	18.6		18.6	18.6			47.4			47.4	
Effective Green, g (s)	18.6	18.6		18.6	18.6			47.4			47.4	
Actuated g/C Ratio	0.25	0.25		0.25	0.25			0.63			0.63	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			2.0			2.0	
Lane Grp Cap (vph)	282	384		294	402			1683			1779	
v/s Ratio Prot		0.03			0.07							
v/s Ratio Perm	0.03			c0.11				0.24			c0.33	
v/c Ratio	0.11	0.14		0.46	0.28			0.38			0.53	
Uniform Delay, d1	21.8	22.0		23.9	22.8			6.7			7.6	
Progression Factor	1.00	1.00		1.00	1.00			1.00			0.56	
Incremental Delay, d2	0.2	0.2		1.1	0.4			0.6			1.0	
Delay (s)	22.0	22.1		25.0	23.1			7.3			5.2	
Level of Service	C	C		C	C			A			A	
Approach Delay (s)		22.1			24.1			7.3			5.2	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	9.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	81.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	125	155	35	470	765	170
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	129	160	36	485	789	175
Pedestrians	29			3	3	
Lane Width (ft)	12.0			12.0	12.0	
Walking Speed (ft/s)	4.0			4.0	4.0	
Percent Blockage	2			0	0	
Right turn flare (veh)		8				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				309	705	
pX, platoon unblocked	0.96	0.97	0.97			
vC, conflicting volume	1223	514	993			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	989	426	922			
tC, single (s)	6.8	6.9	4.2			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	41	71	95			
cM capacity (veh/h)	217	545	688			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	289	198	323	526	438
Volume Left	129	36	0	0	0
Volume Right	160	0	0	0	175
cSH	487	688	1700	1700	1700
Volume to Capacity	0.59	0.05	0.19	0.31	0.26
Queue Length 95th (ft)	95	4	0	0	0
Control Delay (s)	27.2	2.4	0.0	0.0	0.0
Lane LOS	D	A			
Approach Delay (s)	27.2	0.9		0.0	
Approach LOS	D				

Intersection Summary			
Average Delay	4.7		
Intersection Capacity Utilization	57.7%	ICU Level of Service	B
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
5: 29th Ave & Willamette Street

S. Willamette Street Corridor
2018 PM Peak - No Build

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	120	280	320	120	370	75	275	310	45	165	600	105
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	10	10	10	10	11	11	10	11	12	12	12
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.94	1.00	0.99		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1662	1601	1339	1492	1617	1324	1591	2927		1626	3180	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1662	1601	1339	1492	1617	1324	1591	2927		1626	3180	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	126	295	337	126	389	79	289	326	47	174	632	111
RTOR Reduction (vph)	0	0	45	0	0	58	0	9	0	0	12	0
Lane Group Flow (vph)	126	295	292	126	389	21	289	364	0	174	731	0
Confl. Peds. (#/hr)	23		15	15		23	20		13	13		20
Confl. Bikes (#/hr)			25			17			5			14
Heavy Vehicles (%)	0%	2%	1%	4%	1%	2%	1%	3%	5%	1%	1%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	5	3	0	0
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2	3	1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	10.8	28.5	51.6	11.7	29.4	29.4	23.1	36.3		15.5	28.7	
Effective Green, g (s)	10.8	28.5	51.6	11.7	29.4	29.4	23.1	36.3		15.5	28.7	
Actuated g/C Ratio	0.10	0.26	0.47	0.11	0.27	0.27	0.21	0.33		0.14	0.26	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	163	414	682	158	432	353	334	965		229	829	
v/s Ratio Prot	0.08	0.18	0.09	c0.08	c0.24		c0.18	0.12		0.11	c0.23	
v/s Ratio Perm			0.13			0.02						
v/c Ratio	0.77	0.71	0.43	0.80	0.90	0.06	0.87	0.38		0.76	0.88	
Uniform Delay, d1	48.4	37.0	19.4	48.0	38.9	30.0	41.9	28.2		45.5	39.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	18.5	4.8	0.2	22.3	21.0	0.0	19.6	0.1		12.1	10.6	
Delay (s)	66.9	41.8	19.6	70.3	59.9	30.0	61.5	28.3		57.5	49.6	
Level of Service	E	D	B	E	E	C	E	C		E	D	
Approach Delay (s)		36.1			58.2			42.8			51.1	
Approach LOS		D			E			D			D	

Intersection Summary			
HCM 2000 Control Delay	46.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	81.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL2	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER	NER2
Lane Configurations												
Volume (vph)	5	10	20	5	245	5	30	335	620	370	5	5
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	12	12	12	14	12	12	12	12	12	12	12
Total Lost time (s)		4.0			4.0			4.0	5.0	5.0		
Lane Util. Factor		1.00			1.00			1.00	1.00	1.00		
Frpb, ped/bikes		0.99			1.00			1.00	0.99	1.00		
Flpb, ped/bikes		1.00			1.00			1.00	1.00	1.00		
Frt		0.92			1.00			1.00	0.85	1.00		
Flt Protected		0.98			1.00			1.00	1.00	0.95		
Satd. Flow (prot)		1508			1824			1726	1452	1645		
Flt Permitted		0.98			0.99			0.96	1.00	1.00		
Satd. Flow (perm)		1508			1812			1666	1452	1725		
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	11	21	5	258	5	32	353	653	389	5	5
RTOR Reduction (vph)	0	28	0	0	1	0	0	0	0	11	0	0
Lane Group Flow (vph)	0	9	0	0	267	0	0	385	653	388	0	0
Confl. Peds. (#/hr)			1	2		8	8		2	1		
Confl. Bikes (#/hr)			2			2			4			4
Heavy Vehicles (%)	0%	0%	6%	0%	2%	0%	0%	1%	1%	1%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA	custom	NA		
Protected Phases		8			2			6				
Permitted Phases	8			2			6		3 6	3		
Actuated Green, G (s)		10.0			16.3			16.3	39.8	14.5		
Effective Green, g (s)		10.0			16.3			16.3	35.8	14.5		
Actuated g/C Ratio		0.25			0.41			0.41	0.90	0.36		
Clearance Time (s)		4.0			4.0			4.0		5.0		
Vehicle Extension (s)		2.5			2.5			2.5		2.0		
Lane Grp Cap (vph)		378			742			682	1306	628		
v/s Ratio Prot												
v/s Ratio Perm		0.01			0.15			0.23	c0.45	c0.22		
v/c Ratio		0.02			0.36			0.56	0.50	0.62		
Uniform Delay, d1		11.2			8.1			9.0	0.4	10.4		
Progression Factor		1.00			1.00			1.00	1.00	1.00		
Incremental Delay, d2		0.0			0.2			0.9	0.1	1.3		
Delay (s)		11.2			8.4			9.9	0.5	11.7		
Level of Service		B			A			A	A	B		
Approach Delay (s)		11.2			8.4			4.0		11.7		
Approach LOS		B			A			A		B		

Intersection Summary			
HCM 2000 Control Delay	6.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	39.8	Sum of lost time (s)	11.0
Intersection Capacity Utilization	73.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
1: Willamette Street/Willamette St & 24th Avenue

S. Willamette Street Corridor
2018 PM Peak - Alt 1 (4-lane)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	45	15	235	80	40	5	420	195	50	700	15
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	14	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)		4.5			4.5	4.5		4.5	4.5		4.5	
Lane Util. Factor		1.00			1.00	1.00		1.00	1.00		0.95	
Frpb, ped/bikes		0.99			1.00	0.94		1.00	0.95		1.00	
Flpb, ped/bikes		1.00			0.99	1.00		1.00	1.00		1.00	
Frt		0.97			1.00	0.85		1.00	0.85		1.00	
Flt Protected		0.99			0.96	1.00		1.00	1.00		1.00	
Satd. Flow (prot)		1779			1669	1403		1732	1373		3269	
Flt Permitted		0.92			0.73	1.00		0.99	1.00		0.89	
Satd. Flow (perm)		1648			1268	1403		1720	1373		2935	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	16	49	16	258	88	44	5	462	214	55	769	16
RTOR Reduction (vph)	0	10	0	0	0	28	0	0	104	0	1	0
Lane Group Flow (vph)	0	71	0	0	346	16	0	467	110	0	839	0
Confl. Peds. (#/hr)	15		10	10		15	20		10	10		20
Confl. Bikes (#/hr)			26			6			17			11
Heavy Vehicles (%)	0%	0%	0%	0%	1%	0%	0%	1%	1%	0%	1%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6		6	8		8	4		
Actuated Green, G (s)		27.5			27.5	27.5		38.5	38.5		38.5	
Effective Green, g (s)		27.5			27.5	27.5		38.5	38.5		38.5	
Actuated g/C Ratio		0.37			0.37	0.37		0.51	0.51		0.51	
Clearance Time (s)		4.5			4.5	4.5		4.5	4.5		4.5	
Vehicle Extension (s)		3.0			3.0	3.0		2.0	2.0		2.0	
Lane Grp Cap (vph)		604			464	514		882	704		1506	
v/s Ratio Prot												
v/s Ratio Perm		0.04			c0.27	0.01		0.27	0.08		c0.29	
v/c Ratio		0.12			0.75	0.03		0.53	0.16		0.56	
Uniform Delay, d1		15.7			20.7	15.2		12.2	9.7		12.4	
Progression Factor		1.00			1.00	1.00		0.37	0.04		1.00	
Incremental Delay, d2		0.1			6.4	0.0		2.2	0.5		1.5	
Delay (s)		15.8			27.1	15.2		6.7	0.8		13.9	
Level of Service		B			C	B		A	A		B	
Approach Delay (s)		15.8			25.8			4.8			13.9	
Approach LOS		B			C			A			B	

Intersection Summary			
HCM 2000 Control Delay	13.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	84.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	5	10	25	5	15	15	575	15	5	915	25
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	14	12	12	14	12	12	12	12	12	12	12
Total Lost time (s)		4.5			4.5			4.5			4.5	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frpb, ped/bikes		0.99			0.98			1.00			1.00	
Flpb, ped/bikes		0.97			0.99			1.00			1.00	
Frt		0.97			0.95			1.00			1.00	
Flt Protected		0.97			0.97			1.00			1.00	
Satd. Flow (prot)		1649			1678			3247			3248	
Flt Permitted		0.83			0.86			0.92			0.95	
Satd. Flow (perm)		1416			1482			3005			3095	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	32	5	11	27	5	16	16	618	16	5	984	27
RTOR Reduction (vph)	0	8	0	0	12	0	0	2	0	0	2	0
Lane Group Flow (vph)	0	40	0	0	36	0	0	648	0	0	1014	0
Confl. Peds. (#/hr)	40		15	15		40	15		10	10		15
Confl. Bikes (#/hr)			6			7			17			17
Heavy Vehicles (%)	3%	0%	0%	0%	0%	0%	0%	1%	0%	0%	1%	0%
Bus Blockages (#/hr)	0	0	4	0	0	4	0	4	0	0	4	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)		18.0			18.0			48.0			48.0	
Effective Green, g (s)		18.0			18.0			48.0			48.0	
Actuated g/C Ratio		0.24			0.24			0.64			0.64	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Vehicle Extension (s)		3.0			3.0			2.0			2.0	
Lane Grp Cap (vph)		339			355			1923			1980	
v/s Ratio Prot												
v/s Ratio Perm		c0.03			0.02			0.22			c0.33	
v/c Ratio		0.12			0.10			0.34			0.51	
Uniform Delay, d1		22.3			22.2			6.2			7.2	
Progression Factor		1.00			1.00			1.72			1.45	
Incremental Delay, d2		0.2			0.1			0.5			0.8	
Delay (s)		22.4			22.3			11.1			11.3	
Level of Service		C			C			B			B	
Approach Delay (s)		22.4			22.3			11.1			11.3	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	11.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	54.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Willamette Street & 27th Avenue

S. Willamette Street Corridor
2018 PM Peak - Alt 1 (4-lane)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	40	50	130	95	35	30	555	35	25	825	60
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frpb, ped/bikes	1.00	0.97		1.00	0.98			0.99			1.00	
Flpb, ped/bikes	0.95	1.00		0.97	1.00			1.00			1.00	
Frt	1.00	0.92		1.00	0.96			0.99			0.99	
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)	1576	1534		1592	1610			2983			3010	
Flt Permitted	0.67	1.00		0.70	1.00			0.89			0.93	
Satd. Flow (perm)	1112	1534		1167	1610			2647			2799	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	31	41	52	134	98	36	31	572	36	26	851	62
RTOR Reduction (vph)	0	39	0	0	23	0	0	4	0	0	5	0
Lane Group Flow (vph)	31	54	0	134	111	0	0	635	0	0	934	0
Confl. Peds. (#/hr)	50		30	30		50	20		30	30		20
Confl. Bikes (#/hr)			7			4			15			13
Heavy Vehicles (%)	0%	3%	0%	1%	3%	0%	0%	2%	3%	5%	1%	0%
Bus Blockages (#/hr)	0	0	4	0	0	4	0	4	0	0	4	0
Parking (#/hr)							5	5	5	5	5	5
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	18.7	18.7		18.7	18.7			47.3			47.3	
Effective Green, g (s)	18.7	18.7		18.7	18.7			47.3			47.3	
Actuated g/C Ratio	0.25	0.25		0.25	0.25			0.63			0.63	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			2.0			2.0	
Lane Grp Cap (vph)	277	382		290	401			1669			1765	
v/s Ratio Prot		0.04			0.07							
v/s Ratio Perm	0.03			c0.11				0.24			c0.33	
v/c Ratio	0.11	0.14		0.46	0.28			0.38			0.53	
Uniform Delay, d1	21.7	21.9		23.9	22.7			6.7			7.7	
Progression Factor	1.00	1.00		1.00	1.00			1.00			0.86	
Incremental Delay, d2	0.2	0.2		1.2	0.4			0.7			1.0	
Delay (s)	21.9	22.1		25.1	23.1			7.4			7.6	
Level of Service	C	C		C	C			A			A	
Approach Delay (s)		22.0			24.1			7.4			7.6	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	10.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	81.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Willamette Street & Willamette Street Plaza Driveway

S. Willamette Street Corridor
2018 PM Peak - Alt 1 (4-lane)

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	125	155	35	470	765	170
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frpb, ped/bikes	1.00	0.95		1.00	0.96	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	0.97	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1646	1403		3213	3082	
Flt Permitted	0.95	1.00		0.83	1.00	
Satd. Flow (perm)	1646	1403		2692	3082	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	129	160	36	485	789	175
RTOR Reduction (vph)	0	117	0	0	16	0
Lane Group Flow (vph)	129	43	0	521	948	0
Confl. Peds. (#/hr)	15	15	50			50
Confl. Bikes (#/hr)		3				9
Heavy Vehicles (%)	1%	1%	3%	2%	0%	1%
Bus Blockages (#/hr)	0	0	0	4	4	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	2			8	4	
Permitted Phases		2	8			
Actuated Green, G (s)	32.0	32.0		80.0	80.0	
Effective Green, g (s)	32.0	32.0		80.0	80.0	
Actuated g/C Ratio	0.27	0.27		0.67	0.67	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	438	374		1794	2054	
v/s Ratio Prot	c0.08				c0.31	
v/s Ratio Perm		0.03		0.19		
v/c Ratio	0.29	0.11		0.29	0.46	
Uniform Delay, d1	35.0	33.3		8.3	9.6	
Progression Factor	1.00	1.00		0.19	1.00	
Incremental Delay, d2	1.7	0.6		0.4	0.7	
Delay (s)	36.7	33.9		2.0	10.4	
Level of Service	D	C		A	B	
Approach Delay (s)	35.2			2.0	10.4	
Approach LOS	D			A	B	

Intersection Summary			
HCM 2000 Control Delay	12.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	63.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑↱		↰	↑↱	
Volume (vph)	120	280	320	120	370	75	275	310	45	165	600	105
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	10	10	10	10	11	11	10	11	12	12	12
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.96	1.00	1.00	0.90	1.00	0.99		1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1662	1601	1318	1492	1617	1269	1591	2913		1607	3151	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1662	1601	1318	1492	1617	1269	1591	2913		1607	3151	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	126	295	337	126	389	79	289	326	47	174	632	111
RTOR Reduction (vph)	0	0	89	0	0	58	0	8	0	0	11	0
Lane Group Flow (vph)	126	295	248	126	389	21	289	365	0	174	732	0
Confl. Peds. (#/hr)	45		30	30		45	40		25	25		40
Confl. Bikes (#/hr)			25			17			5			14
Heavy Vehicles (%)	0%	2%	1%	4%	1%	2%	1%	3%	5%	1%	1%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	10	6	0	0
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2	3	1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	13.3	31.4	56.0	14.0	32.1	32.1	24.6	39.2		17.4	32.0	
Effective Green, g (s)	13.3	31.4	56.0	14.0	32.1	32.1	24.6	39.2		17.4	32.0	
Actuated g/C Ratio	0.11	0.26	0.47	0.12	0.27	0.27	0.21	0.33		0.14	0.27	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	184	418	664	174	432	339	326	951		233	840	
v/s Ratio Prot	0.08	0.18	0.08	c0.08	c0.24		c0.18	0.13		0.11	c0.23	
v/s Ratio Perm			0.11			0.02						
v/c Ratio	0.68	0.71	0.37	0.72	0.90	0.06	0.89	0.38		0.75	0.87	
Uniform Delay, d1	51.3	40.1	20.7	51.1	42.4	32.7	46.3	31.1		49.2	42.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.33	0.83	
Incremental Delay, d2	8.1	4.4	0.1	11.9	21.0	0.0	23.2	1.2		9.9	11.1	
Delay (s)	59.5	44.5	20.8	63.0	63.4	32.8	69.6	32.3		75.4	45.9	
Level of Service	E	D	C	E	E	C	E	C		E	D	
Approach Delay (s)		36.5			59.3			48.6			51.5	
Approach LOS		D			E			D			D	

Intersection Summary			
HCM 2000 Control Delay	48.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	82.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL2	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER	NER2
Lane Configurations												
Volume (vph)	5	10	20	5	245	5	30	335	620	370	5	5
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	12	12	12	14	12	12	12	12	12	12	12
Total Lost time (s)		4.0			4.0			4.0	5.0	5.0		
Lane Util. Factor		1.00			1.00			1.00	1.00	1.00		
Frpb, ped/bikes		0.98			1.00			1.00	0.98	1.00		
Flpb, ped/bikes		1.00			1.00			1.00	1.00	1.00		
Frt		0.92			1.00			1.00	0.85	1.00		
Flt Protected		0.98			1.00			1.00	1.00	0.95		
Satd. Flow (prot)		1495			1824			1725	1449	1642		
Flt Permitted		0.98			0.99			0.96	1.00	1.00		
Satd. Flow (perm)		1495			1812			1665	1449	1722		
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	11	21	5	258	5	32	353	653	389	5	5
RTOR Reduction (vph)	0	28	0	0	1	0	0	0	0	11	0	0
Lane Group Flow (vph)	0	9	0	0	267	0	0	385	653	388	0	0
Confl. Peds. (#/hr)	5		5	5		15	15		5	5		5
Confl. Bikes (#/hr)			2			2			4			4
Heavy Vehicles (%)	0%	0%	6%	0%	2%	0%	0%	1%	1%	1%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA	custom	NA		
Protected Phases		8			2			6				
Permitted Phases	8			2			6		3 6	3		
Actuated Green, G (s)		10.2			16.5			16.5	40.2	14.7		
Effective Green, g (s)		10.2			16.5			16.5	36.2	14.7		
Actuated g/C Ratio		0.25			0.41			0.41	0.90	0.37		
Clearance Time (s)		4.0			4.0			4.0		5.0		
Vehicle Extension (s)		2.5			2.5			2.5		2.0		
Lane Grp Cap (vph)		379			743			683	1304	629		
v/s Ratio Prot												
v/s Ratio Perm		0.01			0.15			0.23	c0.45	c0.23		
v/c Ratio		0.02			0.36			0.56	0.50	0.62		
Uniform Delay, d1		11.3			8.2			9.1	0.4	10.4		
Progression Factor		1.00			1.00			1.00	1.00	1.00		
Incremental Delay, d2		0.0			0.2			0.9	0.1	1.3		
Delay (s)		11.3			8.4			10.0	0.5	11.7		
Level of Service		B			A			A	A	B		
Approach Delay (s)		11.3			8.4			4.0		11.7		
Approach LOS		B			A			A		B		

Intersection Summary			
HCM 2000 Control Delay	6.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	40.2	Sum of lost time (s)	11.0
Intersection Capacity Utilization	73.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↱		↰	↱	
Volume (vph)	120	280	330	120	370	70	275	310	45	155	575	105
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	10	10	10	10	11	11	10	11	12	12	12
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.91	1.00	1.00	0.83	1.00	0.99		1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1662	1601	1254	1492	1617	1170	1591	1534		1607	1657	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1662	1601	1254	1492	1617	1170	1591	1534		1607	1657	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	126	295	347	126	389	74	289	326	47	163	605	111
RTOR Reduction (vph)	0	0	198	0	0	57	0	4	0	0	5	0
Lane Group Flow (vph)	126	295	149	126	389	17	289	369	0	163	711	0
Confl. Peds. (#/hr)	45		30	30		45	40		25	25		40
Confl. Bikes (#/hr)			25			17			5			14
Heavy Vehicles (%)	0%	2%	1%	4%	1%	2%	1%	3%	5%	1%	1%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	10	6	0	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	7.5	24.3	24.3	10.5	27.3	27.3	20.5	51.2		16.0	46.7	
Effective Green, g (s)	7.5	24.3	24.3	10.5	27.3	27.3	20.5	51.2		16.0	46.7	
Actuated g/C Ratio	0.06	0.20	0.20	0.09	0.23	0.23	0.17	0.43		0.13	0.39	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	103	324	253	130	367	266	271	654		214	644	
v/s Ratio Prot	0.08	0.18		c0.08	c0.24		c0.18	c0.24		0.10	c0.43	
v/s Ratio Perm			0.12			0.01						
v/c Ratio	1.22	0.91	0.59	0.97	1.06	0.06	1.07	0.56		0.76	1.10	
Uniform Delay, d1	56.2	46.8	43.3	54.6	46.4	36.3	49.8	26.0		50.2	36.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.87	1.12	
Incremental Delay, d2	160.4	28.0	2.3	68.3	63.7	0.0	73.3	3.5		7.4	58.8	
Delay (s)	216.7	74.7	45.6	122.8	110.1	36.4	123.1	29.5		51.2	99.7	
Level of Service	F	E	D	F	F	D	F	C		D	F	
Approach Delay (s)		84.9			103.5			70.3			90.7	
Approach LOS		F			F			E			F	

Intersection Summary			
HCM 2000 Control Delay	87.1	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	100.2%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1: Willamette Street/Willamette St & 24th Avenue

S. Willamette Street Corridor
2018 PM Peak - Alt 3&5 (Modified 3-lane)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	45	15	220	80	40	5	410	190	55	690	15
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	14	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)		4.5			4.5	4.5	4.5	4.5		4.5	4.5	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.99			1.00	0.94	1.00	0.98		1.00	1.00	
Flpb, ped/bikes		1.00			0.99	1.00	1.00	1.00		0.99	1.00	
Frt		0.97			1.00	0.85	1.00	0.95		1.00	1.00	
Flt Protected		0.99			0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1768			1661	1402	1662	1624		1654	1725	
Flt Permitted		0.92			0.76	1.00	0.20	1.00		0.28	1.00	
Satd. Flow (perm)		1634			1310	1402	347	1624		480	1725	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	16	49	16	242	88	44	5	451	209	60	758	16
RTOR Reduction (vph)	0	11	0	0	0	30	0	20	0	0	1	0
Lane Group Flow (vph)	0	70	0	0	330	14	5	640	0	60	773	0
Confl. Peds. (#/hr)	15		10	10		15	20		10	10		20
Confl. Bikes (#/hr)			26			6			17			11
Heavy Vehicles (%)	0%	0%	0%	0%	1%	0%	0%	1%	1%	0%	1%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6		6	8			4		
Actuated Green, G (s)		23.4			23.4	23.4	42.6	42.6		42.6	42.6	
Effective Green, g (s)		23.4			23.4	23.4	42.6	42.6		42.6	42.6	
Actuated g/C Ratio		0.31			0.31	0.31	0.57	0.57		0.57	0.57	
Clearance Time (s)		4.5			4.5	4.5	4.5	4.5		4.5	4.5	
Vehicle Extension (s)		3.0			3.0	3.0	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)		509			408	437	197	922		272	979	
v/s Ratio Prot								0.39			c0.45	
v/s Ratio Perm		0.04			c0.25	0.01	0.01			0.13		
v/c Ratio		0.14			0.81	0.03	0.03	0.69		0.22	0.79	
Uniform Delay, d1		18.5			23.7	17.9	7.1	11.6		8.0	12.7	
Progression Factor		1.00			1.00	1.00	1.63	1.57		1.00	1.00	
Incremental Delay, d2		0.1			11.2	0.0	0.2	3.7		1.9	6.5	
Delay (s)		18.7			35.0	18.0	11.8	21.9		9.9	19.2	
Level of Service		B			C	B	B	C		A	B	
Approach Delay (s)		18.7			33.0			21.8			18.5	
Approach LOS		B			C			C			B	

Intersection Summary			
HCM 2000 Control Delay	22.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	81.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
2: Willamette Street & 25th Avenue

S. Willamette Street Corridor
2018 PM Peak - Alt 3&5 (Modified 3-lane)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	5	10	25	5	15	15	560	15	5	895	25
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	14	12	12	14	12	12	12	12	12	12	12
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.99			0.96		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		0.95			0.98		1.00	1.00		0.99	1.00	
Frt		0.97			0.95		1.00	1.00		1.00	1.00	
Flt Protected		0.97			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1605			1642		1662	1697		1652	1696	
Flt Permitted		0.83			0.86		0.12	1.00		0.34	1.00	
Satd. Flow (perm)		1378			1450		217	1697		599	1696	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	32	5	11	27	5	16	16	602	16	5	962	27
RTOR Reduction (vph)	0	8	0	0	12	0	0	1	0	0	1	0
Lane Group Flow (vph)	0	40	0	0	36	0	16	617	0	5	988	0
Confl. Peds. (#/hr)	40		15	15		40	15		10	10		15
Confl. Bikes (#/hr)			6			7			17			17
Heavy Vehicles (%)	3%	0%	0%	0%	0%	0%	0%	1%	0%	0%	1%	0%
Bus Blockages (#/hr)	0	0	4	0	0	4	0	4	0	0	4	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)		18.0			18.0		48.0	48.0		48.0	48.0	
Effective Green, g (s)		18.0			18.0		48.0	48.0		48.0	48.0	
Actuated g/C Ratio		0.24			0.24		0.64	0.64		0.64	0.64	
Clearance Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)		3.0			3.0		2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)		330			348		138	1086		383	1085	
v/s Ratio Prot								0.36			c0.58	
v/s Ratio Perm		c0.03			0.02		0.07			0.01		
v/c Ratio		0.12			0.10		0.12	0.57		0.01	0.91	
Uniform Delay, d1		22.3			22.2		5.2	7.6		4.9	11.6	
Progression Factor		1.00			1.00		1.91	1.97		0.91	0.76	
Incremental Delay, d2		0.2			0.1		1.4	1.8		0.0	8.7	
Delay (s)		22.5			22.3		11.4	16.8		4.5	17.5	
Level of Service		C			C		B	B		A	B	
Approach Delay (s)		22.5			22.3			16.7			17.5	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	17.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	75.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Willamette Street & 27th Avenue

S. Willamette Street Corridor
2018 PM Peak - Alt 3&5 (Modified 3-lane)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	50	45	125	100	35	30	540	40	30	810	55
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.96		1.00	0.97		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	0.91	1.00		0.95	1.00		1.00	1.00		0.98	1.00	
Frt	1.00	0.93		1.00	0.96		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1521	1533		1556	1591		1455	1452		1357	1472	
Flt Permitted	0.66	1.00		0.69	1.00		0.18	1.00		0.36	1.00	
Satd. Flow (perm)	1054	1533		1136	1591		276	1452		510	1472	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	31	52	46	129	103	36	31	557	41	31	835	57
RTOR Reduction (vph)	0	35	0	0	17	0	0	4	0	0	3	0
Lane Group Flow (vph)	31	63	0	129	122	0	31	594	0	31	889	0
Confl. Peds. (#/hr)	50		30	30		50	20		30	30		20
Confl. Bikes (#/hr)			7			4			15			13
Heavy Vehicles (%)	0%	3%	0%	1%	3%	0%	0%	2%	3%	5%	1%	0%
Bus Blockages (#/hr)	0	0	4	0	0	4	0	4	0	0	4	0
Parking (#/hr)							5	5	5	5	5	5
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	18.0	18.0		18.0	18.0		48.0	48.0		48.0	48.0	
Effective Green, g (s)	18.0	18.0		18.0	18.0		48.0	48.0		48.0	48.0	
Actuated g/C Ratio	0.24	0.24		0.24	0.24		0.64	0.64		0.64	0.64	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	252	367		272	381		176	929		326	942	
v/s Ratio Prot		0.04			0.08			0.41			c0.60	
v/s Ratio Perm	0.03			c0.11			0.11			0.06		
v/c Ratio	0.12	0.17		0.47	0.32		0.18	0.64		0.10	0.94	
Uniform Delay, d1	22.3	22.6		24.4	23.5		5.5	8.2		5.2	12.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		0.13	0.11	
Incremental Delay, d2	0.2	0.2		1.3	0.5		2.2	3.4		0.3	10.2	
Delay (s)	22.5	22.8		25.7	24.0		7.7	11.6		0.9	11.6	
Level of Service	C	C		C	C		A	B		A	B	
Approach Delay (s)		22.7			24.8			11.4			11.2	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	13.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	84.6%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰	↱	↰	↑	↑↱	
Volume (vph)	125	150	35	465	735	170
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	
Frpb, ped/bikes	1.00	0.95	1.00	1.00	0.96	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.97	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1646	1403	1614	1688	3075	
Flt Permitted	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	1646	1403	1614	1688	3075	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	129	155	36	479	758	175
RTOR Reduction (vph)	0	116	0	0	15	0
Lane Group Flow (vph)	129	39	36	479	918	0
Confl. Peds. (#/hr)	15	15	50			50
Confl. Bikes (#/hr)		3				9
Heavy Vehicles (%)	1%	1%	3%	2%	0%	1%
Bus Blockages (#/hr)	0	0	0	4	4	0
Turn Type	NA	Perm	Prot	NA	NA	
Protected Phases	2		3	8	4	
Permitted Phases		2				
Actuated Green, G (s)	30.0	30.0	5.7	82.0	72.3	
Effective Green, g (s)	30.0	30.0	5.7	82.0	72.3	
Actuated g/C Ratio	0.25	0.25	0.05	0.68	0.60	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	411	350	76	1153	1852	
v/s Ratio Prot	c0.08		0.02	c0.28	c0.30	
v/s Ratio Perm		0.03				
v/c Ratio	0.31	0.11	0.47	0.42	0.50	
Uniform Delay, d1	36.6	34.7	55.7	8.4	13.5	
Progression Factor	1.00	1.00	1.47	0.14	1.00	
Incremental Delay, d2	2.0	0.6	3.4	0.8	1.0	
Delay (s)	38.6	35.3	85.3	2.0	14.5	
Level of Service	D	D	F	A	B	
Approach Delay (s)	36.8			7.8	14.5	
Approach LOS	D			A	B	

Intersection Summary			
HCM 2000 Control Delay	16.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	51.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	120	280	330	120	370	70	275	310	45	155	575	105
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1500	1500	1500	1750	1750	1750
Lane Width	12	10	10	10	10	11	11	10	11	12	12	12
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.92	1.00	1.00	0.83	1.00	0.99		1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1662	1601	1262	1492	1617	1175	1364	1314		1607	3145	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1662	1601	1262	1492	1617	1175	1364	1314		1607	3145	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	126	295	347	126	389	74	289	326	47	163	605	111
RTOR Reduction (vph)	0	0	196	0	0	54	0	3	0	0	12	0
Lane Group Flow (vph)	126	295	151	126	389	20	289	370	0	163	704	0
Confl. Peds. (#/hr)	45		30	30		45	40		25	25		40
Confl. Bikes (#/hr)			25			17			5			14
Heavy Vehicles (%)	0%	2%	1%	4%	1%	2%	1%	3%	5%	1%	1%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	10	6	0	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	13.3	31.4	31.4	14.0	32.1	32.1	27.1	40.0		16.6	29.5	
Effective Green, g (s)	13.3	31.4	31.4	14.0	32.1	32.1	27.1	40.0		16.6	29.5	
Actuated g/C Ratio	0.11	0.26	0.26	0.12	0.27	0.27	0.23	0.33		0.14	0.25	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	184	418	330	174	432	314	308	438		222	773	
v/s Ratio Prot	0.08	0.18		c0.08	c0.24		c0.21	c0.28		0.10	0.22	
v/s Ratio Perm			0.12			0.02						
v/c Ratio	0.68	0.71	0.46	0.72	0.90	0.06	0.94	0.84		0.73	0.91	
Uniform Delay, d1	51.3	40.1	37.2	51.1	42.4	32.7	45.6	37.1		49.6	44.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.22	0.90	
Incremental Delay, d2	8.1	4.4	0.4	11.9	21.0	0.0	34.6	17.7		9.4	15.5	
Delay (s)	59.5	44.5	37.5	63.0	63.4	32.8	80.2	54.9		69.8	55.2	
Level of Service	E	D	D	E	E	C	F	D		E	E	
Approach Delay (s)		43.8			59.5			65.9			57.9	
Approach LOS		D			E			E			E	

Intersection Summary			
HCM 2000 Control Delay	56.3	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	84.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: S. Willamette & Donald St/Willamette Street & 32nd Ave

S. Willamette Street Corridor
2018 PM Peak - Alt 3&5 (Modified 3-lane)

Movement	WBL2	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER	NER2
Lane Configurations												
Volume (vph)	5	10	20	5	245	5	30	320	615	365	5	5
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	12	12	12	14	12	12	12	12	12	12	12
Total Lost time (s)		4.0			4.0			4.0	5.0	5.0		
Lane Util. Factor		1.00			1.00			1.00	1.00	1.00		
Frpb, ped/bikes		0.98			1.00			1.00	0.98	1.00		
Flpb, ped/bikes		1.00			1.00			1.00	1.00	1.00		
Frt		0.92			1.00			1.00	0.85	1.00		
Flt Protected		0.98			1.00			1.00	1.00	0.95		
Satd. Flow (prot)		1495			1824			1725	1449	1642		
Flt Permitted		0.98			0.99			0.96	1.00	1.00		
Satd. Flow (perm)		1495			1812			1662	1449	1722		
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	11	21	5	258	5	32	337	647	384	5	5
RTOR Reduction (vph)	0	28	0	0	1	0	0	0	0	11	0	0
Lane Group Flow (vph)	0	9	0	0	267	0	0	369	647	383	0	0
Confl. Peds. (#/hr)	5		5	5		15	15		5	5		5
Confl. Bikes (#/hr)			2			2			4			4
Heavy Vehicles (%)	0%	0%	6%	0%	2%	0%	0%	1%	1%	1%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA	custom	NA		
Protected Phases		8			2			6				
Permitted Phases	8			2			6		3 6	3		
Actuated Green, G (s)		10.0			15.9			15.9	39.4	14.5		
Effective Green, g (s)		10.0			15.9			15.9	35.4	14.5		
Actuated g/C Ratio		0.25			0.40			0.40	0.90	0.37		
Clearance Time (s)		4.0			4.0			4.0		5.0		
Vehicle Extension (s)		2.5			2.5			2.5		2.0		
Lane Grp Cap (vph)		379			731			670	1301	633		
v/s Ratio Prot												
v/s Ratio Perm		0.01			0.15			0.22	c0.45	c0.22		
v/c Ratio		0.02			0.36			0.55	0.50	0.61		
Uniform Delay, d1		11.0			8.2			9.0	0.4	10.1		
Progression Factor		1.00			1.00			1.00	1.00	1.00		
Incremental Delay, d2		0.0			0.2			0.8	0.1	1.1		
Delay (s)		11.1			8.4			9.8	0.5	11.3		
Level of Service		B			A			A	A	B		
Approach Delay (s)		11.1			8.4			3.9		11.3		
Approach LOS		B			A			A		B		

Intersection Summary			
HCM 2000 Control Delay	6.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	39.4	Sum of lost time (s)	11.0
Intersection Capacity Utilization	72.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
1: Willamette Street/Willamette St & 24th Avenue

S. Willamette Street Corridor
2018 PM Peak - Alt 3 (Modified 3-lane) - Double Bike Vol

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	45	15	220	80	40	5	410	190	55	690	15
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	14	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)		4.5			4.5	4.5	4.5	4.5		4.5	4.5	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.98			1.00	0.93	1.00	0.98		1.00	1.00	
Flpb, ped/bikes		1.00			0.99	1.00	1.00	1.00		0.99	1.00	
Frt		0.97			1.00	0.85	1.00	0.95		1.00	1.00	
Flt Protected		0.99			0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1757			1661	1387	1662	1618		1654	1725	
Flt Permitted		0.92			0.76	1.00	0.20	1.00		0.28	1.00	
Satd. Flow (perm)		1623			1310	1387	347	1618		480	1725	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	16	49	16	242	88	44	5	451	209	60	758	16
RTOR Reduction (vph)	0	11	0	0	0	30	0	20	0	0	1	0
Lane Group Flow (vph)	0	70	0	0	330	14	5	640	0	60	773	0
Confl. Peds. (#/hr)	15		10	10		15	20		10	10		20
Confl. Bikes (#/hr)			55			15			35			20
Heavy Vehicles (%)	0%	0%	0%	0%	1%	0%	0%	1%	1%	0%	1%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6		6	8			4		
Actuated Green, G (s)		23.4			23.4	23.4	42.6	42.6		42.6	42.6	
Effective Green, g (s)		23.4			23.4	23.4	42.6	42.6		42.6	42.6	
Actuated g/C Ratio		0.31			0.31	0.31	0.57	0.57		0.57	0.57	
Clearance Time (s)		4.5			4.5	4.5	4.5	4.5		4.5	4.5	
Vehicle Extension (s)		3.0			3.0	3.0	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)		506			408	432	197	919		272	979	
v/s Ratio Prot								0.40			c0.45	
v/s Ratio Perm		0.04			c0.25	0.01	0.01			0.13		
v/c Ratio		0.14			0.81	0.03	0.03	0.70		0.22	0.79	
Uniform Delay, d1		18.6			23.7	17.9	7.1	11.6		8.0	12.7	
Progression Factor		1.00			1.00	1.00	1.63	1.57		1.00	1.00	
Incremental Delay, d2		0.1			11.2	0.0	0.2	3.8		1.9	6.5	
Delay (s)		18.7			35.0	18.0	11.8	22.0		9.9	19.2	
Level of Service		B			C	B	B	C		A	B	
Approach Delay (s)		18.7			33.0			21.9			18.5	
Approach LOS		B			C			C			B	

Intersection Summary			
HCM 2000 Control Delay	22.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	81.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
2: Willamette Street & 25th Avenue

S. Willamette Street Corridor
2018 PM Peak - Alt 3 (Modified 3-lane) - Double Bike Vol

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	5	10	25	5	15	15	560	15	5	895	25
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	14	12	12	14	12	12	12	12	12	12	12
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.98			0.96		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		0.95			0.98		1.00	1.00		0.99	1.00	
Frt		0.97			0.95		1.00	1.00		1.00	1.00	
Flt Protected		0.97			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1600			1636		1662	1696		1652	1695	
Flt Permitted		0.83			0.86		0.12	1.00		0.34	1.00	
Satd. Flow (perm)		1373			1445		217	1696		599	1695	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	32	5	11	27	5	16	16	602	16	5	962	27
RTOR Reduction (vph)	0	8	0	0	12	0	0	1	0	0	1	0
Lane Group Flow (vph)	0	40	0	0	36	0	16	617	0	5	988	0
Confl. Peds. (#/hr)	40		15	15		40	15		10	10		15
Confl. Bikes (#/hr)			15			15			35			35
Heavy Vehicles (%)	3%	0%	0%	0%	0%	0%	0%	1%	0%	0%	1%	0%
Bus Blockages (#/hr)	0	0	4	0	0	4	0	4	0	0	4	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)		18.0			18.0		48.0	48.0		48.0	48.0	
Effective Green, g (s)		18.0			18.0		48.0	48.0		48.0	48.0	
Actuated g/C Ratio		0.24			0.24		0.64	0.64		0.64	0.64	
Clearance Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)		3.0			3.0		2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)		329			346		138	1085		383	1084	
v/s Ratio Prot								0.36			c0.58	
v/s Ratio Perm		c0.03			0.02		0.07			0.01		
v/c Ratio		0.12			0.10		0.12	0.57		0.01	0.91	
Uniform Delay, d1		22.3			22.2		5.2	7.6		4.9	11.7	
Progression Factor		1.00			1.00		1.91	1.97		0.91	0.76	
Incremental Delay, d2		0.2			0.1		1.4	1.8		0.0	8.8	
Delay (s)		22.5			22.3		11.4	16.8		4.5	17.6	
Level of Service		C			C		B	B		A	B	
Approach Delay (s)		22.5			22.3			16.7			17.5	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	17.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	75.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Willamette Street & 27th Avenue

S. Willamette Street Corridor
2018 PM Peak - Alt 3 (Modified 3-lane) - Double Bike Vol

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	50	45	125	100	35	30	540	40	30	810	55
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.95		1.00	0.96		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	0.91	1.00		0.95	1.00		1.00	1.00		0.98	1.00	
Frt	1.00	0.93		1.00	0.96		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1521	1524		1556	1588		1455	1451		1357	1471	
Flt Permitted	0.66	1.00		0.69	1.00		0.18	1.00		0.36	1.00	
Satd. Flow (perm)	1054	1524		1136	1588		276	1451		510	1471	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	31	52	46	129	103	36	31	557	41	31	835	57
RTOR Reduction (vph)	0	35	0	0	17	0	0	4	0	0	3	0
Lane Group Flow (vph)	31	63	0	129	122	0	31	594	0	31	889	0
Confl. Peds. (#/hr)	50		30	30		50	20		30	30		20
Confl. Bikes (#/hr)			15			10			30			25
Heavy Vehicles (%)	0%	3%	0%	1%	3%	0%	0%	2%	3%	5%	1%	0%
Bus Blockages (#/hr)	0	0	4	0	0	4	0	4	0	0	4	0
Parking (#/hr)							5	5	5	5	5	5
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	18.0	18.0		18.0	18.0		48.0	48.0		48.0	48.0	
Effective Green, g (s)	18.0	18.0		18.0	18.0		48.0	48.0		48.0	48.0	
Actuated g/C Ratio	0.24	0.24		0.24	0.24		0.64	0.64		0.64	0.64	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	252	365		272	381		176	928		326	941	
v/s Ratio Prot		0.04			0.08			0.41			c0.60	
v/s Ratio Perm	0.03			c0.11			0.11			0.06		
v/c Ratio	0.12	0.17		0.47	0.32		0.18	0.64		0.10	0.94	
Uniform Delay, d1	22.3	22.6		24.4	23.5		5.5	8.2		5.2	12.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		0.13	0.11	
Incremental Delay, d2	0.2	0.2		1.3	0.5		2.2	3.4		0.3	10.3	
Delay (s)	22.5	22.8		25.7	24.0		7.7	11.6		0.9	11.7	
Level of Service	C	C		C	C		A	B		A	B	
Approach Delay (s)		22.8			24.8			11.4			11.3	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	14.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	84.6%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	125	150	35	465	735	170
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	
Frpb, ped/bikes	1.00	0.95	1.00	1.00	0.96	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.97	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1646	1400	1614	1688	3071	
Flt Permitted	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	1646	1400	1614	1688	3071	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	129	155	36	479	758	175
RTOR Reduction (vph)	0	116	0	0	15	0
Lane Group Flow (vph)	129	39	36	479	918	0
Confl. Peds. (#/hr)	15	15	50			50
Confl. Bikes (#/hr)		5				20
Heavy Vehicles (%)	1%	1%	3%	2%	0%	1%
Bus Blockages (#/hr)	0	0	0	4	4	0
Turn Type	NA	Perm	Prot	NA	NA	
Protected Phases	2		3	8	4	
Permitted Phases		2				
Actuated Green, G (s)	30.0	30.0	5.7	82.0	72.3	
Effective Green, g (s)	30.0	30.0	5.7	82.0	72.3	
Actuated g/C Ratio	0.25	0.25	0.05	0.68	0.60	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	411	350	76	1153	1850	
v/s Ratio Prot	c0.08		0.02	c0.28	c0.30	
v/s Ratio Perm		0.03				
v/c Ratio	0.31	0.11	0.47	0.42	0.50	
Uniform Delay, d1	36.6	34.7	55.7	8.4	13.5	
Progression Factor	1.00	1.00	1.47	0.14	1.00	
Incremental Delay, d2	2.0	0.6	3.4	0.8	1.0	
Delay (s)	38.6	35.3	85.4	2.0	14.5	
Level of Service	D	D	F	A	B	
Approach Delay (s)	36.8			7.8	14.5	
Approach LOS	D			A	B	

Intersection Summary			
HCM 2000 Control Delay	16.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	51.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	120	280	330	120	370	70	275	310	45	155	575	105
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1500	1500	1500	1750	1750	1750
Lane Width	12	10	10	10	10	11	11	10	11	12	12	12
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.90	1.00	1.00	0.81	1.00	0.99		1.00	0.97	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1662	1601	1235	1492	1617	1144	1364	1313		1607	3135	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1662	1601	1235	1492	1617	1144	1364	1313		1607	3135	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	126	295	347	126	389	74	289	326	47	163	605	111
RTOR Reduction (vph)	0	0	196	0	0	54	0	3	0	0	12	0
Lane Group Flow (vph)	126	295	151	126	389	20	289	370	0	163	704	0
Confl. Peds. (#/hr)	45		30	30		45	40		25	25		40
Confl. Bikes (#/hr)			50			35			10			30
Heavy Vehicles (%)	0%	2%	1%	4%	1%	2%	1%	3%	5%	1%	1%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	10	6	0	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	13.3	31.4	31.4	14.0	32.1	32.1	27.1	40.0		16.6	29.5	
Effective Green, g (s)	13.3	31.4	31.4	14.0	32.1	32.1	27.1	40.0		16.6	29.5	
Actuated g/C Ratio	0.11	0.26	0.26	0.12	0.27	0.27	0.23	0.33		0.14	0.25	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	184	418	323	174	432	306	308	437		222	770	
v/s Ratio Prot	0.08	0.18		c0.08	c0.24		c0.21	c0.28		0.10	0.22	
v/s Ratio Perm			0.12			0.02						
v/c Ratio	0.68	0.71	0.47	0.72	0.90	0.06	0.94	0.85		0.73	0.91	
Uniform Delay, d1	51.3	40.1	37.3	51.1	42.4	32.8	45.6	37.1		49.6	44.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.22	0.91	
Incremental Delay, d2	8.1	4.4	0.4	11.9	21.0	0.0	34.6	18.0		9.4	15.9	
Delay (s)	59.5	44.5	37.7	63.0	63.4	32.8	80.2	55.1		69.8	55.8	
Level of Service	E	D	D	E	E	C	F	E		E	E	
Approach Delay (s)		43.9			59.5			66.1			58.4	
Approach LOS		D			E			E			E	

Intersection Summary			
HCM 2000 Control Delay	56.5	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	84.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL2	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER	NER2
Lane Configurations												
Volume (vph)	5	10	20	5	245	5	30	320	615	365	5	5
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	12	12	12	14	12	12	12	12	12	12	12
Total Lost time (s)		4.0			4.0			4.0	5.0	5.0		
Lane Util. Factor		1.00			1.00			1.00	1.00	1.00		
Frpb, ped/bikes		0.98			1.00			1.00	0.98	1.00		
Flpb, ped/bikes		1.00			1.00			1.00	1.00	1.00		
Frt		0.92			1.00			1.00	0.85	1.00		
Flt Protected		0.98			1.00			1.00	1.00	0.95		
Satd. Flow (prot)		1491			1824			1725	1446	1642		
Flt Permitted		0.98			0.99			0.96	1.00	1.00		
Satd. Flow (perm)		1491			1812			1662	1446	1722		
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	11	21	5	258	5	32	337	647	384	5	5
RTOR Reduction (vph)	0	28	0	0	1	0	0	0	0	11	0	0
Lane Group Flow (vph)	0	9	0	0	267	0	0	369	647	383	0	0
Confl. Peds. (#/hr)	5		5	5		15	15		5	5		5
Confl. Bikes (#/hr)			5			5			10			10
Heavy Vehicles (%)	0%	0%	6%	0%	2%	0%	0%	1%	1%	1%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA	custom	NA		
Protected Phases		8			2			6				
Permitted Phases	8			2			6		3 6	3		
Actuated Green, G (s)		10.0			15.9			15.9	39.4	14.5		
Effective Green, g (s)		10.0			15.9			15.9	35.4	14.5		
Actuated g/C Ratio		0.25			0.40			0.40	0.90	0.37		
Clearance Time (s)		4.0			4.0			4.0		5.0		
Vehicle Extension (s)		2.5			2.5			2.5		2.0		
Lane Grp Cap (vph)		378			731			670	1299	633		
v/s Ratio Prot												
v/s Ratio Perm		0.01			0.15			0.22	c0.45	c0.22		
v/c Ratio		0.02			0.36			0.55	0.50	0.61		
Uniform Delay, d1		11.0			8.2			9.0	0.4	10.1		
Progression Factor		1.00			1.00			1.00	1.00	1.00		
Incremental Delay, d2		0.0			0.2			0.8	0.1	1.1		
Delay (s)		11.1			8.4			9.8	0.5	11.3		
Level of Service		B			A			A	A	B		
Approach Delay (s)		11.1			8.4			3.9		11.3		
Approach LOS		B			A			A		B		

Intersection Summary			
HCM 2000 Control Delay	6.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	39.4	Sum of lost time (s)	11.0
Intersection Capacity Utilization	72.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
1: Willamette Street/Willamette St & 24th Avenue

S. Willamette Street Corridor
2018 PM Peak - Alt 3&5 (Modified 3-lane) - Bus Pullouts

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	45	15	220	80	40	5	410	190	55	690	15
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	14	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)		4.5			4.5	4.5	4.5	4.5		4.5	4.5	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.99			1.00	0.94	1.00	0.98		1.00	1.00	
Flpb, ped/bikes		1.00			0.99	1.00	1.00	1.00		0.99	1.00	
Frt		0.97			1.00	0.85	1.00	0.95		1.00	1.00	
Flt Protected		0.99			0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1768			1661	1402	1662	1624		1654	1725	
Flt Permitted		0.92			0.76	1.00	0.20	1.00		0.28	1.00	
Satd. Flow (perm)		1634			1310	1402	347	1624		480	1725	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	16	49	16	242	88	44	5	451	209	60	758	16
RTOR Reduction (vph)	0	11	0	0	0	30	0	20	0	0	1	0
Lane Group Flow (vph)	0	70	0	0	330	14	5	640	0	60	773	0
Confl. Peds. (#/hr)	15		10	10		15	20		10	10		20
Confl. Bikes (#/hr)			26			6			17			11
Heavy Vehicles (%)	0%	0%	0%	0%	1%	0%	0%	1%	1%	0%	1%	0%
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6		6	8			4		
Actuated Green, G (s)		23.4			23.4	23.4	42.6	42.6		42.6	42.6	
Effective Green, g (s)		23.4			23.4	23.4	42.6	42.6		42.6	42.6	
Actuated g/C Ratio		0.31			0.31	0.31	0.57	0.57		0.57	0.57	
Clearance Time (s)		4.5			4.5	4.5	4.5	4.5		4.5	4.5	
Vehicle Extension (s)		3.0			3.0	3.0	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)		509			408	437	197	922		272	979	
v/s Ratio Prot								0.39			c0.45	
v/s Ratio Perm		0.04			c0.25	0.01	0.01			0.13		
v/c Ratio		0.14			0.81	0.03	0.03	0.69		0.22	0.79	
Uniform Delay, d1		18.5			23.7	17.9	7.1	11.6		8.0	12.7	
Progression Factor		1.00			1.00	1.00	1.64	1.54		1.00	1.00	
Incremental Delay, d2		0.1			11.2	0.0	0.2	3.7		1.9	6.5	
Delay (s)		18.7			35.0	18.0	11.9	21.5		9.9	19.2	
Level of Service		B			C	B	B	C		A	B	
Approach Delay (s)		18.7			33.0			21.5			18.5	
Approach LOS		B			C			C			B	

Intersection Summary			
HCM 2000 Control Delay	22.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	81.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
2: Willamette Street & 25th Avenue

S. Willamette Street Corridor
2018 PM Peak - Alt 3&5 (Modified 3-lane) - Bus Pullouts

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	5	10	25	5	15	15	560	15	5	895	25
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	14	12	12	14	12	12	12	12	12	12	12
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.99			0.96		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		0.95			0.98		1.00	1.00		0.99	1.00	
Frt		0.97			0.95		1.00	1.00		1.00	1.00	
Flt Protected		0.97			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1605			1642		1662	1724		1652	1723	
Flt Permitted		0.83			0.86		0.12	1.00		0.34	1.00	
Satd. Flow (perm)		1378			1450		217	1724		599	1723	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	32	5	11	27	5	16	16	602	16	5	962	27
RTOR Reduction (vph)	0	8	0	0	12	0	0	1	0	0	1	0
Lane Group Flow (vph)	0	40	0	0	36	0	16	617	0	5	988	0
Confl. Peds. (#/hr)	40		15	15		40	15		10	10		15
Confl. Bikes (#/hr)			6			7			17			17
Heavy Vehicles (%)	3%	0%	0%	0%	0%	0%	0%	1%	0%	0%	1%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)		18.0			18.0		48.0	48.0		48.0	48.0	
Effective Green, g (s)		18.0			18.0		48.0	48.0		48.0	48.0	
Actuated g/C Ratio		0.24			0.24		0.64	0.64		0.64	0.64	
Clearance Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)		3.0			3.0		2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)		330			348		138	1103		383	1102	
v/s Ratio Prot								0.36			c0.57	
v/s Ratio Perm		c0.03			0.02		0.07			0.01		
v/c Ratio		0.12			0.10		0.12	0.56		0.01	0.90	
Uniform Delay, d1		22.3			22.2		5.2	7.6		4.9	11.4	
Progression Factor		1.00			1.00		1.94	1.97		0.91	0.73	
Incremental Delay, d2		0.2			0.1		1.4	1.7		0.0	7.6	
Delay (s)		22.5			22.3		11.6	16.6		4.5	15.9	
Level of Service		C			C		B	B		A	B	
Approach Delay (s)		22.5			22.3			16.4			15.9	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	16.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	75.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	50	45	125	100	35	30	540	40	30	810	55
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.96		1.00	0.97		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	0.91	1.00		0.95	1.00		1.00	1.00		0.98	1.00	
Frt	1.00	0.93		1.00	0.96		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1521	1533		1556	1591		1455	1476		1357	1496	
Flt Permitted	0.66	1.00		0.69	1.00		0.18	1.00		0.36	1.00	
Satd. Flow (perm)	1054	1533		1136	1591		276	1476		510	1496	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	31	52	46	129	103	36	31	557	41	31	835	57
RTOR Reduction (vph)	0	35	0	0	17	0	0	4	0	0	3	0
Lane Group Flow (vph)	31	63	0	129	122	0	31	594	0	31	889	0
Confl. Peds. (#/hr)	50		30	30		50	20		30	30		20
Confl. Bikes (#/hr)			7			4			15			13
Heavy Vehicles (%)	0%	3%	0%	1%	3%	0%	0%	2%	3%	5%	1%	0%
Parking (#/hr)							5	5	5	5	5	5
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	18.0	18.0		18.0	18.0		48.0	48.0		48.0	48.0	
Effective Green, g (s)	18.0	18.0		18.0	18.0		48.0	48.0		48.0	48.0	
Actuated g/C Ratio	0.24	0.24		0.24	0.24		0.64	0.64		0.64	0.64	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	252	367		272	381		176	944		326	957	
v/s Ratio Prot		0.04			0.08			0.40			c0.59	
v/s Ratio Perm	0.03			c0.11			0.11			0.06		
v/c Ratio	0.12	0.17		0.47	0.32		0.18	0.63		0.10	0.93	
Uniform Delay, d1	22.3	22.6		24.4	23.5		5.5	8.1		5.2	12.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		0.13	0.12	
Incremental Delay, d2	0.2	0.2		1.3	0.5		2.2	3.2		0.3	9.0	
Delay (s)	22.5	22.8		25.7	24.0		7.7	11.3		0.9	10.4	
Level of Service	C	C		C	C		A	B		A	B	
Approach Delay (s)		22.7			24.8			11.1			10.1	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	13.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	84.6%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis — S. Willamette Street Corridor

4: Willamette Street & Willamette Street Plaza Driveway — 2018 PM Peak - Alt 3&5 (Modified 3-lane) - Bus Pullouts

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	125	150	35	465	735	170
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	
Frpb, ped/bikes	1.00	0.95	1.00	1.00	0.96	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.97	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1646	1403	1614	1716	3099	
Flt Permitted	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	1646	1403	1614	1716	3099	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	129	155	36	479	758	175
RTOR Reduction (vph)	0	116	0	0	15	0
Lane Group Flow (vph)	129	39	36	479	918	0
Confl. Peds. (#/hr)	15	15	50			50
Confl. Bikes (#/hr)		3				9
Heavy Vehicles (%)	1%	1%	3%	2%	0%	1%
Turn Type	NA	Perm	Prot	NA	NA	
Protected Phases	2		3	8	4	
Permitted Phases		2				
Actuated Green, G (s)	30.0	30.0	5.7	82.0	72.3	
Effective Green, g (s)	30.0	30.0	5.7	82.0	72.3	
Actuated g/C Ratio	0.25	0.25	0.05	0.68	0.60	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	411	350	76	1172	1867	
v/s Ratio Prot	c0.08		0.02	c0.28	c0.30	
v/s Ratio Perm		0.03				
v/c Ratio	0.31	0.11	0.47	0.41	0.49	
Uniform Delay, d1	36.6	34.7	55.7	8.3	13.5	
Progression Factor	1.00	1.00	1.47	0.14	1.00	
Incremental Delay, d2	2.0	0.6	3.4	0.8	0.9	
Delay (s)	38.6	35.3	85.6	2.0	14.4	
Level of Service	D	D	F	A	B	
Approach Delay (s)	36.8			7.8	14.4	
Approach LOS	D			A	B	

Intersection Summary			
HCM 2000 Control Delay	16.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	51.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
5: 29th Ave & Willamette Street

S. Willamette Street Corridor
2018 PM Peak - Alt 3&5 (Modified 3-lane) - Bus Pullouts

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	120	280	330	120	370	70	275	310	45	155	575	105
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1500	1500	1500	1750	1750	1750
Lane Width	12	10	10	10	10	11	11	10	11	12	12	12
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.92	1.00	1.00	0.83	1.00	0.99		1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1662	1601	1262	1492	1617	1175	1364	1314		1646	3145	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1662	1601	1262	1492	1617	1175	1364	1314		1646	3145	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	126	295	347	126	389	74	289	326	47	163	605	111
RTOR Reduction (vph)	0	0	196	0	0	54	0	3	0	0	12	0
Lane Group Flow (vph)	126	295	151	126	389	20	289	370	0	163	704	0
Confl. Peds. (#/hr)	45		30	30		45	40		25	25		40
Confl. Bikes (#/hr)			25			17			5			14
Heavy Vehicles (%)	0%	2%	1%	4%	1%	2%	1%	3%	5%	1%	1%	0%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	13.3	31.4	31.4	14.0	32.1	32.1	27.1	40.3		16.3	29.5	
Effective Green, g (s)	13.3	31.4	31.4	14.0	32.1	32.1	27.1	40.3		16.3	29.5	
Actuated g/C Ratio	0.11	0.26	0.26	0.12	0.27	0.27	0.23	0.34		0.14	0.25	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	184	418	330	174	432	314	308	441		223	773	
v/s Ratio Prot	0.08	0.18		c0.08	c0.24		c0.21	0.28		0.10	c0.22	
v/s Ratio Perm			0.12			0.02						
v/c Ratio	0.68	0.71	0.46	0.72	0.90	0.06	0.94	0.84		0.73	0.91	
Uniform Delay, d1	51.3	40.1	37.2	51.1	42.4	32.7	45.6	36.8		49.7	44.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.21	0.90	
Incremental Delay, d2	8.1	4.4	0.4	11.9	21.0	0.0	34.6	17.1		9.2	15.5	
Delay (s)	59.5	44.5	37.5	63.0	63.4	32.8	80.2	54.0		69.6	55.1	
Level of Service	E	D	D	E	E	C	F	D		E	E	
Approach Delay (s)		43.8			59.5			65.4			57.8	
Approach LOS		D			E			E			E	

Intersection Summary			
HCM 2000 Control Delay	56.2	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	84.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL2	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER	NER2
Lane Configurations												
Volume (vph)	5	10	20	5	245	5	30	320	615	365	5	5
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	12	12	12	14	12	12	12	12	12	12	12
Total Lost time (s)		4.0			4.0			4.0	5.0	5.0		
Lane Util. Factor		1.00			1.00			1.00	1.00	1.00		
Frpb, ped/bikes		0.98			1.00			1.00	0.98	1.00		
Flpb, ped/bikes		1.00			1.00			1.00	1.00	1.00		
Frt		0.92			1.00			1.00	0.85	1.00		
Flt Protected		0.98			1.00			1.00	1.00	0.95		
Satd. Flow (prot)		1495			1824			1725	1449	1642		
Flt Permitted		0.98			0.99			0.96	1.00	1.00		
Satd. Flow (perm)		1495			1812			1662	1449	1722		
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	11	21	5	258	5	32	337	647	384	5	5
RTOR Reduction (vph)	0	28	0	0	1	0	0	0	0	11	0	0
Lane Group Flow (vph)	0	9	0	0	267	0	0	369	647	383	0	0
Confl. Peds. (#/hr)	5		5	5		15	15		5	5		5
Confl. Bikes (#/hr)			2			2			4			4
Heavy Vehicles (%)	0%	0%	6%	0%	2%	0%	0%	1%	1%	1%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA	custom	NA		
Protected Phases		8			2			6				
Permitted Phases	8			2			6		3 6	3		
Actuated Green, G (s)		10.0			15.9			15.9	39.4	14.5		
Effective Green, g (s)		10.0			15.9			15.9	35.4	14.5		
Actuated g/C Ratio		0.25			0.40			0.40	0.90	0.37		
Clearance Time (s)		4.0			4.0			4.0		5.0		
Vehicle Extension (s)		2.5			2.5			2.5		2.0		
Lane Grp Cap (vph)		379			731			670	1301	633		
v/s Ratio Prot												
v/s Ratio Perm		0.01			0.15			0.22	c0.45	c0.22		
v/c Ratio		0.02			0.36			0.55	0.50	0.61		
Uniform Delay, d1		11.0			8.2			9.0	0.4	10.1		
Progression Factor		1.00			1.00			1.00	1.00	1.00		
Incremental Delay, d2		0.0			0.2			0.8	0.1	1.1		
Delay (s)		11.1			8.4			9.8	0.5	11.3		
Level of Service		B			A			A	A	B		
Approach Delay (s)		11.1			8.4			3.9		11.3		
Approach LOS		B			A			A		B		

Intersection Summary			
HCM 2000 Control Delay	6.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	39.4	Sum of lost time (s)	11.0
Intersection Capacity Utilization	72.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
1: Willamette Street/Willamette St & 24th Avenue

S. Willamette Street Corridor
2018 AM Peak - Alt 1 (4-lane)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	85	15	115	55	35	5	520	210	30	325	15
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	14	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)		4.5			4.5	4.5		4.5	4.5		4.5	
Lane Util. Factor		1.00			1.00	1.00		1.00	1.00		0.95	
Frpb, ped/bikes		1.00			1.00	0.91		1.00	0.88		1.00	
Flpb, ped/bikes		1.00			0.99	1.00		1.00	1.00		1.00	
Frt		0.98			1.00	0.85		1.00	0.85		0.99	
Flt Protected		0.99			0.97	1.00		1.00	1.00		1.00	
Satd. Flow (prot)		1797			1672	1359		1715	1278		3060	
Flt Permitted		0.94			0.73	1.00		1.00	1.00		0.89	
Satd. Flow (perm)		1695			1266	1359		1711	1278		2740	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	22	93	16	126	60	38	5	571	231	33	357	16
RTOR Reduction (vph)	0	7	0	0	0	28	0	0	91	0	4	0
Lane Group Flow (vph)	0	124	0	0	186	10	0	576	140	0	402	0
Confl. Peds. (#/hr)	10		10	10		10	25		50	50		25
Confl. Bikes (#/hr)			5			35			5			5
Heavy Vehicles (%)	0%	1%	0%	0%	2%	0%	0%	2%	1%	4%	7%	13%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6		6	8		8	4		
Actuated Green, G (s)		18.7			18.7	18.7		42.3	42.3		42.3	
Effective Green, g (s)		18.7			18.7	18.7		42.3	42.3		42.3	
Actuated g/C Ratio		0.27			0.27	0.27		0.60	0.60		0.60	
Clearance Time (s)		4.5			4.5	4.5		4.5	4.5		4.5	
Vehicle Extension (s)		3.0			3.0	3.0		2.0	2.0		2.0	
Lane Grp Cap (vph)		452			338	363		1033	772		1655	
v/s Ratio Prot												
v/s Ratio Perm		0.07			c0.15	0.01		c0.34	0.11		0.15	
v/c Ratio		0.27			0.55	0.03		0.56	0.18		0.24	
Uniform Delay, d1		20.3			22.0	18.9		8.3	6.2		6.4	
Progression Factor		1.00			1.00	1.00		0.37	0.26		1.00	
Incremental Delay, d2		0.3			1.9	0.0		2.0	0.5		0.3	
Delay (s)		20.6			24.0	19.0		5.0	2.1		6.8	
Level of Service		C			C	B		A	A		A	
Approach Delay (s)		20.6			23.1			4.2			6.8	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	8.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	71.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	5	5	15	5	15	10	725	15	15	430	20
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	14	12	12	14	12	12	12	12	12	12	12
Total Lost time (s)		4.5			4.5			4.5			4.5	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frpb, ped/bikes		0.99			0.98			1.00			1.00	
Flpb, ped/bikes		0.98			0.99			1.00			1.00	
Frt		0.97			0.94			1.00			0.99	
Flt Protected		0.97			0.98			1.00			1.00	
Satd. Flow (prot)		1704			1658			3244			3175	
Flt Permitted		0.87			0.91			0.95			0.92	
Satd. Flow (perm)		1532			1536			3075			2925	
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	18	6	6	18	6	18	12	873	18	18	518	24
RTOR Reduction (vph)	0	4	0	0	13	0	0	2	0	0	4	0
Lane Group Flow (vph)	0	26	0	0	29	0	0	901	0	0	556	0
Confl. Peds. (#/hr)	35		25	25		35	15		30	30		15
Confl. Bikes (#/hr)			5			5			10			10
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	1%	8%	0%	3%	0%
Bus Blockages (#/hr)	0	0	4	0	0	4	0	4	0	0	4	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)		18.0			18.0			43.0			43.0	
Effective Green, g (s)		18.0			18.0			43.0			43.0	
Actuated g/C Ratio		0.26			0.26			0.61			0.61	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Vehicle Extension (s)		3.0			3.0			2.0			2.0	
Lane Grp Cap (vph)		393			394			1888			1796	
v/s Ratio Prot												
v/s Ratio Perm		0.02			c0.02			c0.29			0.19	
v/c Ratio		0.06			0.07			0.48			0.31	
Uniform Delay, d1		19.6			19.7			7.4			6.4	
Progression Factor		1.00			1.00			0.62			1.03	
Incremental Delay, d2		0.1			0.1			0.8			0.4	
Delay (s)		19.7			19.8			5.3			7.1	
Level of Service		B			B			A			A	
Approach Delay (s)		19.7			19.8			5.3			7.1	
Approach LOS		B			B			A			A	

Intersection Summary			
HCM 2000 Control Delay	6.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	52.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	25	45	30	25	35	15	20	695	35	15	395	15
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frpb, ped/bikes	1.00	0.99		1.00	0.99			1.00			1.00	
Flpb, ped/bikes	0.99	1.00		0.98	1.00			1.00			1.00	
Frt	1.00	0.94		1.00	0.96			0.99			0.99	
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)	1581	1574		1637	1655			3024			2920	
Flt Permitted	0.72	1.00		0.70	1.00			0.94			0.92	
Satd. Flow (perm)	1198	1574		1208	1655			2837			2694	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	29	52	34	29	40	17	23	799	40	17	454	17
RTOR Reduction (vph)	0	27	0	0	14	0	0	4	0	0	3	0
Lane Group Flow (vph)	29	59	0	29	43	0	0	858	0	0	485	0
Confl. Peds. (#/hr)	10		15	15		10	10		40	40		10
Confl. Bikes (#/hr)			5			10			5			10
Heavy Vehicles (%)	4%	0%	8%	0%	0%	0%	0%	1%	0%	0%	5%	8%
Bus Blockages (#/hr)	0	0	4	0	0	4	0	4	0	0	4	0
Parking (#/hr)							5	5	5	5	5	5
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	14.4	14.4		14.4	14.4			46.6			46.6	
Effective Green, g (s)	14.4	14.4		14.4	14.4			46.6			46.6	
Actuated g/C Ratio	0.21	0.21		0.21	0.21			0.67			0.67	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			2.0			2.0	
Lane Grp Cap (vph)	246	323		248	340			1888			1793	
v/s Ratio Prot		c0.04			0.03							
v/s Ratio Perm	0.02			0.02				c0.30			0.18	
v/c Ratio	0.12	0.18		0.12	0.13			0.45			0.27	
Uniform Delay, d1	22.6	22.9		22.6	22.7			5.6			4.8	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.2	0.3		0.2	0.2			0.8			0.4	
Delay (s)	22.8	23.2		22.8	22.8			6.4			5.1	
Level of Service	C	C		C	C			A			A	
Approach Delay (s)		23.1			22.8			6.4			5.1	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	8.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	60.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Willamette Street & Willamette Street Plaza Driveway

S. Willamette Street Corridor
2018 AM Peak - Alt 1 (4-lane)

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	50	20	20	685	340	55
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frpb, ped/bikes	1.00	0.94		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	0.98	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1614	1397		3258	3107	
Flt Permitted	0.95	1.00		0.93	1.00	
Satd. Flow (perm)	1614	1397		3045	3107	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	57	23	23	787	391	63
RTOR Reduction (vph)	0	18	0	0	11	0
Lane Group Flow (vph)	57	5	0	810	443	0
Confl. Peds. (#/hr)	20	20	20			20
Confl. Bikes (#/hr)		5				5
Heavy Vehicles (%)	3%	0%	0%	1%	3%	0%
Bus Blockages (#/hr)	0	0	0	4	4	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	2			8	4	
Permitted Phases		2	8			
Actuated Green, G (s)	25.0	25.0		87.0	87.0	
Effective Green, g (s)	25.0	25.0		87.0	87.0	
Actuated g/C Ratio	0.21	0.21		0.72	0.72	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	336	291		2207	2252	
v/s Ratio Prot	c0.04				0.14	
v/s Ratio Perm		0.00		c0.27		
v/c Ratio	0.17	0.02		0.37	0.20	
Uniform Delay, d1	39.0	37.7		6.2	5.3	
Progression Factor	1.00	1.00		0.25	1.00	
Incremental Delay, d2	1.1	0.1		0.4	0.2	
Delay (s)	40.1	37.8		2.0	5.5	
Level of Service	D	D		A	A	
Approach Delay (s)	39.4			2.0	5.5	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	5.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	56.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis | S. Willamette Street Corridor
5: 29th Ave & Willamette Street | 2018 AM Peak - Alt 1 (4-lane)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑↱		↰	↑↱	
Volume (vph)	105	335	185	50	230	60	315	570	60	80	225	40
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	10	10	10	10	11	11	10	11	12	12	12
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.94	1.00	0.99		1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1630	1601	1249	1349	1586	1351	1545	2977		1502	2992	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1630	1601	1249	1349	1586	1351	1545	2977		1502	2992	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	119	381	210	57	261	68	358	648	68	91	256	45
RTOR Reduction (vph)	0	0	80	0	0	52	0	6	0	0	11	0
Lane Group Flow (vph)	119	381	130	57	261	16	358	710	0	91	290	0
Confl. Peds. (#/hr)	15		20	20		15	30		20	20		30
Confl. Bikes (#/hr)			25			25			10			10
Heavy Vehicles (%)	2%	2%	8%	15%	3%	0%	4%	1%	11%	8%	6%	11%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	10	6	0	0
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2	3	1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	11.4	32.8	63.9	6.0	27.4	27.4	31.1	52.1		11.1	32.1	
Effective Green, g (s)	11.4	32.8	63.9	6.0	27.4	27.4	31.1	52.1		11.1	32.1	
Actuated g/C Ratio	0.10	0.27	0.53	0.05	0.23	0.23	0.26	0.43		0.09	0.27	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	154	437	711	67	362	308	400	1292		138	800	
v/s Ratio Prot	c0.07	c0.24	0.05	0.04	0.16		c0.23	c0.24		0.06	0.10	
v/s Ratio Perm			0.06			0.01						
v/c Ratio	0.77	0.87	0.18	0.85	0.72	0.05	0.90	0.55		0.66	0.36	
Uniform Delay, d1	53.0	41.6	14.5	56.6	42.8	36.1	42.9	25.2		52.6	35.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.22	0.89	
Incremental Delay, d2	19.4	16.7	0.0	59.3	5.9	0.0	21.2	1.7		8.3	1.3	
Delay (s)	72.4	58.3	14.6	115.9	48.7	36.2	64.1	26.9		72.6	32.9	
Level of Service	E	E	B	F	D	D	E	C		E	C	
Approach Delay (s)		47.7			56.4			39.3			42.1	
Approach LOS		D			E			D			D	

Intersection Summary			
HCM 2000 Control Delay	44.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	73.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: S. Willamette & Donald St/Willamette Street & 32nd Ave

S. Willamette Street Corridor
2018 AM Peak - Alt 1 (4-lane)

Movement	WBL2	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER	NER2
Lane Configurations												
Volume (vph)	5	5	20	5	300	5	10	195	280	630	5	5
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	12	12	12	14	12	12	12	12	12	12	12
Total Lost time (s)		4.0			4.0			4.0	5.0	5.0		
Lane Util. Factor		1.00			1.00			1.00	1.00	1.00		
Frpb, ped/bikes		0.98			1.00			1.00	0.98	1.00		
Flpb, ped/bikes		1.00			1.00			1.00	1.00	0.99		
Frt		0.91			1.00			1.00	0.85	1.00		
Flt Protected		0.98			1.00			1.00	1.00	0.95		
Satd. Flow (prot)		1535			1790			1666	1398	1623		
Flt Permitted		0.98			0.99			0.98	1.00	1.00		
Satd. Flow (perm)		1535			1783			1631	1398	1703		
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	6	6	24	6	357	6	12	232	333	750	6	6
RTOR Reduction (vph)	0	20	0	0	1	0	0	0	0	6	0	0
Lane Group Flow (vph)	0	16	0	0	368	0	0	244	333	756	0	0
Confl. Peds. (#/hr)	5		5	10		10	10		10	5		5
Confl. Bikes (#/hr)			2			2			4			4
Heavy Vehicles (%)	0%	0%	0%	0%	4%	0%	0%	5%	4%	2%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA	custom	NA		
Protected Phases		8			2			6				
Permitted Phases	8			2			6		3 6	3		
Actuated Green, G (s)		26.0			17.4			17.4	56.9	30.5		
Effective Green, g (s)		26.0			17.4			17.4	52.9	30.5		
Actuated g/C Ratio		0.46			0.31			0.31	0.93	0.54		
Clearance Time (s)		4.0			4.0			4.0		5.0		
Vehicle Extension (s)		2.5			2.5			2.5		2.0		
Lane Grp Cap (vph)		701			545			498	1299	912		
v/s Ratio Prot												
v/s Ratio Perm		0.01			c0.21			0.15	0.24	c0.44		
v/c Ratio		0.02			0.68			0.49	0.26	0.83		
Uniform Delay, d1		8.5			17.3			16.1	0.2	11.0		
Progression Factor		1.00			1.00			1.00	1.00	1.00		
Incremental Delay, d2		0.0			3.0			0.6	0.0	6.0		
Delay (s)		8.5			20.3			16.7	0.2	17.0		
Level of Service		A			C			B	A	B		
Approach Delay (s)		8.5			20.3			7.2		17.0		
Approach LOS		A			C			A		B		

Intersection Summary			
HCM 2000 Control Delay	14.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	56.9	Sum of lost time (s)	11.0
Intersection Capacity Utilization	74.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis — S. Willamette Street Corridor
1: Willamette Street/Willamette St & 24th Avenue — 2018 PM Peak - Alt 3&5 (Modified 3-lane)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	85	15	115	55	35	5	520	210	30	325	15
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	14	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)		4.5			4.5	4.5	4.5	4.5		4.5	4.5	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.99			1.00	0.91	1.00	0.97		1.00	1.00	
Flpb, ped/bikes		1.00			0.99	1.00	0.97	1.00		0.98	1.00	
Frt		0.98			1.00	0.85	1.00	0.96		1.00	0.99	
Flt Protected		0.99			0.97	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1793			1665	1356	1618	1590		1572	1616	
Flt Permitted		0.93			0.73	1.00	0.51	1.00		0.22	1.00	
Satd. Flow (perm)		1690			1258	1356	864	1590		358	1616	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	22	93	16	126	60	38	5	571	231	33	357	16
RTOR Reduction (vph)	0	7	0	0	0	28	0	21	0	0	2	0
Lane Group Flow (vph)	0	124	0	0	186	10	5	781	0	33	371	0
Confl. Peds. (#/hr)	10		10	10		10	25		50	50		25
Confl. Bikes (#/hr)			5			35			5			5
Heavy Vehicles (%)	0%	1%	0%	0%	2%	0%	0%	2%	1%	4%	7%	13%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6		6	8			4		
Actuated Green, G (s)		18.1			18.1	18.1	42.9	42.9		42.9	42.9	
Effective Green, g (s)		18.1			18.1	18.1	42.9	42.9		42.9	42.9	
Actuated g/C Ratio		0.26			0.26	0.26	0.61	0.61		0.61	0.61	
Clearance Time (s)		4.5			4.5	4.5	4.5	4.5		4.5	4.5	
Vehicle Extension (s)		3.0			3.0	3.0	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)		436			325	350	529	974		219	990	
v/s Ratio Prot								c0.49			0.23	
v/s Ratio Perm		0.07			c0.15	0.01	0.01			0.09		
v/c Ratio		0.28			0.57	0.03	0.01	0.80		0.15	0.37	
Uniform Delay, d1		20.8			22.6	19.4	5.3	10.3		5.8	6.8	
Progression Factor		1.00			1.00	1.00	0.86	0.62		1.00	1.00	
Incremental Delay, d2		0.4			2.4	0.0	0.0	3.9		1.5	1.1	
Delay (s)		21.1			25.0	19.4	4.6	10.2		7.2	7.9	
Level of Service		C			C	B	A	B		A	A	
Approach Delay (s)		21.1			24.1			10.2			7.8	
Approach LOS		C			C			B			A	

Intersection Summary			
HCM 2000 Control Delay	12.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	86.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
2: Willamette Street & 25th Avenue

S. Willamette Street Corridor
2018 PM Peak - Alt 3&5 (Modified 3-lane)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	5	5	15	5	15	10	725	15	15	430	20
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	14	12	12	14	12	12	12	12	12	12	12
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.99			0.96		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		0.96			0.98		0.99	1.00		1.00	1.00	
Frt		0.97			0.94		1.00	1.00		1.00	0.99	
Flt Protected		0.97			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1667			1618		1644	1695		1662	1659	
Flt Permitted		0.87			0.91		0.39	1.00		0.16	1.00	
Satd. Flow (perm)		1499			1499		667	1695		286	1659	
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	18	6	6	18	6	18	12	873	18	18	518	24
RTOR Reduction (vph)	0	4	0	0	13	0	0	1	0	0	2	0
Lane Group Flow (vph)	0	26	0	0	29	0	12	890	0	18	540	0
Confl. Peds. (#/hr)	35		25	25		35	15		30	30		15
Confl. Bikes (#/hr)			5			5			10			10
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	1%	8%	0%	3%	0%
Bus Blockages (#/hr)	0	0	4	0	0	4	0	4	0	0	4	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)		18.0			18.0		43.0	43.0		43.0	43.0	
Effective Green, g (s)		18.0			18.0		43.0	43.0		43.0	43.0	
Actuated g/C Ratio		0.26			0.26		0.61	0.61		0.61	0.61	
Clearance Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)		3.0			3.0		2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)		385			385		409	1041		175	1019	
v/s Ratio Prot								c0.53			0.33	
v/s Ratio Perm		0.02			c0.02		0.02			0.06		
v/c Ratio		0.07			0.07		0.03	0.85		0.10	0.53	
Uniform Delay, d1		19.6			19.7		5.3	11.0		5.6	7.7	
Progression Factor		1.00			1.00		1.11	0.68		1.11	0.87	
Incremental Delay, d2		0.1			0.1		0.1	6.2		1.1	1.9	
Delay (s)		19.7			19.8		6.0	13.6		7.3	8.6	
Level of Service		B			B		A	B		A	A	
Approach Delay (s)		19.7			19.8			13.5			8.5	
Approach LOS		B			B			B			A	

Intersection Summary			
HCM 2000 Control Delay	12.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	65.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	25	45	30	25	35	15	20	695	35	15	395	15
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.98		1.00	0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.98	1.00		0.97	1.00		0.99	1.00		0.99	1.00	
Frt	1.00	0.94		1.00	0.96		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1570	1560		1619	1643		1442	1475		1435	1423	
Flt Permitted	0.72	1.00		0.70	1.00		0.45	1.00		0.23	1.00	
Satd. Flow (perm)	1189	1560		1195	1643		687	1475		348	1423	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	29	52	34	29	40	17	23	799	40	17	454	17
RTOR Reduction (vph)	0	27	0	0	14	0	0	2	0	0	2	0
Lane Group Flow (vph)	29	59	0	29	43	0	23	837	0	17	469	0
Confl. Peds. (#/hr)	10		15	15		10	10		40	40		10
Confl. Bikes (#/hr)			5			10			5			10
Heavy Vehicles (%)	4%	0%	8%	0%	0%	0%	0%	1%	0%	0%	5%	8%
Bus Blockages (#/hr)	0	0	4	0	0	4	0	4	0	0	4	0
Parking (#/hr)							5	5	5	5	5	5
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	14.4	14.4		14.4	14.4		46.6	46.6		46.6	46.6	
Effective Green, g (s)	14.4	14.4		14.4	14.4		46.6	46.6		46.6	46.6	
Actuated g/C Ratio	0.21	0.21		0.21	0.21		0.67	0.67		0.67	0.67	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	244	320		245	337		457	981		231	947	
v/s Ratio Prot		c0.04			0.03			c0.57			0.33	
v/s Ratio Perm	0.02			0.02			0.03			0.05		
v/c Ratio	0.12	0.18		0.12	0.13		0.05	0.85		0.07	0.50	
Uniform Delay, d1	22.6	23.0		22.6	22.7		4.0	9.0		4.1	5.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.42	1.27	
Incremental Delay, d2	0.2	0.3		0.2	0.2		0.2	9.3		0.5	1.6	
Delay (s)	22.9	23.2		22.8	22.9		4.3	18.4		6.4	9.0	
Level of Service	C	C		C	C		A	B		A	A	
Approach Delay (s)		23.1			22.9			18.0			8.9	
Approach LOS		C			C			B			A	

Intersection Summary			
HCM 2000 Control Delay	15.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	64.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	50	20	20	685	340	55
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	
Frpb, ped/bikes	1.00	0.94	1.00	1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.98	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1614	1394	1662	1705	3106	
Flt Permitted	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	1614	1394	1662	1705	3106	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	57	23	23	787	391	63
RTOR Reduction (vph)	0	20	0	0	10	0
Lane Group Flow (vph)	57	3	23	787	444	0
Confl. Peds. (#/hr)	20	20	20			20
Confl. Bikes (#/hr)		5				5
Heavy Vehicles (%)	3%	0%	0%	1%	3%	0%
Bus Blockages (#/hr)	0	0	0	4	4	0
Turn Type	NA	Perm	Prot	NA	NA	
Protected Phases	2		3	8	4	
Permitted Phases		2				
Actuated Green, G (s)	18.0	18.0	4.6	94.0	85.4	
Effective Green, g (s)	18.0	18.0	4.6	94.0	85.4	
Actuated g/C Ratio	0.15	0.15	0.04	0.78	0.71	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	242	209	63	1335	2210	
v/s Ratio Prot	c0.04		0.01	c0.46	0.14	
v/s Ratio Perm		0.00				
v/c Ratio	0.24	0.02	0.37	0.59	0.20	
Uniform Delay, d1	44.9	43.5	56.3	5.2	5.8	
Progression Factor	1.00	1.00	1.39	0.06	1.00	
Incremental Delay, d2	2.3	0.1	1.7	0.9	0.2	
Delay (s)	47.2	43.6	79.9	1.2	6.0	
Level of Service	D	D	E	A	A	
Approach Delay (s)	46.2			3.4	6.0	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	6.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	59.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	105	335	185	50	230	60	315	570	60	80	225	40
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	10	10	10	10	11	11	10	11	12	12	12
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.93	1.00	1.00	0.90	1.00	0.99		1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1630	1601	1200	1349	1586	1289	1545	1567		1502	2992	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1630	1601	1200	1349	1586	1289	1545	1567		1502	2992	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	119	381	210	57	261	68	358	648	68	91	256	45
RTOR Reduction (vph)	0	0	102	0	0	53	0	3	0	0	11	0
Lane Group Flow (vph)	119	381	108	57	261	15	358	713	0	91	290	0
Confl. Peds. (#/hr)	15		20	20		15	30		20	20		30
Confl. Bikes (#/hr)			25			25			10			10
Heavy Vehicles (%)	2%	2%	8%	15%	3%	0%	4%	1%	11%	8%	6%	11%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	10	6	0	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	9.5	29.8	29.8	5.5	25.8	25.8	32.1	58.5		8.2	34.6	
Effective Green, g (s)	9.5	29.8	29.8	5.5	25.8	25.8	32.1	58.5		8.2	34.6	
Actuated g/C Ratio	0.08	0.25	0.25	0.05	0.22	0.22	0.27	0.49		0.07	0.29	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	129	397	298	61	340	277	413	763		102	862	
v/s Ratio Prot	c0.07	c0.24		0.04	0.16		c0.23	c0.46		0.06	0.10	
v/s Ratio Perm			0.09			0.01						
v/c Ratio	0.92	0.96	0.36	0.93	0.77	0.05	0.87	0.93		0.89	0.34	
Uniform Delay, d1	54.9	44.5	37.2	57.1	44.3	37.4	41.9	28.9		55.5	33.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.01	0.85	
Incremental Delay, d2	55.1	34.1	0.3	90.4	9.0	0.0	16.6	20.0		54.6	1.0	
Delay (s)	110.0	78.6	37.5	147.5	53.3	37.4	58.5	49.0		110.5	29.7	
Level of Service	F	E	D	F	D	D	E	D		F	C	
Approach Delay (s)		71.7			64.4			52.1			48.5	
Approach LOS		E			E			D			D	

Intersection Summary			
HCM 2000 Control Delay	58.9	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	79.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: S. Willamette & Donald St/Willamette Street & 32nd Ave

S. Willamette Street Corridor
2018 PM Peak - Alt 3&5 (Modified 3-lane)

Movement	WBL2	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER	NER2
Lane Configurations												
Volume (vph)	5	5	20	5	300	5	10	195	280	630	5	5
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	12	12	12	14	12	12	12	12	12	12	12
Total Lost time (s)		4.0			4.0			4.0	5.0	5.0		
Lane Util. Factor		1.00			1.00			1.00	1.00	1.00		
Frpb, ped/bikes		0.98			1.00			1.00	0.98	1.00		
Flpb, ped/bikes		1.00			1.00			1.00	1.00	0.99		
Frt		0.91			1.00			1.00	0.85	1.00		
Flt Protected		0.98			1.00			1.00	1.00	0.95		
Satd. Flow (prot)		1529			1790			1666	1396	1623		
Flt Permitted		0.98			0.99			0.98	1.00	1.00		
Satd. Flow (perm)		1529			1782			1631	1396	1703		
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	6	6	24	6	357	6	12	232	333	750	6	6
RTOR Reduction (vph)	0	20	0	0	1	0	0	0	0	6	0	0
Lane Group Flow (vph)	0	16	0	0	368	0	0	244	333	756	0	0
Confl. Peds. (#/hr)	5		5	10		10	10		10	5		5
Confl. Bikes (#/hr)			10			10			10			10
Heavy Vehicles (%)	0%	0%	0%	0%	4%	0%	0%	5%	4%	2%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA	custom	NA		
Protected Phases		8			2			6				
Permitted Phases	8			2			6		3 6	3		
Actuated Green, G (s)		26.0			17.4			17.4	56.9	30.5		
Effective Green, g (s)		26.0			17.4			17.4	52.9	30.5		
Actuated g/C Ratio		0.46			0.31			0.31	0.93	0.54		
Clearance Time (s)		4.0			4.0			4.0		5.0		
Vehicle Extension (s)		2.5			2.5			2.5		2.0		
Lane Grp Cap (vph)		698			544			498	1297	912		
v/s Ratio Prot												
v/s Ratio Perm		0.01			c0.21			0.15	0.24	c0.44		
v/c Ratio		0.02			0.68			0.49	0.26	0.83		
Uniform Delay, d1		8.5			17.3			16.1	0.2	11.0		
Progression Factor		1.00			1.00			1.00	1.00	1.00		
Incremental Delay, d2		0.0			3.0			0.6	0.0	6.0		
Delay (s)		8.5			20.3			16.7	0.2	17.0		
Level of Service		A			C			B	A	B		
Approach Delay (s)		8.5			20.3			7.2		17.0		
Approach LOS		A			C			A		B		

Intersection Summary			
HCM 2000 Control Delay	14.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	56.9	Sum of lost time (s)	11.0
Intersection Capacity Utilization	74.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
1: Willamette Street/Willamette St & 24th Avenue

S. Willamette Street Corridor
2018 PM Shoulder - Alt 1 (4-lane)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	55	30	160	55	30	5	485	180	35	530	10
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	14	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)		4.5			4.5	4.5		4.5	4.5		4.5	
Lane Util. Factor		1.00			1.00	1.00		1.00	1.00		0.95	
Frpb, ped/bikes		0.98			1.00	0.92		1.00	0.93		1.00	
Flpb, ped/bikes		1.00			0.98	1.00		1.00	1.00		1.00	
Frt		0.96			1.00	0.85		1.00	0.85		1.00	
Flt Protected		0.99			0.96	1.00		1.00	1.00		1.00	
Satd. Flow (prot)		1727			1645	1348		1731	1343		3267	
Flt Permitted		0.94			0.74	1.00		0.99	1.00		0.90	
Satd. Flow (perm)		1637			1258	1348		1722	1343		2953	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	17	61	33	178	61	33	6	539	200	39	589	11
RTOR Reduction (vph)	0	23	0	0	0	23	0	0	83	0	1	0
Lane Group Flow (vph)	0	88	0	0	239	10	0	545	117	0	638	0
Confl. Peds. (#/hr)	20		20	20		20	20		20	20		20
Confl. Bikes (#/hr)			20			20			20			20
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6		6	8		8	4		
Actuated Green, G (s)		22.1			22.1	22.1		43.9	43.9		43.9	
Effective Green, g (s)		22.1			22.1	22.1		43.9	43.9		43.9	
Actuated g/C Ratio		0.29			0.29	0.29		0.59	0.59		0.59	
Clearance Time (s)		4.5			4.5	4.5		4.5	4.5		4.5	
Vehicle Extension (s)		3.0			3.0	3.0		2.0	2.0		2.0	
Lane Grp Cap (vph)		482			370	397		1007	786		1728	
v/s Ratio Prot												
v/s Ratio Perm		0.05			c0.19	0.01		c0.32	0.09		0.22	
v/c Ratio		0.18			0.65	0.02		0.54	0.15		0.37	
Uniform Delay, d1		19.7			23.0	18.8		9.4	7.1		8.2	
Progression Factor		1.00			1.00	1.00		0.36	0.02		1.00	
Incremental Delay, d2		0.2			3.8	0.0		2.0	0.4		0.6	
Delay (s)		19.9			26.9	18.8		5.4	0.5		8.8	
Level of Service		B			C	B		A	A		A	
Approach Delay (s)		19.9			25.9			4.1			8.8	
Approach LOS		B			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	10.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	71.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	25	5	10	15	5	15	10	675	10	15	645	25
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	14	12	12	14	12	12	12	12	12	12	12
Total Lost time (s)		4.5			4.5			4.5			4.5	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frpb, ped/bikes		0.99			0.98			1.00			1.00	
Flpb, ped/bikes		0.99			0.99			1.00			1.00	
Frt		0.97			0.94			1.00			0.99	
Flt Protected		0.97			0.98			1.00			1.00	
Satd. Flow (prot)		1687			1653			3253			3235	
Flt Permitted		0.85			0.90			0.94			0.93	
Satd. Flow (perm)		1477			1525			3073			3025	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	28	6	11	17	6	17	11	750	11	17	717	28
RTOR Reduction (vph)	0	8	0	0	13	0	0	1	0	0	3	0
Lane Group Flow (vph)	0	37	0	0	27	0	0	771	0	0	759	0
Confl. Peds. (#/hr)	20		20	20		20	20		20	20		20
Confl. Bikes (#/hr)			15			15			15			15
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	4	0	0	4	0	4	0	0	4	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)		18.0			18.0			48.0			48.0	
Effective Green, g (s)		18.0			18.0			48.0			48.0	
Actuated g/C Ratio		0.24			0.24			0.64			0.64	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Vehicle Extension (s)		3.0			3.0			2.0			2.0	
Lane Grp Cap (vph)		354			366			1966			1936	
v/s Ratio Prot												
v/s Ratio Perm		c0.02			0.02			c0.25			0.25	
v/c Ratio		0.10			0.07			0.39			0.39	
Uniform Delay, d1		22.2			22.1			6.5			6.5	
Progression Factor		1.00			1.00			1.55			1.13	
Incremental Delay, d2		0.1			0.1			0.6			0.6	
Delay (s)		22.3			22.1			10.6			7.9	
Level of Service		C			C			B			A	
Approach Delay (s)		22.3			22.1			10.6			7.9	
Approach LOS		C			C			B			A	

Intersection Summary			
HCM 2000 Control Delay	10.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	54.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Willamette Street & 27th Avenue

S. Willamette Street Corridor
2018 PM Shoulder - Alt 1 (4-lane)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱			⇆			⇆	
Volume (vph)	20	30	25	70	45	30	25	660	30	15	610	30
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frpb, ped/bikes	1.00	0.98		1.00	0.98			1.00			1.00	
Flpb, ped/bikes	0.98	1.00		0.98	1.00			1.00			1.00	
Frt	1.00	0.93		1.00	0.94			0.99			0.99	
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)	1594	1559		1608	1595			2973			2972	
Flt Permitted	0.70	1.00		0.72	1.00			0.92			0.93	
Satd. Flow (perm)	1179	1559		1214	1595			2730			2775	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	22	33	28	78	50	33	28	733	33	17	678	33
RTOR Reduction (vph)	0	23	0	0	27	0	0	2	0	0	3	0
Lane Group Flow (vph)	22	38	0	78	56	0	0	792	0	0	725	0
Confl. Peds. (#/hr)	20		20	20		20	20		20	20		20
Confl. Bikes (#/hr)			15			15			15			15
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	3%	1%	1%	3%	1%
Bus Blockages (#/hr)	0	0	4	0	0	4	0	4	0	0	4	0
Parking (#/hr)							5	5	5	5	5	5
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	14.4	14.4		14.4	14.4			51.6			51.6	
Effective Green, g (s)	14.4	14.4		14.4	14.4			51.6			51.6	
Actuated g/C Ratio	0.19	0.19		0.19	0.19			0.69			0.69	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			2.0			2.0	
Lane Grp Cap (vph)	226	299		233	306			1878			1909	
v/s Ratio Prot		0.02			0.04							
v/s Ratio Perm	0.02			c0.06				c0.29			0.26	
v/c Ratio	0.10	0.13		0.33	0.18			0.42			0.38	
Uniform Delay, d1	24.9	25.1		26.2	25.4			5.1			4.9	
Progression Factor	1.00	1.00		1.00	1.00			1.00			0.98	
Incremental Delay, d2	0.2	0.2		0.9	0.3			0.7			0.5	
Delay (s)	25.1	25.3		27.0	25.7			5.8			5.4	
Level of Service	C	C		C	C			A			A	
Approach Delay (s)		25.3			26.3			5.8			5.4	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	8.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	63.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Willamette Street & Willamette Street Plaza Driveway

S. Willamette Street Corridor
2018 PM Shoulder - Alt 1 (4-lane)

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	95	90	25	605	510	105
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frpb, ped/bikes	1.00	0.93		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	0.97	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1630	1360		3256	3127	
Flt Permitted	0.95	1.00		0.91	1.00	
Satd. Flow (perm)	1630	1360		2956	3127	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	106	100	28	672	567	117
RTOR Reduction (vph)	0	73	0	0	14	0
Lane Group Flow (vph)	106	27	0	700	670	0
Confl. Peds. (#/hr)	20	20	20			20
Confl. Bikes (#/hr)		15				15
Heavy Vehicles (%)	2%	2%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	4	4	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	2			8	4	
Permitted Phases		2	8			
Actuated Green, G (s)	32.0	32.0		80.0	80.0	
Effective Green, g (s)	32.0	32.0		80.0	80.0	
Actuated g/C Ratio	0.27	0.27		0.67	0.67	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	434	362		1970	2084	
v/s Ratio Prot	c0.07				0.21	
v/s Ratio Perm		0.02		c0.24		
v/c Ratio	0.24	0.07		0.36	0.32	
Uniform Delay, d1	34.5	32.9		8.7	8.5	
Progression Factor	1.00	1.00		0.44	1.00	
Incremental Delay, d2	1.3	0.4		0.5	0.4	
Delay (s)	35.8	33.3		4.3	8.9	
Level of Service	D	C		A	A	
Approach Delay (s)	34.6			4.3	8.9	
Approach LOS	C			A	A	

Intersection Summary			
HCM 2000 Control Delay	10.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	58.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: 29th Ave & Willamette Street

S. Willamette Street Corridor
2018 PM Shoulder - Alt 1 (4-lane)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑↑↱		↰	↑↑↱	
Volume (vph)	105	245	215	75	265	65	250	385	45	115	355	70
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	10	10	10	10	11	11	10	11	12	12	12
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.94	1.00	0.99		1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1646	1601	1334	1492	1617	1318	1560	2937		1607	3159	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1646	1601	1334	1492	1617	1318	1560	2937		1607	3159	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	117	272	239	83	294	72	278	428	50	128	394	78
RTOR Reduction (vph)	0	0	97	0	0	56	0	6	0	0	12	0
Lane Group Flow (vph)	117	272	142	83	294	16	278	472	0	128	460	0
Confl. Peds. (#/hr)	20		20	20		20	20		20	20		20
Confl. Bikes (#/hr)			20			20			20			20
Heavy Vehicles (%)	1%	2%	1%	4%	1%	2%	3%	3%	3%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	10	6	0	0
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2	3	1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	12.0	29.3	54.2	9.0	26.3	26.3	24.9	50.2		13.5	38.8	
Effective Green, g (s)	12.0	29.3	54.2	9.0	26.3	26.3	24.9	50.2		13.5	38.8	
Actuated g/C Ratio	0.10	0.24	0.45	0.08	0.22	0.22	0.21	0.42		0.11	0.32	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	164	390	652	111	354	288	323	1228		180	1021	
v/s Ratio Prot	c0.07	c0.17	0.05	0.06	c0.18		c0.18	0.16		0.08	c0.15	
v/s Ratio Perm			0.06			0.01						
v/c Ratio	0.71	0.70	0.22	0.75	0.83	0.05	0.86	0.38		0.71	0.45	
Uniform Delay, d1	52.3	41.3	20.0	54.4	44.7	37.0	45.9	24.2		51.4	32.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.17	0.84	
Incremental Delay, d2	11.5	4.4	0.1	21.1	14.5	0.0	19.6	0.9		10.1	1.4	
Delay (s)	63.9	45.7	20.1	75.5	59.2	37.1	65.5	25.1		70.3	28.4	
Level of Service	E	D	C	E	E	D	E	C		E	C	
Approach Delay (s)		39.3			58.7			40.0			37.3	
Approach LOS		D			E			D			D	

Intersection Summary			
HCM 2000 Control Delay	42.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	70.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: S. Willamette & Donald St/Willamette Street & 32nd Ave

S. Willamette Street Corridor
2018 PM Shoulder - Alt 1 (4-lane)

Movement	WBL2	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER	NER2
Lane Configurations												
Volume (vph)	5	10	20	5	245	5	30	335	620	370	5	5
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	12	12	12	14	12	12	12	12	12	12	12
Total Lost time (s)		4.0			4.0			4.0	5.0	5.0		
Lane Util. Factor		1.00			1.00			1.00	1.00	1.00		
Frpb, ped/bikes		0.97			1.00			1.00	0.98	1.00		
Flpb, ped/bikes		0.99			1.00			1.00	1.00	1.00		
Frt		0.92			1.00			1.00	0.85	1.00		
Flt Protected		0.98			1.00			1.00	1.00	0.95		
Satd. Flow (prot)		1507			1822			1724	1441	1636		
Flt Permitted		0.98			0.99			0.96	1.00	1.00		
Satd. Flow (perm)		1507			1808			1663	1441	1716		
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	6	11	22	6	272	6	33	372	689	411	6	6
RTOR Reduction (vph)	0	29	0	0	1	0	0	0	0	11	0	0
Lane Group Flow (vph)	0	10	0	0	283	0	0	405	689	412	0	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Confl. Bikes (#/hr)			10			10			10			10
Heavy Vehicles (%)	1%	1%	1%	1%	2%	1%	1%	1%	1%	1%	2%	1%
Turn Type	Perm	NA		Perm	NA		Perm	NA	custom	NA		
Protected Phases		8			2			6				
Permitted Phases	8			2			6		3 6	3		
Actuated Green, G (s)		10.8			17.3			17.3	41.7	15.4		
Effective Green, g (s)		10.8			17.3			17.3	37.7	15.4		
Actuated g/C Ratio		0.26			0.41			0.41	0.90	0.37		
Clearance Time (s)		4.0			4.0			4.0		5.0		
Vehicle Extension (s)		2.5			2.5			2.5		2.0		
Lane Grp Cap (vph)		390			750			689	1302	633		
v/s Ratio Prot												
v/s Ratio Perm		0.01			0.16			0.24	c0.48	c0.24		
v/c Ratio		0.03			0.38			0.59	0.53	0.65		
Uniform Delay, d1		11.5			8.5			9.4	0.4	10.9		
Progression Factor		1.00			1.00			1.00	1.00	1.00		
Incremental Delay, d2		0.0			0.2			1.1	0.2	1.8		
Delay (s)		11.5			8.7			10.5	0.5	12.8		
Level of Service		B			A			B	A	B		
Approach Delay (s)		11.5			8.7			4.2		12.8		
Approach LOS		B			A			A		B		

Intersection Summary			
HCM 2000 Control Delay	7.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	41.7	Sum of lost time (s)	11.0
Intersection Capacity Utilization	73.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
1: Willamette Street/Willamette St & 24th Avenue

S. Willamette Street Corridor
2018 Midday - Alt 3&5 (Modified 3-lane)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	55	30	160	55	30	5	485	180	35	530	10
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	14	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)		4.5			4.5	4.5	4.5	4.5		4.5	4.5	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.97			1.00	0.91	1.00	0.98		1.00	1.00	
Flpb, ped/bikes		1.00			0.98	1.00	0.99	1.00		0.99	1.00	
Frt		0.96			1.00	0.85	1.00	0.96		1.00	1.00	
Flt Protected		0.99			0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1708			1629	1344	1625	1630		1632	1726	
Flt Permitted		0.94			0.73	1.00	0.34	1.00		0.25	1.00	
Satd. Flow (perm)		1615			1241	1344	586	1630		435	1726	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	17	61	33	178	61	33	6	539	200	39	589	11
RTOR Reduction (vph)	0	21	0	0	0	24	0	17	0	0	1	0
Lane Group Flow (vph)	0	90	0	0	239	9	6	722	0	39	599	0
Confl. Peds. (#/hr)	20		20	20		20	20		20	20		20
Confl. Bikes (#/hr)			20			20			20			20
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6		6	8			4		
Actuated Green, G (s)		20.0			20.0	20.0	46.0	46.0		46.0	46.0	
Effective Green, g (s)		20.0			20.0	20.0	46.0	46.0		46.0	46.0	
Actuated g/C Ratio		0.27			0.27	0.27	0.61	0.61		0.61	0.61	
Clearance Time (s)		4.5			4.5	4.5	4.5	4.5		4.5	4.5	
Vehicle Extension (s)		3.0			3.0	3.0	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)		430			330	358	359	999		266	1058	
v/s Ratio Prot								c0.44			0.35	
v/s Ratio Perm		0.06			c0.19	0.01	0.01			0.09		
v/c Ratio		0.21			0.72	0.02	0.02	0.72		0.15	0.57	
Uniform Delay, d1		21.4			25.0	20.3	5.7	10.1		6.2	8.6	
Progression Factor		1.00			1.00	1.00	1.72	1.41		1.00	1.00	
Incremental Delay, d2		0.2			7.7	0.0	0.1	3.4		1.2	2.2	
Delay (s)		21.6			32.7	20.3	9.8	17.6		7.3	10.8	
Level of Service		C			C	C	A	B		A	B	
Approach Delay (s)		21.6			31.2			17.5			10.6	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	17.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	81.4%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
2: Willamette Street & 25th Avenue

S. Willamette Street Corridor
2018 Midday - Alt 3&5 (Modified 3-lane)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	25	5	10	15	5	15	10	675	10	15	645	25
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	14	12	12	14	12	12	12	12	12	12	12
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.98			0.96		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		0.98			0.98		0.99	1.00		0.99	1.00	
Frt		0.97			0.94		1.00	1.00		1.00	0.99	
Flt Protected		0.97			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1653			1613		1632	1699		1632	1691	
Flt Permitted		0.85			0.90		0.27	1.00		0.26	1.00	
Satd. Flow (perm)		1448			1488		458	1699		441	1691	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	28	6	11	17	6	17	11	750	11	17	717	28
RTOR Reduction (vph)	0	8	0	0	13	0	0	1	0	0	2	0
Lane Group Flow (vph)	0	37	0	0	27	0	11	760	0	17	743	0
Confl. Peds. (#/hr)	20		20	20		20	20		20	20		20
Confl. Bikes (#/hr)			20			20			20			20
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	4	0	0	4	0	4	0	0	4	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)		18.0			18.0		48.0	48.0		48.0	48.0	
Effective Green, g (s)		18.0			18.0		48.0	48.0		48.0	48.0	
Actuated g/C Ratio		0.24			0.24		0.64	0.64		0.64	0.64	
Clearance Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)		3.0			3.0		2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)		347			357		293	1087		282	1082	
v/s Ratio Prot								c0.45			0.44	
v/s Ratio Perm		c0.03			0.02		0.02			0.04		
v/c Ratio		0.11			0.08		0.04	0.70		0.06	0.69	
Uniform Delay, d1		22.2			22.1		5.0	8.8		5.1	8.7	
Progression Factor		1.00			1.00		1.41	1.81		0.71	0.66	
Incremental Delay, d2		0.1			0.1		0.2	2.7		0.3	3.0	
Delay (s)		22.4			22.2		7.2	18.6		3.9	8.7	
Level of Service		C			C		A	B		A	A	
Approach Delay (s)		22.4			22.2			18.4			8.6	
Approach LOS		C			C			B			A	

Intersection Summary			
HCM 2000 Control Delay	14.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	61.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	30	25	70	45	30	25	660	30	15	610	30
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.96		1.00	0.96		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.96	1.00		0.96	1.00		0.99	1.00		0.99	1.00	
Frt	1.00	0.93		1.00	0.94		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1569	1532		1583	1572		1425	1450		1427	1449	
Flt Permitted	0.70	1.00		0.72	1.00		0.31	1.00		0.28	1.00	
Satd. Flow (perm)	1161	1532		1195	1572		470	1450		425	1449	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	22	33	28	78	50	33	28	733	33	17	678	33
RTOR Reduction (vph)	0	23	0	0	27	0	0	2	0	0	2	0
Lane Group Flow (vph)	22	38	0	78	56	0	28	764	0	17	709	0
Confl. Peds. (#/hr)	20		20	20		20	20		20	20		20
Confl. Bikes (#/hr)			15			15			15			15
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	3%	1%	1%	3%	1%
Bus Blockages (#/hr)	0	0	4	0	0	4	0	4	0	0	4	0
Parking (#/hr)							5	5	5	5	5	5
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	14.2	14.2		14.2	14.2		51.8	51.8		51.8	51.8	
Effective Green, g (s)	14.2	14.2		14.2	14.2		51.8	51.8		51.8	51.8	
Actuated g/C Ratio	0.19	0.19		0.19	0.19		0.69	0.69		0.69	0.69	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	219	290		226	297		324	1001		293	1000	
v/s Ratio Prot		0.02			0.04			c0.53			0.49	
v/s Ratio Perm	0.02			c0.07			0.06			0.04		
v/c Ratio	0.10	0.13		0.35	0.19		0.09	0.76		0.06	0.71	
Uniform Delay, d1	25.1	25.3		26.4	25.6		3.8	7.6		3.7	7.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		0.16	0.52	
Incremental Delay, d2	0.2	0.2		0.9	0.3		0.5	5.5		0.3	3.2	
Delay (s)	25.3	25.5		27.3	25.9		4.3	13.1		0.9	6.8	
Level of Service	C	C		C	C		A	B		A	A	
Approach Delay (s)		25.4			26.6			12.8			6.7	
Approach LOS		C			C			B			A	

Intersection Summary			
HCM 2000 Control Delay	12.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	62.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Willamette Street & Willamette Street Plaza Driveway

S. Willamette Street Corridor
2018 Midday - Alt 3&5 (Modified 3-lane)

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	95	90	25	605	510	105
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	
Frpb, ped/bikes	1.00	0.93	1.00	1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.97	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1630	1352	1646	1705	3127	
Flt Permitted	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	1630	1352	1646	1705	3127	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	106	100	28	672	567	117
RTOR Reduction (vph)	0	82	0	0	13	0
Lane Group Flow (vph)	106	18	28	672	671	0
Confl. Peds. (#/hr)	20	20	20			20
Confl. Bikes (#/hr)		15				15
Heavy Vehicles (%)	2%	2%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	4	4	0
Turn Type	NA	Perm	Prot	NA	NA	
Protected Phases	2		3	8	4	
Permitted Phases		2				
Actuated Green, G (s)	22.0	22.0	4.7	90.0	81.3	
Effective Green, g (s)	22.0	22.0	4.7	90.0	81.3	
Actuated g/C Ratio	0.18	0.18	0.04	0.75	0.68	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	298	247	64	1278	2118	
v/s Ratio Prot	c0.07		0.02	c0.39	0.21	
v/s Ratio Perm		0.01				
v/c Ratio	0.36	0.07	0.44	0.53	0.32	
Uniform Delay, d1	42.8	40.6	56.4	6.2	7.9	
Progression Factor	1.00	1.00	1.41	0.24	1.00	
Incremental Delay, d2	3.3	0.6	4.0	1.3	0.4	
Delay (s)	46.1	41.2	83.6	2.8	8.3	
Level of Service	D	D	F	A	A	
Approach Delay (s)	43.7			6.0	8.3	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	11.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	54.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: 29th Ave & Willamette Street

S. Willamette Street Corridor
2018 Midday - Alt 3&5 (Modified 3-lane)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	105	245	215	75	265	65	250	385	45	115	355	70
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	10	10	10	10	11	11	10	11	12	12	12
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.94	1.00	1.00	0.89	1.00	0.99		1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1646	1601	1286	1492	1617	1255	1560	1546		1607	3160	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1646	1601	1286	1492	1617	1255	1560	1546		1607	3160	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	117	272	239	83	294	72	278	428	50	128	394	78
RTOR Reduction (vph)	0	0	154	0	0	57	0	3	0	0	12	0
Lane Group Flow (vph)	117	272	85	83	294	15	278	475	0	128	460	0
Confl. Peds. (#/hr)	20		20	20		20	20		20	20		20
Confl. Bikes (#/hr)			20			20			20			20
Heavy Vehicles (%)	1%	2%	1%	4%	1%	2%	3%	3%	3%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	10	6	0	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	10.8	26.8	26.8	8.9	24.9	24.9	24.3	54.2		12.1	42.0	
Effective Green, g (s)	10.8	26.8	26.8	8.9	24.9	24.9	24.3	54.2		12.1	42.0	
Actuated g/C Ratio	0.09	0.22	0.22	0.07	0.21	0.21	0.20	0.45		0.10	0.35	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	148	357	287	110	335	260	315	698		162	1106	
v/s Ratio Prot	c0.07	0.17		0.06	c0.18		c0.18	c0.31		0.08	0.15	
v/s Ratio Perm			0.07			0.01						
v/c Ratio	0.79	0.76	0.30	0.75	0.88	0.06	0.88	0.68		0.79	0.42	
Uniform Delay, d1	53.5	43.6	38.8	54.5	46.1	38.1	46.5	26.0		52.7	29.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.07	0.81	
Incremental Delay, d2	22.9	8.4	0.2	22.6	21.3	0.0	23.3	5.3		20.6	1.1	
Delay (s)	76.4	52.0	39.0	77.0	67.4	38.2	69.8	31.3		76.7	25.2	
Level of Service	E	D	D	E	E	D	E	C		E	C	
Approach Delay (s)		51.6			64.5			45.5			36.2	
Approach LOS		D			E			D			D	

Intersection Summary			
HCM 2000 Control Delay	48.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	70.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: S. Willamette & Donald St/Willamette Street & 32nd Ave

S. Willamette Street Corridor
2018 Midday - Alt 3&5 (Modified 3-lane)

Movement	WBL2	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER	NER2
Lane Configurations												
Volume (vph)	5	10	20	5	245	5	30	335	620	370	5	5
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	12	12	12	14	12	12	12	12	12	12	12
Total Lost time (s)		4.0			4.0			4.0	5.0	5.0		
Lane Util. Factor		1.00			1.00			1.00	1.00	1.00		
Frpb, ped/bikes		0.97			1.00			1.00	0.98	1.00		
Flpb, ped/bikes		0.99			1.00			1.00	1.00	1.00		
Frt		0.92			1.00			1.00	0.85	1.00		
Flt Protected		0.98			1.00			1.00	1.00	0.95		
Satd. Flow (prot)		1507			1822			1724	1441	1636		
Flt Permitted		0.98			0.99			0.96	1.00	1.00		
Satd. Flow (perm)		1507			1808			1663	1441	1716		
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	6	11	22	6	272	6	33	372	689	411	6	6
RTOR Reduction (vph)	0	29	0	0	1	0	0	0	0	11	0	0
Lane Group Flow (vph)	0	10	0	0	283	0	0	405	689	412	0	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Confl. Bikes (#/hr)			10			10			10			10
Heavy Vehicles (%)	1%	1%	1%	1%	2%	1%	1%	1%	1%	1%	2%	1%
Turn Type	Perm	NA		Perm	NA		Perm	NA	custom	NA		
Protected Phases		8			2			6				
Permitted Phases	8			2			6		3 6	3		
Actuated Green, G (s)		10.8			17.3			17.3	41.7	15.4		
Effective Green, g (s)		10.8			17.3			17.3	37.7	15.4		
Actuated g/C Ratio		0.26			0.41			0.41	0.90	0.37		
Clearance Time (s)		4.0			4.0			4.0		5.0		
Vehicle Extension (s)		2.5			2.5			2.5		2.0		
Lane Grp Cap (vph)		390			750			689	1302	633		
v/s Ratio Prot												
v/s Ratio Perm		0.01			0.16			0.24	c0.48	c0.24		
v/c Ratio		0.03			0.38			0.59	0.53	0.65		
Uniform Delay, d1		11.5			8.5			9.4	0.4	10.9		
Progression Factor		1.00			1.00			1.00	1.00	1.00		
Incremental Delay, d2		0.0			0.2			1.1	0.2	1.8		
Delay (s)		11.5			8.7			10.5	0.5	12.8		
Level of Service		B			A			B	A	B		
Approach Delay (s)		11.5			8.7			4.2		12.8		
Approach LOS		B			A			A		B		

Intersection Summary			
HCM 2000 Control Delay	7.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	41.7	Sum of lost time (s)	11.0
Intersection Capacity Utilization	73.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
1: Willamette Street/Willamette St & 24th Avenue

S. Willamette Street Corridor
2018 PM Shoulder - Alt 1 (4-lane)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	55	15	165	55	35	5	455	155	35	630	15
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	14	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)		4.5			4.5	4.5		4.5	4.5		4.5	
Lane Util. Factor		1.00			1.00	1.00		1.00	1.00		0.95	
Frpb, ped/bikes		0.99			1.00	0.94		1.00	0.93		1.00	
Flpb, ped/bikes		1.00			0.99	1.00		1.00	1.00		1.00	
Frt		0.98			1.00	0.85		1.00	0.85		1.00	
Flt Protected		0.99			0.96	1.00		1.00	1.00		1.00	
Satd. Flow (prot)		1770			1657	1389		1732	1353		3267	
Flt Permitted		0.93			0.75	1.00		0.99	1.00		0.91	
Satd. Flow (perm)		1663			1296	1389		1720	1353		2983	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	17	62	17	185	62	39	6	511	174	39	708	17
RTOR Reduction (vph)	0	12	0	0	0	27	0	0	73	0	1	0
Lane Group Flow (vph)	0	84	0	0	247	12	0	517	101	0	763	0
Confl. Peds. (#/hr)	15		10	10		15	10		15	15		10
Confl. Bikes (#/hr)			20			5			25			20
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6		6	8		8	4		
Actuated Green, G (s)		22.4			22.4	22.4		43.6	43.6		43.6	
Effective Green, g (s)		22.4			22.4	22.4		43.6	43.6		43.6	
Actuated g/C Ratio		0.30			0.30	0.30		0.58	0.58		0.58	
Clearance Time (s)		4.5			4.5	4.5		4.5	4.5		4.5	
Vehicle Extension (s)		3.0			3.0	3.0		2.0	2.0		2.0	
Lane Grp Cap (vph)		496			387	414		999	786		1734	
v/s Ratio Prot												
v/s Ratio Perm		0.05			c0.19	0.01		c0.30	0.07		0.26	
v/c Ratio		0.17			0.64	0.03		0.52	0.13		0.44	
Uniform Delay, d1		19.4			22.8	18.6		9.4	7.1		8.8	
Progression Factor		1.00			1.00	1.00		0.40	0.06		1.00	
Incremental Delay, d2		0.2			3.4	0.0		1.9	0.3		0.8	
Delay (s)		19.6			26.2	18.6		5.6	0.7		9.6	
Level of Service		B			C	B		A	A		A	
Approach Delay (s)		19.6			25.2			4.4			9.6	
Approach LOS		B			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	10.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	75.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
2: Willamette Street & 25th Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	10	15	20	10	15	15	580	10	15	845	25
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	14	12	12	14	12	12	12	12	12	12	12
Total Lost time (s)		4.5			4.5			4.5			4.5	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frpb, ped/bikes		0.99			0.99			1.00			1.00	
Flpb, ped/bikes		0.99			0.99			1.00			1.00	
Frt		0.96			0.95			1.00			1.00	
Flt Protected		0.97			0.98			1.00			1.00	
Satd. Flow (prot)		1702			1696			3250			3244	
Flt Permitted		0.86			0.89			0.93			0.94	
Satd. Flow (perm)		1496			1543			3016			3058	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	32	11	16	21	11	16	16	617	11	16	899	27
RTOR Reduction (vph)	0	12	0	0	12	0	0	1	0	0	3	0
Lane Group Flow (vph)	0	47	0	0	36	0	0	643	0	0	939	0
Confl. Peds. (#/hr)	15		10	10		15	10		15	15		10
Confl. Bikes (#/hr)			10			10			15			15
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	4	0	0	4	0	4	0	0	4	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)		18.0			18.0			48.0			48.0	
Effective Green, g (s)		18.0			18.0			48.0			48.0	
Actuated g/C Ratio		0.24			0.24			0.64			0.64	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Vehicle Extension (s)		3.0			3.0			2.0			2.0	
Lane Grp Cap (vph)		359			370			1930			1957	
v/s Ratio Prot												
v/s Ratio Perm		c0.03			0.02			0.21			c0.31	
v/c Ratio		0.13			0.10			0.33			0.48	
Uniform Delay, d1		22.4			22.2			6.2			7.0	
Progression Factor		1.00			1.00			1.47			0.93	
Incremental Delay, d2		0.2			0.1			0.4			0.8	
Delay (s)		22.5			22.3			9.5			7.3	
Level of Service		C			C			A			A	
Approach Delay (s)		22.5			22.3			9.5			7.3	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	9.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	60.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	25	45	120	65	40	35	575	30	35	835	30
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00			0.95			0.95	
Frpb, ped/bikes	1.00	0.97		1.00	0.98			1.00			1.00	
Flpb, ped/bikes	0.98	1.00		0.98	1.00			1.00			1.00	
Frt	1.00	0.90		1.00	0.94			0.99			0.99	
Flt Protected	0.95	1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)	1595	1506		1609	1605			2971			2979	
Flt Permitted	0.68	1.00		0.71	1.00			0.87			0.91	
Satd. Flow (perm)	1150	1506		1199	1605			2592			2715	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	21	27	48	128	69	43	37	612	32	37	888	32
RTOR Reduction (vph)	0	36	0	0	33	0	0	3	0	0	2	0
Lane Group Flow (vph)	21	39	0	128	79	0	0	678	0	0	955	0
Confl. Peds. (#/hr)	20		20	20		20	15		10	10		15
Confl. Bikes (#/hr)			10			10			10			10
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	3%	1%	1%	3%	1%
Bus Blockages (#/hr)	0	0	4	0	0	4	0	4	0	0	4	0
Parking (#/hr)							5	5	5	5	5	5
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	18.3	18.3		18.3	18.3			47.7			47.7	
Effective Green, g (s)	18.3	18.3		18.3	18.3			47.7			47.7	
Actuated g/C Ratio	0.24	0.24		0.24	0.24			0.64			0.64	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			2.0			2.0	
Lane Grp Cap (vph)	280	367		292	391			1648			1726	
v/s Ratio Prot		0.03			0.05							
v/s Ratio Perm	0.02			c0.11				0.26			c0.35	
v/c Ratio	0.07	0.11		0.44	0.20			0.41			0.55	
Uniform Delay, d1	21.8	22.0		24.0	22.6			6.7			7.7	
Progression Factor	1.00	1.00		1.00	1.00			1.00			0.92	
Incremental Delay, d2	0.1	0.1		1.1	0.3			0.8			1.2	
Delay (s)	21.9	22.1		25.1	22.8			7.5			8.2	
Level of Service	C	C		C	C			A			A	
Approach Delay (s)		22.1			24.0			7.5			8.2	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	10.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	72.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Willamette Street & Willamette Street Plaza Driveway

S. Willamette Street Corridor
2018 PM Shoulder - Alt 1 (4-lane)

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	115	135	40	520	710	160
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frpb, ped/bikes	1.00	0.96		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	0.97	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1630	1397		3249	3097	
Flt Permitted	0.95	1.00		0.83	1.00	
Satd. Flow (perm)	1630	1397		2715	3097	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	119	139	41	536	732	165
RTOR Reduction (vph)	0	102	0	0	16	0
Lane Group Flow (vph)	119	37	0	577	881	0
Confl. Peds. (#/hr)	10	10	30			30
Confl. Bikes (#/hr)		10				10
Heavy Vehicles (%)	2%	2%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	4	4	0
Turn Type	NA	Perm	Perm	NA	NA	
Protected Phases	2			8	4	
Permitted Phases		2	8			
Actuated Green, G (s)	32.0	32.0		80.0	80.0	
Effective Green, g (s)	32.0	32.0		80.0	80.0	
Actuated g/C Ratio	0.27	0.27		0.67	0.67	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	434	372		1810	2064	
v/s Ratio Prot	c0.07				c0.28	
v/s Ratio Perm		0.03		0.21		
v/c Ratio	0.27	0.10		0.32	0.43	
Uniform Delay, d1	34.8	33.1		8.5	9.3	
Progression Factor	1.00	1.00		0.20	1.00	
Incremental Delay, d2	1.6	0.5		0.4	0.6	
Delay (s)	36.4	33.7		2.1	10.0	
Level of Service	D	C		A	A	
Approach Delay (s)	34.9			2.1	10.0	
Approach LOS	C			A	A	

Intersection Summary			
HCM 2000 Control Delay	11.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	67.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: 29th Ave & Willamette Street

S. Willamette Street Corridor
2018 PM Shoulder - Alt 1 (4-lane)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑↱		↰	↑↱	
Volume (vph)	140	265	255	105	340	75	295	360	55	175	485	80
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	10	10	10	10	11	11	10	11	12	12	12
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.94	1.00	0.99		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1646	1601	1330	1492	1617	1326	1560	2922		1607	3179	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1646	1601	1330	1492	1617	1326	1560	2922		1607	3179	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	146	276	266	109	354	78	307	375	57	182	505	83
RTOR Reduction (vph)	0	0	61	0	0	59	0	9	0	0	10	0
Lane Group Flow (vph)	146	276	205	109	354	19	307	423	0	182	578	0
Confl. Peds. (#/hr)	15		25	25		15	20		20	20		20
Confl. Bikes (#/hr)			15			25			5			15
Heavy Vehicles (%)	1%	2%	1%	4%	1%	2%	3%	3%	3%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	10	6	0	0
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2	3	1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	13.2	30.9	57.1	11.3	29.0	29.0	26.2	42.4		17.4	33.6	
Effective Green, g (s)	13.2	30.9	57.1	11.3	29.0	29.0	26.2	42.4		17.4	33.6	
Actuated g/C Ratio	0.11	0.26	0.48	0.09	0.24	0.24	0.22	0.35		0.14	0.28	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	181	412	682	140	390	320	340	1032		233	890	
v/s Ratio Prot	c0.09	0.17	0.07	0.07	c0.22		c0.20	0.14		0.11	c0.18	
v/s Ratio Perm			0.09			0.01						
v/c Ratio	0.81	0.67	0.30	0.78	0.91	0.06	0.90	0.41		0.78	0.65	
Uniform Delay, d1	52.2	40.0	19.2	53.1	44.2	35.0	45.7	29.3		49.5	38.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.28	0.83	
Incremental Delay, d2	21.3	3.2	0.1	21.6	23.7	0.0	25.5	1.2		13.5	3.4	
Delay (s)	73.5	43.2	19.3	74.7	67.9	35.0	71.2	30.5		76.7	34.8	
Level of Service	E	D	B	E	E	D	E	C		E	C	
Approach Delay (s)		40.4			64.5			47.4			44.7	
Approach LOS		D			E			D			D	

Intersection Summary			
HCM 2000 Control Delay	48.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	78.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: S. Willamette & Donald St/Willamette Street & 32nd Ave

S. Willamette Street Corridor
2018 PM Shoulder - Alt 1 (4-lane)

Movement	WBL2	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER	NER2
Lane Configurations												
Volume (vph)	5	10	25	5	270	5	20	280	535	385	5	5
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	12	12	12	14	12	12	12	12	12	12	12
Total Lost time (s)		4.0			4.0			4.0	5.0	5.0		
Lane Util. Factor		1.00			1.00			1.00	1.00	1.00		
Frpb, ped/bikes		0.97			1.00			1.00	0.98	1.00		
Flpb, ped/bikes		0.99			1.00			1.00	1.00	1.00		
Frt		0.92			1.00			1.00	0.85	1.00		
Flt Protected		0.98			1.00			1.00	1.00	0.95		
Satd. Flow (prot)		1497			1824			1726	1442	1637		
Flt Permitted		0.98			0.99			0.97	1.00	1.00		
Satd. Flow (perm)		1497			1814			1676	1442	1717		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	11	27	5	293	5	22	304	582	418	5	5
RTOR Reduction (vph)	0	31	0	0	1	0	0	0	0	10	0	0
Lane Group Flow (vph)	0	12	0	0	302	0	0	326	582	418	0	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Confl. Bikes (#/hr)			10			10			10			10
Heavy Vehicles (%)	1%	1%	1%	1%	2%	1%	1%	1%	1%	1%	2%	1%
Turn Type	Perm	NA		Perm	NA		Perm	NA	custom	NA		
Protected Phases		8			2			6				
Permitted Phases	8			2			6		3 6	3		
Actuated Green, G (s)		10.7			14.6			14.6	38.7	15.1		
Effective Green, g (s)		10.7			14.6			14.6	34.7	15.1		
Actuated g/C Ratio		0.28			0.38			0.38	0.90	0.39		
Clearance Time (s)		4.0			4.0			4.0		5.0		
Vehicle Extension (s)		2.5			2.5			2.5		2.0		
Lane Grp Cap (vph)		413			684			632	1292	669		
v/s Ratio Prot												
v/s Ratio Perm		0.01			0.17			0.19	c0.40	c0.24		
v/c Ratio		0.03			0.44			0.52	0.45	0.62		
Uniform Delay, d1		10.2			9.0			9.3	0.3	9.5		
Progression Factor		1.00			1.00			1.00	1.00	1.00		
Incremental Delay, d2		0.0			0.3			0.5	0.1	1.3		
Delay (s)		10.2			9.3			9.8	0.4	10.8		
Level of Service		B			A			A	A	B		
Approach Delay (s)		10.2			9.3			3.8		10.8		
Approach LOS		B			A			A		B		

Intersection Summary			
HCM 2000 Control Delay	6.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	38.7	Sum of lost time (s)	11.0
Intersection Capacity Utilization	65.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
1: Willamette Street/Willamette St & 24th Avenue

S. Willamette Street Corridor
2018 PM Shoulder - Alt 3&5 (Modified 3-lane)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	55	15	165	55	35	5	455	155	35	630	15
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	14	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)		4.5			4.5	4.5	4.5	4.5		4.5	4.5	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.99			1.00	0.94	1.00	0.99		1.00	1.00	
Flpb, ped/bikes		1.00			0.99	1.00	0.99	1.00		0.99	1.00	
Frt		0.98			1.00	0.85	1.00	0.96		1.00	1.00	
Flt Protected		0.99			0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1761			1648	1388	1632	1643		1638	1724	
Flt Permitted		0.93			0.75	1.00	0.26	1.00		0.29	1.00	
Satd. Flow (perm)		1650			1291	1388	449	1643		494	1724	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	17	62	17	185	62	39	6	511	174	39	708	17
RTOR Reduction (vph)	0	11	0	0	0	29	0	15	0	0	1	0
Lane Group Flow (vph)	0	85	0	0	247	10	6	670	0	39	724	0
Confl. Peds. (#/hr)	15		10	10		15	20		10	10		20
Confl. Bikes (#/hr)			20			5			25			20
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	4	0	0	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6		6	8			4		
Actuated Green, G (s)		20.1			20.1	20.1	45.9	45.9		45.9	45.9	
Effective Green, g (s)		20.1			20.1	20.1	45.9	45.9		45.9	45.9	
Actuated g/C Ratio		0.27			0.27	0.27	0.61	0.61		0.61	0.61	
Clearance Time (s)		4.5			4.5	4.5	4.5	4.5		4.5	4.5	
Vehicle Extension (s)		3.0			3.0	3.0	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)		442			345	371	274	1005		302	1055	
v/s Ratio Prot								0.41			c0.42	
v/s Ratio Perm		0.05			c0.19	0.01	0.01			0.08		
v/c Ratio		0.19			0.72	0.03	0.02	0.67		0.13	0.69	
Uniform Delay, d1		21.2			24.9	20.2	5.7	9.5		6.1	9.7	
Progression Factor		1.00			1.00	1.00	1.78	1.99		1.00	1.00	
Incremental Delay, d2		0.2			6.9	0.0	0.1	3.0		0.9	3.6	
Delay (s)		21.4			31.8	20.3	10.3	22.0		7.0	13.4	
Level of Service		C			C	C	B	C		A	B	
Approach Delay (s)		21.4			30.2			21.9			13.0	
Approach LOS		C			C			C			B	

Intersection Summary			
HCM 2000 Control Delay	19.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	77.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	10	15	20	10	15	15	580	10	15	845	25
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	14	12	12	14	12	12	12	12	12	12	12
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		0.98			0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		0.98			0.99		1.00	1.00		0.99	1.00	
Frt		0.96			0.95		1.00	1.00		1.00	1.00	
Flt Protected		0.97			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1680			1675		1646	1699		1630	1695	
Flt Permitted		0.86			0.89		0.16	1.00		0.34	1.00	
Satd. Flow (perm)		1478			1524		279	1699		580	1695	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	32	11	16	21	11	16	16	617	11	16	899	27
RTOR Reduction (vph)	0	12	0	0	12	0	0	1	0	0	1	0
Lane Group Flow (vph)	0	47	0	0	36	0	16	627	0	16	925	0
Confl. Peds. (#/hr)	15		10	10		15	10		15	15		10
Confl. Bikes (#/hr)			10			10			15			15
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	4	0	0	4	0	4	0	0	4	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)		18.0			18.0		48.0	48.0		48.0	48.0	
Effective Green, g (s)		18.0			18.0		48.0	48.0		48.0	48.0	
Actuated g/C Ratio		0.24			0.24		0.64	0.64		0.64	0.64	
Clearance Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)		3.0			3.0		2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)		354			365		178	1087		371	1084	
v/s Ratio Prot								0.37			c0.55	
v/s Ratio Perm		c0.03			0.02		0.06			0.03		
v/c Ratio		0.13			0.10		0.09	0.58		0.04	0.85	
Uniform Delay, d1		22.4			22.2		5.2	7.7		5.0	10.7	
Progression Factor		1.00			1.00		1.77	1.95		0.73	0.83	
Incremental Delay, d2		0.2			0.1		0.8	1.8		0.2	6.7	
Delay (s)		22.5			22.3		9.9	16.8		3.8	15.5	
Level of Service		C			C		A	B		A	B	
Approach Delay (s)		22.5			22.3			16.7			15.3	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	16.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	72.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Willamette Street & 27th Avenue

S. Willamette Street Corridor
2018 PM Shoulder - Alt 3&5 (Modified 3-lane)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	25	45	120	65	40	35	575	30	35	835	30
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.95		1.00	0.97		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.96	1.00		0.96	1.00		1.00	1.00		0.99	1.00	
Frt	1.00	0.90		1.00	0.94		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1572	1474		1584	1584		1440	1450		1431	1453	
Flt Permitted	0.68	1.00		0.71	1.00		0.18	1.00		0.34	1.00	
Satd. Flow (perm)	1133	1474		1181	1584		279	1450		514	1453	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	21	27	48	128	69	43	37	612	32	37	888	32
RTOR Reduction (vph)	0	38	0	0	30	0	0	3	0	0	2	0
Lane Group Flow (vph)	21	37	0	128	82	0	37	641	0	37	918	0
Confl. Peds. (#/hr)	20		20	20		20	15		10	10		15
Confl. Bikes (#/hr)			10			10			10			10
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	3%	1%	1%	3%	1%
Bus Blockages (#/hr)	0	0	4	0	0	4	0	4	0	0	4	0
Parking (#/hr)							5	5	5	5	5	5
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	16.0	16.0		16.0	16.0		50.0	50.0		50.0	50.0	
Effective Green, g (s)	16.0	16.0		16.0	16.0		50.0	50.0		50.0	50.0	
Actuated g/C Ratio	0.21	0.21		0.21	0.21		0.67	0.67		0.67	0.67	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	241	314		251	337		186	966		342	968	
v/s Ratio Prot		0.03			0.05			0.44			c0.63	
v/s Ratio Perm	0.02			c0.11			0.13			0.07		
v/c Ratio	0.09	0.12		0.51	0.24		0.20	0.66		0.11	0.95	
Uniform Delay, d1	23.6	23.8		26.0	24.5		4.8	7.5		4.5	11.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		0.15	0.33	
Incremental Delay, d2	0.2	0.2		1.6	0.4		2.4	3.6		0.4	12.6	
Delay (s)	23.8	24.0		27.7	24.9		7.2	11.1		1.0	16.3	
Level of Service	C	C		C	C		A	B		A	B	
Approach Delay (s)		23.9			26.4			10.9			15.7	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	15.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	72.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Willamette Street & Willamette Street Plaza Driveway

S. Willamette Street Corridor
2018 PM Shoulder - Alt 3&5 (Modified 3-lane)

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	115	135	40	520	710	160
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	
Frpb, ped/bikes	1.00	0.96	1.00	1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.97	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1630	1395	1646	1705	3096	
Flt Permitted	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	1630	1395	1646	1705	3096	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	119	139	41	536	732	165
RTOR Reduction (vph)	0	108	0	0	15	0
Lane Group Flow (vph)	119	31	41	536	882	0
Confl. Peds. (#/hr)	10	10	30			30
Confl. Bikes (#/hr)		10				10
Heavy Vehicles (%)	2%	2%	1%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	4	4	0
Turn Type	NA	Perm	Prot	NA	NA	
Protected Phases	2		3	8	4	
Permitted Phases		2				
Actuated Green, G (s)	27.0	27.0	7.2	85.0	73.8	
Effective Green, g (s)	27.0	27.0	7.2	85.0	73.8	
Actuated g/C Ratio	0.22	0.22	0.06	0.71	0.61	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	366	313	98	1207	1904	
v/s Ratio Prot	c0.07		0.02	c0.31	c0.28	
v/s Ratio Perm		0.02				
v/c Ratio	0.33	0.10	0.42	0.44	0.46	
Uniform Delay, d1	38.9	36.9	54.4	7.4	12.4	
Progression Factor	1.00	1.00	1.50	0.12	1.00	
Incremental Delay, d2	2.4	0.6	2.1	0.8	0.8	
Delay (s)	41.2	37.5	83.7	1.7	13.2	
Level of Service	D	D	F	A	B	
Approach Delay (s)	39.2			7.6	13.2	
Approach LOS	D			A	B	

Intersection Summary			
HCM 2000 Control Delay	15.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	54.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: 29th Ave & Willamette Street

S. Willamette Street Corridor
2018 PM Shoulder - Alt 3&5 (Modified 3-lane)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	140	265	255	105	340	75	295	360	55	175	485	80
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	10	10	10	10	11	11	10	11	12	12	12
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.93	1.00	1.00	0.90	1.00	0.99		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1646	1601	1283	1492	1617	1270	1560	1538		1607	3180	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1646	1601	1283	1492	1617	1270	1560	1538		1607	3180	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	146	276	266	109	354	78	307	375	57	182	505	83
RTOR Reduction (vph)	0	0	166	0	0	59	0	4	0	0	11	0
Lane Group Flow (vph)	146	276	100	109	354	19	307	428	0	182	577	0
Confl. Peds. (#/hr)	15		25	25		15	20		20	20		20
Confl. Bikes (#/hr)			15			25			5			15
Heavy Vehicles (%)	1%	2%	1%	4%	1%	2%	3%	3%	3%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	10	6	0	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	12.1	29.6	29.6	11.3	28.8	28.8	25.4	45.8		15.3	35.7	
Effective Green, g (s)	12.1	29.6	29.6	11.3	28.8	28.8	25.4	45.8		15.3	35.7	
Actuated g/C Ratio	0.10	0.25	0.25	0.09	0.24	0.24	0.21	0.38		0.13	0.30	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	165	394	316	140	388	304	330	587		204	946	
v/s Ratio Prot	c0.09	0.17		0.07	c0.22		c0.20	c0.28		0.11	0.18	
v/s Ratio Perm			0.08			0.01						
v/c Ratio	0.88	0.70	0.32	0.78	0.91	0.06	0.93	0.73		0.89	0.61	
Uniform Delay, d1	53.3	41.2	36.9	53.1	44.4	35.2	46.4	31.8		51.5	36.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.11	0.82	
Incremental Delay, d2	37.9	4.5	0.2	21.6	24.8	0.0	31.7	7.7		32.2	2.7	
Delay (s)	91.2	45.7	37.2	74.7	69.2	35.2	78.1	39.5		89.4	32.5	
Level of Service	F	D	D	E	E	D	E	D		F	C	
Approach Delay (s)		52.1			65.4			55.5			46.0	
Approach LOS		D			E			E			D	

Intersection Summary			
HCM 2000 Control Delay	53.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	78.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL2	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER	NER2
Lane Configurations												
Volume (vph)	5	10	25	5	270	5	20	280	535	385	5	5
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width	12	12	12	12	14	12	12	12	12	12	12	12
Total Lost time (s)		4.0			4.0			4.0	5.0	5.0		
Lane Util. Factor		1.00			1.00			1.00	1.00	1.00		
Frpb, ped/bikes		0.97			1.00			1.00	0.98	1.00		
Flpb, ped/bikes		0.99			1.00			1.00	1.00	1.00		
Frt		0.92			1.00			1.00	0.85	1.00		
Flt Protected		0.98			1.00			1.00	1.00	0.95		
Satd. Flow (prot)		1497			1824			1726	1442	1637		
Flt Permitted		0.98			0.99			0.97	1.00	1.00		
Satd. Flow (perm)		1497			1814			1676	1442	1717		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	11	27	5	293	5	22	304	582	418	5	5
RTOR Reduction (vph)	0	31	0	0	1	0	0	0	0	10	0	0
Lane Group Flow (vph)	0	12	0	0	302	0	0	326	582	418	0	0
Confl. Peds. (#/hr)	10		10	10		10	10		10	10		10
Confl. Bikes (#/hr)			10			10			10			10
Heavy Vehicles (%)	1%	1%	1%	1%	2%	1%	1%	1%	1%	1%	2%	1%
Turn Type	Perm	NA		Perm	NA		Perm	NA	custom	NA		
Protected Phases		8			2			6				
Permitted Phases	8			2			6		3 6	3		
Actuated Green, G (s)		10.7			14.6			14.6	38.7	15.1		
Effective Green, g (s)		10.7			14.6			14.6	34.7	15.1		
Actuated g/C Ratio		0.28			0.38			0.38	0.90	0.39		
Clearance Time (s)		4.0			4.0			4.0		5.0		
Vehicle Extension (s)		2.5			2.5			2.5		2.0		
Lane Grp Cap (vph)		413			684			632	1292	669		
v/s Ratio Prot												
v/s Ratio Perm		0.01			0.17			0.19	c0.40	c0.24		
v/c Ratio		0.03			0.44			0.52	0.45	0.62		
Uniform Delay, d1		10.2			9.0			9.3	0.3	9.5		
Progression Factor		1.00			1.00			1.00	1.00	1.00		
Incremental Delay, d2		0.0			0.3			0.5	0.1	1.3		
Delay (s)		10.2			9.3			9.8	0.4	10.8		
Level of Service		B			A			A	A	B		
Approach Delay (s)		10.2			9.3			3.8		10.8		
Approach LOS		B			A			A		B		

Intersection Summary			
HCM 2000 Control Delay	6.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	38.7	Sum of lost time (s)	11.0
Intersection Capacity Utilization	65.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Appendix

– Simulation Results: Vehicle Queuing Summary

Estimated Vehicle Queuing Comparison for Alternatives - Future Year 2018

Intersection	Movement/ Direction	Alternative 1		Alternative 3 or 5	
		Average	*95th*	Average	*95th*
Willamette Street/ 24th Avenue	SB (Thru/Right)	130	*230*	250	*430*
	SB (Left)*	180	*290*	80	*280*
	NB (Thru/Right)**	40	*80*	180	*260*
	NB (Thru/Left)**	100	*170*	30	*110*
	EB (All)	40	*70*	40	*80*
	WB (Right)	40	*110*	40	*110*
	WB (Thru/Left)	140	*240*	140	*240*
Willamette Street/ 25th Avenue	EB (All)	30	*70*	30	*70*
	WB (All)	30	*60*	30	*70*
	NB (Thru/Right)	70	*150*	220	*370*
	NB (Left)*	100	*190*	20	*80*
	SB (Thru/Right)	140	*230*	290	*570*
	SB (Left)*	140	*220*	10	*20*
Willamette Street/ 27th Avenue	EB (Left)	20	*60*	20	*60*
	EB (Thru/Right)	50	*90*	55	*100*
	WB (Left)	70	*120*	80	*130*
	WB (Thru/Right)	80	*160*	80	*160*
	SB (Thru/Right)	100	*190*	230	*560*
	SB (Left)*	80	*160*	30	*100*
	NB (Thru/Right)	90	*160*	160	*290*
	NB (Left)*	100	*160*	30	*100*
Willamette Street/ Willamette Plaza Driveway	EB (Left)	140	*320*	140	*320*
	EB (Right)	110	*240*	120	*240*
	NB (Left)*	50	*110*	40	*80*
	NB (Thru)	30	*90*	40	*100*
	SB (Thru)	160	*270*	230	*320*
	SB (Thru/Right)	180	*290*	120	*140*
Willamette Street/ 29th Avenue***	SB (Thru/Right)	220	*300*	220	*300*
	SB (Left)	160	*240*	130	*190*

Estimated Vehicle Queuing Comparison for Alternatives - Future Year 2018

	NB (Thru/Right)	140	*300*	310	*530*
	NB (Left)	190	*270*	220	*300*
	WB (Thru)	390	*660*	350	*630*
	WB (Left)	150	*240*	150	*250*
	WB (Right)	60	*160*	60	*140*
	EB (Thru)	350	*670*	420	*760*
	EB (Left)	140	*230*	140	*240*
	EB (Right)	120	*190*	130	*180*
Willamette Street/ 32nd Avenue	WB (32nd Ave.)	20	*40*	20	*40*
	NB (Donald Street)	90	*150*	90	*160*
	SB (Thru/Left)	170	*280*	170	*290*
	SB (Right)	10	*80*	10	*70*
	EB (Willamette Street)	120	*200*	120	*190*

Average = Average simulation queue length (feet)
95th = Ninety fifth percentile (highest five percent) simulation queue length (feet)

* Shared left/through lane in Alternative 1, dedicated left turn lane in Alternatives 3 and 5.
**Shared left/through lane and right lane in Alternative 1, shared right/through lane and left lane in Alternatives 3 and 5.

Appendix

– Traffic Signal Warrant @ Willamette St and Woodfield Station Driveway

OREGON DEPARTMENT OF TRANSPORTATION
TRAFFIC SIGNAL WARRANT COMPARISON
Willamette St at Plaza Driveway
0 M.P. 0
Eugene

Analysis by: DKS Associates (DAM)
Phone: 503-391-8773

Count Date (am) **10/3/2012**
Count Date (pm) **10/3/2012**

DRAFT

Major Street has two approaching lanes
Minor Street has one approaching lane
100% Warrants

100 % Reduction in minor st right turn volume
0.00 % growth per year for 0 years

VOLUME DATA

Time 14 Hours	6:00 - 7:00	7:00 - 8:00	8:00 - 9:00	9:00 - 10:00	10:00 - 11:00	11:00 - 12:00	12:00 - 13:00	13:00 - 14:00	14:00 - 15:00	15:00 - 16:00	16:00 - 17:00	17:00 - 18:00	18:00 - 19:00	19:00 - 20:00
Hourly Volumes on Major Street	249	738	994	934	979	1098	1152	1110	1179	1338	1385	1378	1138	856
Hourly Volumes on Minor Street	71	89	121	151	147	104	136	100	125	98	99	80	51	27
Hourly Volumes other Minor St.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians Xing Major Street only	0	2	6	4	0	0	0	0	0	0	2	6	7	0

Warrants	Minimum Volume Warrant	Number of Hours Warrant is Met		Warrants met	Weight Value
1. Eight-Hour Vehicular Volume:				**YES**	**25**
Condition A: Minimum Vehicular Volume					
Major Street (total of both approaches)	600				
Minor Street (one direction only)	150	1	(8 hours required)		
Condition B: Interruption of Continous Traffic					
Major Street (total of both approaches)	900				
Minor Street (one direction only)	75	10	(8 hours required)	*	
**Condition A: Minimum Vehicular Volume, 80%					
Major Street (total of both approaches)	480				
Minor Street (one direction only)	120	5	(8 hours required)		
**Condition B: Interuption of Continuous Traffic, 80%					
Major Street (total of both approaches)	720				
Minor Street (one direction only)	60	11	(8 hours required)		
2. Four-Hour Vehicular Volume:				**YES**	**5**
	Graph attached	4	(4 hours required)		
3. Peak Hour:				**NO**	
Condition A:					
1.) Total stopped time delay on one minor street approach	4	1	vehicle-hours		
2.) Minor Street (one direction only)	100	0	(1 hour required)		
3.) Total entering volume serviced during the hour	650	0	(1 hour required)		
Condition B:	**Graph attached**	0	(1 hour required)		
4. Pedestrian Volume:				**NO**	
Condition A:					
1.) Pedestrian Volume for each of any four hours	100	0	(4 hours required)		
2.) Pedestrian Volume during any hour	190	0	(1 hour required)		
Condition B:					

OREGON DEPARTMENT OF TRANSPORTATION
TRAFFIC SIGNAL WARRANT COMPARISON
Willamette St at Plaza Driveway
0 M.P. 0
Eugene

Analysis by: DKS Associates (DAM)
Phone: 503-391-8773

Count Date (am) **10/3/2012**
Count Date (pm) **10/3/2012**

Major Street has two approaching lanes
Minor Street has one approaching lane
100% Warrants

100 % Reduction in minor st right turn volume
0.00 % growth per year for 0 years

DRAFT

	1.) Number of gaps per hour of adequate length:	60		(required) see attached analysi
Condition C:				
	1.) Distance to nearest traffic signal along major street (ft):	300	300	

OREGON DEPARTMENT OF TRANSPORTATION
TRAFFIC SIGNAL WARRANT COMPARISON
Willamette St at Plaza Driveway
0 M.P. 0
Eugene

Analysis by: DKS Associates (DAM)
Phone: 503-391-8773

Count Date (am) **10/3/2012**
Count Date (pm) **10/3/2012**

DRAFT

Major Street has two approaching lanes
Minor Street has one approaching lane
100% Warrants

100 % Reduction in minor st right turn volume
0.00 % growth per year for 0 years

Warrants	Minimum Volume Warrant	Number of Hours Warrant is Met		Warrants met	Weight Value
5. School Crossing				N/A	
Condition A;					
1.) Frequency and adeqacy of gaps is not acceptable:					
2.) Students crossing during the highest hour:	N/A				
3.) Other remedial measures have been considered:					
4.) Distance to nearest traffic signal along major street (ft):	N/A				
6. Coordinated Signal System:				N/A	
Condition A:					
1.) Existing traffic signals do not provide the necessary degree of platooning:					
Condition B:					
1.) Existing traffic signals and proposed traffic signal will collectively provide a progressive operation:					
2.) Distance to nearest traffic signal along major street (ft):	N/A				
7. Accident Experience:				NO	
Condition A:					
1.) Adequate trial of alternatives with satisfactory observance and enforcement has failed to reduce the crash frequency:		NO	(required) see attached analysis		
Condition B:					
1.) Preventable Crashes within a 12 month period:	5	0	(5 crashes required)		
Condition C:					
1.) 80% Vehicular Volume: Condition A (SEE WARRANT 1 FOR VOLUMES):		5	(8 hours required)	*	
80% Vehicular Volume: Condition B (SEE WARRANT 1 FOR VOLUMES):		11	(8 hours required)		
2.) 80% Pedestrian Volume:	80	0	(4 hours required)		
	152	0	(1 hour required)		
8. Roadway Network:				N/A	
Condition A:					
1.) Entering Volume (Weekday Peak Hour):	N/A				
2.) 5-year projected volumes: Warrant 1					
Condition A: Minimum Vehicular Volume					
Major Street (total of both approaches):	N/A				
Minor Street (one direction only):	N/A				
Condition B: Interruption of Continous Traffic					
Major Street (total of both approaches):	N/A				
Minor Street (one direction only):	N/A				
**Condition A: Minimum Vehicular Volume, 80%					
Major Street (total of both approaches):	N/A				
Minor Street (one direction only):	N/A				
**Condition B: Interuption of Continuous Traffic, 80%					
Major Street (total of both approaches):	N/A				
Minor Street (one direction only):	N/A				
3.) 5-year projected volumes: Warrant 2					
4.) 5-year projected volumes: Warrant 3					
Condition A:					
1. Total stopped time delay on one minor street approach :	N/A				
2. Minor Street (one direction only):	N/A				
3. Total entering volume serviced during the hour:	N/A				
Condition B:					

OREGON DEPARTMENT OF TRANSPORTATION
TRAFFIC SIGNAL WARRANT COMPARISON
Willamette St at Plaza Driveway
0 M.P. 0
Eugene

Analysis by: DKS Associates (DAM)
Phone: 503-391-8773

Count Date (am) **10/3/2012**
Count Date (pm) **10/3/2012**

DRAFT

Major Street has two approaching lanes
Minor Street has one approaching lane
100% Warrants

100 % Reduction in minor st right turn volume
0.00 % growth per year for 0 years

Condition B:

1.) Entering Volume (Non-normal business day): N/A

The hourly warrants are those prescribed in the National Manual on Uniform Traffic Control Devices for Streets and Highways, millenium edition.

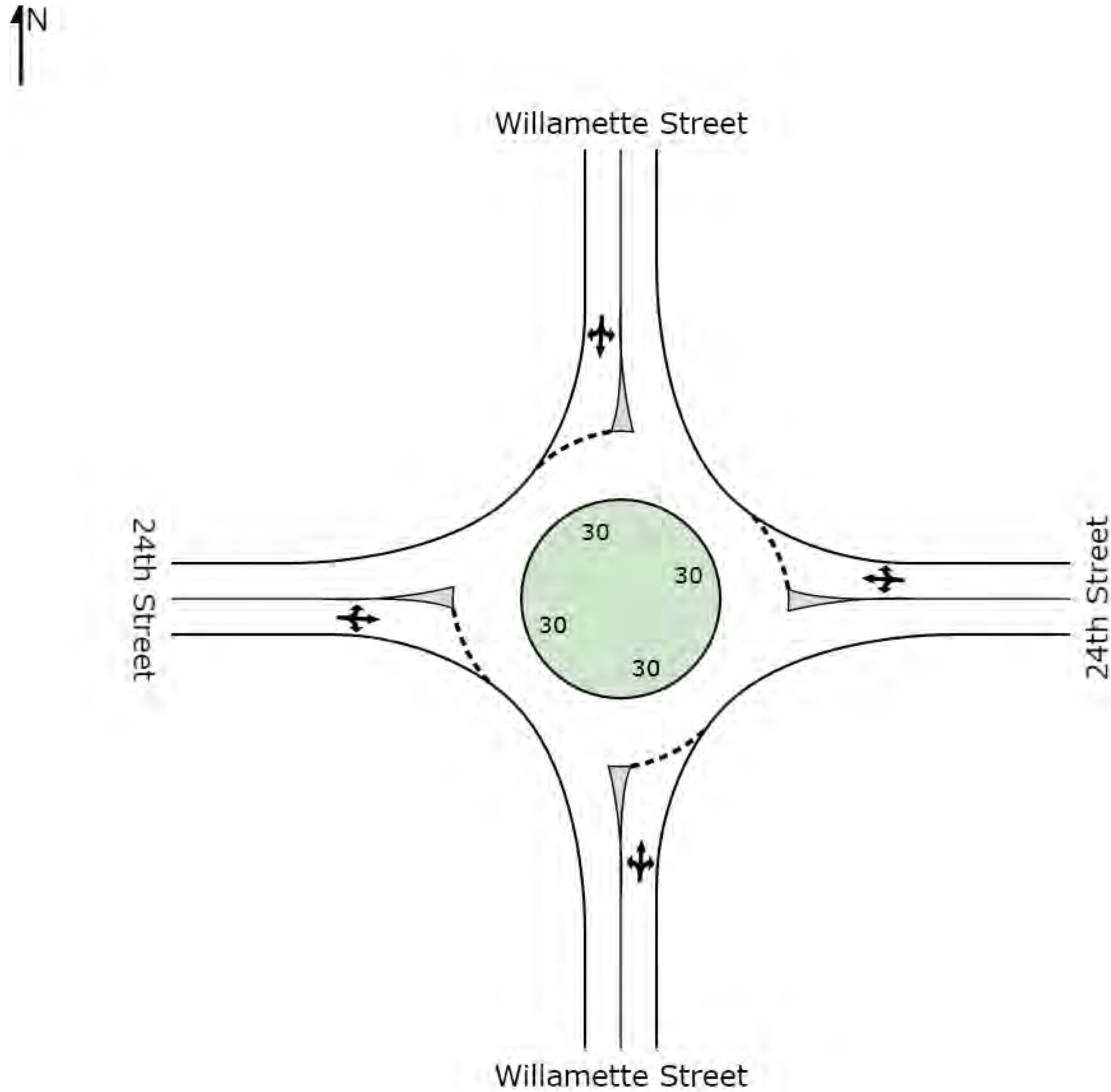
Total Value
30

XX Standard warrants used.
____ 70% of standard warrants used due to 85 percentile speed in excess of 40 MPH or isolated community with population less than 10,000.

Appendix

– Roundabout Operations Analysis, 2018

Item A.


N
Willamette Street
24th Street
30
30
30
30
24th Street
Willamette Street

LANE SUMMARY

Roundabout with 1-lane approaches and circulating road

Roundabout

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Lane Length ft	SL Type	Cap. Adj. %	Prob. Block. %
South: Willamette Street																
Lane 1	5	457	212	674	1.0	1045	0.645	100	8.1	LOS A	7.9	198.0	1600	–	0.0	0.0
Approach	5	457	212	674	1.0		0.645		8.1	LOS A	7.9	198.0				
East: 24th Street																
Lane 1	255	87	43	386	0.2	593	0.650	100	18.9	LOS B	7.4	185.7	1600	–	0.0	0.0
Approach	255	87	43	386	0.2		0.650		18.9	LOS B	7.4	185.7				
North: Willamette Street																
Lane 1	54	761	16	832	0.9	716	1.162	100	97.8	LOS F	60.9	1533.2	1600	–	0.0	3.8
Approach	54	761	16	832	0.9		1.162		97.8	LOS F	60.9	1533.2				
West: 24th Street																
Lane 1	16	49	16	82	0.0	299	0.273	100	18.6	LOS B	2.0	50.5	1600	–	0.0	0.0
Approach	16	49	16	82	0.0		0.273		18.6	LOS B	2.0	50.5				
Intersection				1973	0.8		1.162		48.5	LOS D	60.9	1533.2				

Level of Service (Aver. Int. Delay): LOS D. Based on average delay for all lanes. LOS Method: Delay (HCM).
Level of Service (Worst Lane): LOS F. LOS Method for individual lanes: Delay (HCM).
Approach LOS values are based on the worst delay for any lane.
Roundabout LOS Method: Same as Signalised Intersections.
Roundabout Capacity Model: SIDRA Standard.

Processed: Monday, April 22, 2013 4:29:02 PM
SIDRA INTERSECTION 5.0.5.1510
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LANE SUMMARY

Site: Willamette/24th St-NCHRP 30'

Roundabout with 1-lane approaches and circulating road

Roundabout

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Lane Length ft	SL Type	Cap. Adj. %	Prob. Block. %
South: Willamette Street																
Lane 1	5	451	209	665	1.0	1122	0.593	100	7.7	LOS A	5.0	126.5	1600	–	0.0	0.0
Approach	5	451	209	665	1.0		0.593		7.7	LOS A	5.0	126.5				
East: 24th Street																
Lane 1	242	88	44	374	0.2	699	0.535	100	15.0	LOS B	4.6	114.0	1600	–	0.0	0.0
Approach	242	88	44	374	0.2		0.535		15.0	LOS B	4.6	114.0				
North: Willamette Street																
Lane 1	60	758	16	835	0.9	864	0.966	100	29.2	LOS C	27.4	689.6	1600	–	0.0	0.0
Approach	60	758	16	835	0.9		0.966		29.2	LOS C	27.4	689.6				
West: 24th Street																
Lane 1	16	49	16	82	0.0	388	0.212	100	22.0	LOS C	1.3	32.1	1600	–	0.0	0.0
Approach	16	49	16	82	0.0		0.212		22.0	LOS C	1.3	32.1				
Intersection				1956	0.8		0.966		18.9	LOS B	27.4	689.6				

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all lanes. LOS Method: Delay (HCM).
Level of Service (Worst Lane): LOS C. LOS Method for individual lanes: Delay (HCM).
Approach LOS values are based on the worst delay for any lane.
Roundabout LOS Method: Same as Signalised Intersections.
Roundabout Capacity Model: US NCHRP 572.

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SIDRA INTERSECTION

LANE SUMMARY

Site: Willamette/25th St-NCHRP 30'

Roundabout with 1-lane approaches and circulating road

Roundabout

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Lane Length ft	SL Type	Cap. Adj. %	Prob. Block. %
South: Willamette Street																
Lane 1	16	602	16	634	0.9	1313	0.483	100	6.6	LOS A	3.5	88.4	1600	–	0.0	0.0
Approach	16	602	16	634	0.9		0.483		6.6	LOS A	3.5	88.4				
East: 25th Street																
Lane 1	27	5	16	48	0.0	585	0.083	100	13.9	LOS B	0.5	11.5	1600	–	0.0	0.0
Approach	27	5	16	48	0.0		0.083		13.9	LOS B	0.5	11.5				
North: Willamette Street																
Lane 1	5	962	27	995	1.0	1344	0.740	100	6.8	LOS A	8.8	221.1	1600	–	0.0	0.0
Approach	5	962	27	995	1.0		0.740		6.8	LOS A	8.8	221.1				
West: 25th Street																
Lane 1	32	5	11	48	2.0	406	0.119	100	21.2	LOS C	0.7	17.4	1600	–	0.0	0.0
Approach	32	5	11	48	2.0		0.119		21.2	LOS C	0.7	17.4				
Intersection				1726	1.0		0.740		7.3	LOS A	8.8	221.1				

Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all lanes. LOS Method: Delay (HCM).
Level of Service (Worst Lane): LOS C. LOS Method for individual lanes: Delay (HCM).
Approach LOS values are based on the worst delay for any lane.
Roundabout LOS Method: Same as Signalised Intersections.
Roundabout Capacity Model: US NCHRP 572.

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SIDRA INTERSECTION

LANE SUMMARY

Site: Willamette/27th St - NCHRP 30'

Roundabout with 1-lane approaches and circulating road

Roundabout

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Lane Length ft	SL Type	Cap. Adj. %	Prob. Block. %
South: Willamette Street																
Lane 1	31	557	41	629	2.0	1123	0.560	100	7.5	LOS A	4.4	112.6	1600	–	0.0	0.0
Approach	31	557	41	629	2.0		0.560		7.5	LOS A	4.4	112.6				
East: 27th Street																
Lane 1	129	103	36	268	1.6	592	0.453	100	15.8	LOS B	3.4	85.2	1600	–	0.0	0.0
Approach	129	103	36	268	1.6		0.453		15.8	LOS B	3.4	85.2				
North: Willamette Street																
Lane 1	31	835	57	923	1.1	947	0.974	100	27.2	LOS C	30.1	757.7	1600	–	0.0	0.0
Approach	31	835	57	923	1.1		0.974		27.2	LOS C	30.1	757.7				
West: 27th Street																
Lane 1	31	52	46	129	1.2	408	0.316	100	21.3	LOS C	2.0	50.0	1600	–	0.0	0.0
Approach	31	52	46	129	1.2		0.316		21.3	LOS C	2.0	50.0				
Intersection				1948	1.4		0.974		18.9	LOS B	30.1	757.7				

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all lanes. LOS Method: Delay (HCM).
Level of Service (Worst Lane): LOS C. LOS Method for individual lanes: Delay (HCM).
Approach LOS values are based on the worst delay for any lane.
Roundabout LOS Method: Same as Signalised Intersections.
Roundabout Capacity Model: US NCHRP 572.

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LANE SUMMARY

Site: Willamette/Plaza Driveway-NCHRP 30"

Roundabout with 1-lane approaches and circulating road

Roundabout

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Lane Length ft	SL Type	Cap. Adj. %	Prob. Block. %
South: Willamette Street																
Lane 1	36	479	0	515	2.1	1077	0.479	100	7.5	LOS A	3.4	85.6	1600	–	0.0	0.0
Approach	36	479	0	515	2.1		0.479		7.5	LOS A	3.4	85.6				
North: Willamette Street																
Lane 1	0	758	175	933	0.2	1390	0.671	100	6.7	LOS A	7.0	174.5	1600	–	0.0	0.0
Approach	0	758	175	933	0.2		0.671		6.7	LOS A	7.0	174.5				
West: Plaza Driveway																
Lane 1	129	0	155	284	1.0	524	0.541	100	20.7	LOS C	4.7	118.5	1600	–	0.0	0.0
Approach	129	0	155	284	1.0		0.541		20.7	LOS C	4.7	118.5				
Intersection				1732	0.9		0.671		9.2	LOS A	7.0	174.5				

Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all lanes. LOS Method: Delay (HCM).
Level of Service (Worst Lane): LOS C. LOS Method for individual lanes: Delay (HCM).
Approach LOS values are based on the worst delay for any lane.
Roundabout LOS Method: Same as Signalised Intersections.
Roundabout Capacity Model: US NCHRP 572.

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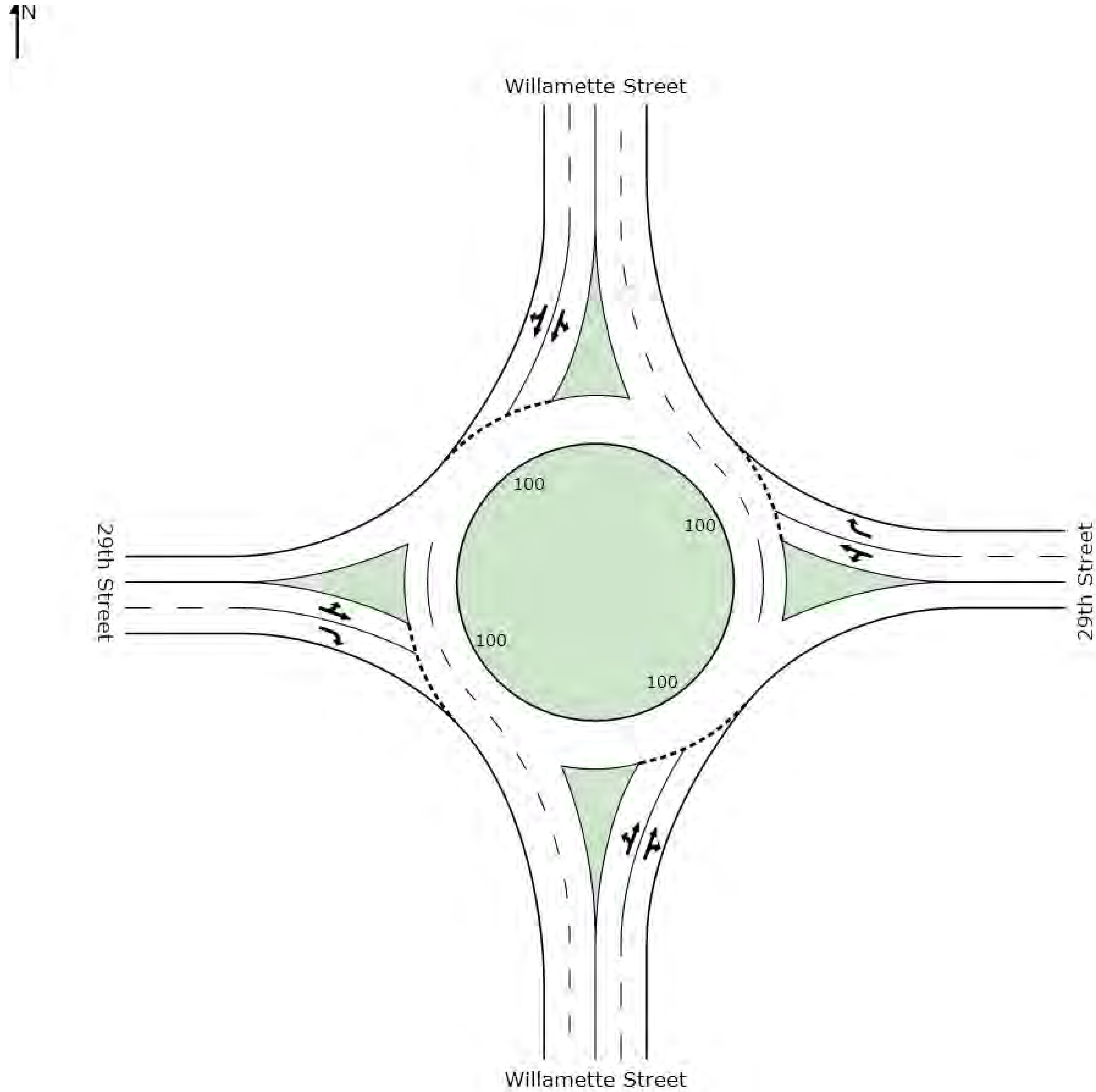
Item A.


N
Willamette Street
29th Street
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29th Street
Willamette Street

LANE SUMMARY

Site: Willamette/29th St-NCHRP

Roundabout with 2 entering lanes on all legs, 2 exiting lanes on north/south legs, and 1 exiting leg on east/west legs
Roundabout

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Lane Length ft	SL Type	Cap. Adj. %	Prob. Block. %
South: Willamette Street																
Lane 1	289	45	0	335	1.3	612	0.547	100	17.9	LOS B	4.7	118.6	1600	–	0.0	0.0
Lane 2	0	281	47	328	3.3	600	0.547	100	12.2	LOS B	4.6	117.4	1600	–	0.0	0.0
Approach	289	326	47	663	2.3		0.547		15.1	LOS B	4.7	118.6				
East: 29th Street																
Lane 1	126	389	0	516	1.7	654	0.789	100	15.3	LOS B	7.6	192.4	1600	–	0.0	0.0
Lane 2	0	0	74	74	2.0	628	0.117	100	8.3	LOS A	0.5	12.3	1600	–	0.0	0.0
Approach	126	389	74	589	1.8		0.789		14.4	LOS B	7.6	192.4				
North: Willamette Street																
Lane 1	163	276	0	439	1.0	493	0.889	100	41.2	LOS D	15.7	395.7	1600	–	0.0	0.0
Lane 2	0	329	111	440	0.7	495	0.889	100	39.0	LOS D	15.8	396.2	1600	–	0.0	0.0
Approach	163	605	111	879	0.9		0.889		40.1	LOS D	15.8	396.2				
West: 29th Street																
Lane 1	126	295	0	421	1.4	590	0.713	100	15.6	LOS B	5.8	146.6	1600	–	0.0	0.0
Lane 2	0	0	347	347	1.0	566	0.613	100	13.6	LOS B	4.4	110.2	1600	–	0.0	0.0
Approach	126	295	347	768	1.2		0.713		14.7	LOS B	5.8	146.6				
Intersection				2900	1.5		0.889		22.4	LOS C	15.8	396.2				

Level of Service (Aver. Int. Delay): LOS C. Based on average delay for all lanes. LOS Method: Delay (HCM).
Level of Service (Worst Lane): LOS D. LOS Method for individual lanes: Delay (HCM).
Approach LOS values are based on the worst delay for any lane.
Roundabout LOS Method: Same as Signalised Intersections.
Roundabout Capacity Model: US NCHRP 572.

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SIDRA INTERSECTION

LANE SUMMARY

Site: Willamette/32nd St-NCHRP 30'

Roundabout with 1-lane approaches and circulating road

Roundabout

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Lane Length ft	SL Type	Cap. Adj. %	Prob. Block. %
South East: Donald Street																
Lane 1	5	0	263	268	1.9	725	0.370	100	11.4	LOS B	2.3	59.1	1600	–	0.0	0.0
Approach	5	0	263	268	1.9		0.370		11.4	LOS B	2.3	59.1				
East: 32nd Avenue																
Lane 1	16	0	21	37	3.4	567	0.065	100	14.1	LOS B	0.3	8.9	1600	–	0.0	0.0
Approach	16	0	21	37	3.4		0.065		14.1	LOS B	0.3	8.9				
North: Willamette Street																
Lane 1	368	0	647	1016	1.0	1458	0.696	100	8.9	LOS A	7.5	190.1	1600	–	0.0	0.0
Approach	368	0	647	1016	1.0		0.696		8.9	LOS A	7.5	190.1				
South West: Willamette Street																
Lane 1	384	0	11	395	1.0	767	0.514	100	14.9	LOS B	4.1	102.7	1600	–	0.0	0.0
Approach	384	0	11	395	1.0		0.514		14.9	LOS B	4.1	102.7				
Intersection				1716	1.2		0.696		10.8	LOS B	7.5	190.1				

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all lanes. LOS Method: Delay (HCM).
Level of Service (Worst Lane): LOS B. LOS Method for individual lanes: Delay (HCM).
Approach LOS values are based on the worst delay for any lane.
Roundabout LOS Method: Same as Signalised Intersections.
Roundabout Capacity Model: US NCHRP 572.

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SIDRA INTERSECTION

ECONorthwest
ECONOMICS • FINANCE • PLANNING

DATE: February 28, 2014

TO: Chris Henry and David Nelkin

FROM: The ECONorthwest Team

SUBJECT: SOUTH WILLAMETTE STREET REDESIGN: ECONOMIC LITERATURE REVIEW

On December 11, 2013, the City of Eugene asked ECONorthwest to conduct a literature review of the effects that the proposed street-design changes to South Willamette would have on nearby businesses. In this memorandum, we[1] summarize the findings from a literature review of existing studies about the economic effects of similar street-design changes in other commercial corridors.

I. Context

Project Background

Based on the Draft South Willamette Street Improvement Plan[2] (Draft Plan) the City has concluded that the transportation infrastructure on South Willamette Street from 24th Avenue to 32nd Avenue needs repair. The Draft Plan evaluated several alternative roadway configurations to serve this purpose. The Draft Plan concluded that the 3-automotive lanes plus 2 bike-lane alternative would best serve the wants and needs of the surrounding community without significantly hindering access or travel times through the area.

Some businesses along South Willamette have expressed concern that the proposed configuration would decrease the number of customers and thereby decrease revenues and profits. The City hired ECONorthwest to evaluate how businesses have fared following similar road-reconfiguration projects elsewhere and to judge, to the extent possible, how the proposed South Willamette reconfiguration might affect businesses and property owners along South Willamette.

The 0.8 mile portion of South Willamette currently has 16,500 average daily trips (ADT) by motor vehicle with an average end-to-end travel time of 2.5 minutes. This portion of South Willamette has 5.2 collisions per million vehicle miles compared to the statewide average of 2.9 collisions per million vehicle miles for urban minor arterial streets. More than 15% of motor vehicles on this stretch travel more than 5 mph above the 25 mph posted speed limit.

Local traffic, those making a stop on this portion of Willamette, accounts for 63% of the traffic. The other 37% are through travelers that do not stop on this portion of Willamette. There are over 70 driveways over the 0.8 mile stretch.

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[1] Throughout this memo, the terms "we," "our," and "us" refer to Beth Goodman, Matthew Kitchen, Michael Weinerman and Ed Whitelaw, all at ECONorthwest <http://www.econw.com/>.

[2] Draft South Willamette Street Improvement Plan. October 2013. http://www.eugene-or.gov/index.aspx?NID=2055

Effects of Road Diets

Transportation planners and professionals use the term "road diet"[3] to refer to roadway configurations similar to that being recommended for South Willamette. Many urban areas across the country have implemented similar "road diet" policies and plans.

Road diets and other traffic adjustments are often accompanied by various studies to describe and explain the effects of the reconfiguration. Most common are analyses that measure changes in motor-vehicle traffic times, congestion, and crashes. Some researchers have also focused on resident, consumer, and business perceptions before and after the reconfiguration; business revenues; customer and delivery truck accessibility; and spending patterns by mode of transportation.

ECONorthwest reviewed the professional literature to find the studies most relevant to the question of the effects of road diets on nearby businesses.[4] We summarize the key points from this literature review in this memorandum.

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[3] The U.S. DOT defines [Federal Highway Administration; "Proven Safety Countermeasures; FHWA-SA-12-013; http://safety.fhwa.dot.gov/provencountermeasures/fhwa_sa_12_013.pdf] road diets as such: *The classic roadway reconfiguration, commonly referred to as a "road diet," involves converting an undivided four lane roadway into three lanes made up of two through lanes and a center two-way left turn lane. The reduction of lanes allows the roadway to be reallocated for other uses such as bike lanes, pedestrian crossing islands, and/or parking. Road diets have multiple safety and operational benefits for vehicles as well as pedestrians, such as:*

- *Decreasing vehicle travel lanes for pedestrians to cross, therefore reducing the multiple-threat crash (when one vehicle stops for a pedestrian in a travel lane on a multi-lane road, but the motorist in the next lane does not, resulting in a crash) for pedestrians,*
- *Providing room for a pedestrian crossing island,*
- *Improving safety for bicyclists when bike lanes are added (such lanes also create a buffer space between pedestrians and vehicles),*
- *Providing the opportunity for on-street parking (also a buffer between pedestrians and vehicles),*
- *Reducing rear-end and side-swipe crashes, and*
- *Improving speed limit compliance and decreasing crash severity when crashes do occur.*

[4] In Appendix A we list the sources we reviewed for this memo.

II. Evaluation Framework

An evaluation of the business effects of a road improvement project is much like other evaluation problems in the social sciences. The standard approach is to

1. Establish one or more hypotheses regarding cause and effect; in this case between the implementation of road redesign and business performance.
2. Seek evidence that either confirms or rejects the hypotheses, ideally with methods that control for other factors that are not being evaluated but nonetheless may influence the outcomes of interest.
3. Review existing literature and if feasible conduct experimentation.
4. Conclude with analysis and communication of results.

How Road Redesign Might Influence Business Performance

Changes in the configuration of a road might influence the performance of businesses along that road in a number of specific ways. The literature shows that changes in the road configuration might permanently alter the following:

- Vehicle traffic volumes in the corridor.
- Non-vehicle trips in the corridor.
- Total number of trips with destinations within the corridor.
- Businesses access.

The construction phase of a road reconfiguration may also have impacts that would not be sustained, that may not be related to the type of reconfiguration, and may not remain after construction is completed.

Evidence and Analysis

An ideal analysis would isolate the effects of a policy or action by controlling for changes in factors unrelated to the policy or action of interest. This ideal is rarely achieved. Reality is too complex for the analytical tools and budget constraints.

In the social sciences the "gold standard" for experiments includes the following:

- An examination of results from settings with and without the policy or "treatment"; an experimental case and a control case.
- An examination of results both before and after the policy or "treatment" is applied.
- The collection of data that represents revealed behaviors.
- In cases where objective data is not available, carefully designed survey methods may be used to understand perceptions, preferences, and other qualitative factors that help establish general magnitudes or relative magnitudes of effects.

In our review of the available literature we have looked for evidence of the means by which road diets might affect business performance while being mindful of the methods used to obtain this evidence.

III. Findings

Summary of Literature Review

Road reconfigurations may affect retail businesses in a number of ways.

If a road diet changes travel times for motorists then shoppers who travel by car may choose to patronize an alternative, more accessible retailer. Likewise, the accessibility of driveways through left turn lanes may increase visits to businesses. The direct empirical evidence for these effects on business performance is virtually nonexistent.

The empirical evidence for road diets' effects on traffic and safety have been more systematically documented. The magnitude of these traffic and safety effects is typically modest for urban arterials with less than 20,000 ADT. There is evidence from the literature that road diets can produce safety benefits.

There is also evidence that supports the use of road diets as tools for traffic flow management, but results are highly context- and design-specific. Traffic flow benefits may come with overall reductions in ADT. The specific design of intersections and management of turn movements will have an influence on traffic patterns.

Adjusting infrastructure and amenities for cyclists and pedestrians may change visits from cyclists and pedestrians. There is some evidence that walking and bike trips are associated with different business patronage and spending behavior than is associated with vehicle trips. In a number of studies bike and walk trips are associated with more frequent business patronage but with smaller per trip expenditures.

If automobile ADT are reduced by a road diet then visits to retailers along the street may also be reduced. Retailers may, however, sustain visits if ADT reductions are primarily amongst through-travelers or if ADT reductions are matched by increases in bicycle and pedestrian visits. The Draft Plan estimates that "[u]p to 500 vehicles per day may reroute to other roadways," mostly to Hilyard Street and/or Amazon Parkway. The literature we reviewed does not show that a reduction in total ADT is linked to a reduction in visits to businesses or a reduction of business revenues.

Finally, in some commercial leases there is a clause that will require the adjustment of the lease rate if the ADT changes. If ADT decreases then lease rates likely decrease, if the ADT increases then the lease rates likely increase. These economic consequences will accrue to property owners rather than tenants.

Similar Street Reconfiguration Projects

Table 1 lists several road diet projects that are similar in scope, ADT, and urban setting to the proposed South Willamette project. This is not an exhaustive list of comparable road diet projects, but the most relevant sites that have thus far emerged from our literature review.

Table 1 Streets similar to South Willamette with reconfigurations

City	Street	ADT[1]	Reconfiguration	Area Type (Urban, Suburban, Rural)	Corridor Type (Commercial, Residential, Mixed)	Project Completed Date
Eugene, OR	Willamette Street	16,500	4 to 3-lane plus bike lanes	Urban	Mixed	N/A
Ashland, OR	North Main Street	18,100-20,700	4 to 3-lane plus bike lanes	Suburban	Mostly Residential	2012
Portland, OR	Division St (60th to 80th)	13,000-18,000	4 to 3-lane plus bike lanes	Urban	Mostly Residential	2013 (August)
Portland, OR	Glisan St (60th to 82nd)	18,000	4 to 3-lane plus bike lanes	Urban	Mixed	2013
Portland, OR	NE Multnomah Blvd	?	5 lanes with bike lanes to 3 lanes with bike lanes plus buffers/parking	Urban	Commercial	2013
Portland, OR	SE Holgate (East of Hwy 205)	15,305	5 lanes to 3 lanes with buffered bike lanes	Urban	Mixed	2009
Seattle, WA	Nickerson Street	18,500	4 to 3-lane plus bike lanes plus parking	Urban	Mixed	2010
Seattle, WA	Phinney Ave (N. of 51st)	?	4 to 3 lane plus bike lanes plus parking	Urban	Mixed	2006
Seattle, WA	Stone Way N	13,300	4 to 3 lane plus bike lanes plus parking	Urban	Mixed	2007
Seattle	NE 125th St	16,200	4 to 3-lane plus bike lanes	Urban	Mostly Residential	2011
Vancouver, WA	Fourth Plain Boulevard	17,000	4 to 3-lane plus bike lanes	Suburban	Commercial – nearby residential	2002

[1]ADT figures, where available, are pre-road reconfiguration.

As a part of this project, we considered developing one or more case studies to describe the economic effects of the street reconfiguration in one of the corridors shown in Table 1. We think the information most likely to result from such a case study is additional qualitative information about the effects of the street reconfiguration on businesses, as well as information and ideas for how to implement a reconfiguration to impact businesses least. Through discussions with stakeholders and City staff, we concluded that this additional information did not justify the cost of conducting case studies.

V. Literature Review Details

Traffic and Economic Performance

The relationships between traffic, traffic congestion, and economic performance are well documented. Road reconfigurations may affect business bottom lines in several ways: longer queues and slower travel times may lead some consumers to opt for a more accessible alternative; longer travel times and narrower lanes may make it more expensive for delivery trucks to deliver goods to a business and thereby increase the cost to the business; and traffic delays may increase the cost incurred by employees when traveling to work. As a result, road reconfigurations may lead to increased transportation costs, which could increase the cost of production and decrease the quantities produced.[5] There are a couple of key conclusions from the literature:

- Firm location and performance are linked to transportation costs, which is consistent with the basic principles of location theory.[6,7] In the case of retail firms, transportation costs are borne in part by customers as they access retail businesses.[8]
- Researchers of Chicago and Philadelphia found that traffic congestion shrinks business market areas and reduces the chances of "agglomeration economies," in turn raising production costs. This research, however, looked at large-scale, highway traffic congestion as opposed to increased traffic on a single, local road like South Willamette.[9]

The general framework that treats transportation costs as an input into the production process is the basis for understanding the potential economic consequences of adopting road diets.

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[5] The economic literature on this topic is summarized in Goodwin, Phil. 2004. "The Economic Costs of Road Traffic Congestion." *ESRC Transport Studies Unit – University College London.*

[6] Thünen, Johann Heinrich von. 1783–1850. *Der Isolierte Staat in Beziehung auf Landwirtschaft und Nationalökonomie, oder Untersuchungen über den Einfluss, den die Getreidepreise, der Reichtum des Bodens und die Abgaben auf den Ackerbau ausüben, Vol. 1,*. and *Der Isolierte Staat…, Vol II: Der Naturgeässe Arbeitslohn und dessen Verhältnis zum Zinsfuss und zur Landrente, Part 1* (Partial translation into English by Carla M. Wartenberg in 1966 as *Isolated State.* New York: Pergamon Press.)

[7] Weber, Alfred. 1929. (translated by Carl J. Friedrich from Weber's 1909 book). *Theory of the Location of Industries*. Chicago: The University of Chicago Press.

[8] Hotelling, Harold. 1929. "Stability in Competition." The Economic Journal, 39 (March), 41-57.

[9] Weisbrod, Glen et al. 2003. "Measuring Economic Costs of Urban Traffic Congestion to Business." *Transportation Research Record: Journal of the Transportation Research Board* 1839, no. 1.

Road Diets

Road diets may consist of a wide range of traffic reconfigurations. In general, a road diet will include a reduction of motor traffic lanes along with other traffic calming measures, such as crosswalks. The primary focus of most road diet studies is the effect that a road diet has had on safety, travel times, and traffic speeds. In general, studies in this field conclude that road diets reduce speeds and crashes while increasing travel times. The benefits from speed and crash reductions are typically found to outweigh the costs of increased travel times, but these net gains are typically only realized in situations where total ADT are below 20,000 and are subject to context-specific factors and conditions. An FHWA report [10] links road diets with reductions in crashes and injuries.

Road diet studies that measure the effect of road diets on retail sales are typically survey based and/or have been implemented in large cities. Quantitative studies use sales tax data to measure the effect of road diets on retail performance. For example, recent research in New York City attempted to develop new metrics to measure the economic impacts and effects of street reconfigurations. These studies found that protected bike lanes, dedicated bus lanes, and other "sustainable" traffic reconfigurations were positively associated with sales tax revenues and negatively associated with commercial vacancies. [11] Oregon, unfortunately for research purposes, does not have sales tax data with which to complete this type of research.

Before and After Studies

Most studies of road diets focus on the traffic statistics on a stretch of road before and after road diet implementation. These studies sometimes describe the effects that the road diet had if all other things are held constant.

In one study qualitative and quantitative data allowed researchers to determine the effects from road diet adjustments on York Boulevard in Los Angeles. They found that there were no "meaningful linkages between the presence of a road diet and changes in economic conditions."[12]

A report on the performance of Main Street in Ashland, Oregon found that the road reconfiguration outperformed what was projected in terms of traffic speeds, queue lengths and intersection LOS and in many instances represented an improvement over the baseline conditions. [13]

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[10] US Department of Transportation - Federal Highway Administration. 2004. "Evaluation of Lane Reduction "Road Diet" Measures and Their Effects on Crashes and Injuries."

[11] New York City Department of Transportation. 2013. "Measuring the Street: New Metrics for 21st Century Streets."

[12] McCormick, Cullen. 2012. "York Blvd: The Economics of a Road Diet." University of California Los Angeles.

[13] Faught, Mike. 2013. "Re: Post Road Diet Assessment - January through October." City of Ashland - Public Works.

Stantec consulting collected economic data of businesses along two corridors in downtown Vancouver, BC where single bike lanes were converted to separated bike lanes. In each case business owners reported reductions in sales (-10%, -4%) and customers reported similar reductions in visits to the area. The reasons customers reported for the reductions were traffic congestion, less parking, turning restrictions, and reduced pedestrian safety.[14] The dense Vancouver downtown area is likely not comparable to South Willamette.

Of the three DKS case studies[15] only the Vancouver, WA study attempted to describe the economic impacts or effects of the road diet project. The Vancouver study found that businesses along the road diet street "faired [sic] no worse than its peer areas" in 2002-2003, when the city experienced a general recession. The reconfigured Fourth Plain Street had a 4.7% decrease in "taxable retail sales" compared to 9.8% and 25.0% reductions at two comparison commercial zones. The only two customer complaints to the city that referred to the reconfiguration concerned traffic signal timing.

Based on data from two bicycle lane installations in Seattle, Rowe used paired comparisons to show that the addition of bike lanes had, in one case, a negligible effect on business revenues and in the other a positive impact on business revenues.[16] The limited number of cases and the aggregation of sales tax data within each business district, however, seriously limit the strength of the conclusions.

Surveys and Opinion Research

Other studies attempt to understand businesses performance through the use of business or consumer surveys. Surveys can be used to understand a respondents' impressions of the usefulness of road improvements, business performance, and consumer behavior.

A survey study of North Main Street in Ashland found that ¾ of businesses said that the road reconfiguration had no effect on their business. The majority of the remaining ¼ mostly reported that deliveries to their location were negatively affected.[17]

Eisele and Frawley found that business perceptions of what the effects of a new raised median would be before the addition were larger than the actual effects of the new median.[18]

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[14] Stantec Consulting ltd. 2011."Vancouver Seperated Bike Lane Business Impact Study."

[15] 2004. "Nickerson Street Rechannelization before and after Report."; City of Orlando - Transportation Planning Bureau. 2002. "Edgewater Drive before & after Re-Striping Results."; City of Vancouver - Transportation Services, "Fourth Plain Boulevard Demonstration Re-Striping Project - Post Implementation Report."

[16] Rowe, Kyle. 2013. "Bikenomics: Measuring the Economic Impact of Bicycle Facilities on Neighborhood Business Districts."

[17] Faught, Mike. 2013. "Re: Post Road Diet Assessment - January through October." City of Ashland - Public Works.

[18] Eisele, William and William Frawley. 2000. "A Methodology for Determining Economic Impacts of Raised Medians: Final Project Results." Texas Transportation Institute, Texas A & M University System.

A survey study completed in the Portland area found that cyclists spent more than automobile consumers at restaurants, drinking establishments, and convenience stores. Motorists spent more than cyclists at supermarkets.[19]

Similar survey research completed in New York's East Village found that pedestrians and cyclists spent more per capita per week than motorists.[20]

A survey study of Polk Street in San Francisco found that motorists spent more per *trip*, but pedestrians and cyclists spent more per *week* by taking more trips to retailers than drivers.[21]

Property Access and Business Performance

The literature related to how property accessibility and access management influence business performance is also limited. The report by Eisele and Frawley, referenced earlier, found that business perceptions of the effects of a new raised median were larger than the actual effects.[22]

A report prepared for the Washington State Transportation Commission examined the relationship between business perceptions of access management and business perceptions of their own performance.[23] Findings from this study include:

- Retail services establishments are less inclined than other retail establishments to see a relationship between access management and business performance.
- Businesses that already have good access from the main corridor are more likely to perceive a relationship between access restrictions and business performance.
- Larger businesses (more than 10 employees) are more likely to see a relationship between access management and business performance. Larger businesses are also more likely to be concerned about access restrictions.
- Two-way turn lanes, as compared with factors that directly effect site accessibility, are not perceived to have an influence on business performance.
- The overall level of congestion within the corridor is perceived to have a more significant influence on business performance than site accessibility and access management.

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[19] Clifton, Kelly et al. 2013. "Consumer Behavior and Travel Mode Choices." Oregon Transportation Research and Education Consortium.

[20] Transportation Alternatives. "East Village Shoppers Study."

[21] San Francisco Municipal Transportation Agency. 2013. "Polk Street Intercept Survey Results."

[22] Eisele, William and William Frawley. 2000. "A Methodology for Determining Economic Impacts of Raised Medians: Final Project Results." Texas Transportation Institute, Texas A & M University System.

[23] Vu, Patrick et al. 2002. "Economic Impacts of Access Management." Washington State Department of Transportation and TRAC.

Appendix A: Literature Reviewed

This appendix presents the articles reviewed by ECONorthwest in this project. It includes a brief summary of the report and an assessment of how the article fits into the economic analysis. Our review of articles focused on economic issues directly related to the effects of street redesign on businesses.

Title	Author(s)	Year	Summary	Notes	Relevant to the Economic Study?
Complete Streets Spark Economic Revitalization	Complete Streets Steering Committee Organization		2-page summary of the economic revitalization that many areas have experienced after implementing complete streets programs.		Yes
Consumer Behavior and Travel Mode Choices	Clifton et al	2013	Research based in the Portland metro area. Supermarkets had the highest share of private vehicle use, 86%; drinking places had the lowest, 43%; high-turnover restaurants, 64%; and convenience Stores, 59%. Automobile consumers were found to spend more per trip, but not statistically different amounts on a monthly basis (ie, they took fewer trips than other modes). Bikers spend more each month than automobile drivers at restaurants, drinking establishments, and convenience stores. Directness and connectivity were a significant predictor of someone choosing bicycle mode of transportation.		Yes
Re: Post Road Diet Assessment - January through October	Faught, Mike	2013	The road reconfiguration was found to outperform what was projected in terms of traffic speeds, queue lengths and intersection LOS and, in many instances, represented an improvement over the baseline conditions.		Yes

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Title	Author(s)	Year	Summary	Notes	Relevant to the Economic Study?
The Economic Benefits of Sustainable Streets	NYDOT	2013	Follows up on the 2012 Measuring the Street study to update metrics to accurately measure the impacts of street revitalization. Has a lit review and makes the case that street improvements and traffic calming increase the number of shoppers, revenue, and property values. Also points out that businesses are typically opposed to projects beforehand. Provides a summary of the biases present in the 2011 Stantec report. NYDOT, with consultants, developed their own metric which includes retail sales tax filings, commercial leases and rents, and city-assessed market value. Methods included paired comparisons between sites and boroughs, and other comparisons between sites other similar sites within the neighborhood. Evaluated the addition of street corridors and plaza on retail trade and food businesses over two years before and after a project. Offers several lessons for doing this type of research in the future. Includes 3 Manhattan, 2 Bronx, and 2 Brooklyn Case studies.	The setting is not comparable to S Willamette, but the methods and results are useful. Oregon doesn't have a sales tax so that data would not be available.	Yes
Bikenomics: Measuring the Economic Impact of Bicycle Facilities on Neighborhood Business Districts	Rowe, Kyle	2013	Concludes that the addition of bicycle lanes did not have a negative impact on business districts.		Yes
Polk Street Intercept Survey Results	SFMTA	2013	Focuses on consumer spending by mode of transportation to the region. Cars spent more per trip than cyclists, peds, and transit, but motorists also had lower per week spending than all three other travel types.		Yes
Rethinking Streets: An Evidence-Based Guide to 24 Complete Streets Transformations	Rowell & Schlossberg	2013	Includes numerous qualitative results, mostly from survey data, about the effect that road diets have had on traffic and businesses. Provides some theoretical guidance on how street design and traffic speed affects business placement relative to the street and other business choices. Includes some discussion of sales tax revenues and property values in a before-after context, but only provides summary results; no detailed metrics. Offers several potential case-study sites.		Yes

Item A.

Title	Author(s)	Year	Summary	Notes	Relevant to the Economic Study?
York Blvd: The Economics of a Road Diet	McCormick, Cullen	2012	A study of York Blvd, Los Angeles. Relies on qualitative and quantitative data. Most businesses presumed that their customers arrived by car, but these notions were mistaken. Business turnover road diet v non-road diet 55% v 62%; did not find statistically different property values; non-road diet areas had a higher growth rate in revenues, but road diet portions had a higher absolute increase in revenues. In sum, "The quantitative analyses in this report do not reveal meaningful linkages between the presence of a road diet and changes in economic conditions."		Yes
Measuring the Street: New Metrics for 21st Century Streets	NYDOT	2012	For the first protected bike lane in the US, 8th and 9th avenues in Manhattan, found that locally-based business on 9th from 23rd-31st had "up to 49% increase in retail sales" compared to a 3% increase borough wide. There was also "49% fewer commercial vacancies" compared to 5% borough-wide. In regards to dedicated lanes for buses and bike on 1st and 2nd Avenues in Manhattan: 47% fewer commercial vacancies compared to 2% borough-wide.	Seemingly useful measures, but the source of data and methods are unclear.	Yes
Vancouver Separated Bike Lane Business Impact Study	Stantec Consulting	2011	Collected business economic data to measure the impacts of 2 bike lanes. The net impact on sales at businesses adjacent to the bike lanes was -10% and -4%, respectively. Business owners estimated losses to be between -6% to -9%. These loses were found to be insufficient to create persistent vacancies. Customers reported comparable reductions in visiting the two areas; the reasons for these reductions were traffic congestion, less parking, turning restrictions, and reduced pedestrian safety. Provides a list of recommended mitigation measures, but many of these are specific to a dense downtown area.	This is a different type of conversion than that proposed for S Willamette. Downtown Vancouver is not be comparable to S. Willamette.	Yes
Fourth Plain Boulevard Demonstration Re-Striping Project - Post Implementation Report	City of Vancouver - Transportation Services	2004	DKS Case Study. Estimated "taxable retail sales" in the area. The study found that the area faired no worse than its peers and in 2002-2003, the last year of the study, the area faced a 4.7% decline in revenues versus 9.8% and 25.0% declines in other nearby commercial zones. 2 consumer complaints were made that regarded traffic signal timing.	The source of the data was the Washington State Department of Revenue.	Yes

Title	Author(s)	Year	Summary	Notes	Relevant to the Economic Study?
The Economic Costs of Road Traffic Congestion	Goodwin, Phil	2004	Summarizes the academic literature on the relationships between traffic, traffic congestion, and economic performance.		Yes
Evaluation of Lane Reduction "Road Diet" Measures and Their Effects on Crashes and Injuries	USDOT - FHWA	2004	Looked at 24 comparison sites in California and Washington. "On average, crash frequencies at road diets in the after period were approximately 6 percent lower than at the corresponding comparison sites." Road diets, however, did not have an effect on crash type or crash severity, but this study did not account for speed at the time of crash.	Cited on the 4 lanes 4 Willamette Facebook page.	Yes
Economic Effects of Traffic Calming on Urban Small Businesses	Drennen, Emily	2003	Drennen interviewed 27 merchants in the Mission District about Valencia Street bike lanes. 44.4% said economic revitalization was "Better", 0% said it was "Worse." 46.2% said reduced auto speeds had a "Better" effect on sales, 7.7% said it was "Worse." 37% said sales were "Better," 0% "Worse" .... and several other useful results (page 46). Categorizes the benefits that small businesses get from "traffic calming" efforts and provides examples for each: Economic Revitalization and Property Values; Attractiveness and Safety; Sales and Attracting Customers; Parking; Impact on Employees; Construction and Costs. Customers who drive less also have more disposable income.	This neighborhood in San Francisco is likely not comparable to S Willamette.	Yes
Measuring the Economic Costs of Urban Traffic Congestion to Business	Weisbrod et al	2003	Found that each sector if affected in different ways by congestion, as each relies on freight, customers, etc. road use to different degrees. Impacts also depend on location (e.g., industrial v. downtown). Losses are not put in a per-minute drive time or per-day metric.	Findings are specific to "large urban areas," such as Chicago and Philadelphia	Yes
Economic Impacts of Access Management	Vu et al	2002	Examined the relationship between business perceptions of access management and business performance. Has various interesting results, including that retail services establishments are less inclined than other retail establishments to see a relationship between access management and business performance.		Yes

Title	Author(s)	Year	Summary	Notes	Relevant to the Economic Study?
A Methodology for Determining the Economic Impacts of Raised Medians: Final Project Results	Eisele & Frawley	2001	Survey-based research. Found that business perceptions of business impacts prior to the project were worse than actuals. Negative impacts were found during the construction phase.		Yes
Traffic Calming Benefits, Costs and Equity Impacts	Litman, Todd	1999	Provides a framework for doing a cost benefit analysis or road diet projects. Monetizes many costs and benefits that aren't monetized elsewhere. Provides an example of Bridgeport Way where tax revenues increased in the years after a road diet relative to tax revenues from the whole city.		Yes
East Village Shoppers Study	Transportation Alternatives		Surveyed 420 pedestrians. Peds and bikers spend more per capita per week at local businesses and visit the neighborhood more often than car and subway users. Recent additions of bike lanes increased bike use dramatically. 73% of respondents said the lanes had a positive or very positive impact on the neighborhood.	East Village New York is not comparable to S Willamette.	Yes
Trends in Local Business Sales, Building Values, and Office Rents at NYCDOT Street Improvement Project Sites	Bennett Midland		Evaluated the effects on business sales following various types of street improvements including medians, bike lanes, traffic pattern alterations, and creation of new public spaces. At 8 of 11 sites (73%) business sales increased at a greater rate than at comparison areas. At 9 of 11 sites sales increased in the first year after improvements. The projects may have promoted economic growth. Commercial building values increased at 4 of the 6 sites with available data.		Yes
Nickerson Street Rechannelization Before and After Report	(see DKS report)	(see DKS report)	DKS Case Study. Speeding and collisions down significantly after the road diet. Change in total average weekday volume was negligible, about a 1% reduction. No business impacts are discussed.		Yes, but mostly because DKS cited this
Edgewater Drive Before & After Re-Striping Results	City of Orlando - TPB	2002	DKS Case Study. 34% reduction in crashes. 68% reduction in injuries. Significant reductions in speeding. And other traffic results. No business impacts are discussed.		Yes, but mostly because DKS cited this

Title	Author(s)	Year	Summary	Notes	Relevant to the Economic Study?
Bike Lanes, On-Street Parking and Business	The Clean Air Partnership	2009, 2010	Survey research of drivers, pedestrians, and cyclists to a commercial neighborhood in Toronto. Found that most businesses and customers consider the shift towards more walkability and bikability to be advantageous.	Downtown Toronto is not comparable to S Willamette.	No
The Path to Complete Streets in Underserved Communities	Clifton et al		Conducts four case studies about getting complete streets in underserved communities.	Advocacy - complete streets implementation guidance	No
Road Diet Seminar	Daisa		Provides an overview of road diet practices, where the policies are most suitable, and the typical effects on traffic patterns and crashes. Not much on business impacts.		No
Road Diet Handbook - Overview	Rosales, Jennifer		Provides a number of case studies of road diets. Does not include much information on effects on businesses, but does cite a Vancouver case where sales increased when compared to similar, non-road diet sites in the area.		No
Transportation and The Economy	SACTRA		Provides a lot of theoretical guidance. Euro-centric. Chapter 7 focuses on how traffic reductions may affect economies. Focuses on taxation and other policies as means to reduce congestion.		No
RE: Fire/EMS Input on "Road Diet" Projects	Kingsbury, Dwight	2013	Kingsbury is the FDOT Safety Officer in Tallahassee, FL. This memo argues that a 3-lane reconfiguration may *improve* EMS response over 4-lane configurations.	A contribution to the discussion of EMS delays.	No
Evaluating Complete Streets	Litman, Todd	2013	Mostly advocacy, but Table 7 provides a guide to quantification of often overlooked impacts.		No
From Policy to Pavement: Implementing Complete Streets in the San Diego Region	Bleir et al	2012	Mostly advocating for Complete Streets in San Diego, but this article does lay out the range of benefits that stem from Complete Streets including branding and revitalization of commercial districts		No
Walk this Way: The Economic Promise of Walkable Places in Metropolitan Washington, DC	Leinberger & Alfonzo	2012	Found that a 1-level increase in the walkability index (IMI) resulted in higher average office and retail rent per sq ft, higher retail sales, higher res rents, and average home values.	DC neighborhood is not comparable to S Willamette.	No

Title	Author(s)	Year	Summary	Notes	Relevant to the Economic Study?
Safety and Operational Analysis of 4-lane to 3-lane Conversions (Road Diets) in Michigan	Lyles et al	2012	Finds that diets for areas with ADTs over 10K face significant delays, but this mostly applies to sites with peak hour volumes above 1000 (which doesn't appear to apply to S. Willamette). One appendix has a detailed literature review.	Cited on the 4 lanes 4 Willamette Facebook page. There are several appendices that compliment the report, which may require further attention. Not applicable to question of business revenues.	No
38th Avenue Corridor Plan Implementation	Showalter, Sarah	2012	Includes a simple before and after measure of sales tax revenue		No
Methodology for Determining the Economic Development Impacts of Transit Project	TCRP - TRB	2012	Focuses on travel time savings, costs of construction, environmental impacts, effects on land development, and effects on agglomeration economies. It is one of the first studies to look at the later, or so it claims. Does not focus on business impacts		No
New Tool for EstimatingEconomic Impacts ofTransportation Projects:Transportation Project Impact Case Studies	TRB	2012	Focuses on highway expansion. Not applicable to impacts of changes to city streets.		No
Valencia Street traffic poses risk to cyclist	Huet, Ellen	2012	Cars veering for parking spots or to double-park force cyclists to swerve into traffic. "Enforcement seems to be lacking when it comes to double-parking in bike lanes along Valencia Street, where bicyclists sometimes are forced to take potentially dangerous evasive action."	Parking and double-parking are not and would not be issues on S Willamette.	No
The Relationship of Transportation Access and Connectivity to Local Economic Outcomes: A statistical Analysis	Alstadt et al	2011	This article asks many useful questions: how does transpiration infrastructure affect delivery of product inputs, labor market access, and customer access. But the analysis is on a county-level rather than a street or neighborhood level.	Presented at a conference, appears to be unpublished.	No

Title	Author(s)	Year	Summary	Notes	Relevant to the Economic Study?
Washington's Complete Streets and Main Street Highways Program: Case Studies and Practice Resource	Nicholls et al	2011	Mostly advocacy and general description of what the WA Complete Streets program does.		No
Complete Streets	American Planning Association	2010	Has excerpts about complete streets programs from several sources.		No
Final Report for Secretary Department of Transportation and Development	Burk-Kleinpeter, Inc.	2010	Summarizes the costs and benefits of complete streets.	No empirics. Sites included are not comparable to S Willamette.	No
Evaluating Transportation Economic Development Impacts	Litman, Todd	2010	Mostly theoretical guidance on how to measure the economic impacts of transportation projects.		No
Generated Traffic and Induced Travel	Litman, Todd	2010	See other Litman articles. This is mostly about how to value consumer surplus of transportation shifts and does not touch on businesses impacts.		No
Maximizing the Economic Returns of Road Infrastructure Investment. Chapter 3:The Relationship Between Road Infrastructure Investment and Economic Development	Joynt, Hubert	2009	Theoretical guidance.		No
Economic Impact of Traffic Incidents on Businesses	Khattak et al	2008	Focused on North Carolina's interstate highways. Found a significant cost per hour of delay for crashes, but this cost varied by type of business. Did not focus on demand-side delays, just supply-side. Retail cost was $156/hr. of delay.	Not comparable to S Willamette.	No

Title	Author(s)	Year	Summary	Notes	Relevant to the Economic Study?
Portland's Green Dividend	Cortright - CEOs for Cities	2007	Makes the argument that Portlanders save money by not using cars as frequently as others, which leaves them with more money to spend in the local economy. Car and gas money also leaves Oregon immediately. No other business impact discussion.		No
Economic Impact of the Public Realm	ECOTEC	2007	Includes several case studies of public realm projects and their economic impacts in Europe.		No
New York City, New York Municipal Forest Resource Analysis	Peper et al	2007	Mostly non-applicable - cited in NYDOT 2013 paper - but p. 59 has a discussion of the effect that additional trees have on property values and other factors. People are willing to pay 3-7% more for properties with ample trees versus no trees.	If significant planting happens along S Willamette then this can add value to properties	No
Progress and Challenges in the Application of Economic Analysis for Transport Policy and Decision Making	Weisbrod & Alstadt	2007	Discussion paper on the interaction between transportation and economic modeling.		No
Curbing Cars: Shopping, Parking and Pedestrian Space in SoHo	Schaller Consulting	2006	Conducted 1,000 interviews of pedestrians and motorists. Concluded that most wanted less parking space and more pedestrian space. Also asked about spending patterns.	Not comparable to S. Willamette.	No
Hawthorne may not pass three-lane test	Shearer, Lee	2005	Hawthorne drive in Athens Georgia failed traffic tests. "By 2015, a three-lane design would cause longer than desirable traffic delays ... although traffic delays also will be unacceptably long if the road remains four lanes..." because traffic is expected to increase from significantly by 2015.	This article is about how a specific context is not suitable for a 3-lane conversion.	No
The Economic Impact of Investments in Bicycle Facilities: A Case Study of the Northern Outer Banks	Lawrie et al - NCDOT	2004	Survey research to measure the impact of significant investment in bicycling infrastructure. Mostly focuses on tourists and found that bicycle access was much of the reason some tourists visited an area. Investment in bicycling infrastructure was found to pay dividends.	Not applicable, but might be useful in determining the money cyclists bring to an area.	No
How Much Do You Lose When Your Road Goes on a Diet?	Huang et al	2003	Focuses on crashes. Finds no significant impact of road diets on crash rates.		No

Title	Author(s)	Year	Summary	Notes	Relevant to the Economic Study?
Urban Minor Arterial Four-Lane Undivided to Three-Lane Conversion Feasibility: An Update	Knapp et al	2003	Researches the traffic effects of 4-3 lane conversion. Based on simulations, recommends that areas with peaks under 750 vphpd will see few impacts. Those from 750-875 require caution in implementing a conversion. The authors express a lot of concern for those above 875 vphpd. Most simulations had a significant reduction in speeders.		No
Willamette Street Traffic Analysis	McKenney Engineering	2001	Previous evaluation of improvement alternatives for same stretch of Willamette	May be a useful comparison to DKS report.	No
A Comparative Analysis of Bicycle Lanes Versus Wide Curb Lanes: Final Report	USDOT - FHWA	1999	Summarizes the trade-offs between wide sidewalks and bike lanes.	Useful in comparing alternatives 3 and 5 of DKS report.	No
PPS Right Sizing Case Studies			There's several case studies here. None address economics. They all address volumes, crashes, etc.		

SOUTH WILLAMETTE
Street Improvement Plan

-501-

Draft Plan, Economic Study, & Process Update

April 16, 2014

Eugene City Council

Item A.

Background

Plan Goals

Help South Willamette Street become a vibrant urban corridor accessible by bicycle, foot, car, and bus.

- Support existing businesses and the commercial district's vitality
- Create a balanced multi-modal transportation system
- Further City planning efforts to identify compact growth and redevelopment opportunities
- Foster a well-informed and involved community supportive of the plan

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Item A.

SOUTH WILLAMETTE
Street Improvement Plan

Sustainability

- Evaluation of alternatives considered balance of effects on people, the planet, and prosperity
- Adapted Triple-Bottom-Line analysis vetted through Eugene's Transportation System Plan

Review of Alternatives

-505-

SOUTH WILLAMETTE
Street Improvement Plan

Item A.

Alternatives Screening

Tier 1

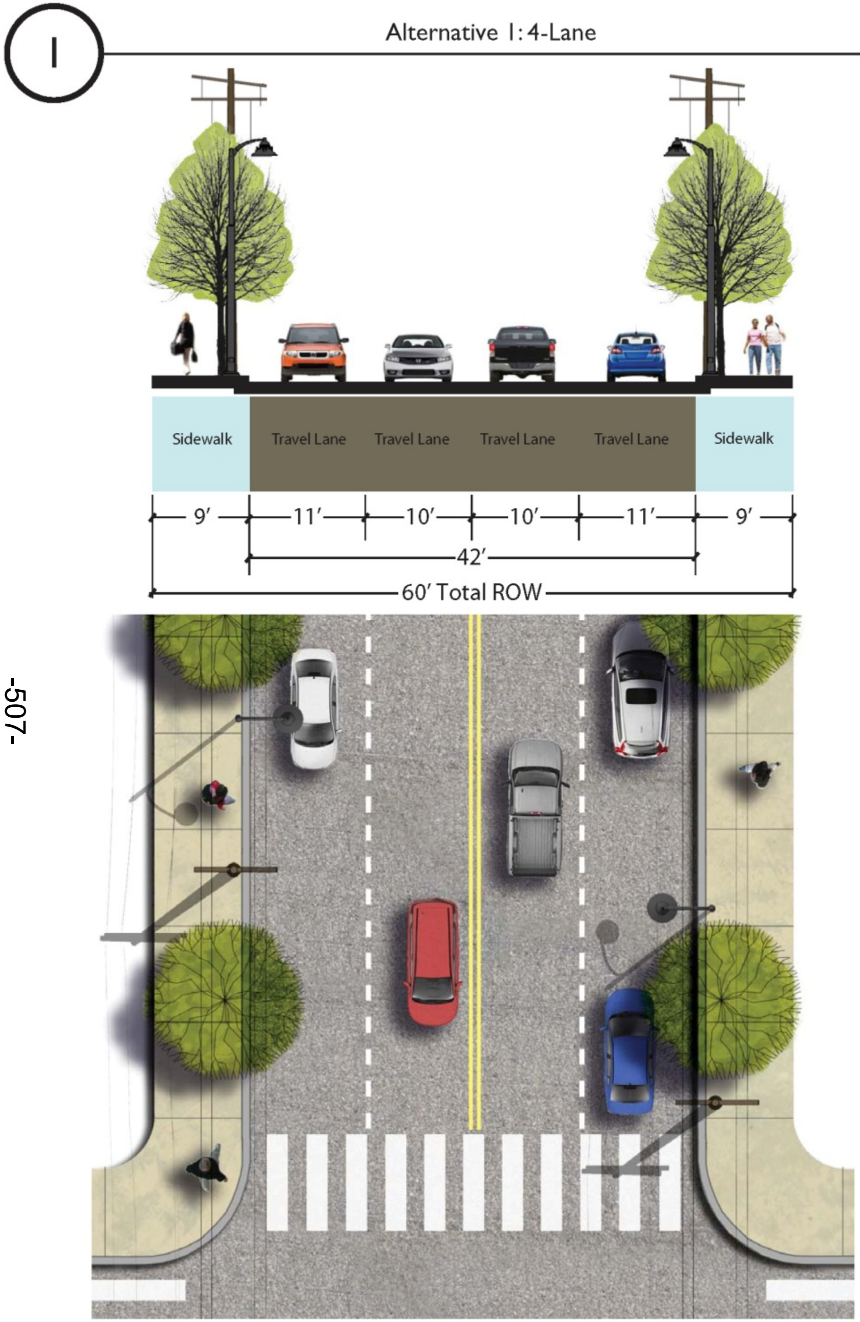
- Evaluation of community priorities
- Identification of broad level tradeoffs
- Assessment using qualitative tool (scoring criteria)

Tier 2

- More details and rigorous analysis of the designs

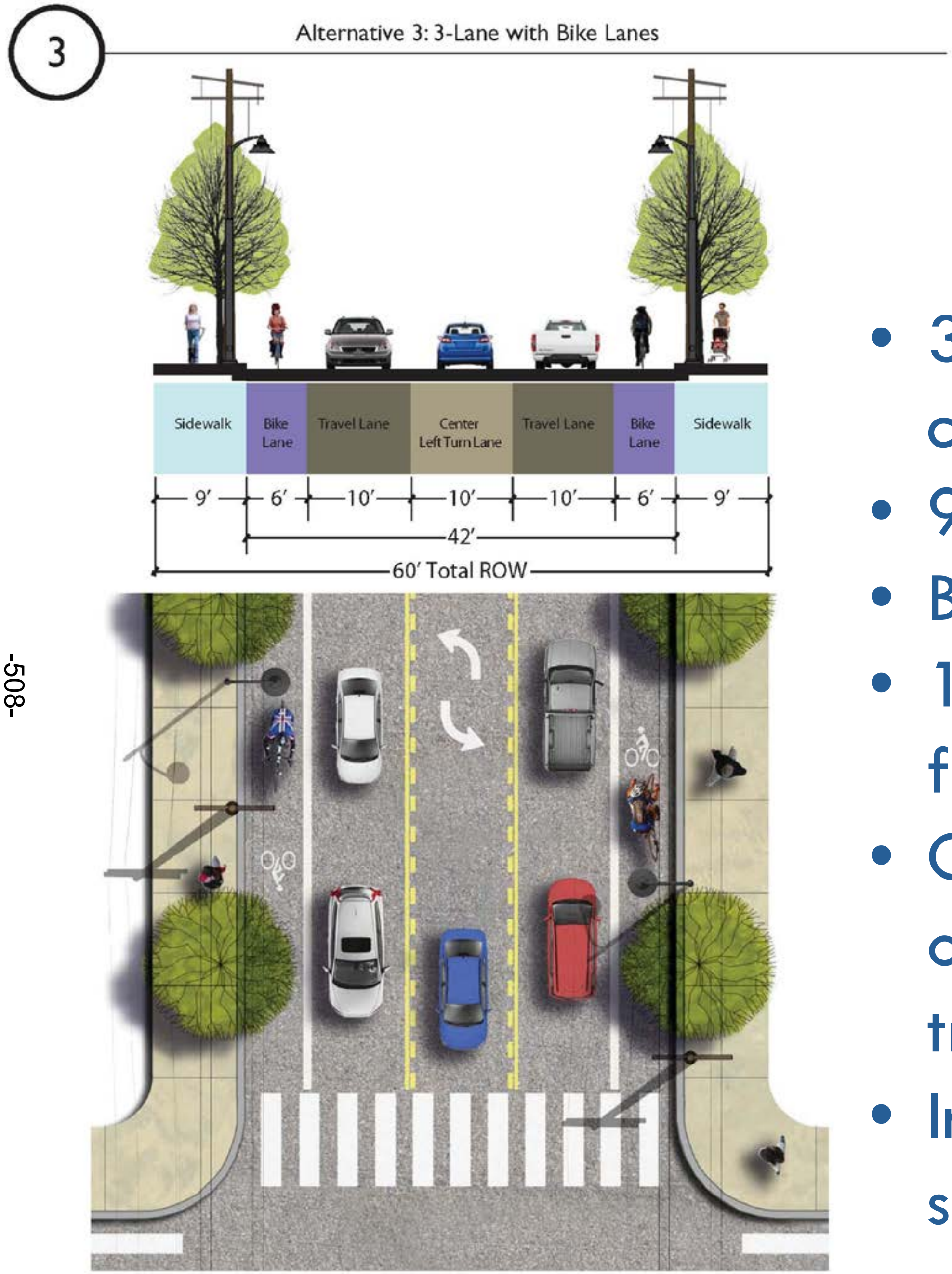
Tier 1: 6 alternatives → 3 alternatives

Tier 2: 3 alternatives → Draft Plan (recommended alternative)



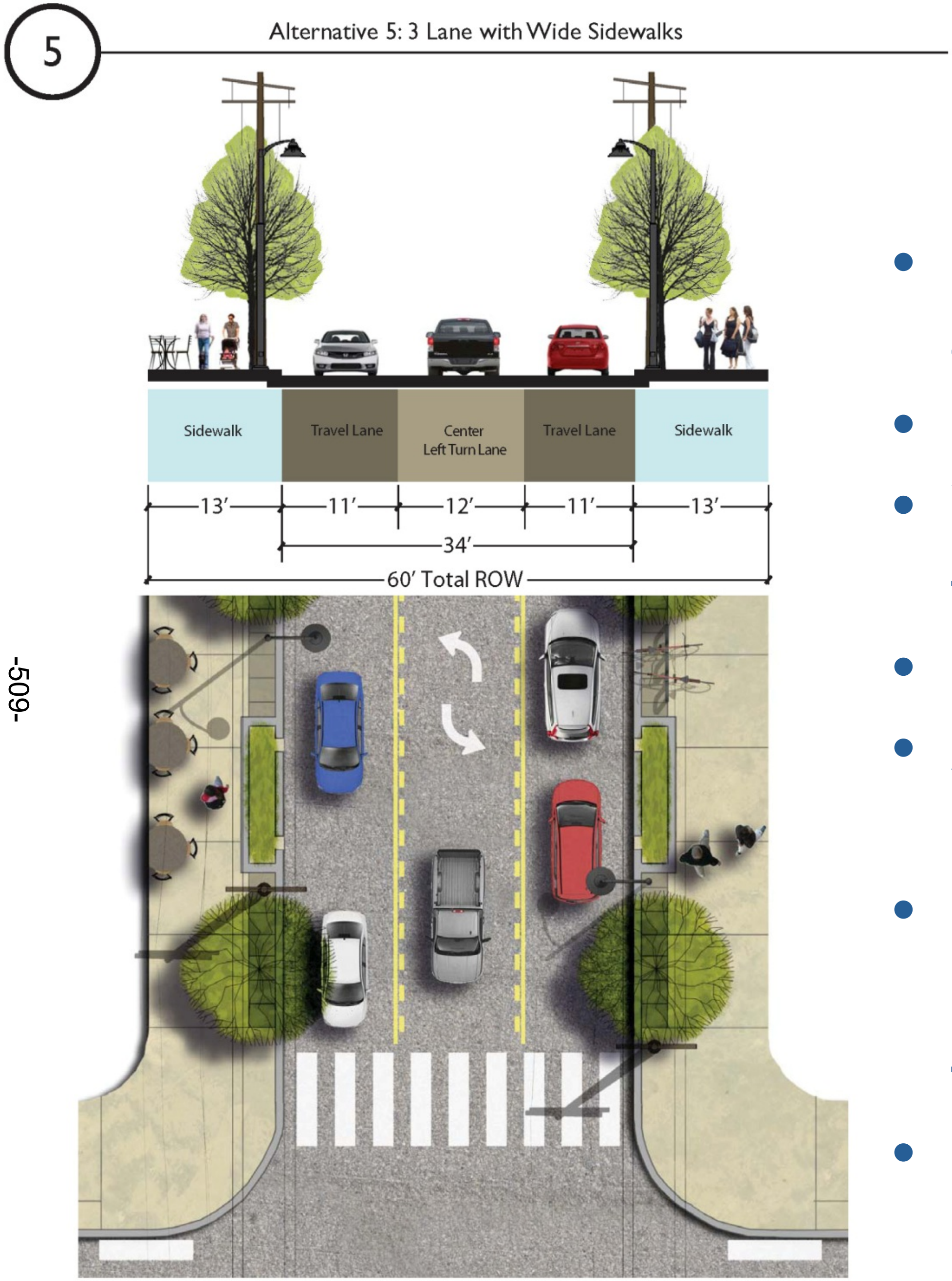
4-Lane

- Maintains existing 4 travel lanes
- Left-turning vehicles block travel lanes
- 9' sidewalks
- No bike lanes
- Maintains 11' outside travel lane for buses



3-Lane with Bike Lanes

- 3 travel lanes (1SB, 1NB, 1 center)
- 9' sidewalks
- Bike lanes
- 10' travel lanes are narrow for buses and trucks
- Center turn lane offers opportunities for design treatments
- Intersections and traffic signals would need to be reconfigured



-509-

3-Lane with Wide Sidewalks

- 3 travel lanes (1SB, 1NB, 1 center)
- 13' sidewalks
- Wide sidewalks provide design treatment options
- No bike lanes
- Maintains 11' outside travel lane
- Center turn lane offers opportunities for design treatments
- Intersections and traffic signals would need to be reconfigured

Item A.

Public Involvement

-510-

SOUTH WILLAMETTE
Street Improvement Plan

Outreach

Stakeholder Conversations

- Business and property owners, residents, and users of all modes (August, February, May, October)

Community Forums

- Three public meetings to "Explore", "Evaluate", and "Refine" Alternatives
- Online survey

Technical Advisory Committee

- Included LTD, EWEB and Emergency Responders (4 meetings)

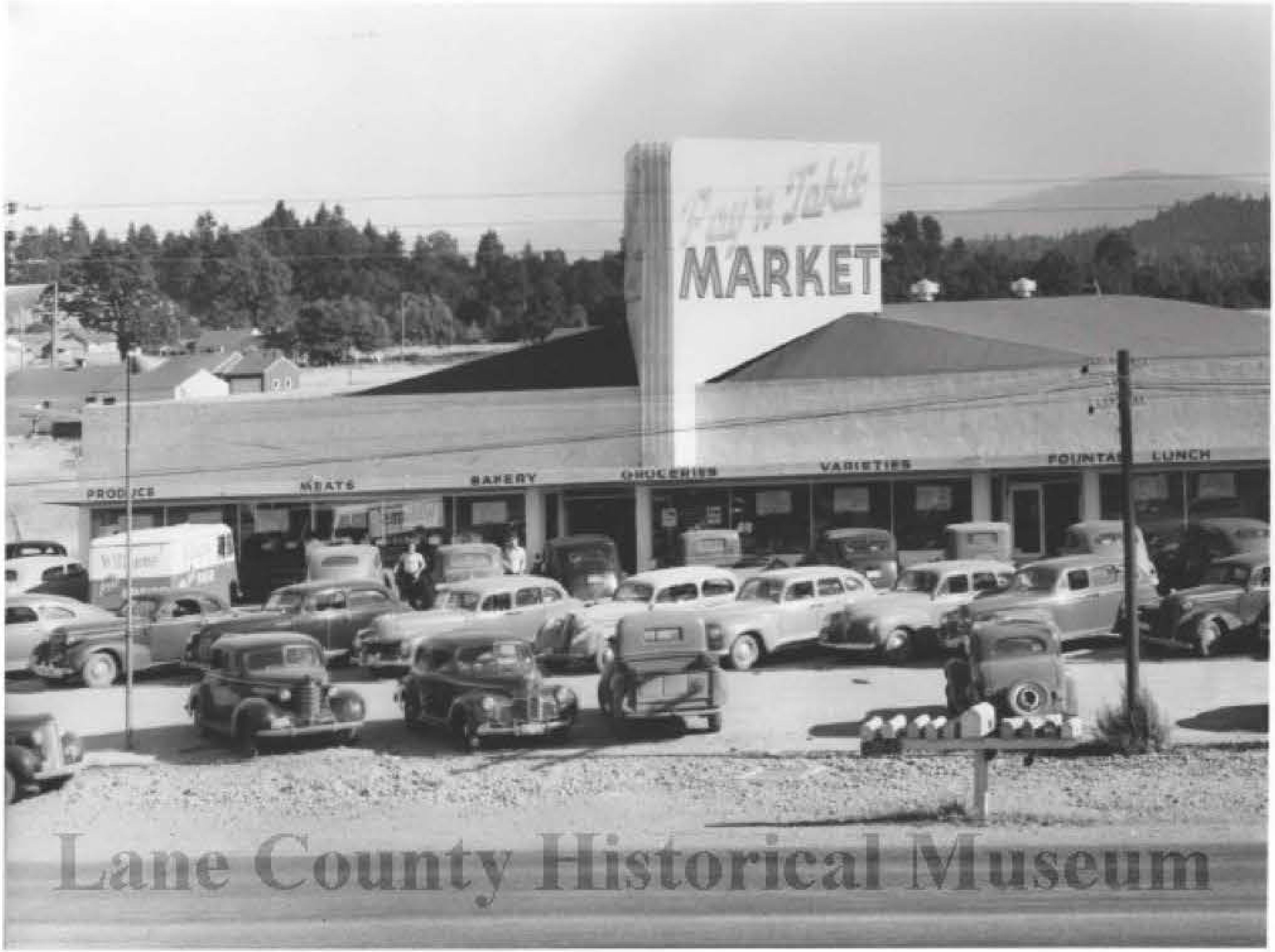
Elected/Appointed Official Oversight

- Planning Commission Meeting (November 2013, April 2014)
- City Council Work Sessions (January & June 2013)

Eugene

SOUTH WILLAMETTE
Street Improvement Plan

Item A.


MARKET
PRODUCE
MEATS
BAKERY
GROCERIES
VARIETIES
FOUNTA
LUNCH

Item A.

Transportation Analysis

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SOUTH WILLAMETTE
Street Improvement Plan

High Collision Rate

Table 5: Segment Collision Summary (2008-2010)

Segment (Distance)	Severity		Type				Total	Collision Rate[b]
	Injury	*PDO*[a]	*Turn*	*Rear-End*	*Angle*	*Other*		
24th Ave thru 27th Ave (0.30 mi.)	14	10	7	10	6	1	24	-
27th Ave thru 29th Ave (0.20 mi.)	15	18	22	8	1	2	33	-
29th Ave thru 32nd Ave (0.28 mi.)	11	6	6	10	0	1	17	-
Entire Study Corridor (0.78 mi.)	**40**	**34**	**35**	**28**	**7**	**4**	**74**	**5.2**
% of Total	**54%**	**46%**	**47%**	**38%**	**10%**	**5%**	**100%**	-

[a] PDO = Property Damage Only

[b] Rate Calculation = Collision per year / (Average Daily Traffic x 365 days / 1 million vehicle-miles traveled)

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- Statewide Average Collision Rate = 2.9
- Total of 4 Bicycle Collisions, 0 Pedestrian Collisions
- 35% Related To Turns from/to Driveway (or Alley)

SOUTH WILLAMETTE
Street Improvement Plan

Item A.

Traffic Analysis Overview

- 2018 P.M. peak hour traffic
- Intersection operations standard

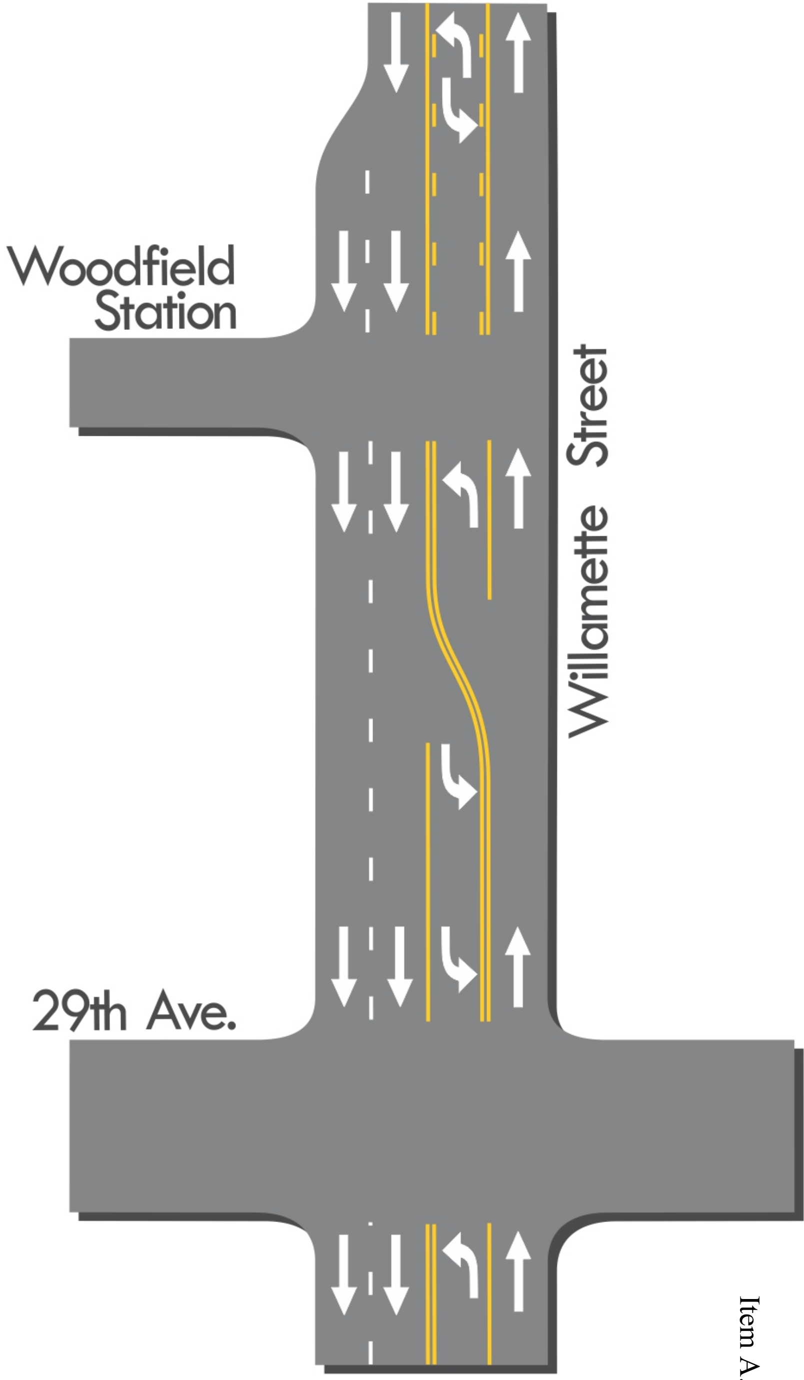
  Citywide: LOS D Downtown: LOS E

- Aside from 29th Avenue, all other intersections operate with LOS D or better for all Alternatives

SOUTH WILLAMETTE
Street Improvement Plan

Proposed Design at 29th Ave

- 2 Southbound through lanes through to 32nd Ave
- Minimize capacity reduction at 29th Ave for p.m. peak direction traffic (southbound)
- Alt 3 would include bike lanes



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SOUTH WILLAMETTE
Street Improvement Plan

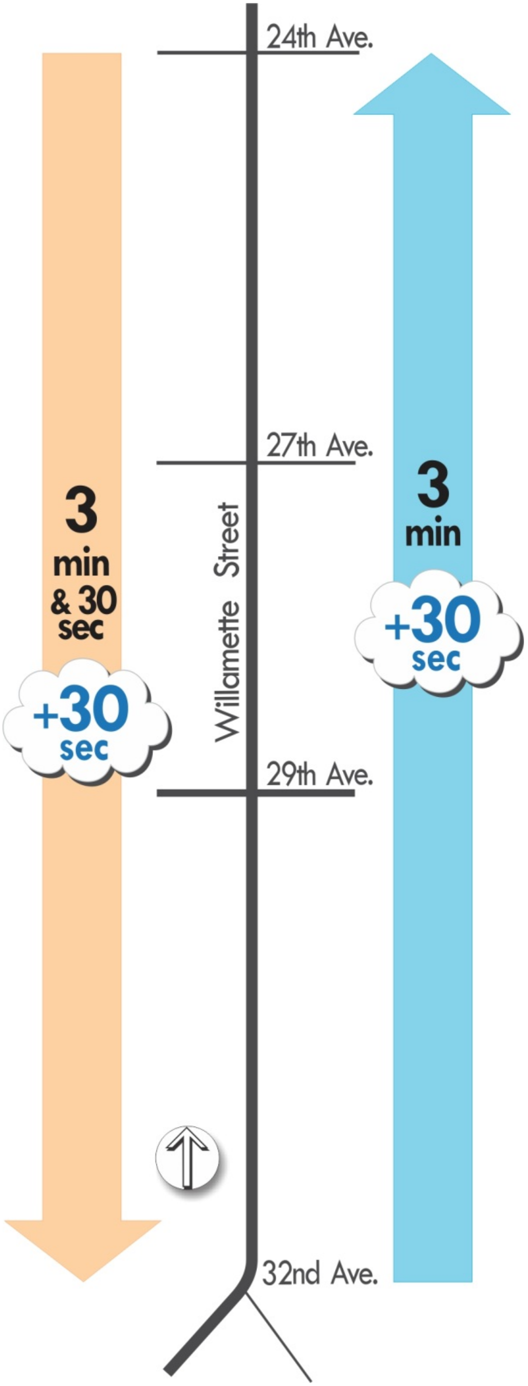
Item A.

Intersection Operations At 29th Ave.

- LOS D with 5 lanes (Alt 1)
- LOS E with 4 lanes (Alt 3 & 5)
- Adequate for peak traffic if downtown standard is accepted

Traffic Modeling Results

- Average travel times between 24th and 32nd Ave would be ~30 seconds longer, southbound and northbound, for Alts 3 & 5
- Travel time would be more reliable in Alt 1 (less variance)
- Queue lengths would ~double



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Street Improvement Plan

Item A.

Consultant Recommendation

Alternative 3

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SOUTH WILLAMETTE
Street Improvement Plan

Item A.

Transportation Findings for Alt 3

- Safety Improvement (expect 30% crash reduction)
- Improved Access for Bicycle and Pedestrian Travel
- Acceptable Impact to Motor Vehicle Mobility
- Case Studies of Similar Facilities Indicate Successful Outcomes
- Highest Ranking Alternative in Criteria Screening Evaluation
- Best Reflects Community Goals and Objectives

Effects on Businesses

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SOUTH WILLAMETTE
Street Improvement Plan

Item A.

Literature Review Findings

Ed Whitelaw - ECONorthwest

Cost Estimates

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Street Improvement Plan

Item A.

Cost to Implement Alternatives

- Alt. 1 (4-lanes, signal): $4.6M
- Alt. 3 (3-lanes, bike lanes, signal): $4.85M
- Alt. 5 (3-lanes, wide sidewalks, signal): $5.6M

Includes: $2.1M Pavement Bond

Not included: $2.6M for utility relocation

Note: Costs shown are high-level planning estimates in 2013 dollars, subject to change.

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Street Improvement Plan

Test of Alternative 3

Purpose

- Provide experience of three travel lanes
- Confirm Transportation Analysis
- Identify Unintended Consequences
- Monitor: Transportation, Economics, Public Opinion

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Street Improvement Plan

Scope

- Traffic Signal at Woodfield Station (includes right-of-way and widening)
- Widening at 24th Avenue
- Striping and Signal Adjustments
- Monitor: Transportation, Economics, Public Opinion

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SOUTH WILLAMETTE
Street Improvement Plan

Item A.

Schedule

Two Year Total Duration (approximate)

- "Before" Data Gathering
- Construction and 3 month Adjustment
- Test for 12 Months
- "After" Data Gathering and Reporting

Budget

Cost to Implement Test of Alternative 3:

$920K total = $760 construction + $160K monitoring

($50K transportation, $50K economy, $60 public opinion)

Incremental Cost (compared to):

- Alt. 1: $214K total = $54K construction + $160K monitoring
- Alt. 3: $173K total = $13K construction + $160K monitoring
- Alt. 5: $173K total = $13K construction + $160K monitoring

Cost to Revert Back to Four Travel Lanes: $13K

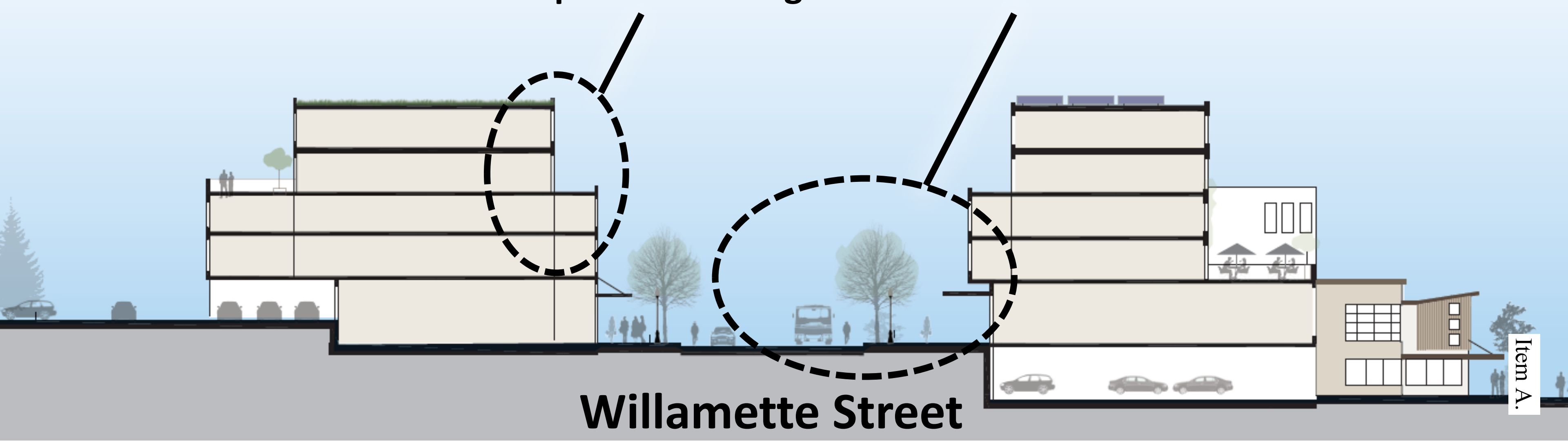
Item A.

Community Vision

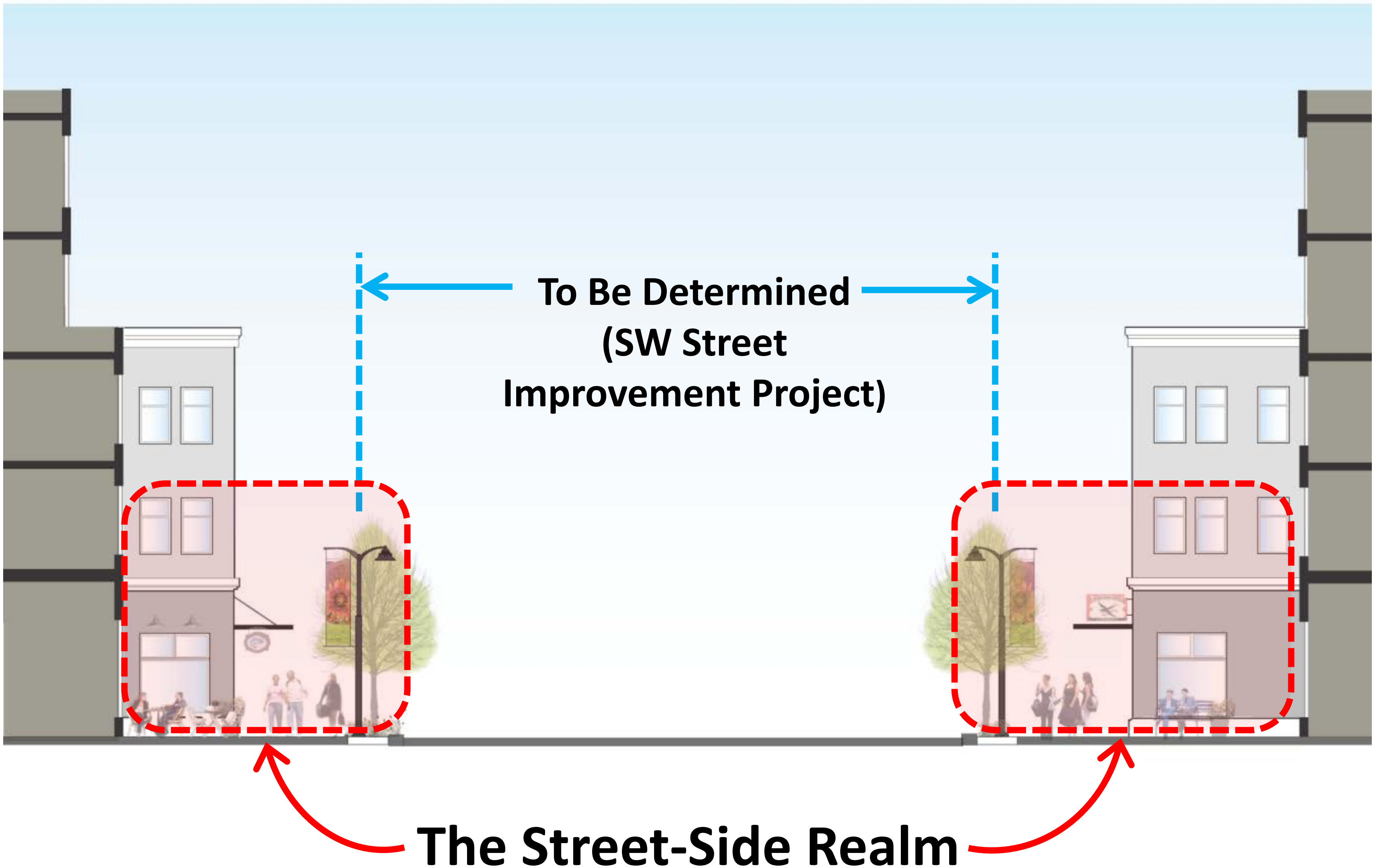
Street-Side Character

Step-back buildings

Active Street-Side Realm



Street-Side Character



Next Steps

Next Steps

- Public Hearing about Alternatives: Monday, May 19, 2014, 7:30 p.m., Harris Hall
- Council Deliberation & Action: Tuesday, May 27, 2014, 7:30 p.m., Harris Hall
- Final Plan

Questions

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SOUTH WILLAMETTE
Street Improvement Plan

Item A.