CLACKAMAS COUNTY

Planning & Zoning

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STAFF REPORT

TO: Planning Commission

FROM: Scott Hoelscher, Senior Planner

DATE: October 3, 2016

RE: ZDO-259: Monroe Neighborhood Street Design Plan

PROPOSAL

In August of 2014, Clackamas County was awarded a Transportation and Growth Management (TGM) grant from the Oregon Department of Transportation (ODOT) to prepare a street improvement plan for the unincorporated portion of Monroe Street. At a March 19, 2015 Business Meeting, the Board of County Commissioners approved an intergovernmental agreement with ODOT to prepare the *Monroe Neighborhood Street Design Plan* (*Monroe Design Plan*). The goal of the *Monroe Design Plan* is to develop a street design that improves safety and travel conditions for all modes of transportation – pedestrians, bicycle travel and vehicle traffic. ZDO-259, a legislative text amendment to the Clackamas County Comprehensive Plan, includes amendments to Chapter 5: Transportation System Plan (TSP) proposed in conjunction with the project. Specifically, the amendments include the following four components:

1. Comprehensive Plan Appendix B
   Appendix B, similar to a bibliography listing publications, includes the various sources and documents used in the preparation of the Comprehensive Plan policies and goals. The amendment package for this project adds the *Monroe Neighborhood Street Design Plan* to Appendix B of the Clackamas County Comprehensive Plan.

2. Comprehensive Plan Chapter 5
   Chapter 5 of the Comprehensive Plan contains the County's TSP and the 20-year Capital Improvement Plan, which is a list of needed transportation-related projects to address gaps and deficiencies in the network. Currently, the 20-Year Capital Project list (Table 5-3(a) of the Comprehensive Plan) contains four projects along the Monroe Street corridor:

   - Project ID #1012 – Boyer Drive: Construct new 2 lane roadway with turn lanes at OR 213 and Fuller Rd, bikeways and pedestrian facilities; install flashing yellow arrow for left turns on northbound and southbound approaches to OR 213 intersection.

- Project ID #1013 – Boyer Dr / 85th Ave / Spencer Dr: Add bikeways in accordance with the Active Transportation Plan.

- Project ID #1035 – Monroe Street: 72nd Ave to Fuller Rd. Add bikeways and pedestrian facilities and traffic calming.

- Project ID #1036 – Monroe Street: Linwood Ave to 72nd Ave. Add bikeways and traffic calming.

The ZDO-259 amendment package amends these four projects the 20-Year Capital Projects to make them consistent with the *Monroe Design Plan.*

3. Amend Active Transportation Plan
   Monroe Street is one of twelve Principal Active Transportation (PAT) Routes in the County's Active Transportation Plan (ATP). PAT Routes are the most important active transportation routes to connect communities and key destinations in the county. The proposed amendments to the ATP amends the Monroe Street route (Route #P5) by updating the route description; modifying the recommended facility types and re-writing the route segment section.

4. Update Urban Roadway Cross Sections
   Minor amendments to the County's urban roadway cross sections are needed to bring them in-line with current construction practices. The ZDO-259 amendment package includes minor updates and clarification amendments to the county's urban roadway cross sections: connector, collector and arterial roads.

BACKGROUND

Monroe Street has long been envisioned as a primary east-west active transportation route connecting downtown Milwaukie with the Clackamas Town Center. The importance of this route is reflected in the number of plans and documents that include Monroe Street. Monroe Street is identified as a 20-year Capital Project in the Transportation System Plan (TSP) and as a Principal Active Transportation Route in the County's Active Transportation Plan. In addition, Metro's Regional Transportation Plan classifies Monroe Street as a Bicycle Parkway – that plan's highest order bicycle route. Finally, Monroe Street is a high priority project in the Milwaukie TSP and a Clackamas Development Agency priority project for the North Clackamas Revitalization Area.

The goal of the *Monroe Design Plan* is to develop a street design that improves safety and travel conditions for all modes of transportation – pedestrians, bicycle travel and vehicle traffic. Key project objectives include increasing active transportation options; supporting a healthy, active community; designing a street that improves safety for all users of the road and encouraging children to walk or bike to school by developing a Safe Routes to School Plan for Whitcomb Elementary. Construction of the improvements described in the *Monroe Design Plan* provide a safe, low stress active transportation connection between Linwood Avenue and the I-205 Multi-Use Path and connect the neighborhood to employment, transit, schools, shopping and parks. A related plan, the *Monroe Street Neighborhood Greenway Concept Plan*, was prepared by the City of Milwaukie for the section of Monroe Street located within the Milwaukie city limits. The combination of these two efforts will provide a safe route for all transportation modes from downtown Milwaukie to the Clackamas Town Center.

The *Monroe Design Plan* includes street cross sections for 10 segments between Linwood Avenue and the I-205 Multi-Use Path. In addition to Monroe Street, the concept plan addresses Thompson Road, 72nd Avenue, Boyer Drive, 85th Avenue and Spencer Drive. Because the existing neighborhood character and street cross sections vary throughout the Monroe corridor, the design treatments for the 10 segments vary to address different contexts and needs. Major design components include:

- Traffic Calming: Speed bumps, chicanes and raised intersections at various locations to slow traffic and create safer environment.
- Safe Crossings: Installation of pedestrian activated rapid-flashing beacon at Whitcomb Elementary School and at the Thompson Road – Fuller Road intersection to provide safe neighborhood crossings.
- Mini-Roundabout: Proposed for the intersection of Monroe Street and 72nd Avenue to calm traffic.
- Separated Facilities: Mix of shared-use paths, bike lanes and sidewalks to provide separation between vehicles and pedestrians/bicyclists.
- Stormwater Management Features: Bioswales (vegetated street buffers) along the Monroe Street segment and permeable path treatments for the shared use path.
- Signage: "Sharrow" pavement markings and bicycle wayfinding in some locations.
- ADA-Compliance Curb Ramps: Recommended throughout study area.

PLANNING COMMISSION STUDY SESSION

An overview of the project and the draft *Monroe Design Plan* was presented to the Planning Commission at a study session on June 27, 2016. The following are staff responses to the main items discussed at the study session.

- **Unimproved Section of Monroe Street:** *Provide clarification on the recommendation to open the "Monroe Gap" to only pedestrians and bicyclists.*

  Discussion: Currently there is an unimproved section of Monroe Street east of 78th Avenue, approximately 120 feet in length. This section is referred to as the "Monroe Gap." Over the course of developing the *Monroe Design Plan*, two options were analyzed for the "Monroe Gap": improve the right-of-way to street standards, thereby making Monroe Street a continuous automobile route, or improve for pedestrians and bicycle access only. The *Monroe Design Plan* recommends improving the "Monroe Gap" only for pedestrians and bicyclists for the following reasons:

  - The street network and automobile circulation functions adequately with "Monroe Gap" closed to automobile traffic. There are no failing intersections that would be relieved by opening the "Monroe Gap" to automobile traffic.

- The recommendation to keep "Monroe Gap" closed to vehicle traffic was strongly supported by public. 89% of Open House #1 survey responses felt the "Monroe Gap" should be open to pedestrians and bicycles only.
- Both the project Technical Advisory Committee (TAC) and Public Advisory Committee (PAC) recommended keeping the "Monroe Gap" closed to vehicle traffic.
- Improving the "Monroe Gap" for pedestrians and bicyclists meets the project objectives of creating safe places for families, residents and visitors to walk and/or bicycle.
- Clackamas County Traffic Engineering estimates over 2,000 vehicles per day on Monroe Street (depending on road classification) if "Monroe Gap" is opened to vehicles. This is would be an increase from the current 200 vehicles per day. Most of these trips are shifting away from the current connection along Thompson Ave.

- The long-term vision in the Comprehensive Plan and the Transportation System Plan is that the "Monroe Gap" would be opened to vehicular traffic at some point in time to improve connectivity and provide direct access from 82nd Avenue to Linwood Avenue. In order to provide clarification that the existing ROW may be used for vehicular access in the future, staff recommends adding the below language to Page 15 of the Monroe Design Plan as shown on the Attachment 1 d.

"The Clackamas Regional Center Design Plan, within the Clackamas County Comprehensive Plan, envisions a road improvement connecting Monroe to 82nd Ave in the long term. In addition, the future functional classification of the road is identified as a Connector in the County Transportation System Plan. The 20-year Capital Improvement Plan, however, does not include a vehicular access improvement project making this connection. The projects in the 20-year Capital Improvement Plan focus on pedestrian and bikeway improvements in this area. Since a vehicular connection was not identified as needed within the 20 year timeframe, the Monroe Design Plan recommends improving the "Monroe Gap" for bicycles and pedestrians only at this time. If, based on traffic conditions, improving vehicle circulation and connectivity becomes necessary in the future, connecting the eastern section of Monroe Street with the section west of the gap for automobile traffic could occur. The existing 60-foot right-of-way could be utilized to design a cross-section that safely accommodates all modes of transportation."

- **King Road Alternative:** *Is King Road a possible alternative active transportation route?*

  Discussion: Local and regional transportation plans include Monroe Street as a primary active transportation route stretching west from the I-205 Multiuse Path to the Trolley Trail in Milwaukie. This connection would improve local access to two MAX lines – the Green Line along I-205 and the Orange Line in Milwaukie and provide safer bicycling and walking to and within the Clackamas Regional Center. The need for this connection is a result of the developed street grid in this portion of Clackamas County. In the area, there are only two continuous streets connecting the east and west sides - Monroe Street and King Road, between 2 and 3 blocks north of Monroe Street. King Road is the main connection for vehicular traffic and the most recent data for King Road shows a daily traffic volume of 12,635 vpd. There are narrow, substandard bike lanes on King Road and narrow, curb-tight sidewalks. As such, King Road is a very uncomfortable and unsafe choice for children, teens and inexperienced adult cyclists. The second continuous east-west route, Monroe Street, is the better choice for the creation of an east-west active transportation connection. Completion of this project and the companion project in

Milwaukie on the west end of the corridors will link downtown Milwaukie and the Clackamas Town Center, connecting local neighborhoods to jobs and essential services along the way.

- **Crash Data:** *Does the Department of Transportation and Development have crash data for the Monroe Street study area?*

  At the beginning of the *Monroe Design Plan* project, staff assembled crash data for the study area for a three year period from 2011-2013. (See Staff Report Exhibit A: Crash Data). The data includes turning movement diagrams for each crash at 14 intersections in the study area. The diagrams indicate direction of travel and if the crash involved a pedestrian and/or bicycle. For streets along the *Monroe Design Plan* route, reported crashes occurred at the following three intersections: Monroe – Linwood intersection (13 crashes); Monroe – Fuller intersection (1 crash) and the Thompson – Fuller intersection (3 crashes). See Exhibit B: Crash Data.

- **Project Cost and Funding Sources:** What are the financial implications of the *Monroe Design Plan*?

  Discussion: The costs associated with project implementation range from relatively inexpensive treatments such as paint and signage to more significant investments such as sidewalk improvements and shared-use paths next to the roadway.

  Funding for Monroe Street and/or connecting roads could potentially come from a variety of sources including Metro Regional Flexible Funds (RFFA) and/or Clackamas County Development Agency-North Clackamas Revitalization Area (NCRA). Monroe Street has been identified by the Clackamas County Development Agency as a primary active transportation route through the North Clackamas Revitalization Area and Monroe roadway improvements are a priority for the Development Agency. Therefore, funding for construction on some of the segments could come from the Development Agency.

  RFFA Funds are Metro-administered federal funds for transportation projects in the tri-county area. The project solicitation for the 2019-2021 RFFA program included two categories: $25.81 Million for Active Transportation projects and $7.3 Million available for Freight investments. The County submitted a portion of the Monroe Street project under the Active Transportation category.

  Total cost for the RFFA project including full design, right-of-way, and construction is estimated to be $6,073,647, which would fund the section from Monroe Street between Linwood Avenue and Fuller Road, Boyer Drive between Fuller Road and 85th Avenue, 85th Avenue and Spencer Drive to the intersection with the I-205 multi-use path. A local funding contribution from the North Clackamas Revitalization Area of $3,073,647 was included in the RFFA application. This would result in a federal fund share of 49.4% (RFFA Grant) and a local fund share of 50.6% (Development Agency).

ANALYSIS AND FINDINGS

1. Section 1307 of Zoning and Development Ordinance (ZDO): The proposed amendments are legislative in nature. Section 1307 of the ZDO establishes review procedures for legislative amendments. However, the ZDO contains no review criteria that must be applied when considering

an amendment to the text of the Comprehensive Plan.

2. Chapter 11: the Planning Process of the Comprehensive Plan (Plan) contains a section titled City, Special District and Agency Coordination. The Oregon Department of Transportation, the Oregon Department of State Lands, Clackamas River Water District, Oak Lodge Sanitary District and all cities within the county are on a standing list to receive notice of all proposed amendments. This level of notification furthers the goals and policies of this section of the Plan.

   Chapter 11 of the Plan also contains a section entitled Amendments and Implementation. This section contains procedural standards for Plan amendments, requires the Plan and the ZDO to be consistent with Statewide Planning Goals and Guidelines and Metro's Urban Growth Management Functional Plan, and requires the ZDO to be consistent with the Plan. Policy 3.0 establishes the procedural standards. The process followed for ZDO-259 is in compliance with these standards. Specifically, notice was mailed to all recognized Community Planning Organizations, Hamlets and Villages at least 35 days before the scheduled public hearing, and the Department of Land Conservation and Development and Metro were provided with an opportunity to review and comment on the proposed amendments. Advertised public hearings are scheduled before the Planning Commission and the Board of County Commissioners to consider the proposed amendments. The Statewide Planning Goals and Guidelines and the Urban Growth Management Functional Plan are addressed below.

3. Statewide Planning Goals and Guidelines

   a. Goal 1: Citizen Involvement: The text amendment does not propose to change the structure of the county's citizen involvement program. Notice of the proposed amendment was provided to Community Planning Organizations, Hamlets, Villages and a list of interested parties. Also, notice of the Planning Commission and Board of County Commissioners hearings was published in the newspaper. The Department of Land Conservation and Development (DLCD) was notified of this proposal, but no response has been received.

   b. Goal 2: Land Use Planning: Not applicable because the text amendment does not propose to change the county's land use planning process. The county will continue to have a comprehensive land use plan and implementing regulations that are consistent with the plan. No exceptions from the Goals are required.

   c. Goal 3: Agricultural Lands: Not applicable because the text amendment does not propose to change the county's Plan policies or implementing regulations for agricultural lands.

   d. Goal 4: Forest Lands: Not applicable because the text amendment does not propose to change the county's Plan policies or implementing regulations for forest lands.

   e. Goal 5: Open Spaces, Scenic and Historic Areas, and Natural Resources. Not applicable because the text amendment does not propose to change the county's Plan policies or implementing regulations for Goal 5 open spaces, scenic and historic areas, and natural resources.

   f. Goal 6: Air, Water and Land Resources Quality. Not applicable because the text amendments do not propose to change the county's Plan policies or implementing regulations for compliance with Goal 6.

g. Goal 7: Areas Subject to Natural Disasters and Hazards: Not applicable because the text amendment does not propose to change the county's Plan or implementing regulations regarding natural disasters and hazards.

h. Goal 8: Recreational Needs: Not applicable because the text amendment does not propose to change the county's Plan or implementing regulations regarding recreational needs.

i. Goal 9: Economy of the State: Not applicable because the text amendments do not propose to change the county's Plan or implementing regulations regarding the economy of the state. The proposed text amendments will not prohibit, and the authorization of similar uses provisions may encourage, development proposals that enhance the local, regional and state economy.

j. Goal 10: Housing: Not applicable because the text amendments do not propose to change the county's Plan or implementing regulations regarding housing.

k. Goal 11: Public Facilities and Services: Not applicable because the text amendments do not propose to change the county's Plan or implementing regulations regarding public facilities and services.

l. Goal 12: Transportation: Goal 12 is implemented by Oregon Administrative Rules Chapter 660, Division 12, the Transportation Planning Rule (TPR). Regulations described in the TPR are largely directed at the development of a jurisdictions' Transportation System Plan (TSP) as a whole or at a land use regulation and land use changes that affect the transportation system. Clackamas County's TSP (Chapter 5 of the Comprehensive Plan) has been acknowledged by the state and is therefore in compliance with OAR 660-012. The changes recommended by the proposed *Monroe Neighborhood Street Design Plan* represent relatively minor changes to the County's TSP and are consistent with the general TPR requirement that a local TSP should identify a system of planned transportation facilities for all modes of transportation. This proposal in compliance with Goal 12.

m. Goal 13: Energy Conservation: Not applicable because the amendments do not propose to change the county's Plan or implementing regulations regarding energy conservation.

n. Goal 14: Urbanization: Not applicable because the amendments do not propose to change the county's Plan or implementing regulations regarding urbanization. Authorization of similar uses in areas outside urban growth boundaries would not waive the square footage limitations that apply to rural uses under the Oregon Administrative Rules that implement Goal 14.

o. Goal 15: Willamette River Greenway: Not applicable because the amendments do not propose to change the county's Plan or implementing regulations regarding the Willamette River Greenway.

4. Metro Urban Growth Management Functional Plan:

a. Title 1. Requirements for Housing and Employment Accommodation. Not applicable because the proposed text amendments would not decrease the amount of land zoned for residential or commercial/industrial use, affect design type boundaries, alter permitted densities or prohibit accessory dwelling units.

b. Title 2. Regional Parking Policy: Not applicable because the proposed text amendments would not change the county's Plan or implementing regulations regarding parking.

c. Title 3. Water Quality and Flood Management: Not applicable because the proposed text amendments would not change the county's Plan or implementing regulations regarding water quality and flood management.

d. Title 4. Industrial and Other Employment Areas: Not applicable because the proposed text amendment would not change the county's Plan or implementing regulations concerning designation of industrial and other employment areas, minimum lot sizes in these areas, or permitted uses in these areas. The ZDO has been found to comply with Title 4, based in part on the fact that the urban industrial zones regulated by Title 4 do not provide for the types of service and retail uses restricted by Title 4. The urban industrial zones regulated by Title 4 include strict limits or outright prohibitions on retail and service uses that would not be overridden by the proposed authorization of similar uses standards.

e. Title 5. Neighbor Cities and Rural Reserves: Not applicable because the proposed text amendments would not change the county's Plan or implementing regulations concerning neighbor cities and rural reserves.

f. Title 6. Central City, Regional Centers, Town Centers and Station Communities: Not applicable because the proposed text amendments would not change the boundaries of the Clackamas Regional Center or the Fuller Road Station Community, or alter the mix or density of uses permitted in these areas.

g. Title 7. Housing Choice: Not applicable because the proposed text amendments would not change the county's Plan or implementing regulations concerning housing choices.

h. Title 8. Compliance Procedures: Not applicable. This Title is administrative and relates to Metro's process for ensuring local governments comply with the Functional Plan.

i. Title 9. Performance Measures: Not applicable. This Title is administrative and relates to requirements for measuring whether the Functional Plan is achieving the intended outcomes in the region.

j. Title 10. Functional Plan Definitions: Not applicable. This Title contains definitions only.

l. Title 11. Planning for New Urban Areas: Not applicable because the proposed text amendment would not change the county's Plan or implementing regulations concerning planning for new urban areas.

m. Title 12. Protection of Residential Neighborhoods: Not applicable because the proposed text amendment would not change the county's Plan or implementing regulations concerning residential density, designation of neighborhood centers or access to parks and schools.

n. Title 13. Nature in Neighborhoods: Not applicable because the proposed text amendment would not change the county's Plan or implementing regulations regarding Habitat Conservation Areas, the regulation of which is required by Title 13.

RECOMMENDATION

Staff recommends that the Planning Commission recommend approval of ZDO-259 to the Board of County Commissioners which includes:

1) the Monroe Neighborhood Street Design Plan, as shown in Attachment 1 with the amendment included in Attachment 1d;
2) the Comprehensive Plan map amendments as shown in Attachment 2a-c; and
3) the Active Transportation Plan Amendments as shown in Attachment 3.

ATTACHMENTS

Attachment 1. – Monroe Neighborhood Street Design Plan

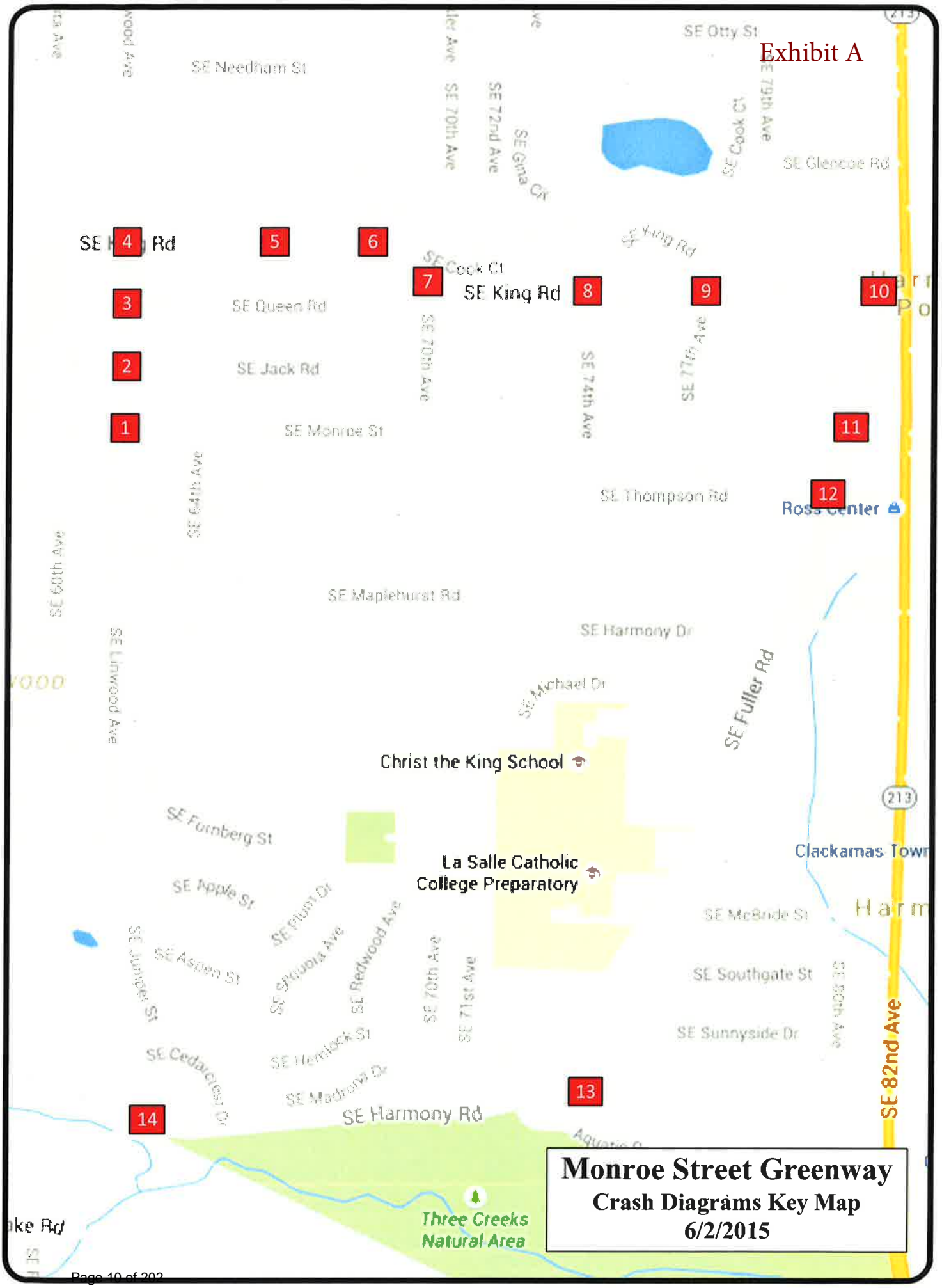
a. Monroe Neighborhood Street Design Plan
b. Monroe Neighborhood Street Design Plan Appendices
c. Whitcomb Safe Routes to Schools Action Plan and Projects
d. Additional language on page 15 of the Monroe Neighborhood Street Design Plan

Attachment 2. – Comprehensive Plan Amendments

a. Appendix B – add reference to Monroe Neighborhood Street Plan
b. Table 5-3(a) amendments
c. Figures 5-1a through 5-1e

Attachment 3. – Amendments to the Clackamas County Active Transportation Plan

Exhibit A



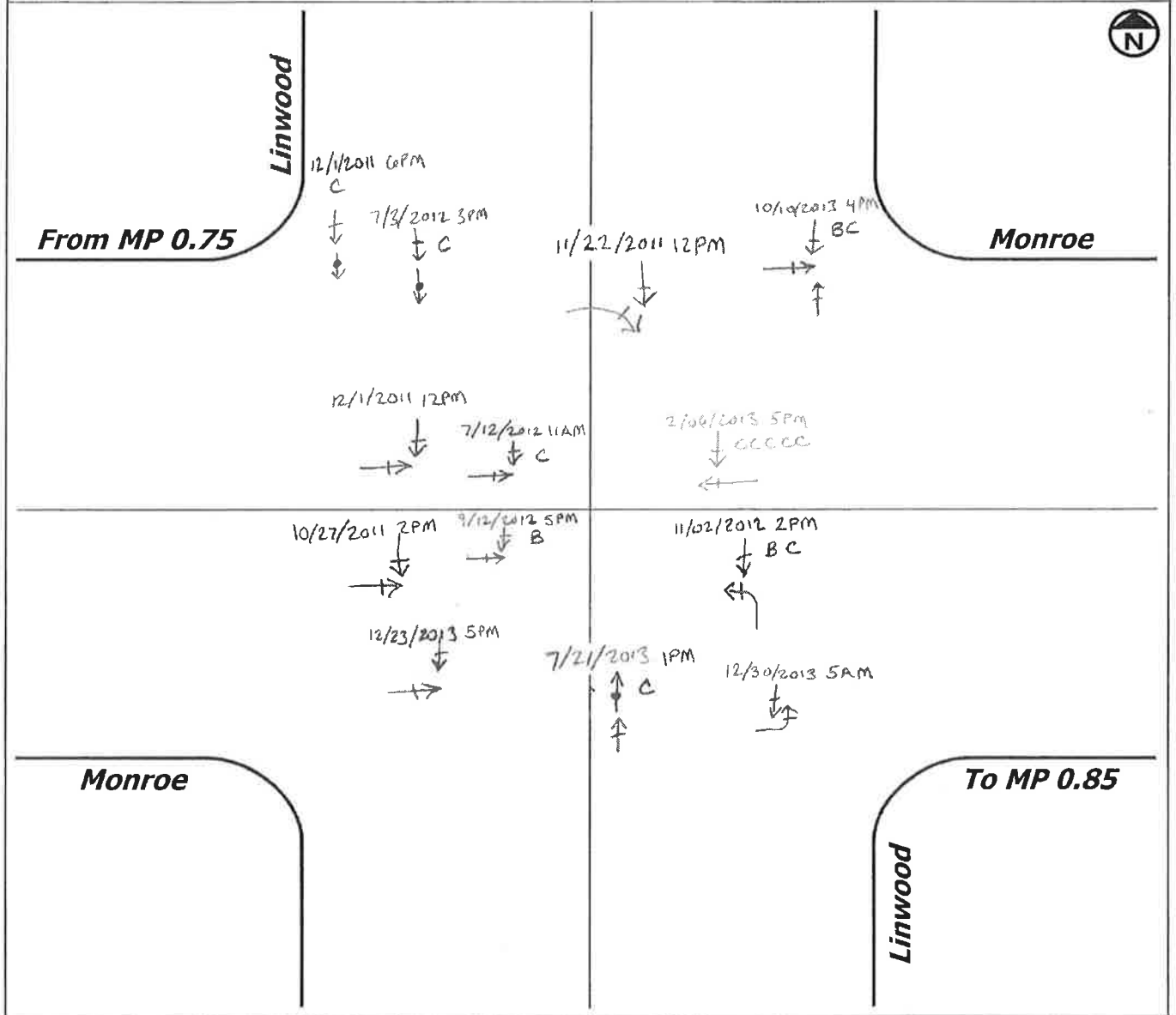
Monroe Street Greenway
Crash Diagrams Key Map
6/2/2015

CLACKAMAS COUNTY

ENGINEERING DIVISION
DEVELOPMENT SERVICE BUILDING
150 BEAVERCREEK ROAD, OREGON CITY, OR 97045

COLLISION DIAGRAM

Location #1		County	Clackamas
Intersection of	Monroe	and	Linwood
Period Covered	2011-2013	SPIS Ranking	0
Compiled by	CLS	Date	5/29/2015



COLLISION TYPE	2011 Fatal	2011 Injury	2011 Property Damage	2011 Total	2012 Fatal	2012 Injury	2012 Property Damage	2012 Total	2013 Fatal	2013 Injury	2013 Property Damage	2013 Total
Right Angle			11			11				11	1	
Head On												
Rear End		1				1				1		
Side Swipe												
Turning Movement			1			1					1	
Pedestrian												
Fixed Object												
Backing												
Other												
TOTAL		1	3	4		4		4		3	2	5

KEY

- Vehicle Moving
- Vehicle Stopped
- Vehicle Backing
- Bicycle
- Pedestrian
- Fixed Object
- Right Angle
- Sideswipe
- Head On
- Rear End
- Turning Movement
- Parking Maneuver

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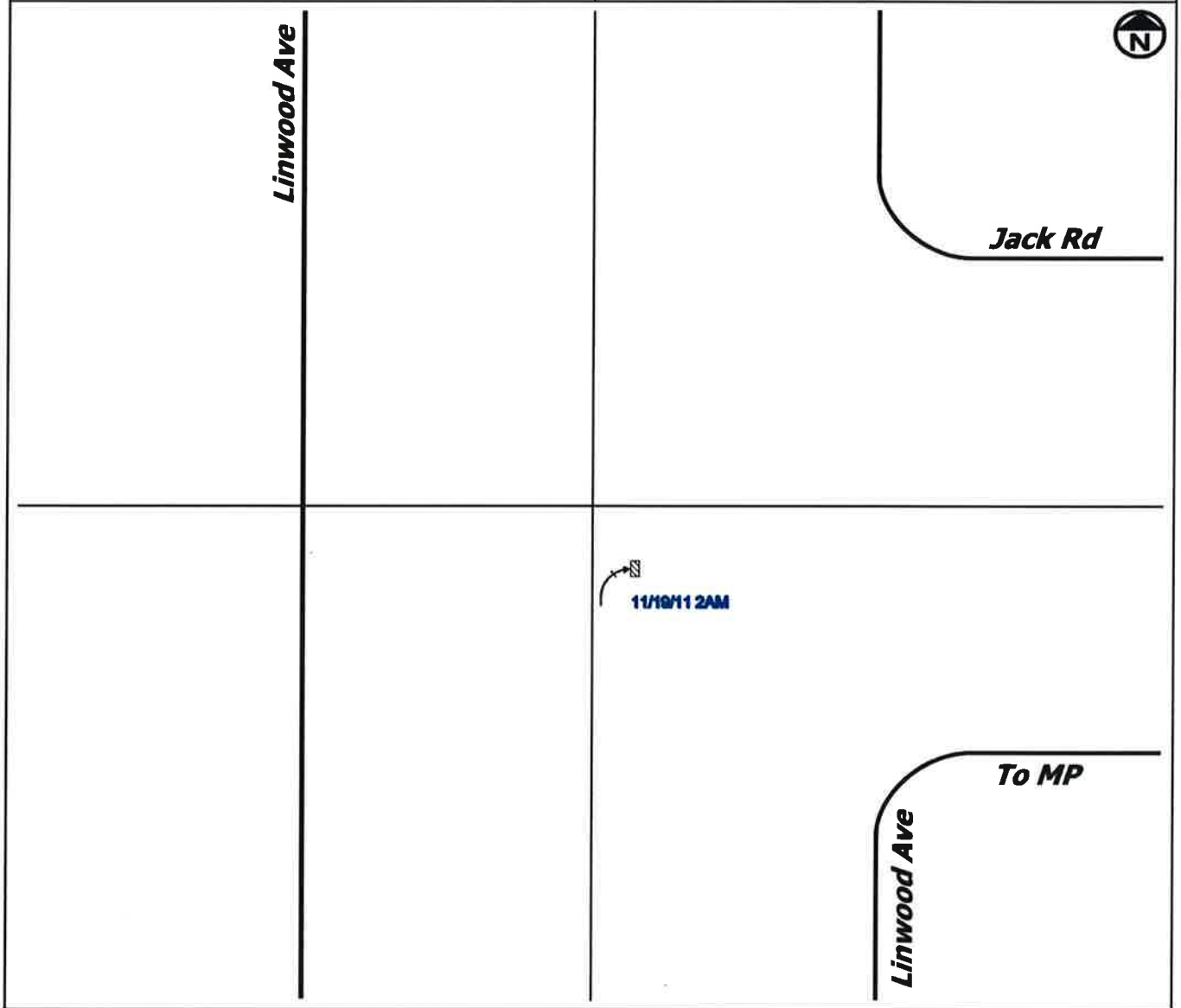
Exhibit A

CLACKAMAS COUNTY

ENGINEERING DIVISION
DEVELOPMENT SERVICE BUILDING
150 BEAVERCREEK ROAD, OREGON CITY, OR 97045

COLLISION DIAGRAM

Location #2 County Clackamas
Intersection of Jack Rd and Linwood Ave
Period Covered 2011-2013 SPIS Ranking 0
Compiled by CLS Date 6/1/2015



COLLISION TYPE	2011 Fatal	2011 Injury	2011 Property Damage	2011 Total	2012 Fatal	2012 Injury	2012 Property Damage	2012 Total	2013 Fatal	2013 Injury	2013 Property Damage	2013 Total
Right Angle												
Head On												
Rear End												
Side Swipe												
Turning Movement												
Pedestrian												
Fixed Object			1	1								
Backing												
Other												
TOTAL			1	1								

KEY

Vehicle Moving
Vehicle Stopped
Vehicle Backing
Bicycle
Pedestrian
Fixed Object
Right Angle
Sideswipe
Head On
Rear End
Turning Movement
Parking Maneuver

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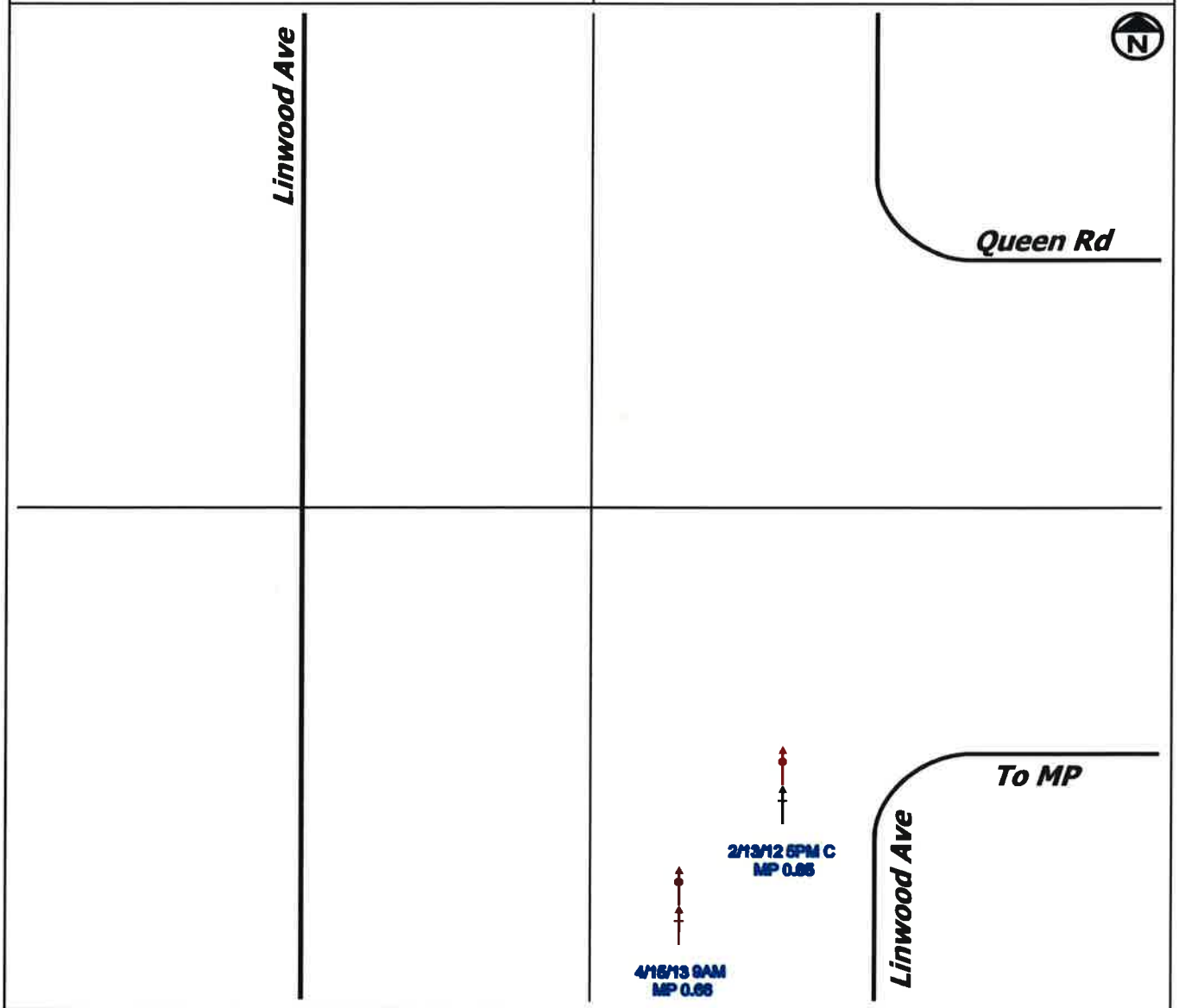
Exhibit A

CLACKAMAS COUNTY

ENGINEERING DIVISION
DEVELOPMENT SERVICE BUILDING
150 BEAVERCREEK ROAD, OREGON CITY, OR 97045

COLLISION DIAGRAM

Location #3 County Clackamas
Intersection of Queen Rd and Linwood Ave
Period Covered 2011-2015 SPIS Ranking 0
Compiled by CLS Date 6/1/2015



COLLISION TYPE	2011 Fatal	2011 Injury	2011 Property Damage	2011 Total	2012 Fatal	2012 Injury	2012 Property Damage	2012 Total	2013 Fatal	2013 Injury	2013 Property Damage	2013 Total
Right Angle												
Head On												
Rear End						1		1			1	1
Side Swipe												
Turning Movement												
Pedestrian												
Fixed Object												
Backing												
Other												
TOTAL						1		1			1	1

KEY

Vehicle Moving
Vehicle Stopped
Vehicle Backing
Bicycle
Pedestrian
Fixed Object
Right Angle
Sideswipe
Head On
Rear End
Turning Movement
Parking Maneuver

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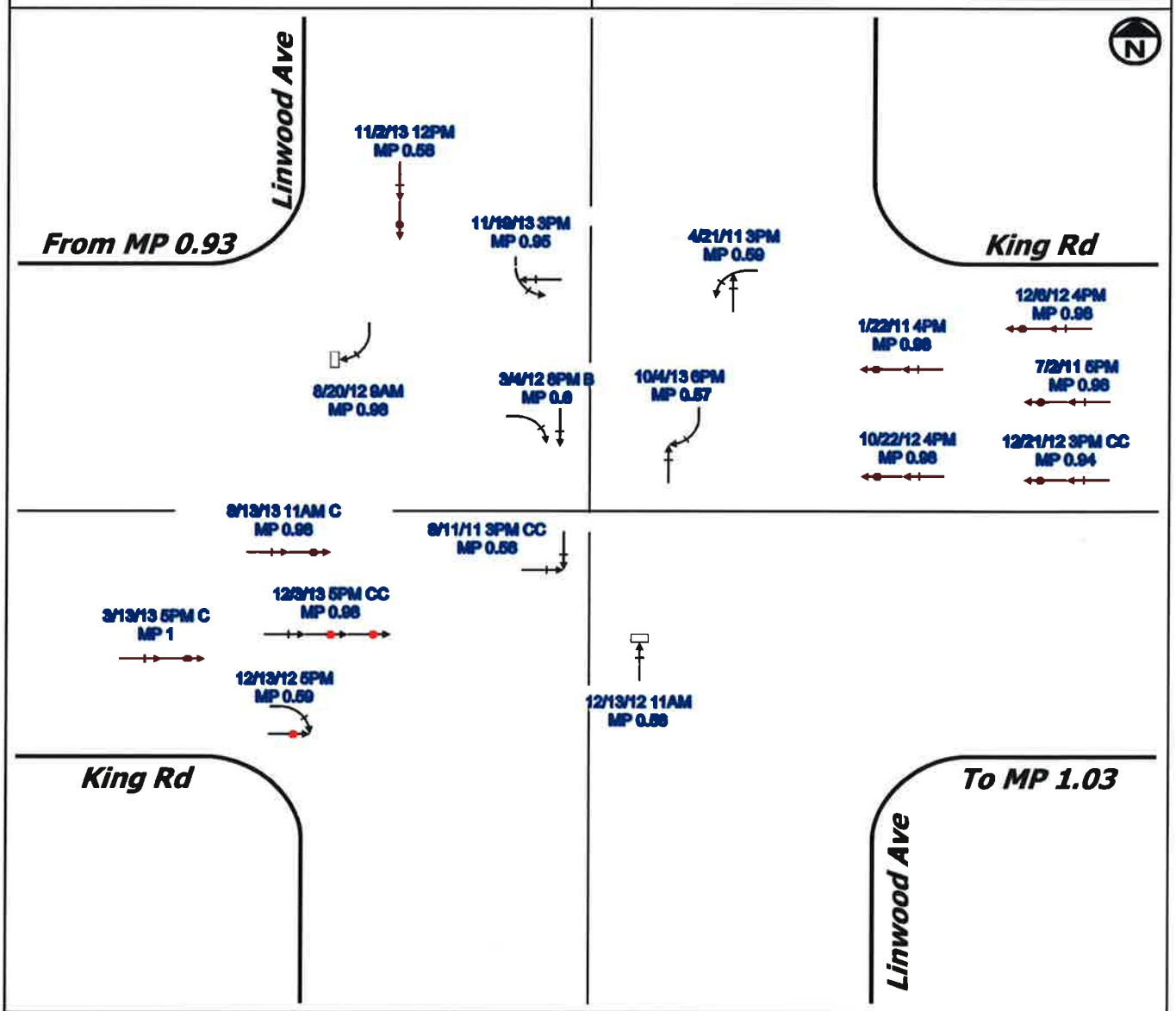
Exhibit A

CLACKAMAS COUNTY

ENGINEERING DIVISION
DEVELOPMENT SERVICE BUILDING
150 BEAVERCREEK ROAD, OREGON CITY, OR 97045

COLLISION DIAGRAM

Location #4 County Clackamas
Intersection of King Rd and Linwood Ave
Period Covered 2011-2013 SPIS Ranking 0
Compiled by CLS Date 5/27/2015



COLLISION TYPE	2011 Fatal	2011 Injury	2011 Property Damage	2011 Total	2012 Fatal	2012 Injury	2012 Property Damage	2012 Total	2013 Fatal	2013 Injury	2013 Property Damage	2013 Total
Right Angle		1		1								
Head On												
Rear End			2	2		1	2	3		3	1	4
Side Swipe												
Turning Movement			1	1		1	1	2			2	2
Pedestrian												
Fixed Object							2	2				
Backing												
Other												
TOTAL		1	3	4		2	5	7		3	3	6

KEY

Vehicle Moving
Vehicle Stopped
Vehicle Backing
Bicycle
Pedestrian
Fixed Object
Right Angle
Sideswipe
Head On
Rear End
Turning Movement
Parking Maneuver

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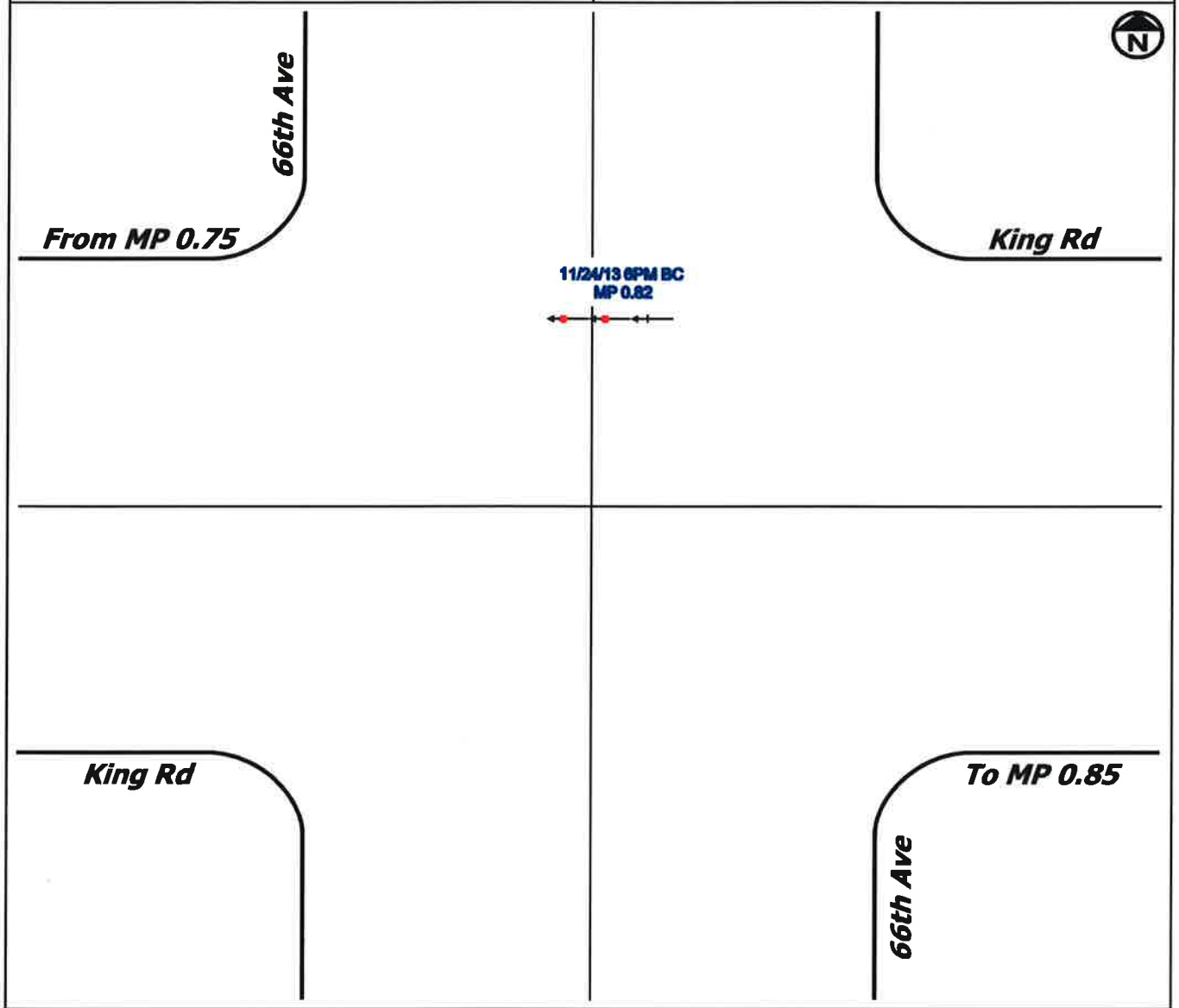
Exhibit A

CLACKAMAS COUNTY

ENGINEERING DIVISION
DEVELOPMENT SERVICE BUILDING
150 BEAVERCREEK ROAD, OREGON CITY, OR 97045

COLLISION DIAGRAM

Location #5		County	Clackamas
Intersection of	King Rd	and	66th Ave
Period Covered	2011-2013	SPIS Ranking	0
Compiled by	CLS	Date	5/29/2015



	2011				2012				2013			
COLLISION TYPE	Fatal	Injury	Property Damage	**Total**	Fatal	Injury	Property Damage	**Total**	Fatal	Injury	Property Damage	**Total**
Right Angle												
Head On												
Rear End										1		**1**
Side Swipe												
Turning Movement												
Pedestrian												
Fixed Object												
Backing												
Other												
TOTAL										1		1

KEY

Vehicle Moving
Vehicle Stopped
Vehicle Backing
Bicycle
Pedestrian
Fixed Object
Right Angle
Sideswipe
Head On
Rear End
Turning Movement
Parking Maneuver

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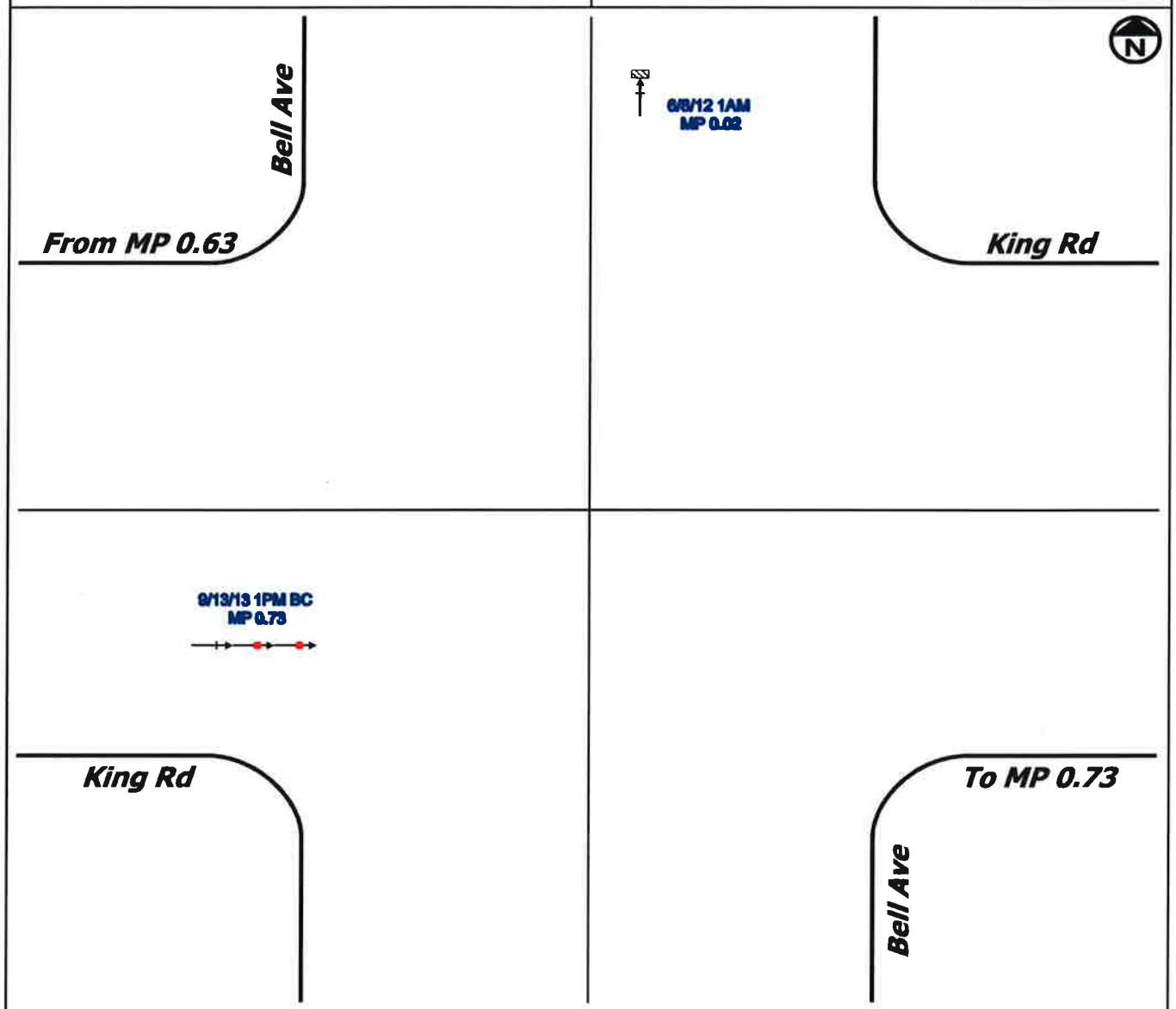
Exhibit A

CLACKAMAS COUNTY

ENGINEERING DIVISION
DEVELOPMENT SERVICE BUILDING
150 BEAVERCREEK ROAD, OREGON CITY, OR 97045

COLLISION DIAGRAM

Location #6		County	Clackamas
Intersection of	King Rd	and	Bell Ave
Period Covered	2011-2015	SPIS Ranking	0
Compiled by	CLS	Date	5/29/2015



	2011				2012				2013			
COLLISION TYPE	Fatal	Injury	Property Damage	**Total**	Fatal	Injury	Property Damage	**Total**	Fatal	Injury	Property Damage	**Total**
Right Angle												
Head On												
Rear End										1		**1**
Side Swipe												
Turning Movement												
Pedestrian												
Fixed Object							1	**1**				
Backing												
Other												
TOTAL							**1**	**1**		**1**		**1**

KEY

- Vehicle Moving
- Vehicle Stopped
- Vehicle Backing
- Bicycle
- Pedestrian
- Fixed Object
- Right Angle
- Sideswipe
- Head On
- Rear End
- Turning Movement
- Parking Maneuver

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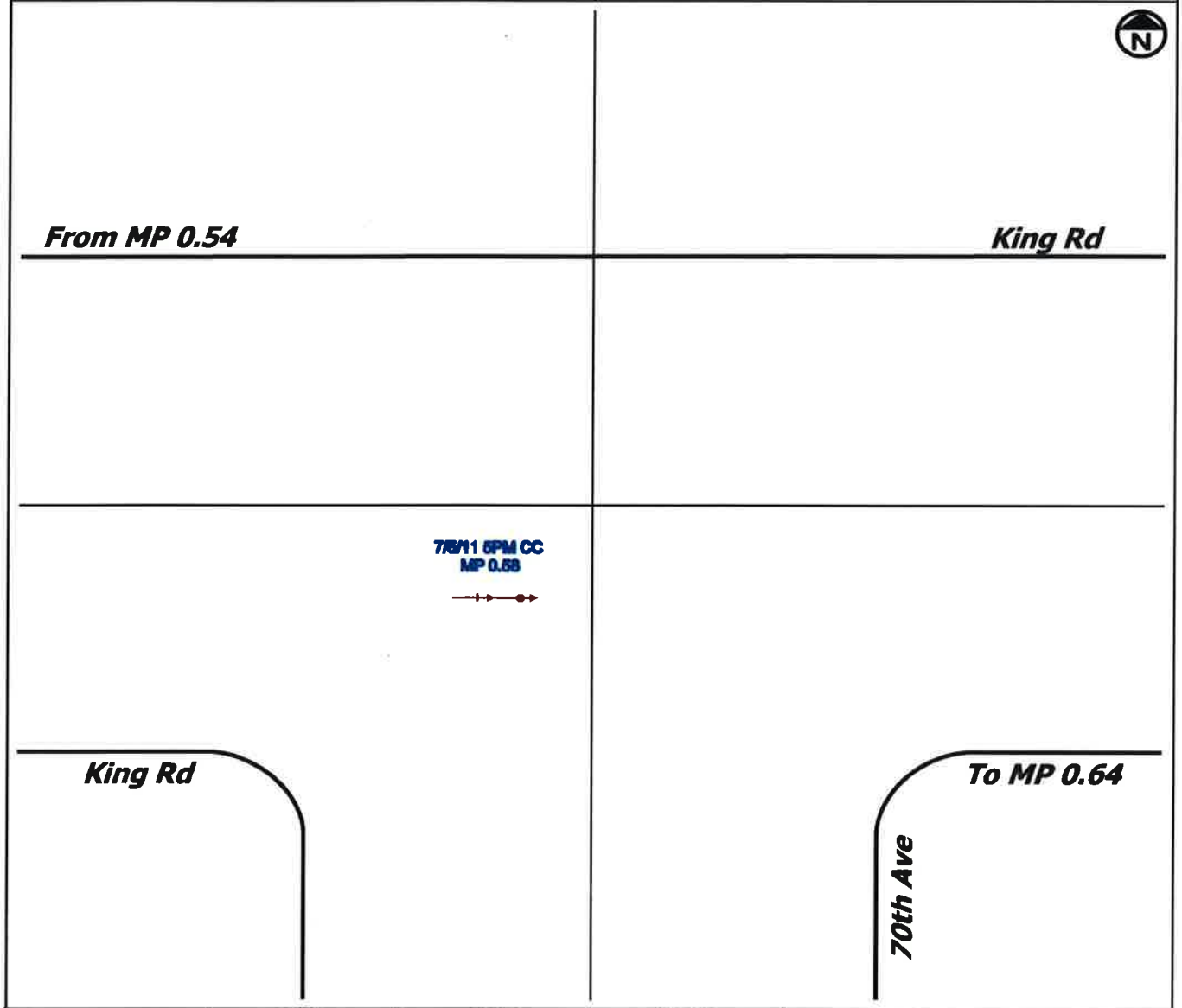
Exhibit A

CLACKAMAS COUNTY

ENGINEERING DIVISION
DEVELOPMENT SERVICE BUILDING
150 BEAVERCREEK ROAD, OREGON CITY, OR 97045

COLLISION DIAGRAM

Location #7		County	Clackamas
Intersection of	King Rd	and	70th Ave
Period Covered	2011-2013	SPIS Ranking	0
Compiled by	CLS	Date	6/1/2015



	2011				2012				2013			
COLLISION TYPE	Fatal	Injury	Property Damage	Total	Fatal	Injury	Property Damage	Total	Fatal	Injury	Property Damage	Total
Right Angle												
Head On												
Rear End		1		1								
Side Swipe												
Turning Movement												
Pedestrian												
Fixed Object												
Backing												
Other												
TOTAL		1		1								

KEY

- Vehicle Moving
- Vehicle Stopped
- Vehicle Backing
- Bicycle
- Pedestrian
- Fixed Object
- Right Angle
- Sideswipe
- Head On
- Rear End
- Turning Movement
- Parking Maneuver

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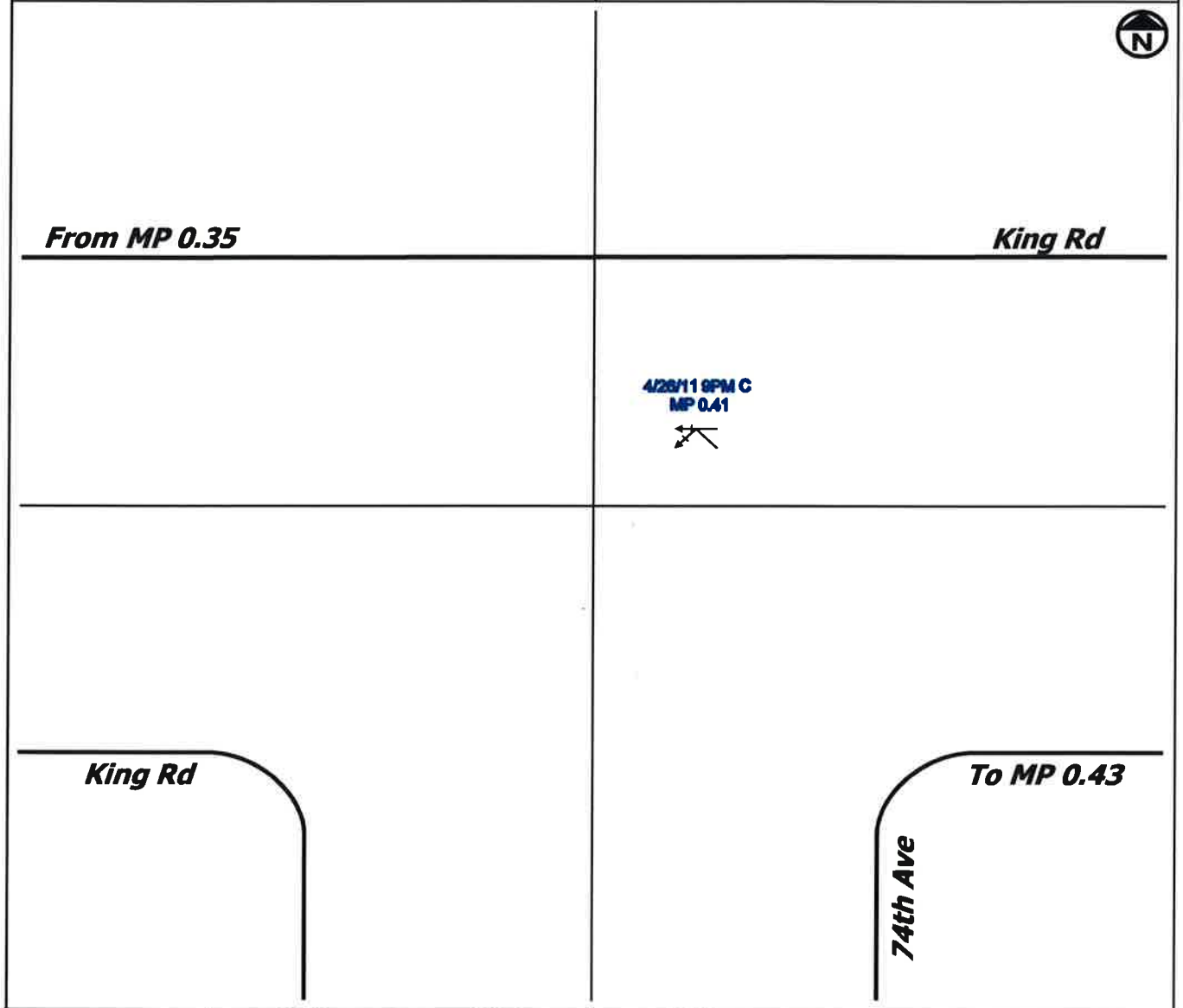
CLACKAMAS COUNTY

ENGINEERING DIVISION
DEVELOPMENT SERVICE BUILDING
150 BEAVERCREEK ROAD, OREGON CITY, OR 97045

COLLISION DIAGRAM

Location #8		County	Clackamas
Intersection of	King Rd	and	74th Ave
Period Covered	2011-2013	SPIS Ranking	0
Compiled by	CLS	Date	6/1/2015



COLLISION TYPE	2011 Fatal	2011 Injury	2011 Property Damage	2011 Total	2012 Fatal	2012 Injury	2012 Property Damage	2012 Total	2013 Fatal	2013 Injury	2013 Property Damage	2013 Total
Right Angle												
Head On												
Rear End												
Side Swipe		1		1								
Turning Movement												
Pedestrian												
Fixed Object												
Backing												
Other												
TOTAL		1		1								

KEY

- Vehicle Moving
- Vehicle Stopped
- Vehicle Backing
- Bicycle
- Pedestrian
- Fixed Object
- Right Angle
- Sideswipe
- Head On
- Rear End
- Turning Movement
- Parking Maneuver

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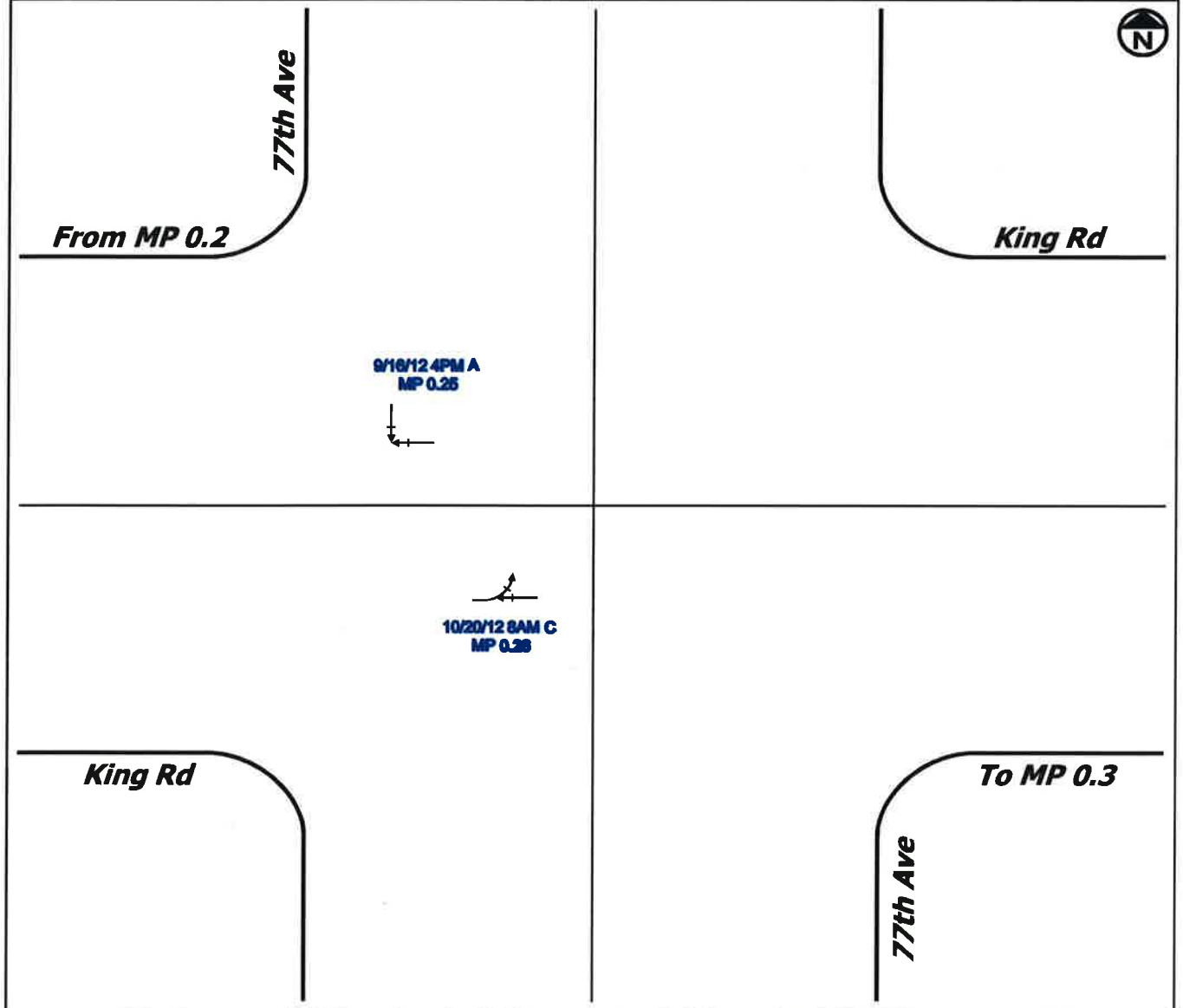
CLACKAMAS COUNTY
ENGINEERING DIVISION
DEVELOPMENT SERVICE BUILDING
150 BEAVERCREEK ROAD, OREGON CITY, OR 97045

COLLISION DIAGRAM

Location #9 | County Clackamas
Intersection of King Rd and 77th Ave
Period Covered 2011-2013 | SPIS Ranking 0
Compiled by CLS | Date 5/29/2015



	2011				2012				2013			
COLLISION TYPE	Fatal	Injury	Property Damage	Total	Fatal	Injury	Property Damage	Total	Fatal	Injury	Property Damage	Total
Right Angle						1		1				
Head On												
Rear End												
Side Swipe												
Turning Movement						1		1				
Pedestrian												
Fixed Object												
Backing												
Other												
TOTAL						2		2				

KEY

Vehicle Moving
Vehicle Stopped
Vehicle Backing
Bicycle
Pedestrian
Fixed Object
Right Angle
Sideswipe
Head On
Rear End
Turning Movement
Parking Maneuver

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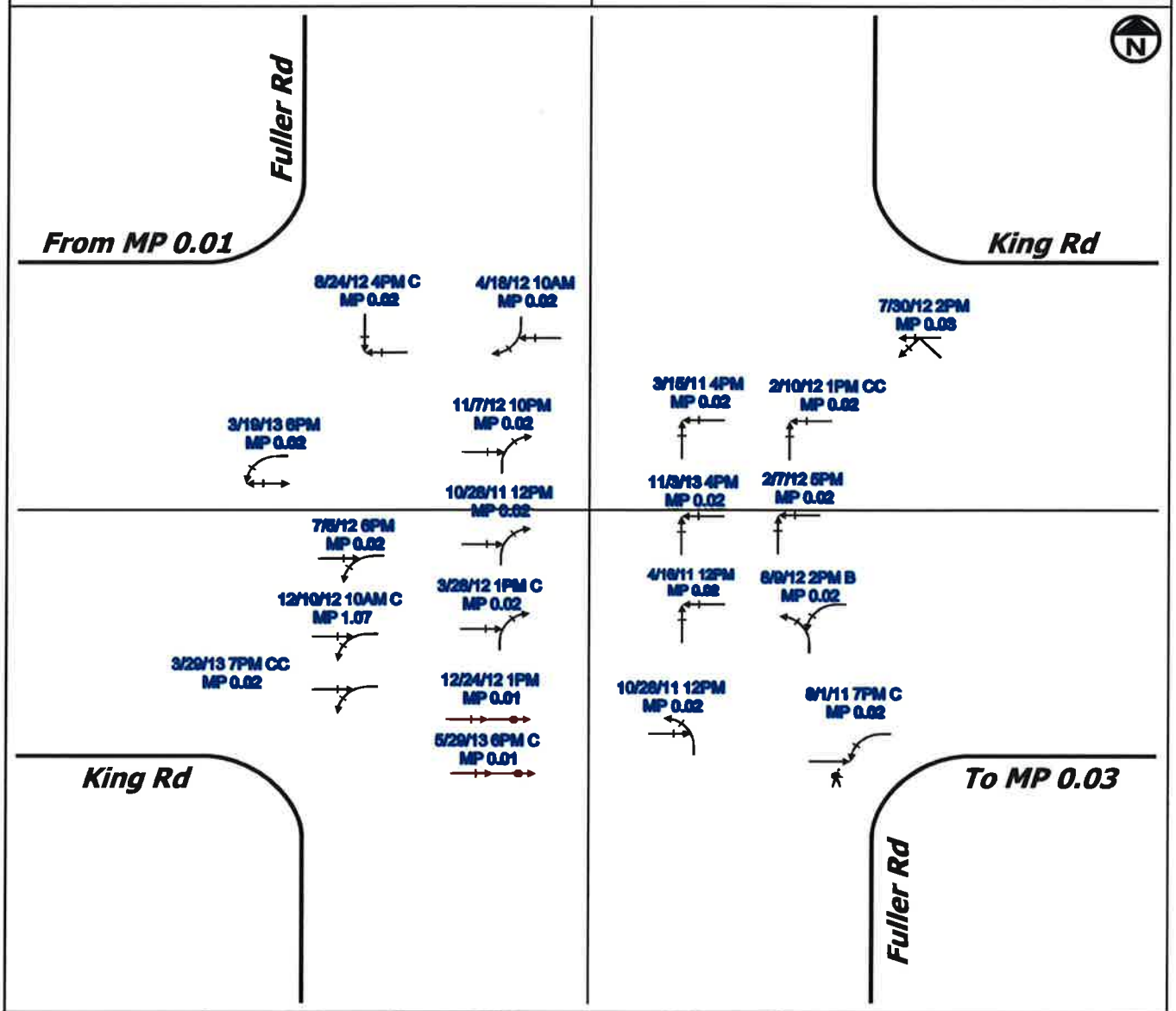
CLACKAMAS COUNTY

ENGINEERING DIVISION
DEVELOPMENT SERVICE BUILDING
150 BEAVERCREEK ROAD, OREGON CITY, OR 97045

COLLISION DIAGRAM

Location #10 | County Clackamas
Intersection of King Rd and Fuller Rd
Period Covered 2011-2013 | SPIS Ranking 0
Compiled by CLS | Date 6/1/2015



	2011				2012				2013			
COLLISION TYPE	Fatal	Injury	Property Damage	**Total**	Fatal	Injury	Property Damage	**Total**	Fatal	Injury	Property Damage	**Total**
Right Angle			2	**2**		2	1	**3**			1	**1**
Head On												
Rear End							1	**1**		1		**1**
Side Swipe							1	**1**				
Turning Movement			2	**2**		3	3	**6**		1		**1**
Pedestrian		1		**1**								
Fixed Object												
Backing											1	**1**
Other												
TOTAL		**1**	**4**	**5**		**5**	**6**	**11**		**2**	**2**	**4**

KEY

Vehicle Moving
Vehicle Stopped
Vehicle Backing
Bicycle
Pedestrian
Fixed Object
Right Angle
Sideswipe
Head On
Rear End
Turning Movement
Parking Maneuver

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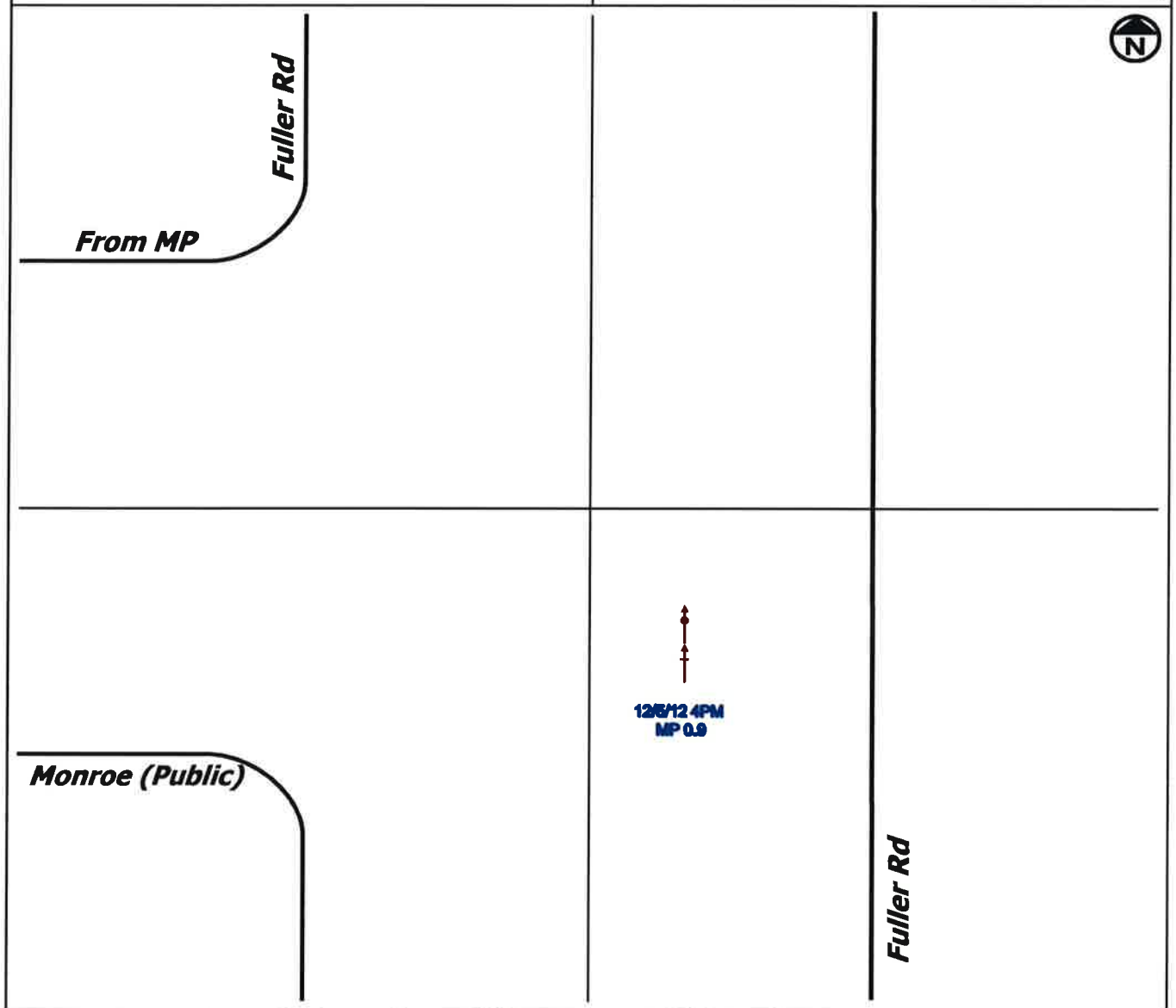
CLACKAMAS COUNTY
ENGINEERING DIVISION
DEVELOPMENT SERVICE BUILDING
150 BEAVERCREEK ROAD, OREGON CITY, OR 97045

COLLISION DIAGRAM

Location #11 County Clackamas
Intersection of Monroe (Public) and Fuller Rd
Period Covered 2011-2013 SPIS Ranking 0
Compiled by CLS Date 6/1/2015



COLLISION TYPE	2011 Fatal	2011 Injury	2011 Property Damage	2011 Total	2012 Fatal	2012 Injury	2012 Property Damage	2012 Total	2013 Fatal	2013 Injury	2013 Property Damage	2013 Total
Right Angle												
Head On												
Rear End							1	1				
Side Swipe												
Turning Movement												
Pedestrian												
Fixed Object												
Backing												
Other												
TOTAL							1	1				

KEY

Vehicle Moving
Vehicle Stopped
Vehicle Backing
Bicycle
Pedestrian
Fixed Object
Right Angle
Sideswipe
Head On
Rear End
Turning Movement
Parking Maneuver

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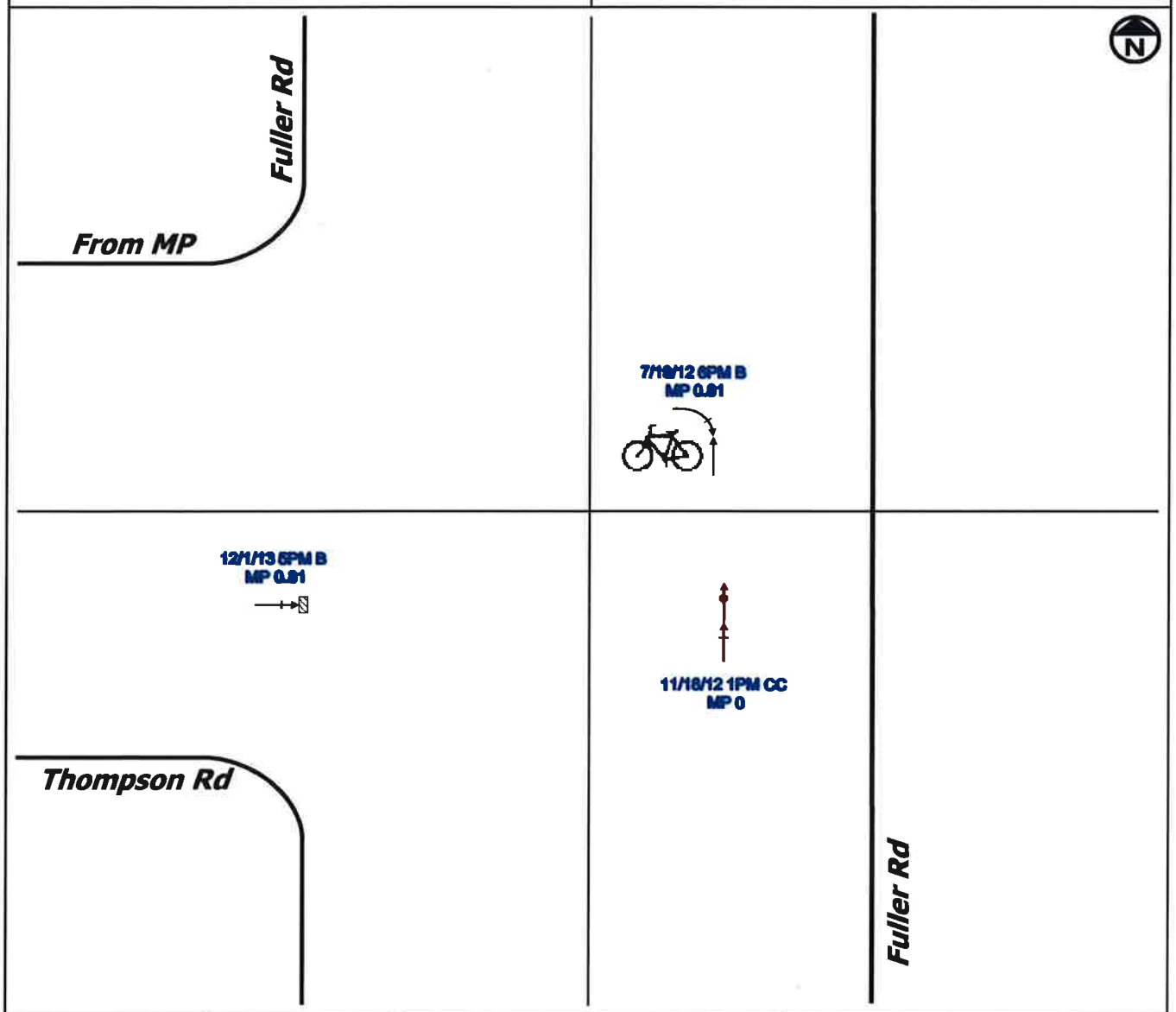
CLACKAMAS COUNTY
ENGINEERING DIVISION
DEVELOPMENT SERVICE BUILDING
150 BEAVERCREEK ROAD, OREGON CITY, OR 97045

COLLISION DIAGRAM

Location #12 County Clackamas
Intersection of Thompson Rd and Fuller Rd
Period Covered 2011-2013 SPIS Ranking 0
Compiled by CLS Date 6/1/2015



COLLISION TYPE	2011 Fatal	2011 Injury	2011 Property Damage	2011 Total	2012 Fatal	2012 Injury	2012 Property Damage	2012 Total	2013 Fatal	2013 Injury	2013 Property Damage	2013 Total
Right Angle												
Head On												
Rear End						1		1				
Side Swipe												
Turning Movement						1		1				
Pedestrian												
Fixed Object										1		1
Backing												
Other												
TOTAL						2		2		1		1

KEY

Vehicle Moving
Vehicle Stopped
Vehicle Backing
Bicycle
Pedestrian
Fixed Object
Right Angle
Sideswipe
Head On
Rear End
Turning Movement
Parking Maneuver

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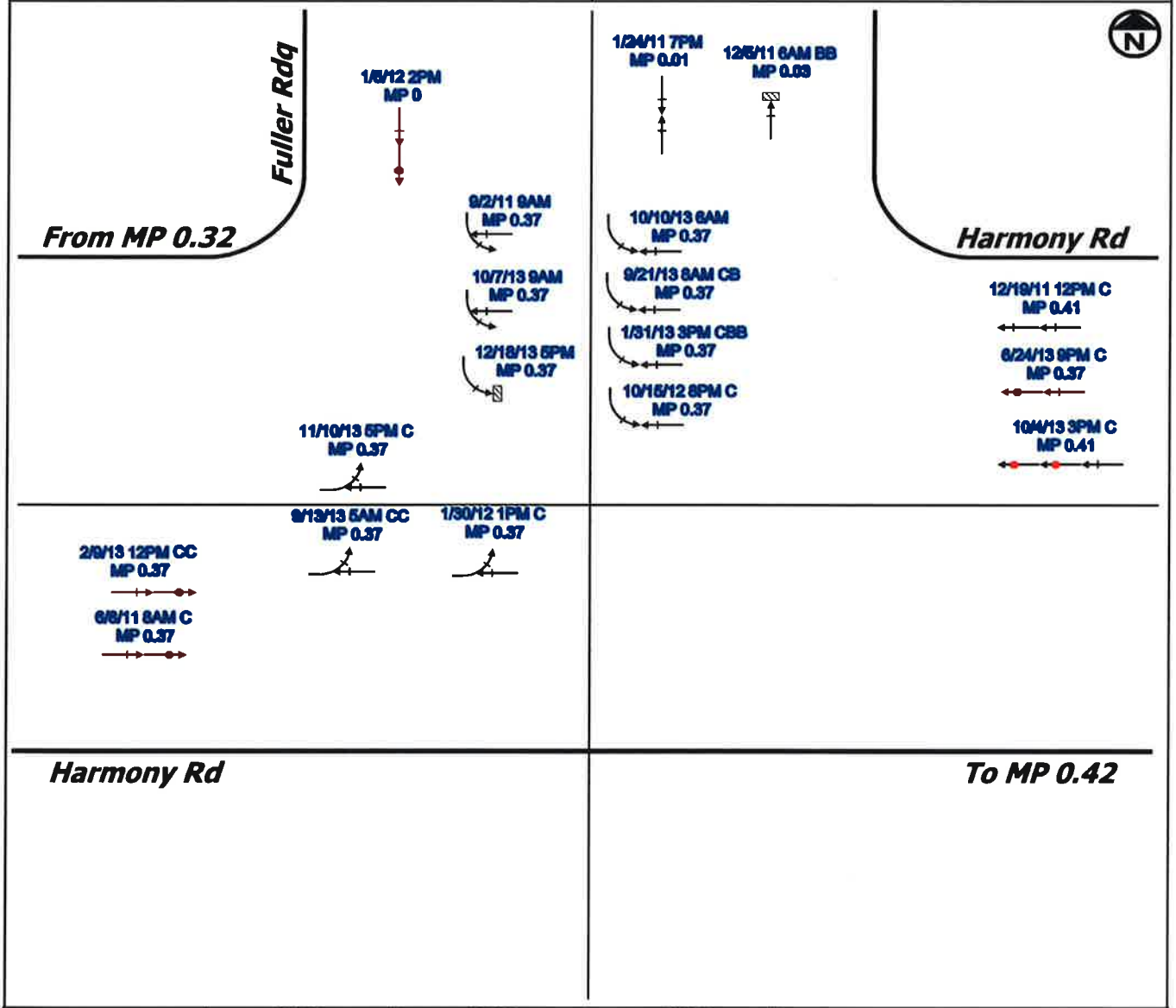
CLACKAMAS COUNTY

ENGINEERING DIVISION
DEVELOPMENT SERVICE BUILDING
150 BEAVERCREEK ROAD, OREGON CITY, OR 97045

COLLISION DIAGRAM

Location #13 County Clackamas
Intersection of Harmony Rd and Fuller Rdq
Period Covered 2011-2013 SPIS Ranking 0
Compiled by CLS Date 6/2/2015



COLLISION TYPE	2011 Fatal	2011 Injury	2011 Property Damage	2011 Total	2012 Fatal	2012 Injury	2012 Property Damage	2012 Total	2013 Fatal	2013 Injury	2013 Property Damage	2013 Total
Right Angle												
Head On			1	1								
Rear End		2		2			1	1		3		3
Side Swipe												
Turning Movement			1	1		2		2		4	2	6
Pedestrian												
Fixed Object		1		1							1	1
Backing												
Other												
TOTAL		3	2	5		2	1	3		7	3	10

KEY

- Vehicle Moving
- Vehicle Stopped
- Vehicle Backing
- Bicycle
- Pedestrian
- Fixed Object
- Right Angle
- Sideswipe
- Head On
- Rear End
- Turning Movement
- Parking Maneuver

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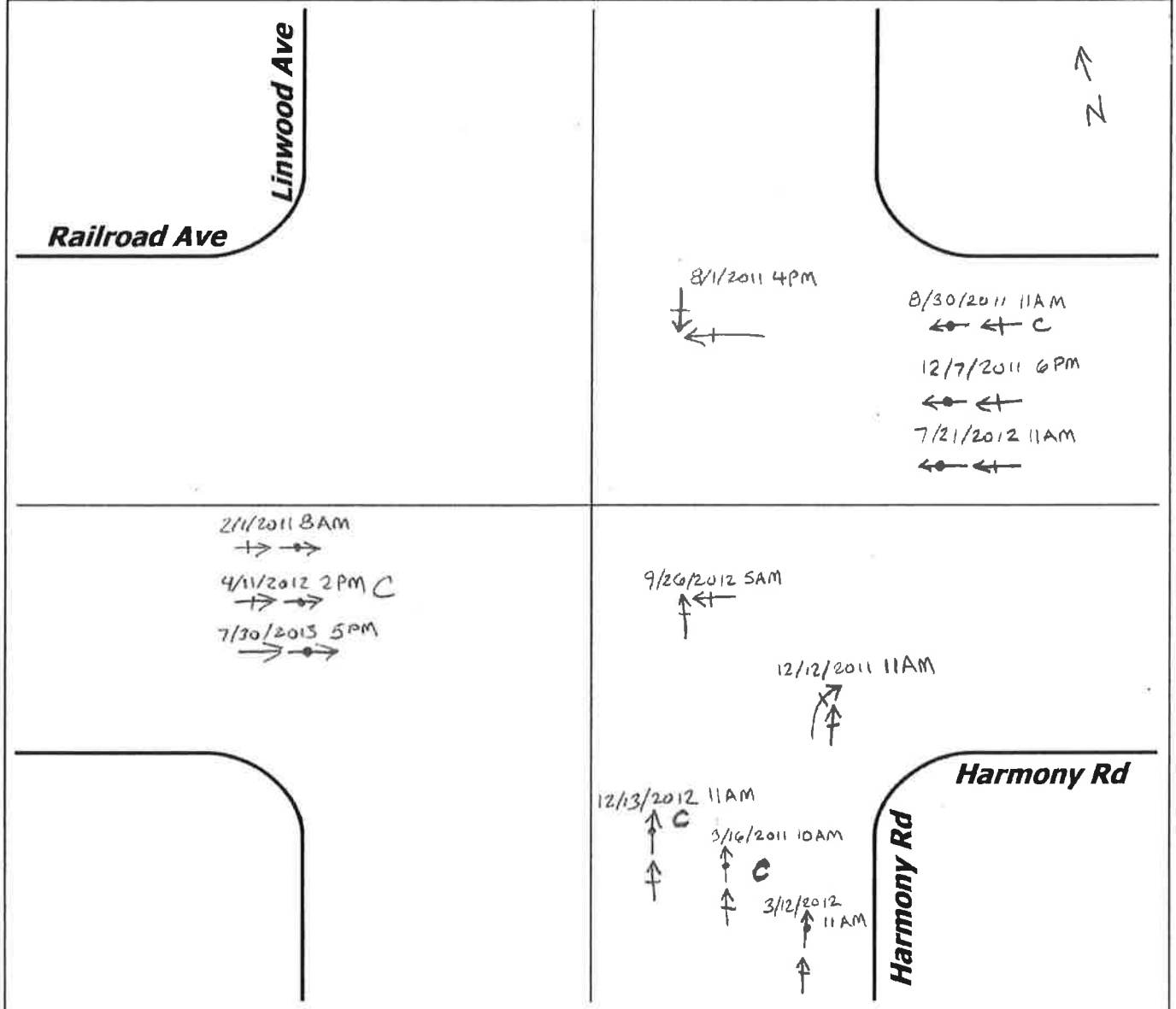
CLACKAMAS COUNTY

ENGINEERING DIVISION
DEVELOPMENT SERVICE BUILDING
150 BEAVERCREEK ROAD, OREGON CITY, OR 97045

COLLISION DIAGRAM

Location #14 | County: Clackamas
Intersection of: Harmony Rd and Linwood Ave
Period Covered: 2011-2013 | SPIS Ranking: 0
Compiled by: CLS | Date: 6/1/2015



COLLISION TYPE	2011 Fatal	2011 Injury	2011 Property Damage	2011 Total	2012 Fatal	2012 Injury	2012 Property Damage	2012 Total	2013 Fatal	2013 Injury	2013 Property Damage	2013 Total
Right Angle			1				1					
Head On												
Rear End		11	11			11	11				1	
Side Swipe			1									
Turning Movement												
Pedestrian												
Fixed Object												
Backing												
Other												
TOTAL		2	4	6		2	3	5			1	1

KEY

- Vehicle Moving
- Vehicle Stopped
- Vehicle Backing
- Bicycle
- Pedestrian
- Fixed Object
- Right Angle
- Sideswipe
- Head On
- Rear End
- Turning Movement
- Parking Maneuver

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Exhibit A

Monroe Neighborhood Street Design Plan

June 2016

DRAFT

Attachment 1.a

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The contents of this document do not necessarily reflect views or policies of the State of Oregon.

ch2m

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1. Project Purpose and Background

Project Description and Policy Context

Located in northern Clackamas County, Monroe Street has long been envisioned as a primary active transportation route linking the Trolley Trail in Milwaukie to the Interstate 205 (I-205) Multi-Use Path located in the unincorporated portion of the County. This connection would improve local access to two lines on the regional Metropolitan Area Express (MAX) light rail system – the Green Line along I-205 and the newly completed Orange Line in Milwaukie – and would provide safer bicycling and walking to the Clackamas Regional Center. Ultimately, the project would link downtown Milwaukie and Clackamas Town Center, connecting local neighborhoods to schools, jobs, shopping and parks.

The Clackamas County *Monroe Neighborhood Street Design Plan* was developed to help make this vision a reality, and to meet active transportation goals and policies set forth in the County's Transportation System Plan, Active Transportation Plan, and Bicycle and Pedestrian Master Plans, which identify Monroe Street as a key east-west pedestrian and bicycle connection. Monroe Street is identified as a "Tier 1" 20-year Capital Project in Clackamas County's Transportation System Plan, and as a Principal Active Transportation Route in the County's Active Transportation Plan.

In addition, Metro's *Regional Transportation Plan* and *Active Transportation Plan* classify Monroe Street as a Bicycle Parkway – that plan's highest bicycle classification. These routes are considered the "highest order" bicycle routes for their function in connecting communities and destinations, including regional transit and employment centers, commercial, and recreation areas.

A related plan – the *Monroe Street Neighborhood Greenway Concept Plan* – was prepared by the City of Milwaukie for the section of Monroe Street located within the City's jurisdiction. The Monroe Street Neighborhood Greenway Concept Plan was completed in an effort to realize the vision for Monroe Street included in the *City of Milwaukie Transportation System Plan*, as well as to help reach regionally-mandated targets of 45%-55% non-single occupant vehicle (SOV) mode share by 2035. In 2015, the Milwaukie City Council adopted the Monroe Street Neighborhood Greenway Concept Plan and is in the process of acquiring project funding as of the writing of this plan. A more thorough analysis of these plans and policies can be found in Appendix A, Policy Framework Memorandum.

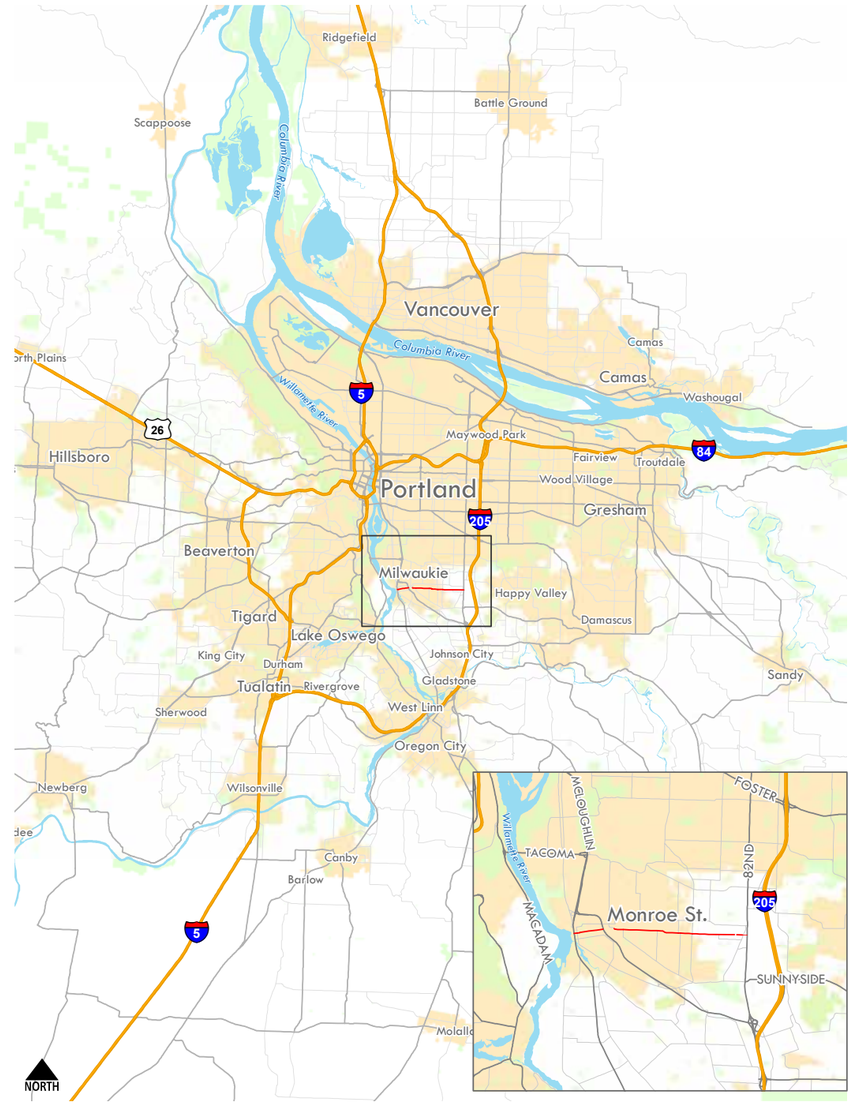

Figure 1.1 Project Vicinity Map

Shows location of Monroe Street in regional context.

This plan includes a proposed concept design for Monroe Street between Linwood Avenue and the I-205 Multi-Use Path that prioritizes safe pedestrian and bicycle connections along this critical corridor. The proposed concept design also places a strong emphasis on improving walking and bicycling conditions near Whitcomb Elementary School on Thompson Road.

Project Objectives

The goal of the Monroe Neighborhood Street Design project is to develop a design that improves safety and travel conditions for pedestrians and bicyclists while balancing neighborhood livability and the needs of vehicle traffic. Key project objectives are outlined below.

Increase Active Transportation Options to Improve Public Health

Creating active transportation options that are accessible and convenient for all users improves public health by promoting physical activity. Better, safer conditions encourage more short trips by walking and biking. Well-connected streets with safe pedestrian and bicycle facilities can promote a healthier, more active lifestyle for all members of the community.

Safety and Comfort on Different Types of Streets

Street design should create an environment that promotes safety, comfort, and access for all users. The recommended design takes into account differing conditions and contexts of each street. Though a street might change from block to block, the level of safety should remain consistent to ensure it is comfortable for all users.

Safe Routes to School Plan

The Safe Routes to School initiative improves safety for pedestrians and bicyclists, encouraging children to walk and bike to school. Safe Routes to School programs in Clackamas County schools can bring a wide range of benefits – including promoting physical activity among children and easing traffic congestion. For more information on the Safe Routes to School component of the *Monroe Neighborhood Street Design Plan*, refer to page 5 and Appendix B: Safe Routes to School Action Plan, Whitcomb Elementary School.

Connection to the Milwaukie Monroe Street Neighborhood Greenway Concept Plan

The *Monroe Street Neighborhood Greenway Concept Plan* is a City of Milwaukie plan to strengthen the neighborhood street character of Monroe Street in Milwaukie and provide safer, low-stress accommodations for pedestrians and bicyclists. The project area extends along Monroe Street from 21st Avenue in downtown Milwaukie to Linwood Avenue at the city's eastern boundary. Intended to reduce the speeds and volumes on Monroe Street in Milwaukie, the plan includes crossing improvements, stormwater treatment features such as chicanes and curb extensions, and partial diverters at OR 224, 42nd Avenue, and Linwood Avenue and Monroe Street. The plan was adopted by the Milwaukie City Council in 2015 and will be implemented over the next few years as funding becomes available.

The *Monroe Neighborhood Street Design Plan* project begins where the Milwaukie *Monroe Street Neighborhood Greenway Concept Plan* ends, creating the opportunity for Clackamas County to develop a low-stress route for east-west bicycle and pedestrian travel from the Willamette River to the I-205 Multi-Use Path and the Clackamas Town Center.

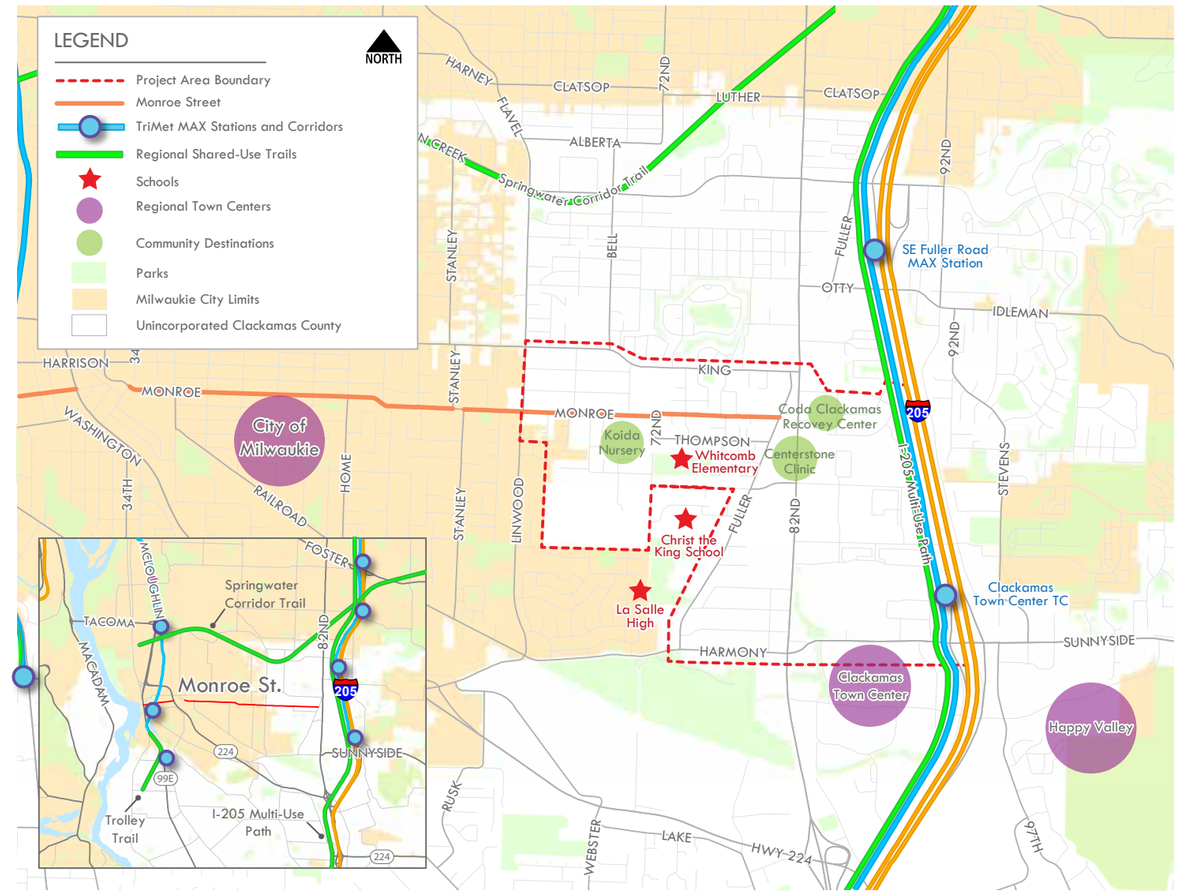

Figure 1.2 Destinations Map

Monroe Street will provide a safe pedestrian and bicycle connection between downtown Milwaukie and the I-205 Multi-Use Path, linking parks, schools, trails and light rail lines along the way.

2. Existing Conditions

Project Area Conditions

West of 82nd Avenue, the Monroe Street corridor includes Monroe Street, 72nd Avenue, Thompson Road, and a soon-to-be constructed section of Boyer Drive. East of 82nd Avenue, the corridor includes Boyer Drive, 85th Avenue, and Spencer Drive. Cross-sections and overall street character vary throughout the study area, including both low-traffic residential streets and busier collector roadways. Existing right-of-way ranges from 40 feet to 80 feet and, as a result, proposed design treatments vary throughout the project to address different contexts and needs.

Monroe Street itself has two separate functional classifications in the Clackamas County TSP. Between Linwood Avenue and 72nd Avenue, it is classified as a Collector street.[1] East of 72nd Avenue to Fuller Road, it is classified as a Connector.[2] This includes the discontinuous segment of Monroe Street east of 78th Avenue, referred to as the "Monroe Gap" throughout this plan.

Lack of Safe Pedestrian Facilities

Many streets in this area lack dedicated pedestrian facilities. For example, there are no existing sidewalks or shoulders on Monroe Street east of Linwood Avenue, so pedestrians must walk in the narrow, undefined shoulders along both sides of the street. Speeds are relatively high (averaging 25 to 35 miles per hour [mph]), making it unsafe to walk along Monroe Street and impossible to use a wheelchair. Conditions are similar on 72nd Avenue between Monroe Street and Thompson Road, with high speeds and no pedestrian facilities. The sidewalk network along Thompson Road is incomplete, with sidewalks only present along the south side of Thompson Road between 74th Avenue and Fuller Road. These conditions do not provide safe walking access to Whitcomb Elementary School. Sidewalk connections between Monroe Street and Thompson Road are nonexistent, and most of the corridor lacks curb ramp treatments that comply with the Americans with Disabilities Act (ADA).

Lack of Continuous Bicycle Infrastructure

Bicycle infrastructure is discontinuous throughout the Monroe Street and Thompson Road corridor. Currently, there are no bicycle facilities on Monroe Street or 72nd Avenue, so people riding bikes must share the road with fast-moving vehicles. In general, only more confident, experienced cyclists ride along Monroe Street and 72nd Avenue.

Cyclists seeking the safety of a bike lane must travel three blocks north to King Road, where speeds east of Linwood Avenue exceed 35 mph, creating an inhospitable bicycling environment for children, families, and less-experienced riders.

Bicycle lanes exist along Thompson Road, between 74th Avenue and Fuller Road, although fast-moving traffic and cars parked in bike lane make Thompson Road challenging for children or less experienced bicyclists.

When the planned and funded extension of Boyer Drive (continuing east from Monroe Street between Fuller Road and 82nd Avenue) is built, it will include sidewalks and cycle tracks, connecting Monroe Street to 82nd Avenue and destinations to the east.

Need for Stormwater Management

Community members identified stormwater runoff and management as a critical need in the project area. Currently, infrequent storm drains do not provide adequate drainage, resulting in localized flooding.

Figure 2.1 Aerial Overview Map

1. A Collector is defined in the County TSP as a "principal carrier within neighborhoods or single land use areas. Links neighborhoods with major activity centers, other neighborhoods, and arterials. Generally not for through traffic. Low to moderate volume; low to moderate speed."
2. A Connector "collects traffic from and distributes traffic to local streets within neighborhoods or industrial districts. Usually longer than local streets. Low traffic volumes (less than 1,500 vehicles per day) and speeds (85th percentile speeds less than 35mph). Primarily serves access and local circulation functions. Not for through traffic in urban areas."

Monroe Gap

Currently, there is an unimproved section of Monroe Street east of 78th Avenue, approximately 120 feet in length. Mature trees and vegetation currently block the 60-foot right-of-way from vehicle access between 78th Avenue and Fuller Road, effectively creating a "gap" in the Clackamas County street network. A narrow dirt path connects the right-of-way to Monroe Street at either end of the Gap. There are no sidewalks through this section; the existing path does not meet ADA standards and is accessible only to pedestrians and bicyclists who walk their bikes. Today, the Gap acts as a natural traffic diverter, directing motorists to Thompson Road one block south of Monroe Street in order to reach Fuller Road and destinations to the east.

Over the course of developing this plan, the project team considered two options for what became known as the Monroe Gap: improving it for pedestrians and bicycles only, or improving the street to Clackamas County local street standards, thereby making Monroe Street a continuous automobile route through the neighborhood.

This plan recommends that the Monroe Gap remain closed to automobile traffic, and is improved for bicycles and pedestrians only. The decision to keep the Monroe Gap closed to automobile traffic was strongly supported by the public, and will help maintain low volumes along an important active transportation route. For a detailed description of proposed Monroe Gap improvements, refer to Chapter 4—Section A, Segment 4.

For a more detailed description of the evaluation process that informed the decision to keep the Monroe Gap closed to automobile traffic, refer to Appendix C: Alternatives Analysis Report.

Figure 2.2 Monroe Gap

Vicinity map showing location of Monroe Gap.

Approaching the Monroe Gap from the east end of the unimproved segment. Photo: CH2M (2015)

Image shows the unimproved Monroe Gap, looking west. Photo: CH2M (2015)

Difficult Crossings for All Modes

Crossing major streets can be challenging for all modes of transportation within the project area. Community feedback indicated the intersection of Linwood Avenue and Monroe Street was a safety focus for those living in the area due to frequent crashes.

Further east, Fuller Road traffic volumes exceed 3,500 vehicles per day and 85th percentile speeds of 35 mph. A lack of midblock crosswalks or median refuge areas make crossing Fuller Road's 48-foot width difficult for pedestrians. 82nd Avenue carried nearly 30,000 vehicles per day in 2013. 82nd Avenue is 80 feet wide and has five lanes, which, in addition to numerous driveway access points, makes for difficult pedestrian crossing conditions. Marked crosswalks along these roads are located only at signalized intersections, which can be up to a quarter mile apart.

Neighborhood Livability Concerns

Monroe Street is primarily a Collector through the City of Milwaukie and Clackamas County and has high levels of through traffic, particularly during the afternoon peak period. Collector streets are intended as moderate-volume, moderate-speed streets that provide access and circulation within and between residential neighborhoods, commercial areas, and industrial areas.

Today, many motorists use Monroe Street to avoid congestion along Harrison Street and King Road, which can be heavy at 42nd Avenue and Linwood Avenue. Neighborhoods along Monroe Street have long expressed concerns regarding the speed of traffic on their street. Although Monroe Street has a speed limit of 25 mph east of Linwood Avenue, 85th percentile speeds are closer to 32 mph.

Appendix D, Existing Conditions and Needs Memorandum, contains a complete description of existing conditions throughout the project area.

Safe Routes to School: Whitcomb Elementary School

As part of the Monroe Plan, Clackamas County partnered with Whitcomb Elementary School to develop a Safe Routes to School (SRTS) Action Plan. The Action Plan used information gathered from travel assessments and student/parent surveys to develop recommended priority projects and activities for Whitcomb Elementary to promote safe walking and bicycling to school. Appendix B contains the Safe Routes to School Action Plan.

The SRTS planning process identified the following needed improvements:

- Marked crosswalks and signage in key locations, including the intersections of Fuller Road/Thompson Road, Fuller Road/Causey Avenue/Harmony Drive and Thompson Road/77th Avenue
- More continuous sidewalks on Thompson Road, including the north side between Fuller Road and 72nd Avenue where none exists now, and on the south side west of the school
- Safe pedestrian accommodation along 72nd Avenue between Monroe Street and Thompson Road, where the S-curve creates hazardous walking conditions in the absence of sidewalks
- Sidewalks along 74th Avenue between Monroe Street and Thompson Road, where students often walk in the street because vehicles are parked on both sides of the roadway
- Continue the practice of using adult crossing guards in the morning and afternoon
- Provide student bike parking at Whitcomb Elementary, as none currently exists
- Upgrade pedestrian access at Maplehurst Road and McEachron Avenue and develop walkway to school building from existing access gate.

Photo: City of Rexburg, ID

Photo: Safe Routes Partnership (2015)

3. Analyzing Project Alternatives

Overview of Route Alternatives

The *Monroe Neighborhood Street Design Plan* considered a range of alternative routes to provide a safe pedestrian and bicycle connection from the intersection of Monroe Street and Linwood Avenue to the I-205 Multi-Use Path. During early planning efforts, the project area was organized into several *route segments* (shown in Figure 3.1) in an effort to understand the opportunities and constraints at a high level of detail. Once the project needs, constraints, and opportunities associated with each of these shorter segments were analyzed, the project team, Technical Advisory Committee (TAC), and Project Advisory Committee (PAC) developed seven *route alternatives* to connect Linwood Avenue to the I-205 Multi-Use Path. The general alignment of each *route alternative* is listed below:

- **Alternative 1:** Monroe Street—Boyer Drive Extension—85th Avenue—Spencer Drive
- **Alternative 2:** Monroe Street—Fuller Road—Causey Avenue
- **Alternative 3:** Monroe Street—Maplehurst/Harmony Road—Causey Avenue
- **Alternative 4:** Monroe Street—Maplehurst/Harmony Road—Fuller Road—Boyer Drive Extension—85th Avenue—Spencer Drive
- **Alternative 5:** Monroe Street—Thompson Road—Fuller Road—Boyer Drive Extension—85th Avenue—Spencer Drive
- **Alternative 6:** Monroe Street—Thompson Road—Fuller Road—Causey Avenue
- **Alternative 7:** Monroe Street—Maplehurst/Harmony Road—Fuller Road—Monterey Avenue

In order to communicate potential trade-offs associated with each route alternative, cut-sheets summarized each route for the PAC, TAC, and project team. Summaries included potential alignment, design considerations, and Safe Routes to School benefits. Feedback was obtained on early design concepts as well, including bicycle and pedestrian facility design, stormwater management considerations, and potential improvements to the Monroe Gap.

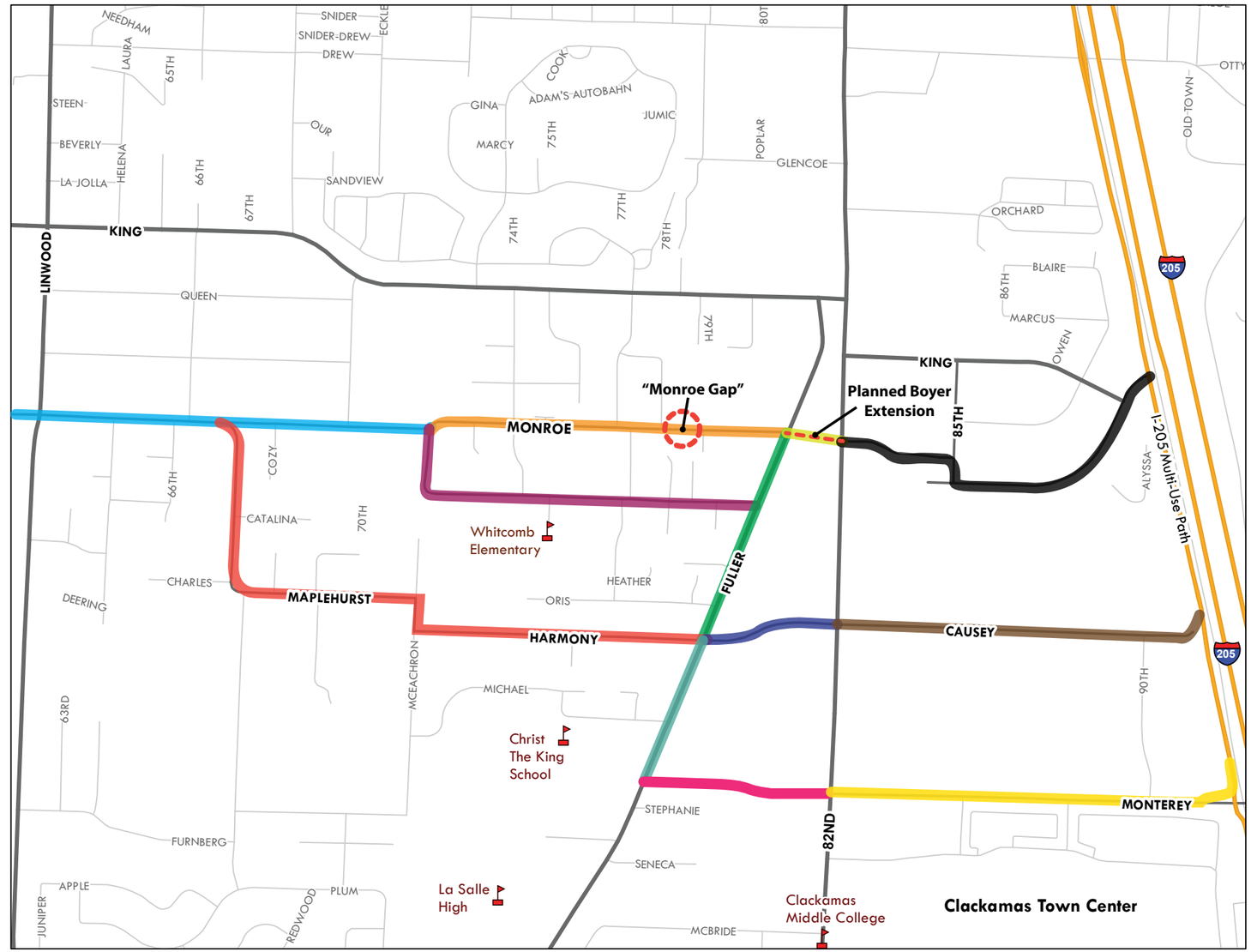

Figure 3.1 Route Segments Considered

Various combinations of the route segments shown in the map above were used to create seven distinct route alternatives. Route alternatives were then evaluated to determine the preferred route for the Monroe Neighborhood Street Design Plan.

Evaluation Criteria

In order to select a preferred route, alternatives were evaluated against project goals and objectives. Building from relevant state, regional, and local plans, criteria were developed to provide an evaluation framework for the selection of a preferred route. The project evaluation criteria defines that the preferred route alternative should seek to:

- Improve safety for all modes, with an emphasis on bicycle/pedestrian safety
- Support healthy and active communities
- Identify safe crossings and safe routes to school
- Provide neighborhood benefits and minimize negative impacts
- Identify options to address stormwater runoff from impervious surfaces
- Create an implementable project plan, which identifies potential funding sources over time

For a more detailed description of the evaluation criteria, refer to Appendix C: Alternatives Analysis Report.

Identifying the Preferred Alternative

Using the evaluation criteria, route alternatives were examined based on how well they supported project goals and objectives. As a method to help inform further discussion with the TAC, PAC, and project team, route alternatives were evaluated based on how well they supported project goals and objectives using a matrix approach (Figure 3.2).

Alternatives 1 and 5 emerged as the preferred routes, which comprise both Monroe Street and Thompson Road. Monroe Street ranked high, offering good connectivity to local and regional destinations and for its potential to realize Clackamas County TSP goal of creating a safe bicycle and pedestrian route. Thompson Road scored high because it serves as the main access road to Whitcomb Elementary.

The preferred route for the *Monroe Neighborhood Street Design Plan* is a hybrid of Alternatives 1 and 5, referred to throughout this plan as the Monroe—Thompson Corridor (Figure 3.3). The corridor is comprised of Monroe Street, Thompson Road, Boyer Drive, and Spencer Drive. For more information about the alternatives analysis process, refer to Appendix C.

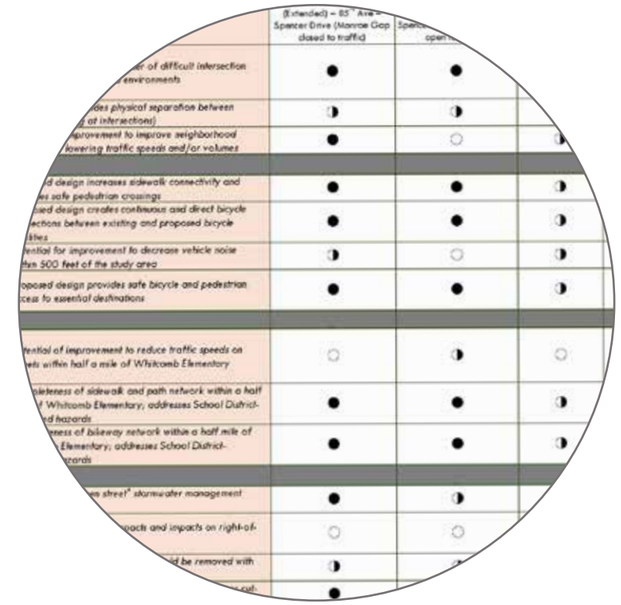

Figure 3.2 Alternatives Analysis Matrix

Indicates the extent to which route alternatives support project goals and objectives:

● *Fully support*

◑ *Neutral*

○ *Does not support*

Preferred Route: Monroe—Thompson Corridor

The preferred route for the *Monroe Neighborhood Street Design Plan* (Figure 3.3) will provide a safe, low-stress active transportation connection between Linwood Avenue and the I-205 Multi-Use Path. The route assumes that the Monroe Gap will be improved to allow bicycle and pedestrian access only. The route also assumes the completion of the Boyer Extension Project, which will provide a new multi-modal connection between Fuller Road and 82nd Avenue.

Given Safe Routes to School objectives, the preferred route includes connections along 72nd Avenue and Thompson Road, which serves as the frontage road for Whitcomb Elementary. East of 82nd Avenue, the preferred Monroe—Thompson Corridor includes Boyer Drive between 82nd and 85th Avenues, and links with the I-205 Multi-Use Path at Spencer Drive. The route will provide improved connections for westbound active transportation users traveling to downtown Milwaukie and Portland, as well as eastbound users traveling to Clackamas Town Center and the I-205 Multi-Use Path.

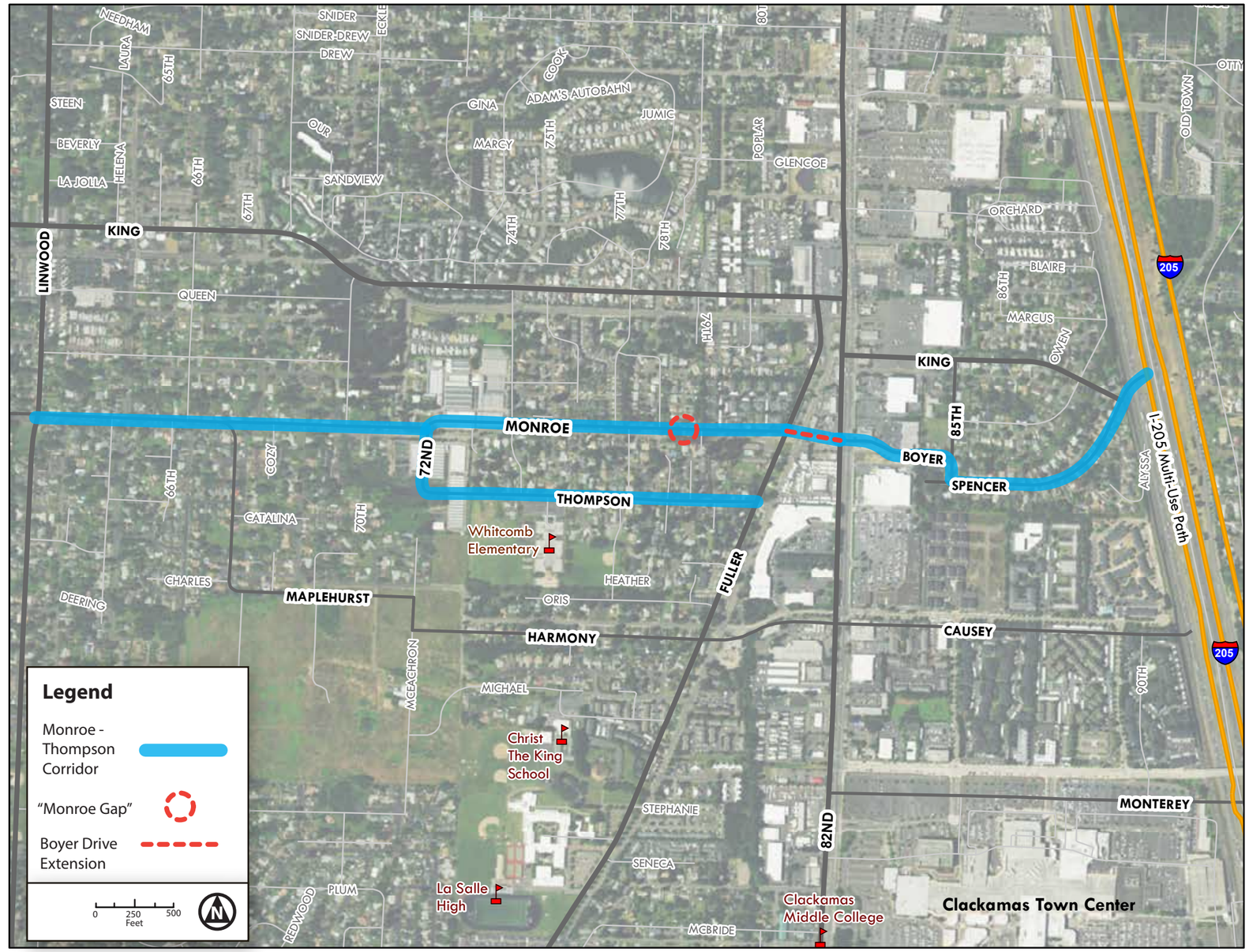

Figure 3.3 Monroe—Thompson Corridor

Map displays the preferred alignment for the Monroe—Thompson Corridor

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4. Monroe Neighborhood Street Design Plan

Designing the Route

The recommended design concept was developed iteratively based on feedback and discussion from the PAC, TAC, and general public. In February 2016, the project team presented a draft concept design to the public during Open House #1. The draft concept design was based on stakeholder input, analysis of the existing conditions, and project goals and objectives.

At Open House #1, the public was given the opportunity to provide feedback on key design considerations including (but not limited to) on-street parking, right-of-way impacts, speed control treatments, and stormwater management. Open House #2 allowed participants to comment on the draft plan.

Subsequent TAC and PAC meetings focused on revising the design to respond to comments received from the PAC, TAC, and general public. In two subsequent revision phases, the project team drew upon public feedback and TAC/PAC recommendations to refine the concept design. This final plan is the result of that revision process.

Example of bicycle wayfinding signage. City of Milwaukie (2012)

Major Design Components

Traffic calming treatments are included throughout the Monroe—Thompson Corridor, including speed cushions, signage, and intersection realignments. Between Linwood Avenue and Fuller Road, major components of the design include a curbed, grade-separated shared-use path along parts of Monroe Street. Bioswale and landscaping features are used to provide intermittent buffers between the shared-use path and the roadway while also providing stormwater management benefits.

The *Monroe Neighborhood Street Design Plan* recommends that the Monroe Gap east of 78th Avenue is improved for bicycle and pedestrian access only. The recommended design to the Monroe Street Gap is a 12-foot shared use path.

Major design components along Thompson Road between 72nd Avenue and Fuller Road include a mini-roundabout at the intersection of 72nd Avenue and Monroe Street, which would facilitate the transition of the Monroe Street shared-use path from the north side of Monroe Street to the south side of Thompson Road. To complete the bicycle and pedestrian network on both sides of Thompson Road, the design also includes a sidewalk and bike lane on the north side of Thompson Road, in addition to raised crosswalks and a pedestrian-activated rapid flashing beacon at Whitcomb Elementary School. To accommodate peak drop-off and pick-up times as well as overflow parking from the Whitcomb Elementary parking lot, on-street parking is maintained on the south side of Thompson Road between 72nd Avenue and 74th Avenue.

Bicycle wayfinding signage is recommended in locations where cyclists face a route-finding decision.

Stormwater Management

Neighborhood-scale stormwater management includes a range of treatments. **Bioswales** are typically oblong, gently sloping, landscaped depressions that capture and hold stormwater runoff, allowing special plants to absorb the water and keep it off of adjacent properties. **Pervious pavement** allows water to seep down through smooth, permeable surfaces used for walkways and driveways.

In addition to stormwater management benefits, bioswales can be utilized as "buffers," separating pedestrians and vehicles. Vegetated stormwater buffers along pedestrian facilities help slow traffic while providing appealing neighborhood landscaping.

The following sections describe the Monroe Neighborhood Street Design in more detail, including concept-level design plans and general cross-section drawings.

Example of chicanes in a neighborhood setting in Shoreline, WA.

Street Right-of-Way: Utility Requirements

The ultimate street right-of-way must include space for utilities, traffic control devices and information signage as determined in the construction design phase. This is in addition to the right-of-way shown for the pedestrian, bicycle and road improvements. As the improvements shown in this plan move toward final design and construction it may be determined that 2-3 feet of right-of-way for utilities and/or signage is needed in excess of the proposed cross sections depicted in Figure 4.10 – 4.23.

Example of a shared-use path in Washington County, OR. Photo: Clackamas County, OR.

3. Although the ***Monroe Street Neighborhood Street Design Plan*** recommends the shared-use path on the north side of Monroe Street, providing the shared-use path on the south side of Monroe Street was also determined as a feasible option during the design process. The final location of the shared-use path on the north or south side of Monroe Street is subject to change as the plan moves toward final design and construction.
4. All design features are subject to modification in final design and construction. Facility locations are representative only; final facility locations will consider factors such as parking, driveway locations, and property impacts.

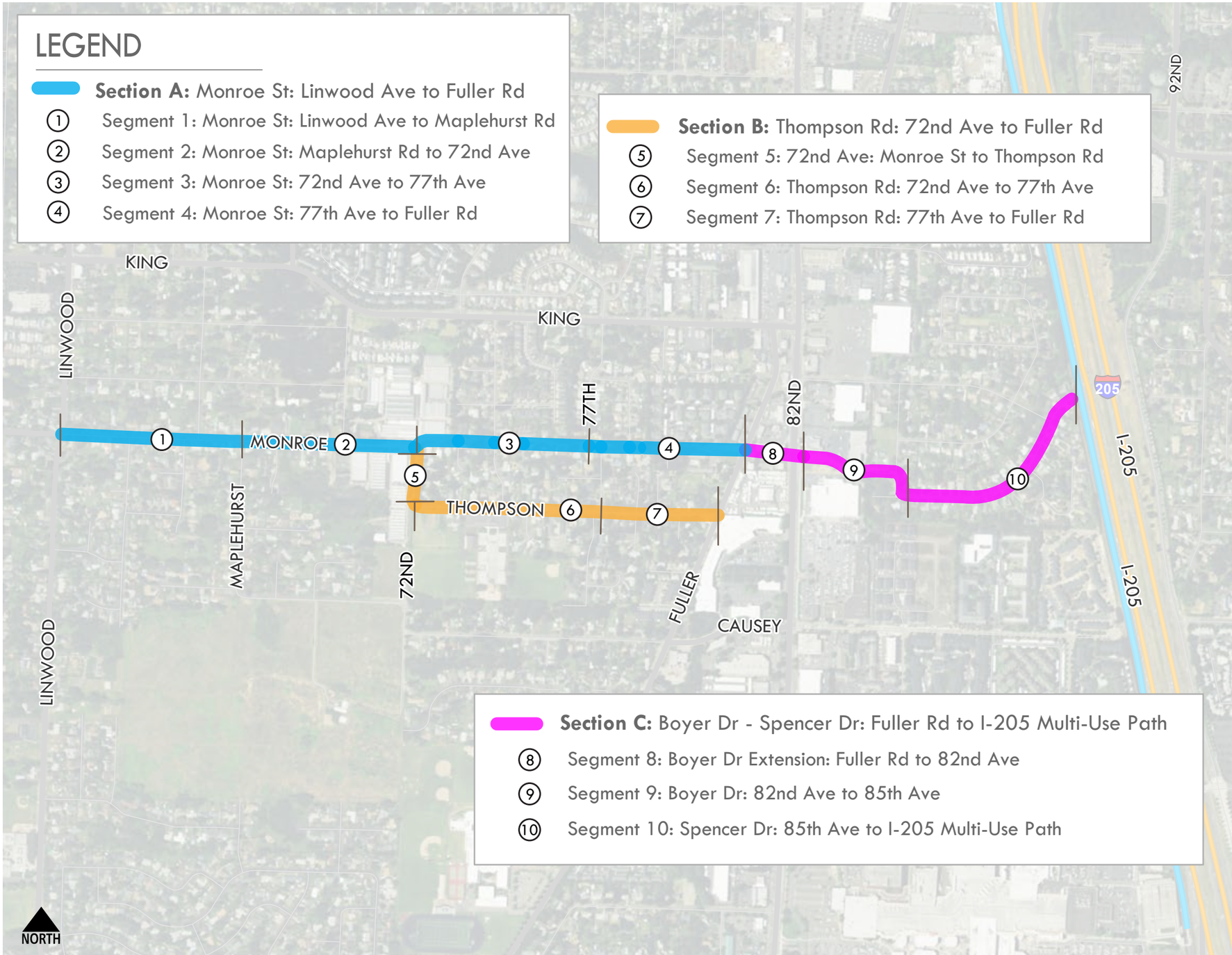


Figure 4.1 Monroe–Thompson Corridor Design Sections: Segments

For analysis purposes, plan recommendations have been organized into Sections A, B, and C.

Design Elements

Section A: Monroe Street—Linwood Avenue to Fuller Road

Segment 1: Monroe Street—Linwood Avenue to Maplehurst Road

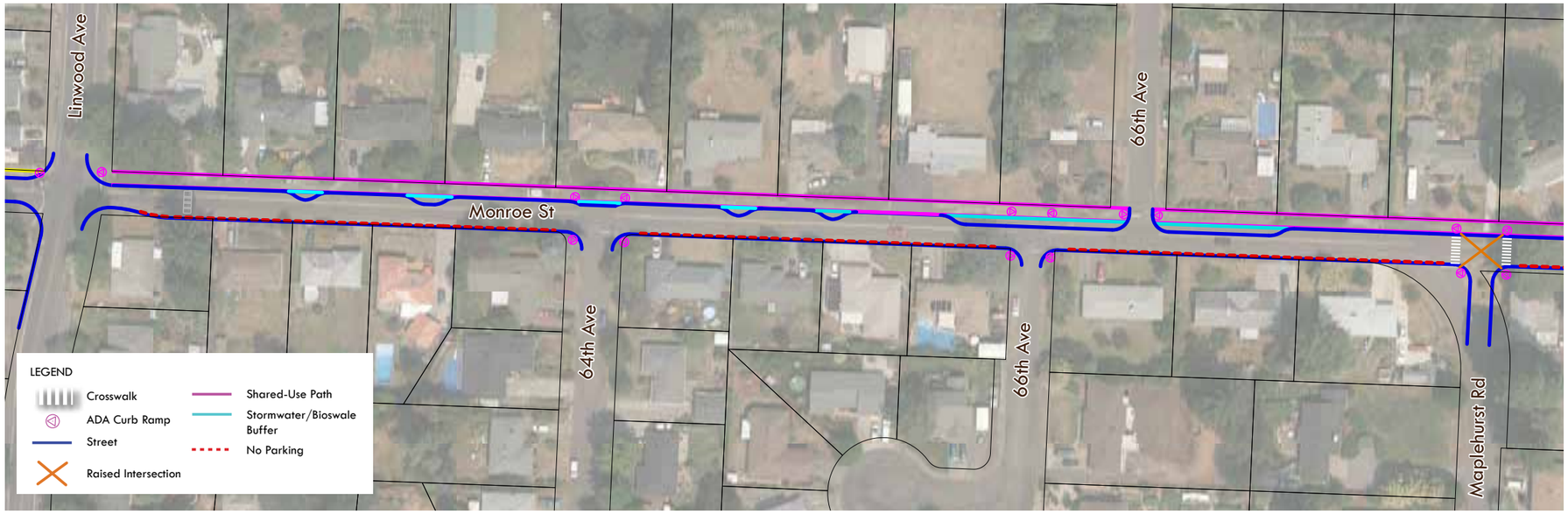


Figure 4.2 Recommended design for Monroe Street—Linwood Avenue to Maplehurst Road

Example of a raised intersection in a residential setting. Photo: Streets.mn (2015)

Monroe Street between Linwood Avenue and Maplehurst Road is relatively narrow, with a right-of-way of 40 feet, and currently does not provide sidewalks or bicycle facilities. Private properties abut the County roadway. The design for this segment of Monroe Street assumes the construction of a traffic diverter at Linwood Avenue as part of the City of Milwaukie's *Neighborhood Greenway Concept Design Plan*, which will prevent motorists from traveling east-west across Linwood Avenue. Bicyclists can continue straight through the intersection.

The major design component for this segment is a 12-foot shared-use path on the north side of Monroe Street, which is designed to provide adequate physical separation between bicycles, pedestrians, and motorists.[5] The shared-use path is grade separated and includes ADA-compliant curb ramps at intersections. The shared-use path also employs intermittent vegetated buffers to provide increased physical separation between active users and motorists, traffic calming, parking spaces within buffer inlets, and stormwater management benefits.

The plan recommends the removal of parking along the south side of Monroe Street. Speeding was noted as a major concern throughout this segment, and speed bumps are included at key locations. Speed bump locations are conceptual, but spacing must be close enough that speeding between them does not occur. The design also recommends a raised intersection at Monroe Street and Maplehurst Road. Raised intersections can help reinforce slow speeds and encourage motorists to yield to pedestrians at crosswalks (NACTO, 2015). Intersection realignment is also recommended at 64th Avenue, 66th Avenues, and Maplehurst Road in order to help slow fast-turning vehicles.

5. Although the ***Monroe Neighborhood Street Design Plan*** recommends the shared-use path on the north side of Monroe Street, providing the shared-use path on the south side of Monroe Street was also determined as a feasible option during the design process. The final location of the shared-use path on the north or south side of Monroe Street is subject to change as the plan moves toward final design and construction.

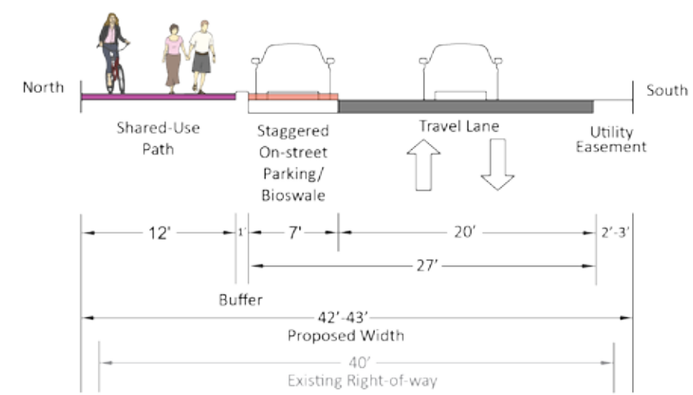


Figure 4.3 Proposed cross-section for Monroe Street, between Linwood Avenue and Maplehurst Road

The 1-foot buffer shown is to provide separation between the shared-use path and parking. The buffer could be a paved curb, permeable landscaping, or a stormwater inlet covered with bicycle-friendly grates. Buffer design details will be determined during final design.

Design Elements

Section A: Monroe Street—Linwood Avenue to Fuller Road

Segment 2: Monroe Street—Maplehurst to 72nd Avenue

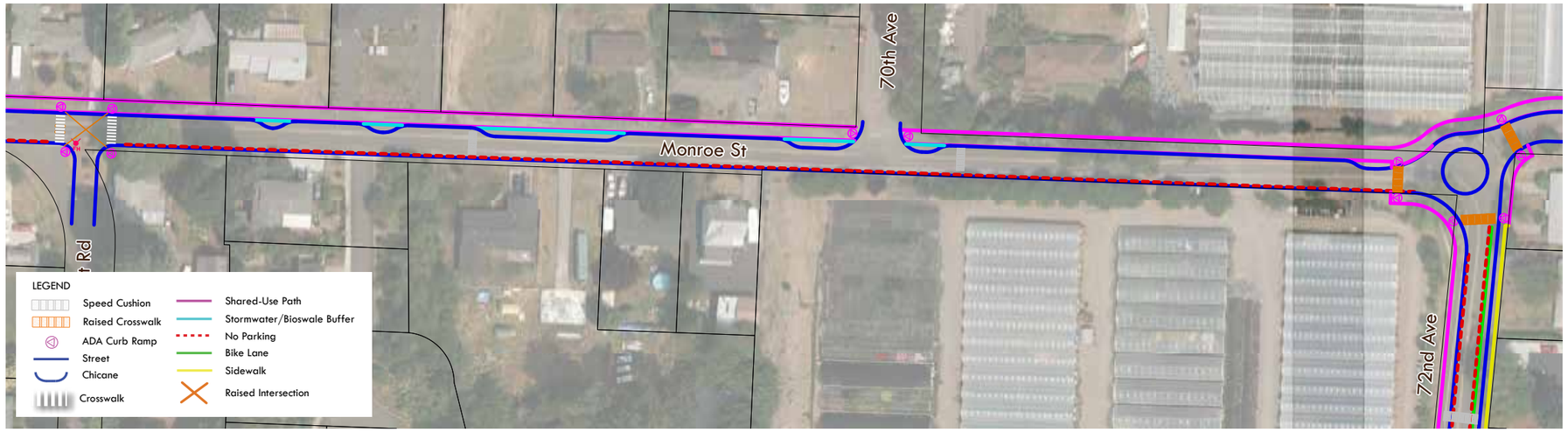


Figure 4.4 Recommended design for Monroe Street—Maplehurst to 72nd Avenue

Example of a neighborhood mini-roundabout with mountable curb in Lansing, Michigan. This design functions as a traffic calming element while preserving access for larger vehicles, such as school buses, delivery trucks, and emergency vehicles. Photo: Google Earth (2011)

The *Monroe Neighborhood Street Design Plan* recommends a continuation of the shared-use path along the north side of Monroe Street between Maplehurst Road and 72nd Avenue, complete with intermittent vegetated buffers and no parking on the south side of the street.

Special consideration was given to minimizing parking impacts near the Koida Nursery, located at the corner of Monroe Street and 72nd Avenue. Parking spaces on Monroe Street are provided along the north side of Monroe Street in the vicinity of the Koida Nursery in order to accommodate nursery employees and visitors.

Roundabout at 72nd Avenue

Neighbors in the area expressed concerns about speeding through the three-way intersection at Monroe Street and 72nd Avenue. This intersection is also difficult for bicyclists traveling east along Monroe Street, where a of lack of bicycle facilities, signage, and pavement markings make the intersection confusing and potentially dangerous given high automobile speeds. To address this challenge, realignment of the intersection to a "T" intersection was explored along with other traffic calming schemes.

Ultimately, the *Monroe Neighborhood Street Design Plan* recommends a mini-roundabout concept at this intersection, which was determined to be the best technical solution to reduce speeds through the intersection. The mini-roundabout concept is designed to accommodate the Monroe Street shared-use path and to provide a smooth transition to the bicycle facilities on Thompson Road. Raised crosswalks are also included at each of the three legs to provide safe bicycle and a pedestrian crossings while encouraging vehicles to slow down. The mini-roundabout configuration is intended to be negotiated at vehicle speeds of 15-20 mph. It is also designed with a mountable curb and is not landscaped so that larger vehicles such as school buses and emergency vehicles can still negotiate the intersection. The mini-roundabout would require some right-of-way acquisition at each corner, and would impact some of the mature trees and landscaping at the intersection. This treatment is designed to provide safer travel through the intersection for all modes.

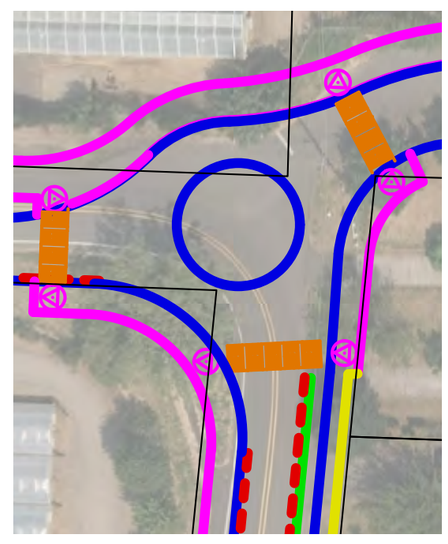


Figure 4.5 Enlarged recommended design for intersection

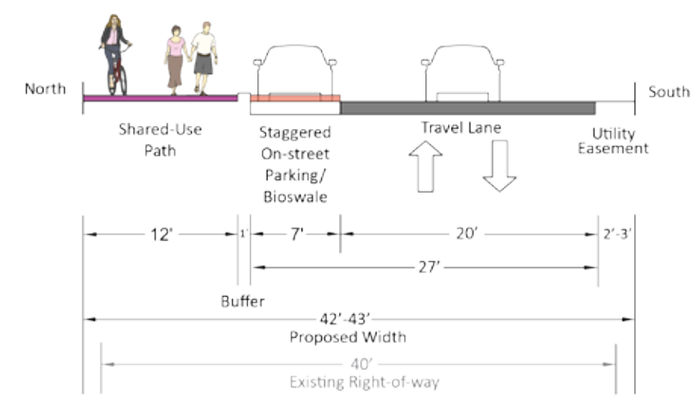


Figure 4.6 Proposed cross-section for Monroe Street, between Maplehurst Road and 72nd Avenue

The 1-foot buffer shown is to provide separation between the shared-use path and parking. The buffer could be a paved curb, permeable landscaping, or a stormwater inlet covered with bicycle-friendly grates. Buffer design details will be determined during final design.

Design Elements

Section A: Monroe Street—Linwood Avenue to Fuller Road

Segment 3: Monroe Street—72nd Avenue to 77th Avenue

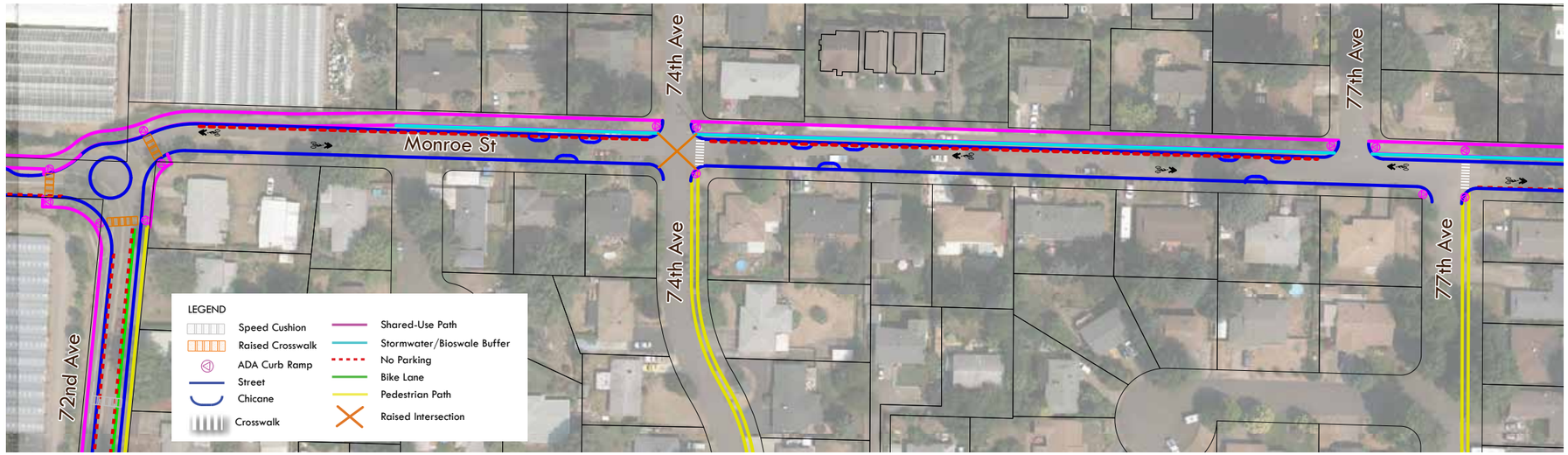


Figure 4.7 Recommended design for Monroe Street—72nd Avenue to 77th Avenue

74th Avenue looking north. Photo: CH2M (2015)

The *Monroe Neighborhood Street Design Plan* recommends the continuation of the path on the north side of Monroe Street between 72nd and 77th Avenues, complete with vegetated buffer space. The path in this segment is reduced from 12 feet to 10 feet. "Sharrow" pavement markings are shown on the street since traffic speeds and volumes are low. Children are likely to use the path rather than share the street with cars. On-street parking is maintained on the south side of Monroe between 72nd Avenue and 74th Avenue. East of 74th Avenue, parking is provided intermittently in key locations.

A raised intersection with crosswalk are recommended at Monroe Street and 74th Avenue. Chicanes are also proposed on both east and west legs of the Monroe Street and 74th Avenue intersection to slow traffic down. [6]

Pedestrian Network Improvements on 74th and 77th Avenues

74th and 77th Avenues serve as important north-south connections between Monroe Street and Thompson Road, particularly for kids and families traveling to and from Whitcomb Elementary School. To support Safe Routes to School objectives, the recommended design includes network improvements along 74th and 77th Avenues, including sidewalks on the east sides of these streets. Crosswalks and raised intersections are included at the intersections of these streets with Monroe Street and Thompson Road to improve pedestrian connections to Whitcomb Elementary.

Example of a standard "Sharrow" pavement marking, used to indicate a street environment shared by bicyclists and automobiles. Image: CH2M (2016).

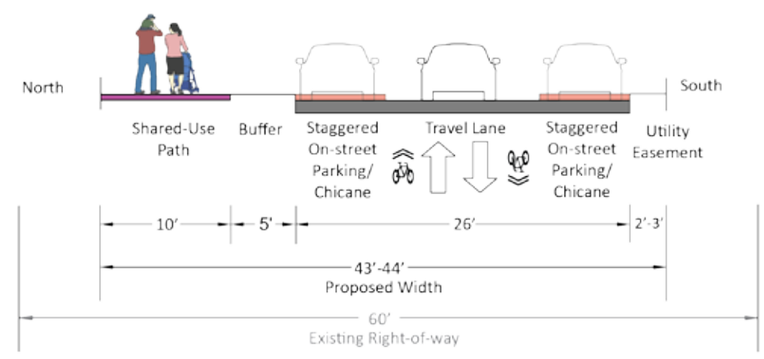


Figure 4.8 Proposed cross-section for Monroe Street, between 72nd Avenue and 77th Avenue

6 Locations of chicanes are conceptual, and are shown for illustrative purposes only. The precise location of chicanes will be determined during final design.

Design Elements

Section A: Monroe Street—Linwood Avenue to Fuller Road

Segment 4: Monroe Street—77th Avenue to Fuller Road

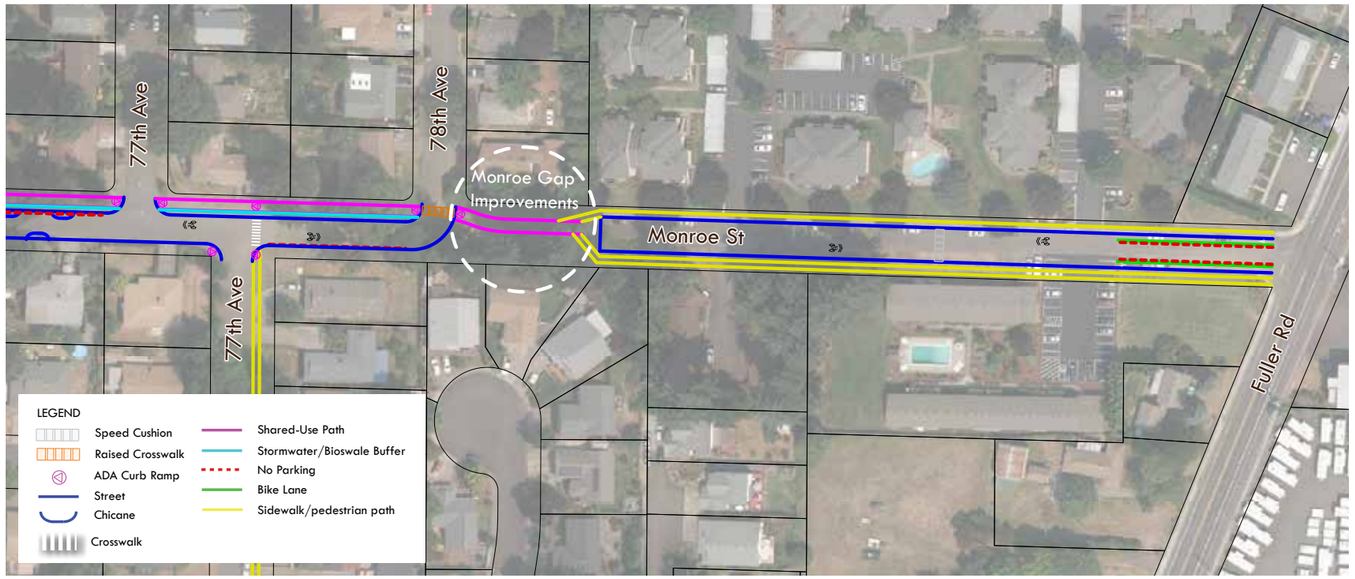


Figure 4.9 Recommended design for Monroe Street—77th Avenue to Fuller Road

The concept design for Monroe Street continues the shared-use path on the north side of Monroe Street to the current Monroe Gap just east of 78th Avenue. The Gap is improved for bicycle and pedestrian access only.

At the west end of the Gap, pedestrians and bicyclists will connect to the shared-use path via a raised crosswalk at 78th Avenue and Monroe Street. Bollards will prevent vehicles from attempting to drive through the Gap. See Section A, Segment 4 for more detailed information about proposed improvements to the Monroe Gap.

At the east end of the gap, the shared-use path transitions to sharrow pavement markings and parking on both sides of the street. There is currently a sub-standard sidewalk on the north side of Monroe Street east of the Gap. The plan recommends adding a 6 foot sidewalk with 5 foot buffer to the south side of the street to complete the pedestrian network in this area. In future stages of the project, the County may decide to further improve the network by updating the existing sidewalk to County standards.

Approximately 200 feet from Fuller Road, the recommended design along Monroe Street transitions from shared space and parking on both sides to bike lanes and no parking on both sides of the street, in an effort to match improvements planned as part of the Boyer Drive Extension project. Sidewalks are recommended on both sides of the street from the Gap to Fuller Road.

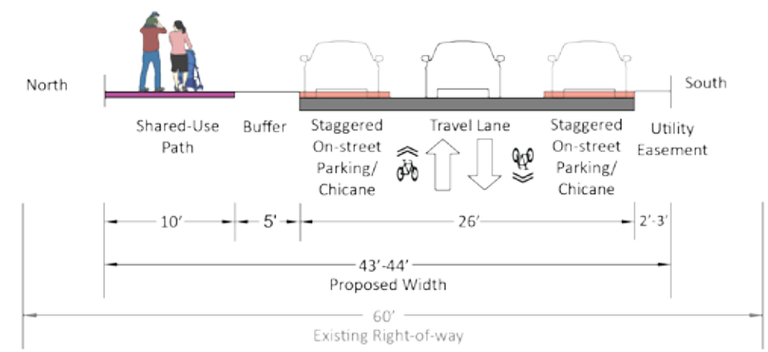


Figure 4.10 Proposed cross-section for Monroe Street, between 72nd Avenue and 78th Avenue (west of the Monroe Gap)

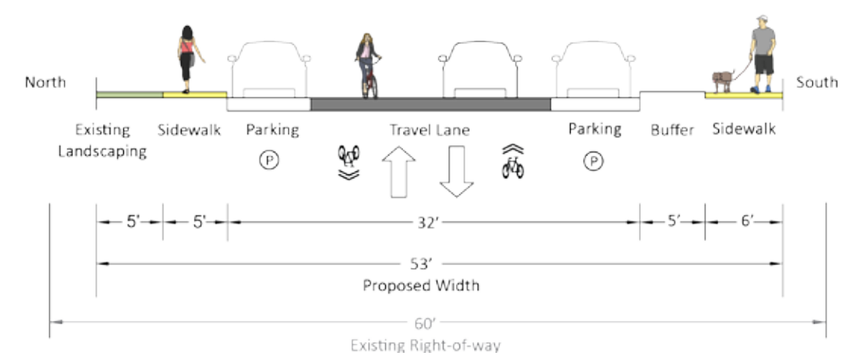


Figure 4.11 Proposed cross-section for Monroe Street, between 77th Avenue to Fuller Road (east of the Monroe Gap)

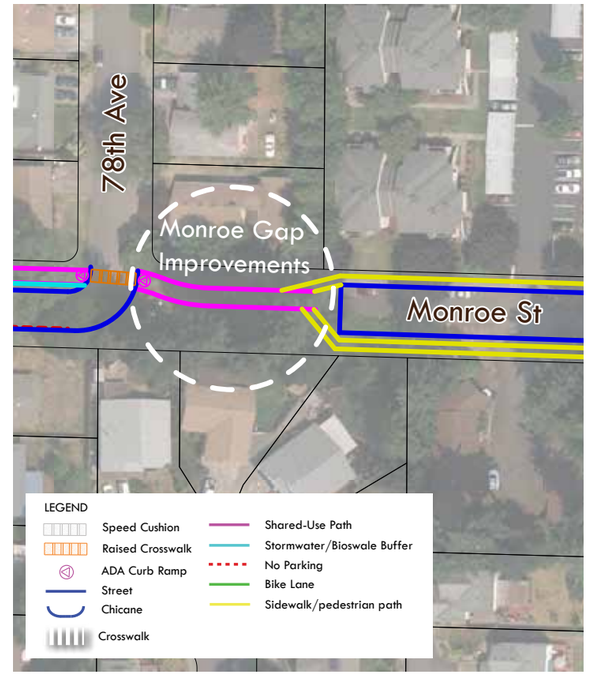
Approximately 200 feet before reaching Fuller Road, cross-section transitions to "no parking" and 6 foot bike lanes on both sides of the street, maintaining a 53' proposed cross-section width.

Design Elements

Section A: Monroe Street—Linwood Avenue to Fuller Road

The Monroe Gap

Figure 4.11 Conceptual rendering of Monroe Gap. Bollards prevent automobiles from driving through while preserving emergency vehicle access. The 12-foot path is bordered by natural landscaping on both sides.



Monroe Gap as it exists during the writing of this plan. Photo: CH2M (2015)

Monroe Gap Improvements

The *Monroe Neighborhood Street Design Plan* recommends that the Monroe Gap just east of 78th Avenue be improved to accommodate an enhanced bicycle and pedestrian-only connection to the I-205 Multi-Use Path and regional trail systems A 12-foot path follows the roadway centerline through the Gap itself.

Design considerations for improving the Monroe Gap could include guidelines for improving safety in public spaces, such as Crime Prevention Through Environmental Design (CPTED) principles.[7] 'Flexible' bollards that can be removed or lowered to allow emergency vehicle access will restrict vehicle access through the Gap. Alternative path treatments through the Gap should also be considered, including pervious pavement and stormwater management features. The County may also explore opportunities to engage community-based partners and residents to help landscape and maintain the Gap.

7. http://www.cpted.net/

Design Elements

Section B: Thompson Road—72nd Avenue to Fuller Road

Segment 5: 72nd Avenue—Monroe Street to Thompson Road

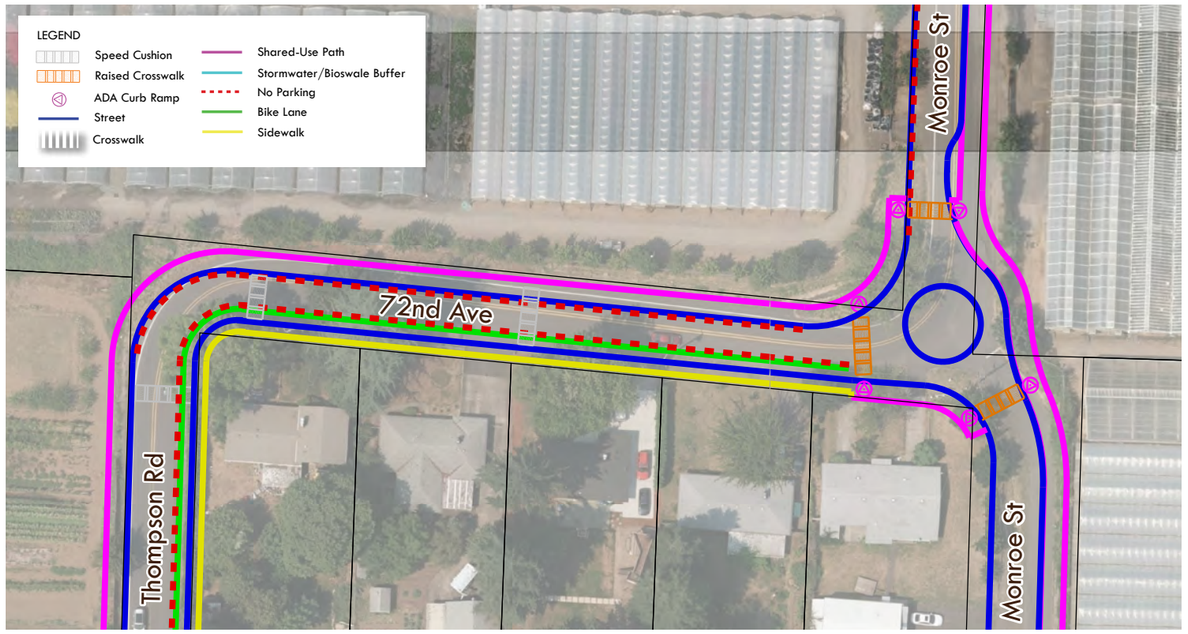


Figure 4.12 Recommended design for 72nd Avenue—Monroe Street to Thompson Road

72nd Avenue between Monroe Street and Thompson Road serves as an important transition between the Monroe Street shared-use path and the bicycle and pedestrian facilities along Thompson Road. Major design components along 72nd Avenue include an extended shared-use path on the west side. The shared-use path in this segment is 10 feet wide.

A sidewalk and conventional bike lane are recommended along the east side of 72nd Avenue, including ADA-accessible curb ramps at each leg of the 72nd Avenue intersection.

Speeding is a significant concern through this segment, and the proposed design recommends speed bumps in key locations. Although the final location of speed bumps will be determined during final design, the plan recommends one mid-block along 72nd Avenue as well as one at each end of the turn from 72nd Avenue to Thompson Road. Parking is eliminated throughout this transition area to minimize potential conflicts between active users and motorists.

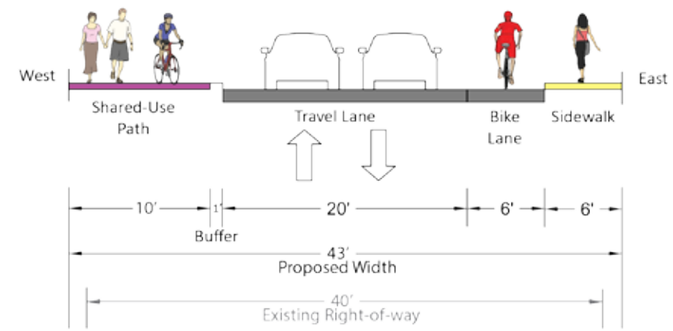


Figure 4.13 Proposed cross-section for 72nd Avenue, between Monroe Street and Thompson Road

The 1-foot buffer shown is to provide separation between the shared-use path and parking. The buffer could be a paved curb, permeable landscaping, or a stormwater inlet covered with bicycle-friendly grates. Buffer design details will be determined during final design.

Design Elements

Section B: Thompson Road—72nd Avenue to Fuller Road

Segment 6: Thompson Road—72nd Avenue to 74th Avenue

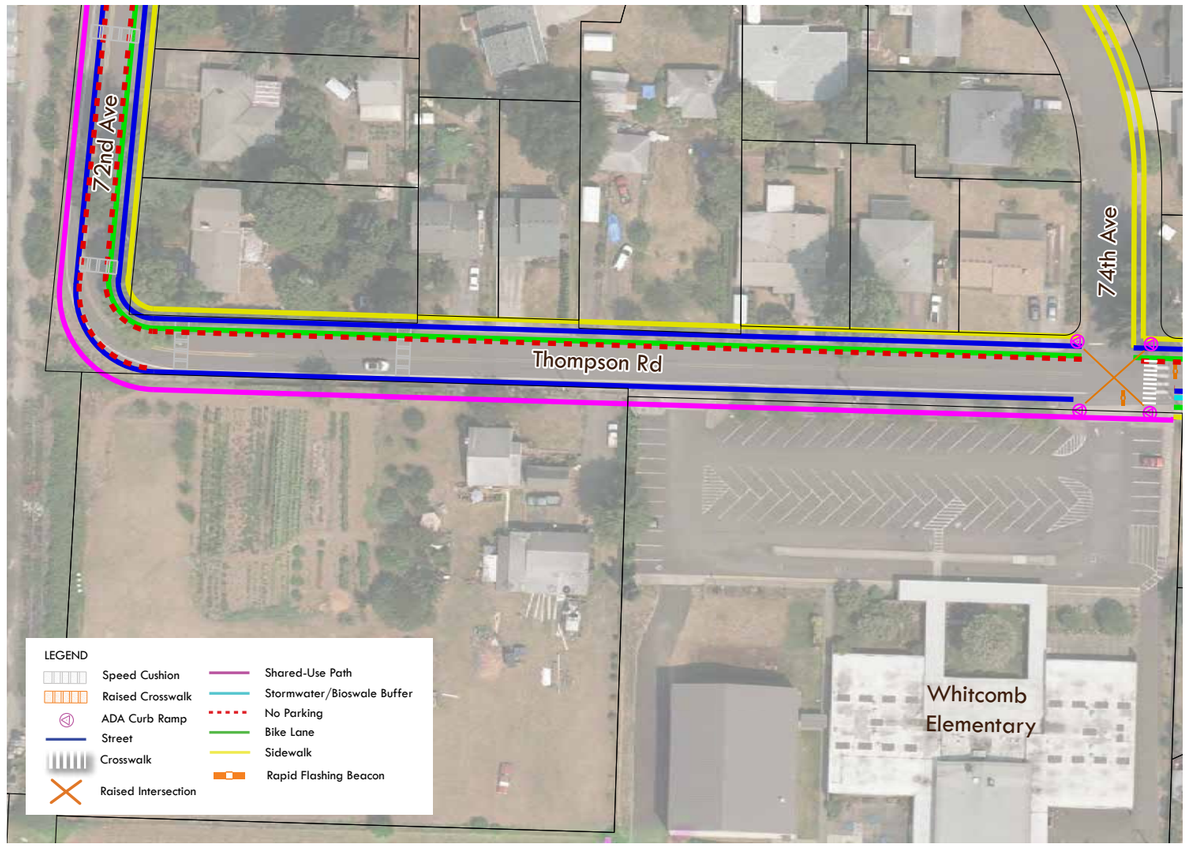


Figure 4.14 Recommended design for Thompson Road—72nd Avenue to 74th Avenue

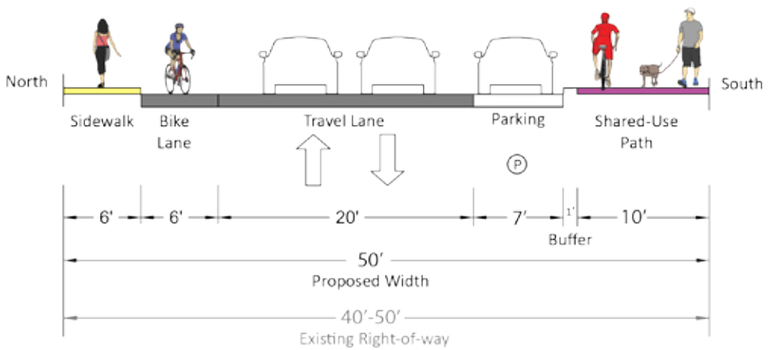
From a Safe Routes to School perspective, Thompson Road between 72nd Avenue and 74th Avenue is the most critical segment of the Monroe Neighborhood Street Design, as it serves as the main access to Whitcomb Elementary School during drop-off and pick-up times. Project stakeholders expressed strong support for improving this area for families and school-age children wishing to walk and bike to school. Speeding through this area is the major consideration, which led to a recommendation of a physical separation between active users and motorists.

Given these considerations, the recommended design for Thompson Road between 72nd Avenue and 74th Avenue includes a 10 foot shared-use path along the south side of Thompson Road, terminating at the eastern boundary of the school property. Parking is allowed in front of the school to accommodate student pick-up and drop-off. A raised intersection, crosswalk, and pedestrian-activated rectangular rapid-flashing beacon are proposed at the intersection of 74th Avenue and Thompson Road to make crossing safer. A sidewalk and bike lane are proposed on the north side of Thompson Road between 72nd Avenue and 74th Avenue to provide safe westbound bicycle access.

Example of a rapid-flashing beacon. Photo: City of Lincoln, NE Traffic Engineering

Figure 4.15 Proposed cross-section for Thompson Road, between 72nd Avenue and 74th Avenue

The 1-foot buffer shown is to provide separation between the shared-use path and parking. The buffer could be a paved curb, permeable landscaping, or a stormwater inlet covered with bicycle-friendly grates. Buffer design details will be determined during final design.



Design Elements

Section B: Thompson Road—72nd Avenue to Fuller Road

Segment 7: Thompson Road—74th Avenue to Fuller Road

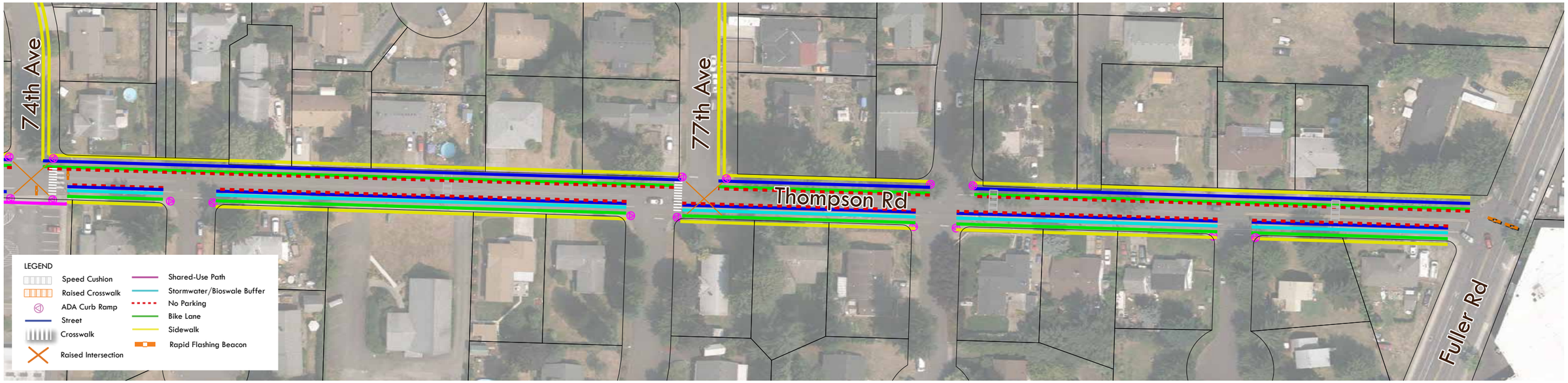


Figure 4.16 Recommended design for Thompson Road—74th Avenue to Fuller Road

The design for Thompson Road between 74th Avenue and Fuller Road recommends sidewalks, bicycle lanes, and no-parking on both sides of the street. The bicycle lane on the south side of Thomspon Road is additionally protected from vehicle traffic by a 5-foot vegetated buffer that will eliminate the possibility of vehicles stopping or parking in the bicycle lane.

A raised intersection, marked crossing, and pedestrian-activated rectangular rapid-flashing beacon are proposed at the intersection of Thompson Road and 77th Avenue to provide a safer neighborhood connection for people walking to Whitcomb Elementary School. Speed bumps are also proposed at key locations throughout this segment to reduce speeding near the school.

A rapid-flashing beacon is recommended at the intersection of Thompson Road and Fuller Road to improve safety for pedestrians and bicyclists accessing Clackamas Town Center, the I-205 Multi-Use Path, and other regional destinations. This will also facilitate safe access to the existing bicycle lanes on Fuller Road.

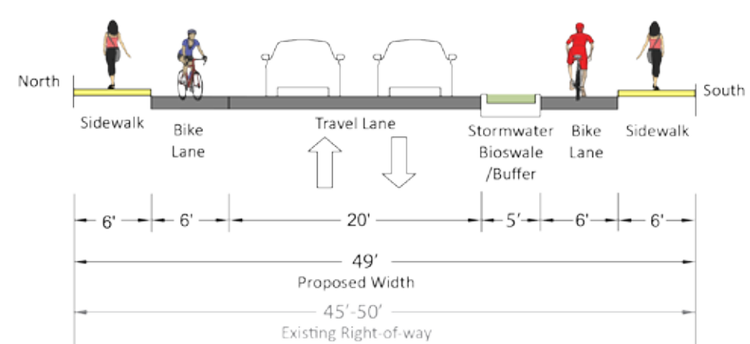
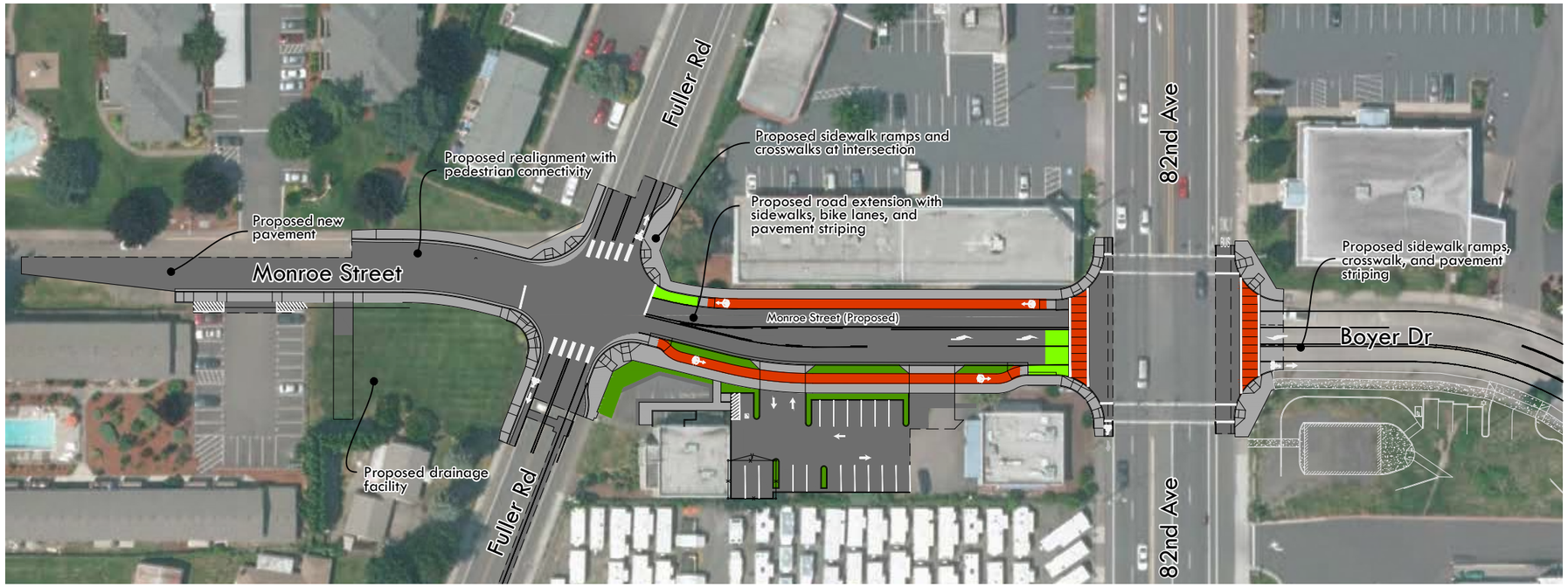


Figure 4.17 Proposed cross-section for Thompson Road, between 74th Avenue and Fuller Road

Design Elements

Section C: Boyer Drive to Spencer Drive—82nd Avenue to I-205 Multi-Use Path

Segment 8: Boyer Drive Extension—Fuller Road to 82nd Avenue



Conceptual rendering showing a bicycle box at a signalized intersection with a bicycle lane approach. Credit: NACTO (2015)

Figure 4.18 Design for Boyer Drive Extension—Fuller Road to 82nd Avenue

The Clackamas Town Center area has few streets connecting neighborhoods west of 82nd Avenue to the many services available in the area. This puts an extra burden on existing roads such as Harmony Road, Causey Avenue and King Road.

To improve connectivity for residents going to and coming from the Town Center area, Clackamas County is extending Boyer Drive from 82nd Avenue to Fuller Road. Improvements will include a new two-lane road with sidewalks, landscaping, lighting, storm drainage facilities, and a new signal at the Fuller Road/82nd Avenue intersection. The Fuller Road/King Road intersection will be modified to only allow right-in and right-out traffic movement.

The Boyer Drive project will also include a separated cycle track between Fuller Road and 82nd Avenue, providing a safe and comfortable connection for active transportation users from Monroe Street to Spencer Drive and ultimately the I-205 Multi-Use Path. Design is scheduled to be completed in winter 2016, and construction beginning in spring 2017.

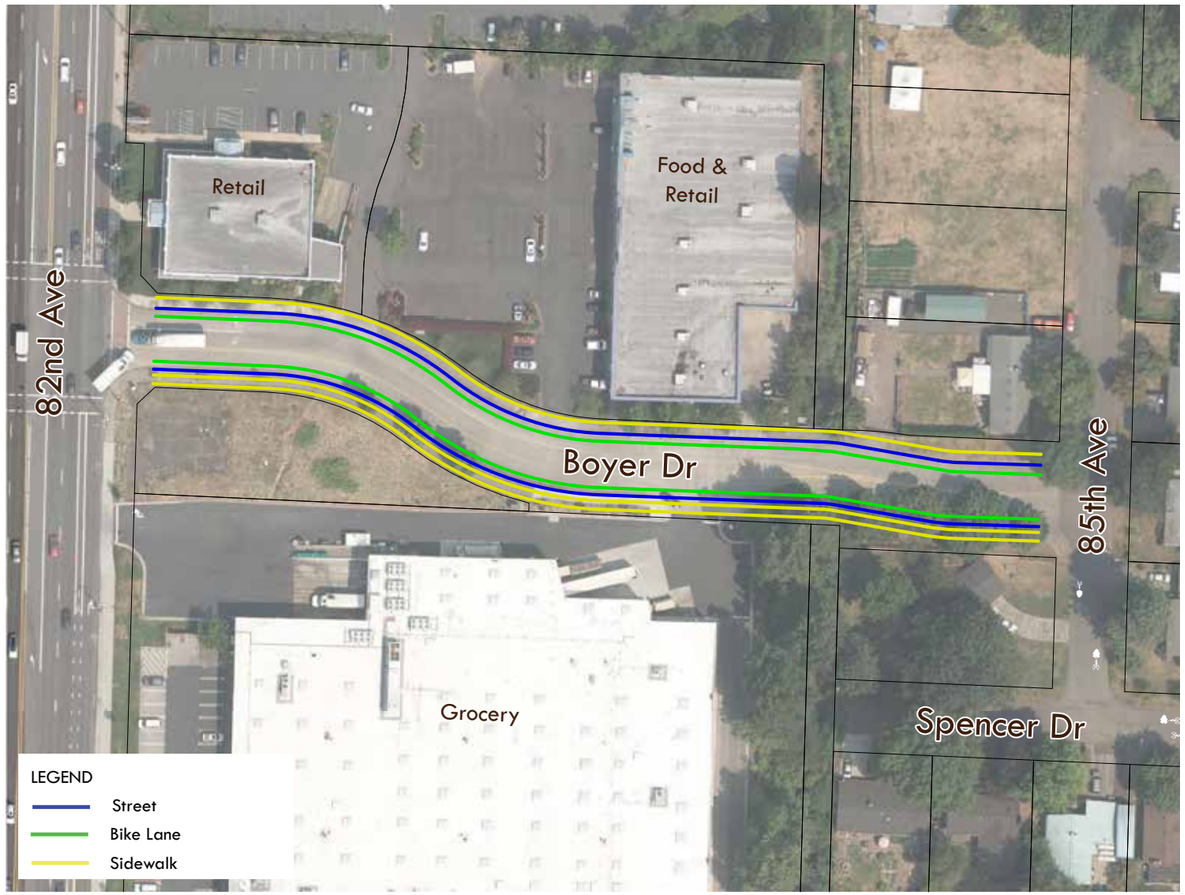
The Boyer Drive Extension Project will also include a "bike box," a designated bicycle-only area just ahead of the vehicle stop line at the intersection of Boyer Drive and 82nd Avenue. Bike boxes are designed to increase safety for riders crossing high-traffic signalized intersections. A green-painted bike lane runs to the right of queued cars, widening to a lane-width "box" at the actual intersection. This allows bicyclists to move to the head of a line of vehicles stopped for a red light, making them visible to drivers and allowing them to clear the intersection safely before vehicles begin turning right. Bike boxes increase safety and predictability for everyone using the intersection – including drivers - and minimize the potential for "right-hook" collisions where a right-turning car collides with a bicyclist heading straight through the intersection. The bike boxes proposed as part of the Boyer Drive Extension Project will be the first in Clackamas County.

Figure 4.19 Cross-section for Boyer Drive Extension, between Fuller Road to 82nd Avenue

Design Elements

Section C: Boyer Drive to Spencer Drive—82nd Avenue to I-205 Multi-Use Path

Segment 9: Boyer Drive — 82nd Avenue to 85th Avenue



The segment of Boyer Drive between 82nd and 85th Avenues will provide an important transition between the improvements planned as part of the Boyer Extension Project and the Monroe Neighborhood Street Design Plan.

The plan for this segment recommends continuous bike lanes and sidewalks along both sides of the Boyer Drive to improve connections to these destinations for pedestrians and bicyclists. Upon reaching 85th Avenue, bike lanes on both sides of the street transition to shared-space along 85th Avenue and Spencer Drive.

Recommended improvements along this segment are designed to help minimize conflicts between active users and vehicle traffic while providing a continuous bicycle and pedestrian connection between Linwood Avenue and the I-205 corridor.

Figure 4.20 Recommended design for Boyer Drive—82nd Avenue to 85th Avenue

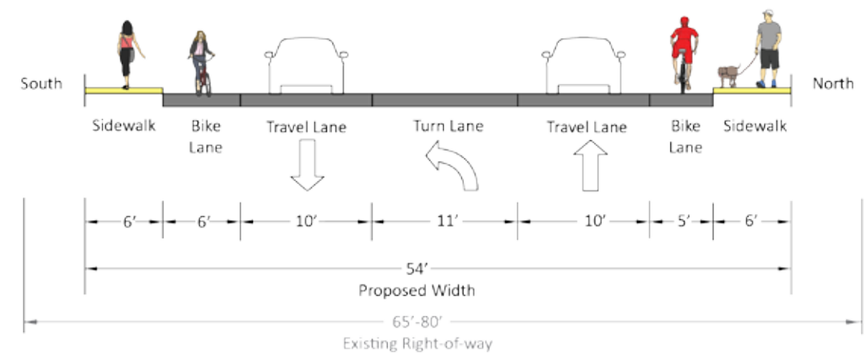


Figure 4.21 Proposed cross-section for Boyer Drive, between 82nd Avenue and 85th Avenue

Design Elements

Section C: Recommended Design for Boyer Drive to Spencer Drive—82nd Avenue to I-205 Multi-Use Path

Segment 10: Boyer Drive to 85th Avenue to Spencer Drive—82nd Avenue to I-205 Multi-Use Path

Figure 4.22 Recommended design for Boyer Drive—82nd Avenue to I-205 Multi-Use Path

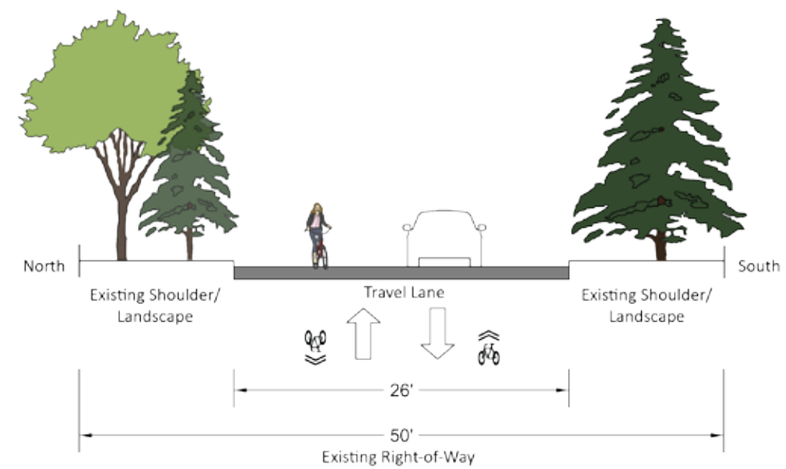


Figure 4.23 Proposed cross-section for Boyer Drive, between 82nd Avenue and the I-205 Multi-Use Path

The easternmost portion of the Monroe—Thompson Corridor connects 85th Avenue to the I-205 Multi-Use Path. It travels along Spencer Drive, a relatively low-speed, low-volume residential street. Few changes are needed to provide safe pedestrian and bicycle accommodations, but sharrow pavement markings are proposed throughout this segment to encourage safe shared use. Bicycle wayfinding signage is recommended at intersections where bicyclists are faced with a decision, such as 85th Avenue at Spencer Drive, and Boyer Drive at 85th Avenue. Special "gateway" wayfinding signage is recommended at the I-205 Multi-Use Path access at the end of Spencer Drive.

Gateway Considerations for the I-205 Multi-Use Path Connection

Stretching through five cities and 15 neighborhoods, the I-205 Multi-Use Path runs 16.5 miles and parallels the I-205 freeway from NE Marine Drive in Portland to SE 82nd Drive in Gladstone. The I-205 corridor, which now includes TriMet's MAX Green Line, transports thousands of Oregonians each day, north and south, via rail, car, bike and foot. The I-205 Multi-Use Path is used extensively by bicyclists, pedestrians and transit users.

Bicyclists and pedestrians can currently access the I-205 Multi-Use Path at the eastern terminus of Spencer Drive. With the exception of two small signs ("No Motor Vehicles" and "Bike Route"), the I-205 access at Spencer Drive currently lacks facility signage. The existing access also has limited sight distance due to landscaping. Given the local and regional significance of the I-205 corridor, wayfinding signage is recommended to improve this connection.

Signage for users entering Spencer Drive from the I-205 Multi-Use Path could provide directions to destinations north and south of Spencer Drive, such as Clackmas Town Center and the SE Fuller Road MAX Station.

Gateway treatments can range from simple signage upgrades to more elaborate installations, including the use of large welcome signs, textured pavements, and pavement markings. Gateway treatments and signage in this location need to be coordinated and approved by the Oregon Department of Transportation.

Example of a neighborhood gateway treatment in Madison, Wisconsin. Actual gateway signage will be required to meet applicable Oregon Revised Statutes pertaining to signage along highways. Photo: Bay Creek Neighbors Association (2015).

I-205 Multi-Use Path access from Spencer Drive as it appears today

Looking north along the I-205 Multi-Use Path from Spencer Drive access

5. Creating the Monroe Neighborhood Street Design Plan

One of the objectives of the ***Monroe Neighborhood Street Design Plan*** was to conduct an open planning process that considers guidance and input from the general public, direct stakeholders, affected regional jurisdictions, and local businesses. To meet this objective, local advisory committees were chartered to provide community and technical guidance throughout the planning process. Brief descriptions of these advisory committees are provided below.

Project Advisory Committee (PAC)

The PAC is an advisory group of neighborhood representatives brought together to provide suggestions, raise important issues, and help meet the project objectives of the *Monroe Neighborhood Street Design Plan*. The PAC was composed of Monroe Street, Thompson Road, and Spencer Drive residents, neighborhood business owners, Whitcomb Elementary School representatives, and other community stakeholders.

The PAC met six times over the course of the project and engaged in a variety of activities, including an initial site visit of the project area to observe the existing conditions of the neighborhood, as well as group discussions, surveys, and design exercises. The PAC provided important guidance on the project evaluation criteria, helped refine route alternatives, and provided feedback on draft designs.

Technical Advisory Committee (TAC)

The TAC was chartered to provide expertise and guidance on the technical aspects of the project, and to ensure the development of a technically sound concept design that conforms to all applicable plans, policies, and Clackamas County roadway engineering standards. Over six meetings, the TAC helped inform decisions related to traffic engineering, roadway configurations, and bicycle and pedestrian facility design. The TAC included expertise from a variety of technical perspectives:

- Clackamas County Development Agency
- County Engineering and Planning divisions
- City of Milwaukie; ODOT
- County Water Environment Services; Clackamas County Fire District #1
- Safe Routes to School National Partnership
- Regional pedestrian and bicycle advocacy groups including the Bicycle Transportation Alliance and Oregon Walks.

Public Open Houses and Outreach

Two public open houses were held during the course of the project to give members of the general public an opportunity to provide input on draft *Monroe Neighborhood Street Design Plan* concept designs. Over 75 people attended each open house, attracting a broad cross-section of neighbors and stakeholders at each meeting. The open houses were publicized through a variety of means, including mailings to residents, press releases, distribution of meeting notices, email blasts, social media, and postings to the Monroe Neighborhood Street Design website (http://www.monroestreetplan.org).

Members of the public were encouraged to raise community issues, to discuss potential trade-offs associated with design concepts, and to weigh-in on potential solutions. Community members provided their feedback via surveys, comment cards, and informal discussion with project team members.

An online open house was also held in conjunction with Open House #1, which helped garner additional feedback from the community. The online open house offered similar methods of collecting community feedback, including detailed survey questions and general comment forms related to specific segments along the corridor.

The recommended Monroe Neighborhood Street Design was informed by public feedback on key elements of the design, including the importance of on-street parking, the appropriate level of investment along the Monroe—Thompson Corridor, and the decision to keep the Monroe Gap closed to automobiles. Community insight helped the project team understand the complexity of these issues, and develop solutions that responded to those concerns.

Photo taken during Open House #1. Photo: CH2M (2016)

6. Implementation and Funding

Concept-level Cost Estimates

Planning level costs for implementing the Monroe Street Neighborhood Street Design Plan are described in Appendix F.

Possible Funding Sources

Implementation of the Monroe Neighborhood Street Design Plan will require an opportunistic funding approach, potentially including funds from regional, state, and local sources. The costs associated with project elements range from relatively inexpensive treatments such paint and signage, to more significant investments such as sidewalk improvements and shared-use pathways. The funding strategy should seek to match specific elements to appropriate funding sources, including (but not necessarily limited to) the following:

ODOT STIP Enhance Funds

ODOT's Statewide Transportation Enhancement Improvement Program (STIP) Enhance program funds projects that enhance, expand, or improve the transportation system. The Enhance program reflects ODOT's goal to support multimodal investments in the statewide transportation system, including bicycle and pedestrian improvements. The selection process to receive STIP funding is competitive, as state and local agencies can apply for projects that are both on and off the ODOT highway system. The Oregon Transportation Commission selects STIP funding recipients based on local Area Commission on Transportation (ACT) recommendations.

ODOT Quick-Fix Program

This ODOT-administered program could be an appropriate funding source for crossing safety improvements at Fuller Road and 82nd Avenue.

ODOT ADA Funds

Beginning in 2015, the ODOT Highway Division has funding available to improve missing or substandard Americans with Disabilities (ADA) facilities on or adjacent to ODOT-owned roadways. This could potentially fund ADA ramps and crossing improvements on or adjacent to 82nd Avenue.

Metro MTIP/Regional Flexible Funds

Metro allocates federal Regional Flexible Funds through the Metropolitan Transportation Improvement Program (MTIP) on a four-year cycle. Funding is allocated to projects throughout the Portland Metro Region via a competitive application process. The next round of Regional Flexible Funds (RFF) proposals is due in late August, 2016. The Monroe Neighborhood Street Design could be submitted for funding at that time, either as a standalone project or in combination with the Monroe Street Neighborhood Greenway project in Milwaukie. In general, joint applications for projects of regional significance are especially strong in the RFF process. Key criteria for the 2016 round of applications include making conditions safer and more comfortable for walking and bicycling; and equity considerations.

In addition to the RFF application process, the Monroe Neighborhood Street Design project could be eligible for Metro funds to support project development in advance of a potential new regional funding source. This set-aside is intended to help projects of regional importance – including those that benefit walking and bicycling – be prepared to take advantage of new regional funding should it become available.

Clackamas County Road Fund

The County Road Fund is made up of revenue received through the Oregon State Highway Trust Fund from state gas tax, weight-mile tax, vehicle registration fees (VRF) and vehicle title fees. These funds are distributed to the County based on allocation schedules set out in state law. The Oregon Constitution and Oregon Revised Statutes (ORS) require that the Oregon State Highway Trust Fund revenue be used "…for the construction reconstruction, improvement, repair, maintenance, operation and use of public highways, roads, streets…" (including a mandatory minimum 1% annual expenditure on bicycle and pedestrian facilities). Road fund money is often used as the local contribution (match) for projects funded by federal, state and other local funding programs. The County Road Fund also includes federal funds from the Secure Rural Schools program.

Clackamas County Development Agency

SE Monroe Street, SE 72nd Avenue and a portion of SE Thompson Road west of Whitcomb Elementary are within the North Clackamas Revitalization Area (NCRA) urban renewal district. Roadway improvements are a priority of the NCRA Plan and funding for construction on these segments could come from the Clackamas County Development Agency. Approval of funding for individual projects is at the discretion of the Development Agency Board.

Implementing the Plan

The *Monroe Neighborhood Street Design Plan* articulates a vision for a low-stress pedestrian and bicycle connection that creates a safe street environment for neighbors and people traveling through the area. Achieving this vision will require the following:

Ongoing Community-Based Support

Community support will be necessary for the *Monroe Neighborhood Street Design Plan* to become a reality. The PAC, local businesses, and the general public provided critical local insight and support for the project, helping to identify tradeoffs and develop solutions to community issues.

Committed County Leadership

To become a reality, the *Monroe Neighborhood Street Design Plan* will need ongoing, committed support from Clackamas County leaders including the County Department of Transportation and Development and the Clackamas County Development Agency, as well as fire and school district representatives.

Additional Analysis

The *Monroe Neighborhood Street Design Plan* includes a detailed concept for Monroe Street and Thompson Road. However, several project elements will need to be developed and designed in greater detail, including bioswale buffers, chicanes, and stormwater treatments. In order to complete final engineering, additional stormwater analysis and property surveys will be required to determine the exact location and dimensions of stormwater treatment elements.

Additional survey work will be required to determine the exact placement of bicycle and pedestrian facilities, including signage, ADA curb ramps, and pavement treatments. Right of way and encroachment issues will need to be addressed.

Final engineering will need to be completed to determine the exact location and dimensions of specific project elements.

7. List of Appendices (included in a separate volume)

A. Policy Framework Memorandum

B. Safe Routes to School Action Plan, Whitcomb Elementary School

C. Alternatives Analysis Report

D. Existing Conditions and Needs Memorandum

E. Traffic Summary

F. Planning Level Costs

Monroe Neighborhood Street Design Plan: Appendices

June 2016

DRAFT

Appendices

A. Policy Framework Memorandum

B. Safe Routes to School Action Plan, Whitcomb Elementary School

C. Alternatives Analysis Report

D. Existing Conditions and Needs Memorandum

E. Traffic Summary

F. Planning Level Costs

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Appendix A

Policy Framework Memorandum

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MONROE NEIGHBORHOOD STREET DESIGN PLAN

POLICY FRAMEWORK & ALTERNATIVE ANALYSIS SELECTION CRITERIA MEMO

August 24, 2015

Introduction

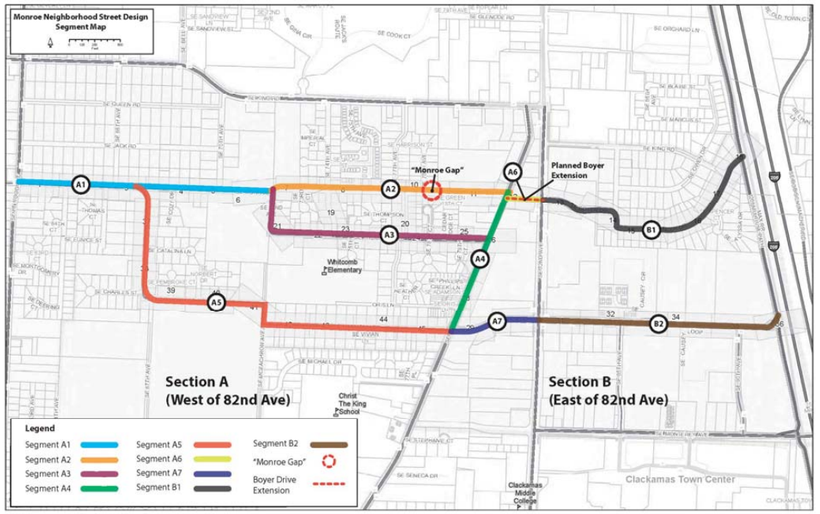
This memorandum summarizes policies and plans that establish the policy framework for the Clackamas County Monroe Neighborhood Street Design Plan effort. In addition, it describes a set of criteria to help the project team evaluate how potential alternatives perform against project objectives. Finally, the memo includes a summary list of comparable projects in the Portland region and beyond that can help inform options for the Monroe Neighborhood Street Design Plan.

Background

The Clackamas County Monroe Neighborhood Street Design Plan was developed to meet the goals and policies set forth in the County's Transportation System Plan, Active Transportation Plan, and Bicycle and Pedestrian Master Plans.

Stretching east from the Willamette River through Milwaukie and unincorporated Clackamas County to the I-205 multi-use path, Monroe Street is a key active transportation link in the area, connecting the Clackamas Town Center area, MAX Green Line station, and Springwater Corridor trail to downtown Milwaukie, the Milwaukie Orange Line station, and the Trolley Trail via the Monroe Neighborhood Greenway in Milwaukie. Monroe Street is identified as a key east-west pedestrian and bicycle connection in the County's transportation system plan, and as a Principal Active Transportation Route in the County's Active Transportation Plan. In addition, Metro's Regional Transportation Plan and Active Transportation Plan classify Monroe Street as a Bicycle Parkway, that plan's highest bicycle classification. A related plan has been developed for the section of Monroe located in the City of Milwaukie – the Monroe Street Neighborhood Greenway Concept Plan – and is in the adoption and implementation phase.

To build on this foundation, the Monroe Neighborhood Street Design Plan will develop a design for the section of Monroe between SE Linwood Avenue and the I-205 multi-use path that improves safety and travel conditions for pedestrians and bicyclists while balancing neighborhood livability and the needs of motor vehicle traffic on Monroe Street. The map below illustrates possible routes for the Monroe Neighborhood Street Design Plan. The map, routes, and associated analysis segments are discussed in detail in Technical Memorandum #2: Needs, Constraints, and Potential Solutions.



The primary purpose of the Clackamas County Monroe Neighborhood Street Design Plan is to identify a safe and direct active transportation route and conceptual design from the intersection of SE Linwood Avenue and Monroe Street in order to connect the City of Milwaukie Monroe Street Greenway to the I-205 multi-use path and Clackamas Regional Center area.

The plan will also include a Safe Routes to School element for Lot Whitcomb Elementary School, located one block south of Monroe Street on Thompson Street at 74th. The Safe Routes to School plan will engage students, parents and school staff to assess the physical barriers and hazards within several blocks of Whitcomb that discourage children from walking or biking to school. The Monroe Neighborhood Street Plan will include recommendations to address those barriers with a range of education, enforcement and engineering solutions. In concert with other Monroe Neighborhood Street Plan elements, these solutions will strengthen the active transportation connections between Whitcomb Elementary and local homes, parks, trails and other destinations.

Applicable plans and policies

The following plans, policies, and studies were reviewed and their relevance to the project is highlighted in this memorandum.

Clackamas County plans

- Clackamas County Transportation System Plan
- Clackamas County Active Transportation Plan
- Clackamas Regional Center Area Design Plan
- Clackamas Regional Center Area Pedestrian/Bicycle Connections Project
- Clackamas County Urban Renewal Districts
- Clackamas County Community Health Improvement Plan

- Clackamas County Transportation Safety Action Plan

Other relevant plans

- Metro Regional Active Transportation Plan
- Milwaukie Transportation System Plan
- Milwaukie Monroe Street Neighborhood Greenway Concept Plan
- Bicycle Transportation Alliance Blueprint for World-Class Bicycling

Clackamas County Transportation System Plan

The Clackamas County Transportation System Plan (TSP), adopted in 2013, reflects all relevant national, state, and regional transportation and planning requirements and provides policies, guidelines, and projects to meet transportation needs for residents, businesses, and visitors in unincorporated Clackamas County for 20 years. The TSP envisions a well-maintained and designed transportation system that provides safety, flexibility, mobility, accessibility and connectivity for all modes of travel. It is tailored to Clackamas County's diverse geographies and supports future needs and land use plans in the region. The TSP contains six goals to guide plan implementation:

- Goal 1: Provide a transportation system that optimizes benefits to the environment, the economy and the community
- Goal 2: Plan the transportation system to create a prosperous and adaptable economy and further the economic well-being of business and residents of the County
- Goal 3: Tailor transportation solutions to suit the diversity of local communities.
- Goal 4: Promote a transportation system that maintains or improves our safety, health and security
- Goal 5: Provide an equitable transportation system
- Goal 6: Promote a fiscally responsible approach to protect and improve the existing transportation system and implement a cost-effective system to meet future needs

Project Relevance

The TSP identifies Monroe Street in its 20-Year Capital Projects list as a facility that serves as a key east-west bicycle route connection in the region. 20-Year Capital Projects are the highest priority projects in the TSP and are considered needed transportation projects that can reasonably be undertaken given the current estimates of available funding. Improvements to the Monroe Street route (currently classified as a collector to 77th Avenue and a future connector to 82nd Avenue) are intended to provide bicycle and pedestrian enhancements for the North Clackamas Revitalization Area urban renewal district. The TSP contains three projects for Monroe Street:

- SE Linwood Avenue to 72nd Avenue – Add bikeways (TSP Project ID #1036)
- 72nd Avenue to Fuller Road – Add bikeways, pedestrian facilities, and traffic calming (TSP Project ID #1035)

Other TSP projects that intersect with Monroe Street include:

- Boyer Extension West project (TSP Project ID #1012)
- Boyer Drive/85th Ave/Spencer Drive – bikeway connection from 82nd Ave to the I-205 bike path (TSP Project ID #1013)

- Monroe Street to 72nd Avenue to Thompson Road – Add pedestrian facilities. (TSP Project ID# 2010)

Active Transportation Policies

The TSP states that new facilities should improve safety and connectivity for active transportation users in the County. The active transportation policies in the TSP incorporates the development of the Clackamas County Pedestrian Master Plan and the Clackamas County Bicycle Master Plan. These policies support the development and implementation of walking and biking infrastructure that encourage direct, continuous routes on low-volume, local streets – such as the section of Monroe Street addressed by this plan. Several of those policies support the Monroe Neighborhood Street Plan, including:

5.J. General Active Transportation Policies

> **5.J.8:** Identify low traffic volume streets that are appropriate for signing as bicycle routes to enhance safety and connectivity and to supplement the system of bikeways found on the major street system.

5.K. Design Policies

> **5.K.3:** Improve the safety and appeal of walking and biking by supporting the development of bikeways and pedestrian facilities and networks on low volume or local roads and off of existing street rights-of-way.
>
> **5.K.4:** (**Urban) –** Identify pedestrian facilities and bikeway improvements necessary to ensure direct and continuous networks of pedestrian facilities and bikeways on the county road system.

5.C. Equity, Health and Sustainability Policies

> **5.C.1:** Support programs and projects, such as pedestrian and bike connections to transit stops, that expand and improve transportation options for residents in areas with identified transportation-disadvantaged populations.
>
> **5.C.2:** Protect neighborhoods, recreation areas, pedestrian facilities, bikeways and sensitive land uses (such as schools, daycare centers and senior centers whose users are more vulnerable to pollution) from transportation-related environmental degradation. Coordinate transportation and land use planning and use mitigation strategies, such as physical barriers and design features, to minimize transmission of air, noise and water pollution from roads to neighboring land uses.
>
> **5.C.4:** Ensure that programs to encourage and educate people about bicycle, pedestrian, and transit transportation options are appropriate for all County residents, particularly transportation disadvantages populations.
>
> **5.C.5:** Build working partnerships between the County's Public Health and Transportation Divisions and utilize tools, such as health impact assessments, to better connect the effects of transportation projects with the health of communities.

Other TSP policies relevant to the plan specify that the County should seek out and implement innovative active transportation treatments to address/meet user needs, and work with neighboring jurisdictions to coordinate facility improvements.

Roadway Policies

Creating and maintaining a safe, continuous County-wide road system is a major goal of the Clackamas TSP. The road system accommodates movement by all travel modes, which means the county must set standards for development of new roads and redevelopment of existing roads, including design and access standards for urban and rural roads.

In addition to policies specifically promoting active transportation, the TSP contains several roadway policies that support the bicycle, pedestrian, and safe routes to schools improvements anticipated as a part of this project. Policies also encourage the implementation of stormwater and "green street" improvements to manage runoff.

5.O. Functional Classification and Design Policies

> **5.O.5:** Develop and implement traffic calming strategies, appropriate for the road functional classification, that will improve the safety and convenience of travel by all modes, particularly in areas with high crash rates or high rates of bicycle and/or pedestrian activity.
>
> **5.O.7: (Urban)** – Minimize impacts of managing storm water by allowing for Metro's alternative street standards, such as "green streets," as design alternatives.
>
> **5.O.8: (Urban) –** Design arterials and collectors to allow safe and convenient passage of buses, bicycles, and pedestrians.
>
> **5.O.9: (Urban)** – Streets, alleys, bikeways, pedestrian facilities, multi-use paths, trails and transit stops are allowed uses in all urban zoning districts. Consider all state and County policies relating to these facilities when widening, improving or constructing new transportation infrastructure.

Clackamas County Active Transportation Plan

The Clackamas County Active Transportation Plan (ATP) aims to identify key active transportation routes that connect destination and communities in Clackamas County, both rural and urban. It complements the county's Bicycle and Pedestrian Master Plans to provide an assessment of policies and plans for the principal active transportation system in unincorporated Clackamas County.

A set of goals was established for the ATP to ensure that Clackamas County has an interconnected, safe, and equitable active transportation network. The plan sets out policies that encourage more residents to bicycle and walk for recreation and transportation by supporting a transportation network that enhances connections to transit, schools, town centers, shopping, employment, and other key destinations. The ATP encourages jurisdictions in the County to work toward an active transportation network that is accessible to all ages, abilities, and incomes, helping improve the health of residents by giving them safe places to walk, run, or bike.

Chapter 5 of the ATP contains the County's Facility Design Toolkit, a catalog of pedestrian and bicycle facility types for a range of rural and urban settings as well as varying roadway speeds and traffic volumes. Each facility type includes a photo illustration, general description, preferred and minimum dimensions and special design considerations unique to that facility. The Facility Design Toolkit provides guidance to planners and engineers during the planning and design of new roads and roadway improvements throughout Clackamas County.

Project Relevance

Twelve principal active transportation corridors (geographic areas between destinations for active transportation connectivity) were identified during the ATP process, including Milwaukie to the Clackamas Regional Center. This corridor is identified as the area connecting the Milwaukie town center to the MAX Orange Line, MAX Green Line, the Clackamas Regional Center area, schools, parks, Providence Milwaukie hospital, Springwater Corridor, I-205 multi-use path, and the Monroe Street bike boulevard.

Within this corridor, Monroe Street, from Highway 99E to 1-205, is identified as a Principal Active Transportation Route. Principal routes are the most important routes to connect communities and key destinations in the county. The route was selected because although it currently lacks active

transportation facilities, it is relatively low-speed and low-volume, making it a prime candidate for a low-stress shared facility such as a bike boulevard or neighborhood greenway.

Clackamas County Regional Center Area Design Plan

The Clackamas Regional Center is a major residential and business area, comprising 2,100 acres in Clackamas County, including the Clackamas Town Center and several regional corridors such as 82nd Avenue/OR213, Johnson Creek Boulevard, and Sunnyside Road. The Clackamas Regional Center Area Design Plan, one of the six community plans included in Chapter 10 of the county's Comprehensive Plan, sets the framework to plan for growth and guide the area to a preferred future identified by citizens, the business community, and public service providers. The plan builds off the county's Comprehensive Plan and sets specific goals and policies for the regional center area.

Project Relevance

The easternmost section of the Monroe Neighborhood Street Plan is located within the Clackamas Regional Center Area. The Regional Center Area Plan highlights pedestrian and bikeway networks that connect the Clackamas Region Center to neighborhoods and districts via off-street pedestrian linkages, regional multi-use paths, and area greenway trails. The plan also establishes guidelines for new residential and mixed-use developments in the study area that encourage pedestrian and bicycle travel. Policies listed in the plan support direct and convenient connection for public routes connecting residential uses with commercial uses, schools, parks, and other neighborhood facilities. Finally, the plan supports providing bike and pedestrian connections on public right-of-way when full street connections are not possible, a potential element of this project.

Clackamas Regional Center Area Pedestrian/Bicycle Connections Project

In June 2012, Clackamas County and the Oregon Department of Transportation worked with community members around the Clackamas Regional Center to identify safe pedestrian and bicycle connections from the MAX Green Line light rail station to major area employers. The project created an inventory of potential pedestrian and bicycle improvements, analyzed potential solutions, and prioritized connected needed to provide access to the Clackamas Regional Center.

Project Relevance

Planned improvements from the Connections Project will help to support the development of pedestrian and bicycle investments along Monroe Street. While Monroe is not specifically in the Connections project area, nearby streets like Harmony, Causey, and Maplehurst Road are identified as strategic locations for bicycle investment. The Monroe Neighborhood Street Plan will evaluate these streets for bicycle access, and determine which are most appropriate for bicycle improvements as part of this project. In addition, the Plan will improve bicycle connections to these streets, supporting implementation of the Clackamas Regional Center Area Connection Project.

Clackamas County Urban Renewal Districts

Four urban renewal districts have been administered by the Clackamas County Development Agency since the first district was established in 1977. The Development Agency is committed to carrying out plans developed specifically for each urban renewal area that meet three main goals: Increase jobs, improve economic vitality, and improve opportunities and capabilities by removing influences that inhibit development or redevelopment. Urban renewal benefits communities and the County as a whole by enhancing quality of life through new and renovated neighborhood facilities, sidewalks, and bike paths that support safe, health, and active communities, while encouraging economic growth, creating jobs and building new and affordable housing.

Project Relevance

The urban renewal plan created for each district describes the projects and programs planned for each of the four designated area, including how and when they will be funded. Two urban renewal districts include segments of the project area.

Clackamas Town Center Area

Started in 1980, the Clackamas Town Center urban renewal area is located at and around the intersection of I-205 and SE Sunnyside Road. The community needed new and expanded road systems to support the opening of the Clackamas Town Center shopping mall, meet the needs of the growing residential neighborhoods, and serve expanding health care facilities and businesses. The urban renewal district was established to meet several goals, many of which support this project. The program establishes a need for a vibrant and improved business district around Clackamas Town Center, 82nd Avenue, and Sunnyside Road that provides public access to recreational use of open space, safe and efficient traffic circulation, and improved facilities that provide mobility and safety.

North Clackamas Revitalization Area

In 2006, the North Clackamas Revitalization Area (NCRA) was developed, with support from local residents and community organizations. The urban renewal district was primarily established to identify projects to improve the area's livability including public utilities, parks and open spaces, street, curb and sidewalk improvements, and streetscape and neighborhood beautification. The result of the NCRA will be a strong, stable neighborhood for families and small businesses with appropriate infrastructure such as sewers and improved streets. New community amenities are being planned, including the Fuller Road Station Area, featuring a "station community" plan to redevelop a denser street network and a mix of housing, office, institutional, and commercial uses.

Clackamas County Community Health Improvement Plan

In 2012 Clackamas County conducted its first community health improvement planning process to identify priority goals and strategies aimed at addressing the health needs of county residents. The resulting Community Health Improvement Plan (CHIP) includes a series of specific actions to be addressed by community partners and is intended to help the community address significant issues that can improve the overall health of the county. The following mission of the CHIP Planning Committee helped guide plan development:

> *The mission of the committee was to determine how the collective community's health could be improved. Specifically, this committee agreed to create a CHIP that describes how organizations and individuals throughout Clackamas County will work together to improve the health and population of the county's residents.*

Project Relevance

The Clackamas County CHIP includes four strategic directions and 11 measurable objectives. Each of the measurable objectives includes a listing of improvement strategies, names of potential organizations that could be involved and a set of performance measures. The improvement strategies and performance measures applicable to the Monroe Street Neighborhood Street Design Plan include the following:

- **Improvement Strategy**: Promote physical activity before, during and after school
  - **Performance Measure**: Increase number of Safe Routes to School programs implemented at Clackamas County schools
- **Improvement Strategy**: Enhance environment to facilitate ability to be physically active
  - **Performance Measure**: Expand the availability of walking trails and bike paths

Clackamas County Transportation Safety Action Plan

The Clackamas County Transportation Safety Action Plan (TSAP) outlines a strategy for the County to build and implement a County-wide Safety Culture. The plans ultimate goal is to reduce transportation-related fatalities and serious injuries for all modes by 50% over the next ten years. In order to create this culture and effectively meet the stated goal, the TSAP employs a "5E's" approach, with action items related to engineering, education, enforcement, emergency medical services and evaluation activities. Using a data-driven approach based on a detailed review of County-wide crash data, a number of emphasis areas have been identified with specific detail and actions for three primary focus areas – Aggressive Driving, Young Drivers (ages 15-25) and Roadway Departure crashes. For each focus area, a description of the issue and countermeasures are discussed incorporating the 5E approach.

Project Relevance

A primary project objective of the Monroe Neighborhood Street Design Plan is to develop a route that improves safety for all modes of travel. The County has a strong desire to improve the safety of its transportation system for all users and reduce the number and severity of crashes. Improving safety is a multimodal concern that affects each and every resident of the County. Developing a street design plan for Monroe Street will set the stage for creating a needed space for pedestrians and bicyclists to safely travel through the neighborhood and aligns with the goal of creating a "County-wide Safety Culture" envisioned in the TSAP.

Metro Regional Active Transportation Plan

The 2014 Regional Active Transportation Plan provides a vision, plan and policies for communities in the Portland region to increase transportation options and support economic development, healthy active living and equity.

The Guiding Principles pertaining to this project include:

- Cycling, walking, and transit routes are integrated and connections to regional centers and regional destinations are seamless
- Routes are direct, form a complete network, are intuitive and easy-to-use and are accessible at all times
- Routes are safe and comfortable for people of all ages and abilities and welcoming to people of all income levels and backgrounds
- Routes are attractive and travel is enjoyable
- Facility designs are context sensitive and seek to balance all transportation modes
- Increases corridor capacity and relieves strain on other transportation systems
- Ensures access to regional destinations for people with low-incomes, people of color, people with disabilities, people with low-English proficiency, youth and seniors
- Implements regional and local land use and transportation goals and plans to achieve regional active transportation modal targets

Project Relevance

The Metro Active Transportation Plan recommends five policies to help communities in the region achieve active transportation targets, aspirations, and desired outcomes in adopted state, regional, and local plans. Key policies that support this project state that regional partners should work to make walking and bicycling the most convenient, safe, and enjoyable transportation choices for short trips less than three miles. Similarly, the plan encourages all jurisdictions to work together to complete the regional pedestrian and bicycle network, creating a connected system for residents of the region.

The plan also encourages partners to develop a well-connected regional pedestrian and bicycle system that integrates transit and nature while prioritizing safe, convenient, accessible, and comfortable pedestrian and bicycle access for all ages and abilities.

Monroe Street is classified as a Bicycle Parkway in Metro's Active Transportation Plan, the highest classification for regional bicycle routes. These routes operate as the spine of the bicycle network. Monroe Street's connection to urban centers, transit, and key regional destinations makes it a prime location for a regional Bicycle Parkway that provides a direct and efficient link to jobs, amenities, and housing.

Milwaukie Transportation System Plan

The section of Monroe Street west of Linwood Avenue is designated in the Milwaukie TSP as a "Greenway", an active transportation route and is currently being studied by the City of Milwaukie for improvements as part of the Monroe Street Neighborhood Greenway Conceptual Plan project. The City of Milwaukie project will include recommendations for safety and traffic improvements for the intersection of SE Linwood Avenue and Monroe.

Project Relevance

Several policies from the TSP support the Monroe project in Clackamas County and its connection to the Monroe Street Greenway. The City's TSP establishes many of the same project elements that will be included in Clackamas County's Monroe Neighborhood Street Design Plan, helping leverage funding opportunities and meeting county and regional goals in the process. The collaboration between both jurisdictions supports active transportation in both the City of Milwaukie and Clackamas County, since the route connects local and regional destinations in both City and County.

Milwaukie Monroe Street Neighborhood Greenway Concept Plan

The Monroe Street Neighborhood Greenway Concept Plan is a City of Milwaukie plan to strengthen the neighborhood street character of Monroe Street in Milwaukie and provide safer, low-stress accommodations for pedestrians and bicyclists. The project area extends along Monroe Street from SE 21st Avenue in downtown Milwaukie to SE Linwood Avenue at the city's eastern boundary. The project's goals are to reduce the speeds and volumes of cut-through traffic on Monroe Street. The plan features crossing improvements, stormwater treatment features such as chicanes and curb extensions, and partial diverters at OR 224, SE 42nd, and SE Linwood and Monroe. These diverters are designed to reduce cut-through traffic along Monroe to create a quieter, safer, more neighborhood-oriented street. The partial diverter on Linwood Avenue at Monroe Street, in particular, will prevent through travel for motor vehicles, but will allow passage for bicycles and pedestrians. Along with improved crosswalks, curb extensions, and a pedestrian-activated hybrid beacon, this will greatly improve crossing safety at the intersection.

Project Relevance

The Milwaukie Monroe Street Neighborhood Greenway Concept Plan advances several key goals in the County's TSP, including livability, safety, quality design, and reliability. The project ends where the Clackamas Monroe Neighborhood Street Design Plan begins, creating the opportunity for Clackamas County to develop a seamless low-stress route for east-west bicycle and pedestrian travel. Several features from the Monroe Street Neighborhood Greenway Concept Plan will be considered for application in the Clackamas Monroe Street Neighborhood Design Plan.

Bicycle Transportation Alliance: A Blueprint for World-Class Bicycling

Oregon's bicycle advocacy group, the Bicycle Transportation Alliance (BTA), released **A Blueprint for World Class Cycling** that articulates a vision for bicycling in the Portland-Metro region. The Blueprint includes a goal that 50% of the region's urban population will be served by a low-traffic, low-stress neighborhood greenway less than half a mile from their homes.

Project Relevance

The blueprint calls out Monroe Street as a prime location for a quiet neighborhood bicycle route based on its proximity to mass transit and Milwaukie's downtown core, and its connections to several regional multi-use trails. Monroe Street also provides a direct connection to commercial areas on SE King Street and 82nd Avenue. Bicycle improvements on Monroe would provide a much needed east-west route for families and less experienced riders, connecting businesses, schools, trails and trains.

Development of evaluation criteria for route and design alternatives

The Clackamas County Monroe Neighborhood Street Design Plan builds on all the regional, county, and local policies and plans listed above.

Project objectives

Several key objectives will inform decisions on this project and help drive the development and application of criteria to evaluate route and design alternatives along the corridor:

- Develop a neighborhood street conceptual design plan for the selected route that improves safety for all modes of travel but has a particular focus on pedestrians and cyclists;
- Identify safe crossing treatments for significant intersections along the selected Project routes and for the Safe Routes to Schools selected routes; and
- Support a healthy and active community.

In addition to these substantive project goals, the project seeks to achieve a number of process objectives that ensure community engagement and understanding:

- Include criteria that measure impacts on both safety and health
- Identify the walking and biking destinations within and near the Project Area
- Provide a map showing the "gaps and deficiencies" in sidewalks and bikeway facilities near Whitcomb Elementary School
- Document desired road characteristics conducive to increasing pedestrian and bicycle safety or perceived safety for potential or recommended Project route(s) including Whitcomb Elementary Safe Routes to School routes
- Provide outreach to disadvantaged populations in accordance with the requirements of Title VI and involve the public and stakeholders in developing the Safe Routes to School Plan and Project route and neighborhood street design concept
- Assess the potential impacts resulting from recommended street classifications or street design changes that reroute traffic, if necessary
- Determine if additional right-of-way is needed for potential treatments, identify associated property impacts, and address acquisition and mitigation strategies

- Identify options to address stormwater runoff from impervious surface in the right-of-way, considering green street treatments as well as more conventional measures
- Identify project phasing and potential funding sources for improvements for implementation over time

Selection criteria for route alternatives analysis

As route and design alternatives for the Monroe Neighborhood Street Design Plan are developed, those choices will be evaluated to determine the extent to which they support and advance the Monroe Neighborhood Street Design project objectives. The criteria listed in the table below will be used to assess the performance against project objectives and serve as a framework to structure the evaluation process. Potential improvements will be assessed on a three-point scale based on the extent to which an improvement supports each of the criteria (highly supports, somewhat supports, does not support).

	Evaluation Criteria	Performance Measure
Improve safety for all modes, with emphasis on bicycle/pedestrian safety	Reduce and/or avoid bicycle and pedestrian safety hazards	Potential to reduce the number of difficult intersection crossings and high-speed environments
	Reduce conflicts among all modes	Improvement provides physical separation between modes (including at intersections)
	Create a calmer street environment	Potential of improvement to improve neighborhood livability by lowering traffic speeds and/or volumes
Support healthy and active communities	Improve the pedestrian network	Proposed design increases sidewalk connectivity and provides safe pedestrian crossings
	Improve the bicycle network	Proposed design creates continuous and direct bicycle connections between existing and proposed bicycle facilities
	Decrease noise	Potential for improvement to decrease vehicle noise within 500 feet of the study area
	Provide access to essential destinations	Proposed design provides safe bicycle and pedestrian access to essential destinations
Provide safe routes to school	Slow traffic adjacent to Whitcomb Elementary School	Potential of improvement to reduce traffic speeds on streets within half a mile of Whitcomb Elementary
	Provide safer and direct pedestrian access	Completeness of sidewalk and path network within a half mile of Whitcomb Elementary; addresses School District-identified hazards
	Provide safer and direct bicycle access	Completeness of bikeway network within a half mile of Whitcomb Elementary; addresses School District-identified hazards
Provide neighborhood benefits and minimize negative impacts	Provide stormwater management	Potential for "green street" stormwater management features
	Reduce right-of-way/encroachment impacts	Extent of right-of-way impacts and impacts on right-of-way encroachments
	Reduce parking impacts	Number of parking spaces that would be removed with installation of new facilities
	Reduce cut-through traffic	Assessment of whether the proposed design reduces cut-through traffic on Monroe Street
	Improve motor vehicle system	Potential to increase motor vehicle connectivity; potential to address identified motor vehicle safety hazards
Create an implementable project plan	Determine feasibility	Extent of ROW purchases, physical barriers, or ownership issues
	Determine capital cost	Level of needed investment to complete route
	Determine maintenance cost (ongoing)	Alternative aligns well with current or potential future funding and financing sources

Comparable neighborhood streets

The following examples illustrate treatments that can be applied to achieve a balance among various modes while preserving and enhancing neighborhood character.

SW Maplewood Road, Portland, OR

Pedestrian sidepath

The pedestrian sidepath located on SW Maplewood is located on a neighborhood greenway that is part of the greenway system in Portland. In order to create a more pedestrian friendly environment while keeping costs low, the City of Portland installed speed bumps, paved a new shoulder, reduced the width of the street, and reduced the speed limit. These facility changes have created a safer and more appealing pedestrian path, while avoiding the expense of placing sidewalks along the half-mile road.

1st Street, Gresham, OR

Pedestrian sidepath

A pedestrian path was placed along the north side of 1st Street between Kane and 3rd Street in the City of Gresham to assist community members with a safe and direct connection to the Fred Myers grocery store and other local businesses in the neighborhood. The project was listed in the City's TSP and constructed on a low budget. The path includes asphalt grindings left over from other work in the area.

NE Klickitat Street, Portland, OR

Bicycle and pedestrian connection without through-traffic

The "green street" located on NE Klickitat, between 23rd and 24th Street in Portland's Northeast district makes the section between a school and a playground car-free for users and residents of the neighborhood. The facility features motorized vehicle-diverting bollards at either end, narrowed roadway serving bicycle access, concrete surface, stormwater treatments, and sidewalks that are separated from the bicycle lane.

Source: bikeportland.org

Monroe Street, Milwaukie, OR

Conventional bike lane

A portion of Monroe Street, east of the UPRR Main Line crossing, has a 6-foot bicycle lane on the eastbound side separating cyclists from motor vehicles as they climb a steep hill along the corridor. The westbound side has sharrow marks indicating a shared street as vehicles and bicycles go downhill. While there are bike lanes on this road, the street is a high-speed, high-volume road that is not ideal for bicycle riders of all ages and abilities.

17th Avenue NE, Shoreline, WA

Neighborhood greenway

This neighborhood greenway focuses on reducing environmental impacts of urban development in the City of Shoreline. The project on NE 17th Avenue, between NE 150th and NE 145th Streets included treatments for bicycle and pedestrian safety, natural drainage solutions, and enhanced natural habitats. The street features porous asphalt pavement used for walkway and driveways, bioswales, traffic circles, chicanes, walkways, and corners with pedestrian landings at each intersection. The traffic calming elements helped to reduce speeds and discourage cut-through traffic through the neighborhood. Many of the street treatments used in this example are being proposed for a section of Monroe Street in the City of Milwaukie. A permeable pavement path separated from the roadway with either landscaping or parked cars with chicanes for vehicles to reduce speeds is the proposed treatment for that project.

SE Clinton Street, Portland, OR

Neighborhood greenway

Clinton Street is Portland's original neighborhood greenway with the highest bicycle use of any bike boulevard in the city - around 1800 bikes per day along many sections. It has a range of traffic calming tools in place including speed bumps, traffic circles, a bike box, a semi-diverter, & pedestrian crosswalks. Clinton Street has seen a high number of vehicles cutting through the neighborhood, causing tension between autos and bicyclists. The City of Portland is currently considering adding diverters to the greenway to prevent through traffic along the corridor. The City hopes to utilize a mix of on-street pavement markings, signage, & other potential artistic means to lower the use of Clinton Street by motor vehicles.

NE Cully Boulevard, Portland, OR

Raised cycle track

The cycle track located on NE Cully Boulevard in Portland is a grade-separated bike facility that is built of concrete, is separated from motor vehicles by a curb and parked cars, and features distinct pavement marking indicating that the facility is for use by bicycles.

Some of the more distinct pavement markings include large painted "P"s in the street for parking. The raised curb between the cycle track and the parking lane is painted white to bring attention to it, but the curb is painted yellow at locations where driveways are present. The facility also offers dashed marking through intersections, and some also have bike boxes to allow safe left-turn for cyclists.

Appendix B

Safe Routes to School Action Plan, Whitcomb Elementary School

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Appendix C

Alternatives Analysis Report

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MONROE NEIGHBORHOOD STREET DESIGN PLAN

Alternatives Analysis Report

December 2015

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Introduction and Context

Located in northern Clackamas County, Monroe Street has been envisioned by local and regional governments as a primary active transportation route stretching east from the Trolley Trail in Milwaukie to the Interstate 205 Multi-Use Path in the unincorporated portion of the County. This connection would improve local access to two lines on the MAX regional light rail system – the Green Line along I-205 and the newly completed Orange Line in Milwaukie – and would provide safer bicycling and walking to and within the Clackamas Regional Center. Ultimately, the project would link downtown Milwaukie, the Clackamas Town Center, and destinations to the north, connecting local neighborhoods to schools, jobs, shopping and parks along the way.

This memorandum compiles process outcomes and major products that resulted from the Alternatives Analysis. Seven (7) alternative routes were analyzed with respect to the project evaluation criteria described in *Technical Memorandum #1: Policy Framework and Alternatives Analysis Selection Criteria*. The purpose of the Alternatives Analysis process was to determine the route(s) to be advanced to subsequent stages of the Monroe Neighborhood Design Project, including early conceptual design.

Alternatives Analysis Matrix

Monroe Neighborhood Street Design Plan: Alternatives Analysis Table - 11/2/2015

			Alternative Routes							
Evaluation Criteria	**Sub-Criteria**	**Performance Measure**	**Alternative 1A:** Monroe Street – Boyer Drive (Extended) – 85th Ave – Spencer Drive (Monroe Gap closed to traffic)	**Alternative 1B:** Monroe Street – Boyer Drive (Extended) – 85th Ave – Spencer Drive (Monroe Gap open to traffic)	**Alternative 2:** Monroe Street – Fuller Road – Causey Avenue	**Alternative 3:** Monroe Street – Maplehurst Road/Harmony Drive – Causey Avenue	**Alternative 4:** Monroe Street – Maplehurst Road/Harmony Drive – Fuller Road – Boyer Drive (Extended) – 85th Ave – Spencer Drive	**Alternative 5:** Monroe Street – Thompson Road – Fuller Road – Boyer Drive (Extended) – 85th Ave – Spencer Drive	**Alternative 6:** Monroe Street – Thompson Road – Fuller Road – Causey Avenue	**Alternative 7:** Monroe Street – Maplehurst Road/Harmony Drive – Fuller Road– Monterey Ave
Improve safety for all modes, with emphasis on bicycle/pedestrian safety	Reduce and/or avoid bicycle and pedestrian safety hazards	*Potential to reduce the number of difficult intersection crossings and high-speed environments*	●	●	◑	○	○	◑	○	○
	Reduce conflicts among all modes	*Improvement provides physical separation between modes (including at intersections)*	◑	◑	○	○	○	●	◑	○
	Create a calmer street environment	*Potential of improvement to improve neighborhood livability by lowering traffic speeds and/or volumes*	●	○	◑	◑	◑	◑	◑	◑
			8	6	5	4	4	7	5	4
Support healthy and active communities	Improve the pedestrian network	*Proposed design increases sidewalk connectivity and provides safe pedestrian crossings*	●	●	◑	○	○	●	○	○
	Improve the bicycle network	*Proposed design creates continuous and direct bicycle connections between existing and proposed bicycle facilities*	●	●	◑	◑	◑	◑	◑	○
	Decrease noise	*Potential for improvement to decrease vehicle noise within 500 feet of the study area*	◑	○	◑	◑	◑	◑	◑	◑
	Provide access to essential destinations	*Proposed design provides safe bicycle and pedestrian access to essential destinations*	●	●	◑	◑	◑	●	◑	◑
			11	10	8	7	7	10	7	6
Provide safe routes to school	Slow traffic adjacent to Whitcomb Elementary School	*Potential of improvement to reduce traffic speeds on streets within half a mile of Whitcomb Elementary*	○	◑	○	○	○	●	●	○
	Provide safer and direct pedestrian access	*Completeness of sidewalk and path network within a half mile of Whitcomb Elementary; addresses School District-identified hazards*	●	●	◑	◑	◑	●	●	◑
	Provide safer and direct bicycle access	*Completeness of bikeway network within a half mile of Whitcomb Elementary; addresses School District-identified hazards*	●	●	◑	◑	◑	●	●	◑
			7	8	5	5	5	9	9	5
Provide neighborhood benefits and minimize negative impacts	Provide stormwater management	*Potential for "green street" stormwater management features*	●	◑	●	○	○	◑	◑	○
	Avoid right-of-way/encroachment impacts	*Extent of right-of-way impacts and impacts on right-of-way encroachments*	○	○	○	◑	○	◑	◑	●
	Avoid parking impacts	*Number of parking spaces that would be removed with installation of new facilities*	◑	◑	○	◑	●	○	○	●
	Reduce cut-through traffic on Monroe St.	*Assessment of whether the proposed design reduces cut-through traffic on Monroe Street*	●	○	◑	○	○	○	○	○
	Improve motor vehicle system	*Potential to increase motor vehicle connectivity; potential to address identified motor vehicle safety hazards*	○	●	○	○	○	◑	◑	◑
			10	9	8	7	7	8	8	10
Create an implementable project plan	Feasibility	*Extent of ROW purchases, physical barriers, ownership issues, and funding source availability*	●	●	●	◑	◑	●	●	◑
	Capital cost	*Level of needed investment to complete route*	●	◑	○	○	○	◑	○	◑
	Maintenance cost (ongoing)	*Alternative aligns well with current or potential future funding and financing sources*	◑	●	◑	●	●	◑	◑	●
			8	8	5	6	6	7	6	7
		PERFORMANCE SCORE	**44**	**41**	**31**	**29**	**29**	**41**	**35**	**32**

Alternatives Analysis Process Methodology

MEMORANDUM

Monroe Neighborhood Street Design Plan Alternative Analysis: Methodology Summary

To: Scott Hoelscher, Clackamas Co. Project Manager/Senior Transportation Planner
Gail Curtis, ODOT TGM Grant Manager

From: Catherine Ciarlo, CH2M Project Manager
Sharon Daleo, CH2M Senior Engineer
Eduardo Montejo, CH2M Transportation Planner
Brenda Martin, CH2M Public Involvement Specialist

Date: 11/2/2015

Introduction

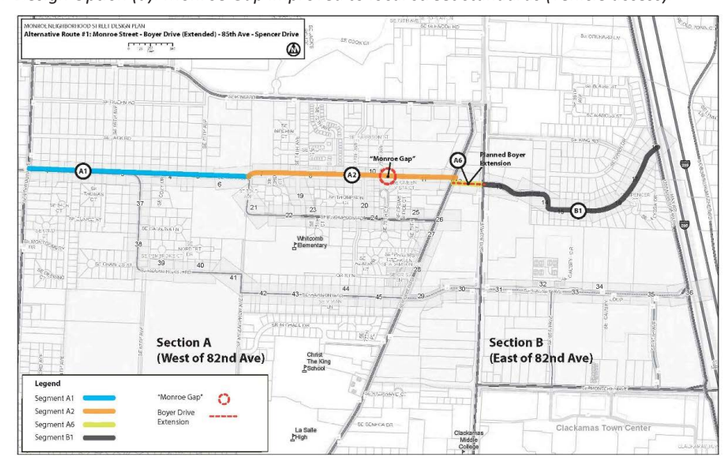
This memorandum is a summary of project team activities to develop an analysis of alternatives for the Monroe Neighborhood Street Design in Clackamas County. This document is intended to be an internal compilation of technical information used during the evaluation process. It is not meant to be an externally-facing Alternatives Analysis Report.

Overview of Alternative Routes

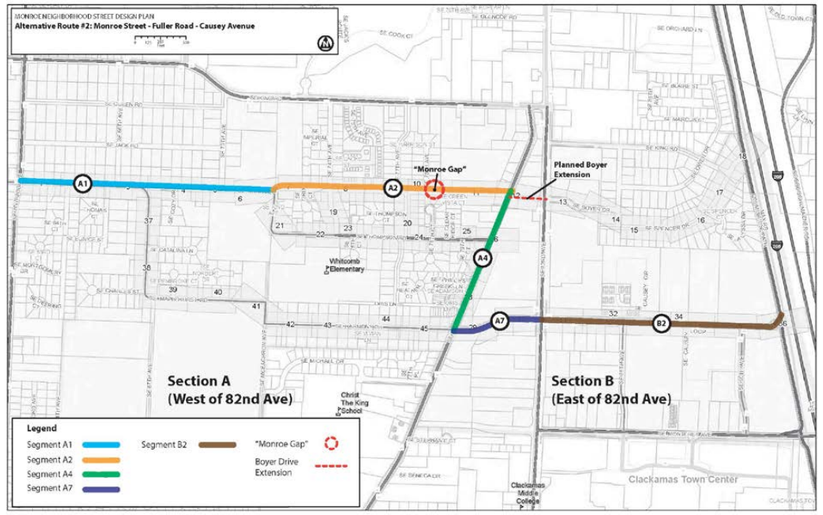
Maps of each alternative route are included below. Written descriptions of each route can be found in the alternative analysis cut sheets, or Technical Memorandum #2: Needs, Constraints, and Potential Solutions.

Alternative 1: Monroe Street – Boyer Drive (Extended) – 85th Ave – Spencer Drive

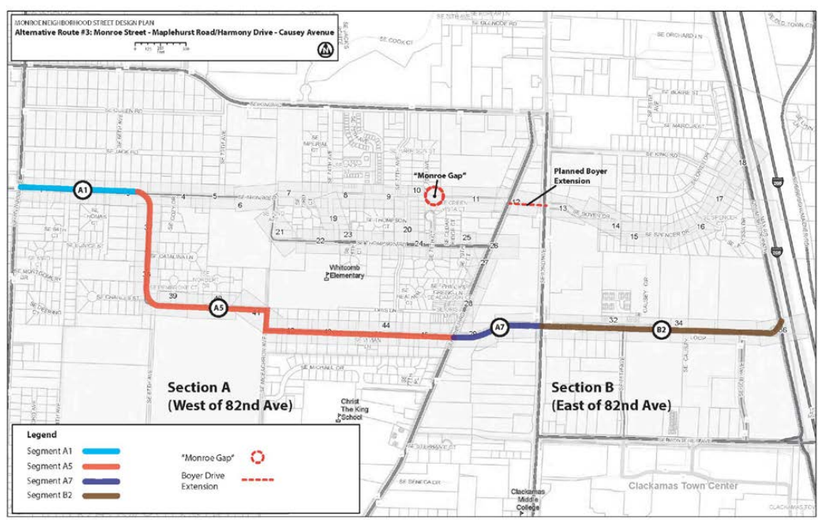
- *Design Option (a): Monroe Gap improved as an exclusive bicycle/pedestrian facility*
- *Design Option (a): Monroe Gap improved to local street standards (vehicle access).*



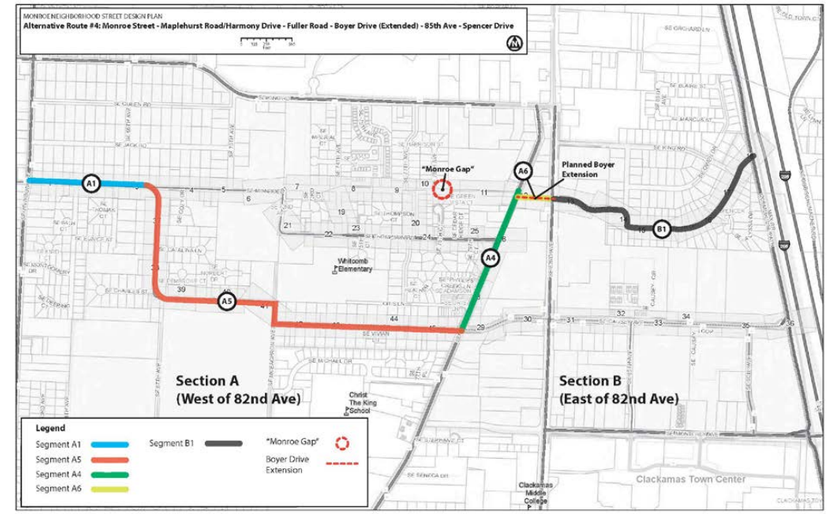
Alternative 2: Monroe Street – Fuller Road – Causey Avenue



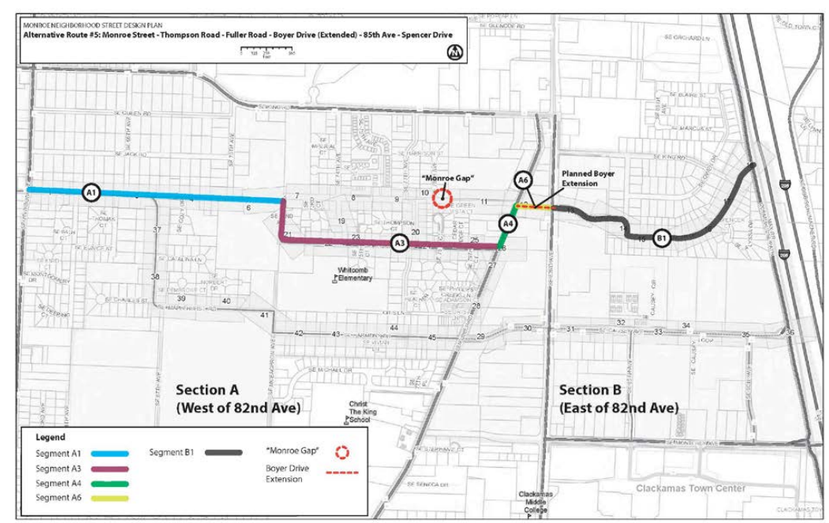
Alternative 3: Monroe Street – Maplehurst Road/Harmony Drive – Causey Avenue



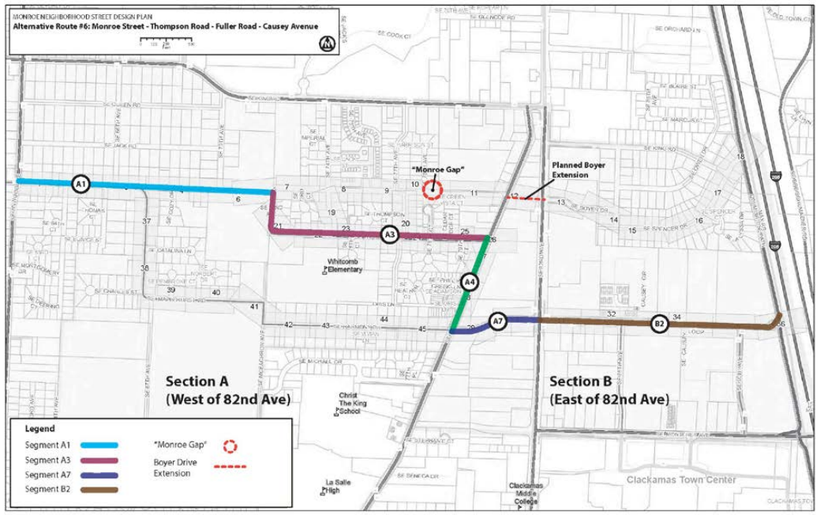
Alternative 4: Monroe Street – Maplehurst Road/Harmony Drive – Fuller Road – Boyer Drive (Extended) – 85th Ave – Spencer Drive



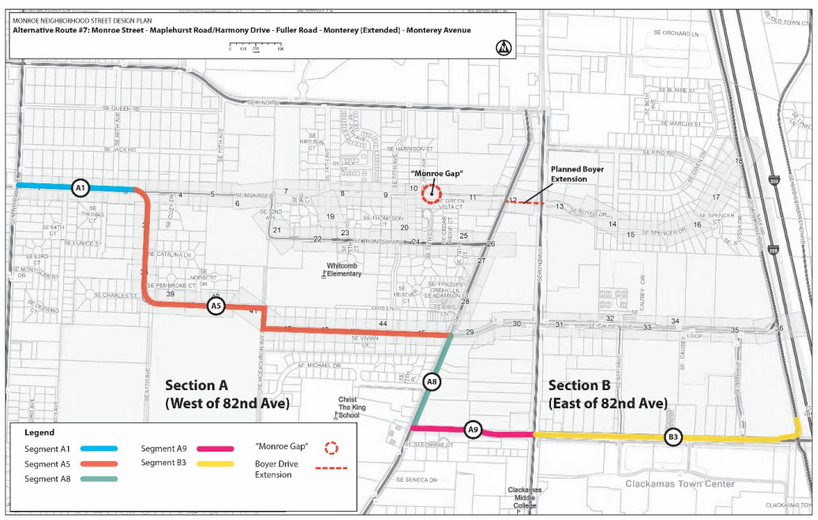
Alternative 5: Monroe Street – Thompson Road – Fuller Road – Boyer Drive (Extended) – 85th Avenue – Spencer Drive



Alternative 6: Monroe Street – Thompson Road – Fuller Road – Causey Avenue



Alternative 7: Monroe Street – Maplehurst Road/Harmony Drive – Fuller Road - Monterey Avenue



Key Findings

The project team noted the following key findings in the process of evaluating the Route Alternatives against the approved evaluation criteria:

- Reflecting concerns raised at past TAC, PAC, and PMT meetings, the Safe Routes to School (SRTS) criteria had an important influence on the performance outcomes of alternative routes. Generally, alternatives determined to *not* offer direct SRTS benefits did not perform as well as those that did.
- Alternatives 1(a) was the highest-performing route under the evaluation criteria. Alternatives 1(b) and 5 (Thompson) were tied as the second highest-performing routes under the evaluation criteria. Alternative 1(a) performed particularly well under bicycle and pedestrian safety, supporting healthy and active communities, providing neighborhood benefits, and implementation criteria. Alternative 5 performed substantially better than Alternative 1(a) well under SRTS criteria, but not as well as 1(a) under other evaluation criteria.
- All of the routes performed better by improving the Monroe Gap under design option (a). It was determined that allowing automobile access between 78th and 82nd Avenues deteriorated the performance of all of the routes in question – therefore, all the routes were evaluated under the assumption that the gap would be improved as an exclusive bicycle/pedestrian facility. It was also determined that diversion at Linwood Ave. and Monroe St. significantly improved the performance of each of the routes under consideration, as through-traffic along Monroe lowered route performance.
- Alternatives 3 and 4 (Causey & Maplehurst/Fuller) were tied for the lowest-performing route. These routes performed poorly with respect to improving the pedestrian network, mostly due to lengthy out-of-direction travel and the diversion of active transportation users to higher-speed, higher volume roads.
- Routes incorporating travel along Fuller Road did not perform as well as those that did not. The reasons why include safety concerns (high-speed, high-volumes), west-bound backtracking if travelling south on Fuller Road, higher costs due to increased signalization needs, and poor improvement to the bicycle/pedestrian network.
- Generally, routes that propose new investments in areas currently not planned for bicycle and pedestrian improvements fared better than those that did not.
- Alternative 7 (Monterey) did not perform as well as four other routes due to safety and access issues at Monterey and the I-205 Multi-Use Path access point. Alternative 7 also did not perform well with respect to improving the bicycle network given that improvements for Monterey are already planned, funded, and underway.
- Generally, alternative routes with good north-south access to the I-205 Multi-Use Path performed better than those that did not.

Alternative Analysis early outcomes and next steps

- Alternatives 1(a) was the best-performing route under the evaluation criteria.
- The performance scores are a qualitative measure of how each alternative performed under the project evaluation criteria. They are not intended to make a definitive route selection, but to reveal trade-offs and inform choices regarding the preferred option (or options).
- The Alternatives Analysis report for the Monroe Neighborhood Street Plan will consist of the completed Evaluation Matrix and a cut sheet for each route alternative that includes cross

sections, benefits and challenges, and other key information to inform the decision about a preferred route.

- The PMT will convene on October 29, 2015 to discuss the alternative analysis findings and identify a proposed preferred alternative for the Monroe Neighborhood Street Design Plan.

Methodology – process and background information

Evaluation criteria revisions

As the project team began the process of applying the Evaluation Criteria described in TM#1 to the seven route alternatives, it became clear that one criterion and several of the performance measures needed some level of revision to allow for practical application to the physical route alternatives. A complete list of these revisions -- including a brief justification for each revision – is listed below.

Evaluation criterion revision:

Reduce cut-through traffic

- Was moved to the 'Provide neighborhood benefits and minimize negative impacts' category from the 'Improves safety for all modes, with an emphasis on bicycle/pedestrian safety.'
- **Justification:** Although reducing cut-through traffic on Monroe is being generally considered as a safety improvement for all modes, such an improvement is more consistent with minimizing neighborhood benefits, as residents along Monroe, cyclists, and pedestrians using the corridor alike have expressed concern about non-local traffic cutting through the neighborhoods along Monroe.

Performance measure revisions:

Potential to reduce the number of difficult intersection crossings and high-speed environments

- **Justification:** This performance measure was revised to more closely align with the *hazards* criterion under the evaluation criteria. Intersections are emphasized as locations where modes frequently conflict, heightening potential hazards. Although intersections are emphasized, the performance measure preserves language around vehicle speeds, as high-speed environments are also considered to be hazardous.

Improvement provides physical separation between modes (including at intersections)

- **Justification:** The original performance measure included language to include the use of signage and/or markings to guide user behavior; this language was removed given that most, if not all, of the alternatives under consideration would include some application of signage and/or markings to create a safer street environment for all modes.

Proposed design creates continuous and *direct* bicycle connections between existing and proposed bicycle facilities.

- **Justification:** Directness was absent from the original evaluation criteria; during the alternatives analysis activity, it was determined that including a measure of directness would be an important consideration in grading the alternative routes. In addition, all of routes were considered to do a fair job of serving 'essential destinations', although they did not all perform relatively well with respect to connect to existing and proposed bicycle facilities.

Completeness of sidewalk and path network *within a half-mile* of the school; addresses School District-identified hazards

- **Justification:** A more specific measure (within a half-mile) was used in place of the original (more vague) language, which read 'school vicinity.'

Completeness of bikeway network *within a half-mile* of the school; addresses School District-identified hazards

- **Justification:** A more specific measure (within a half-mile) was used in place of the original (more vague) language, which read 'school vicinity'.

Extent of ROW purchases or physical barriers

- **Justification:** 'Natural' barriers were removed, as the foremost issues have to do with man-made barriers (such as front yards and adjunct parking). 'Ownership issues' was removed because encroachment is the real issue – county ownership issues are already captured in 'extent of ROW purchases.'

Level of needed investment to complete route

- **Justification:** The original performance measure read, "Alternative aligns well with current or potential future funding and financing sources." This was deemed a secondary consideration to the general cost of the given improvement.

Application of the evaluation criteria to the alternative routes

Using the segments that constitute each of the alternative routes as an analysis framework, the consultant team discussed each route with respect to the revised evaluation criteria. General notes on the discussion -- organized by alternative route -- are provided below:

Alternative 1: Monroe Street – Boyer Drive (Extended) – 85th Ave – Spencer Drive

- *Design Option (a): Monroe Gap improved as an exclusive bicycle/pedestrian facility*
- *Design Option (a): Monroe Gap improved to local street standards (vehicle access)*

  - Alternative 1(a) was the best-performing routes under consideration.
  - A global consideration for all alternatives is with regard to the intersection of Linwood Avenue and Monroe Street. This intersection will require safety improvements to create an active transportation corridor along Monroe Street east of Linwood Avenue.
  - Design option (a) performed considerably better than design option (b). One of the benefits for design option (a) is the increased opportunity to incorporate stormwater treatment features into the neighborhood street design.
  - Design option (a) performed better with respect to capital cost than any other alternative route.
  - Design option (b) performed worse in several areas, including creating a calmer street environment and limiting cut-through traffic on Monroe Street. Design option (b) was also the only route alternative of the seven that is anticipated to make noise levels *worse* along Monroe Street. All other alternatives are anticipated to have no impact on current noise levels.
  - Alternative 1 generally did not perform well with respect to providing safe routes to school, since they would not produce direct improvements within the vicinity of Whitcomb Elementary. Alternative 1 would, however, provide benefits within the vicinity of Sojourner Elementary.
  - Design option (a) did poorly with respect to slowing traffic adjacent to Whitcomb Elementary, as vehicles would be diverted to Thompson and Maplehurst if traveling eastbound, given no vehicle access at the Monroe Gap.
  - Design option (b) performed better than design option (a) with respect to slowing traffic adjacent to Whitcomb Elementary, as new access from Monroe to 82nd Avenue is expected to decrease vehicle volumes along Thompson Road.

- Alternative 1 scored well for having a central location to both MAX stations along the I-205 Multi-Use Path, for general directness, and for bringing the greatest improvement to the bicycle and pedestrian network.
- Work on Monroe could be extensive. There is not room for bike lanes and parking – design option (a) would comprise a neighborhood greenway treatment with a side path ($). Design option (b) would comprise a shared use path with queue street (more $). Work should include realignment of Maplehurst.
- Constructing shared use path in gap – less expensive than signal (only reason this is $ and Alt 5 is $$)
- Additional cost considerations include basic signing and striping, and perhaps some speed cushions east of 85th.

Alternative 2: Monroe Street – Fuller Road – Causey Avenue

- Alternative 2 and all subsequent alternative routes assume that the Monroe Gap is improved as an exclusive bicycle/pedestrian facility.
- Alternative 2 was considered to have difficult crossings and high vehicle speeds along Fuller Road. Given these challenges, significant improvements would have to be made to Fuller in order to bring it up to adequate standards for a bicycle/pedestrian friendly facility.
- Benefits to the Fuller Road segment include exiting bicycle lanes and under-utilized parking space – these features present an opportunity to re-allocate road space to better accommodate Neighborhood Street users.
- It is likely that signalized crossings would be necessary to create safer crossings at Fuller's intersections. The addition of signalization does present additional cost considerations, although the final design would substantially improve Fuller Road for all road users.
- Cost considerations include greenway improvements along Monroe Street, signals at Fuller Road, and improvements along Causey including restriping, sidewalk repair, and speed cushions.

Alternative 3: Monroe Street – Maplehurst Road/Harmony Drive – Causey Avenue

- Alternative 3 includes five (5) difficult crossings and performed poorly with respect to reducing and/or avoiding bicycle and pedestrian safety hazards.
- Alternative 3 does a slightly better job of improving the bicycle network than the pedestrian network – this is mostly because of out-of-direction travel that is not highly feasible on-foot.
- Alternative 3 performed poorly with respect to minimizing parking impacts along Causey.
- Maplehurst Road/Harmony Drive is currently well-traveled by automobiles. Bicycle and pedestrian improvements along Maplehurst Road/Harmony Drive are not expected to yield direct benefits for drivers.
- Cost considerations would include the same Monroe Street greenway improvements, the realignment of the Maplehurst intersection, realignment at Fuller/Harmony/Causey, and the addition of signals. Maplehurst would include sharrows and improved pedestrian facilities.

Alternative 4: Monroe Street – Maplehurst Road/Harmony Drive – Fuller Road – Boyer Drive (Extended) – 85th Ave – Spencer Drive

- Alternative 4 performed was the worst-performing out of the seven routes under consideration.
- Alternative 4 performed very well with regard to minimizing parking impacts.

- Cost considerations would include the greenway improvements along Monroe Street, the realignment of the Maplehurst intersection, realignment at Fuller/Harmony, and the addition of signals. Maplehurst would include sharrows and improved pedestrian facilities.
- Additional cost considerations would include signals at Fuller Road as well as signing, striping, and speed cushions east of 85th Avenue.
- Alternative 4 presents a U-shaped network path and significant out-of-direction travel.
- A left-turn and then significant travel along Fuller Road scored this alternative poorly with respect to avoiding/reducing bicycle/pedestrian hazards, modal conflicts, and improving the motor vehicle system.

Alternative 5: Monroe Street – Thompson Road – Fuller Road – Boyer Drive (Extended) – 85th Avenue – Spencer Drive

- Alternative 5 and Alternative 1(a) were the best-performing routes under consideration (tied).
- Alternative 5 was one of the best-performing routes with regard to providing safe routes to school.
- Alternative 5 achieved the most balanced performance with respect to providing neighborhood benefits of any of the routes under consideration.
- Alternative 5 performed better than any of the other routes under consideration with respect to reducing conflicts among all modes.
- The only criterion under which Alternative 5 performed poorly was 'reduce cut-through traffic'.

Alternative 6: Monroe Street – Thompson Road – Fuller Road – Causey Avenue

- Alternative 6 was one of the best-performing routes with regard to providing safe routes to school. It performed strongly in all three of the sub-criteria under the SRTS category.
- Alternative 6 was not determined to improve the pedestrian network, primarily due to out-of-direction travel associated with a z-shaped network path.
- Alternative 6 performed poorly with respect to minimizing parking impacts along Causey Avenue.
- This alternative performed poorly with respect to minimizing/avoiding bicycle/pedestrian hazards, primarily due to travel along Fuller Road, a left-turn onto Causey, and a high potential for modal conflicts east of 82nd Avenue.
- Alternative 6 also performed poorly with respect to minimizing cut-through traffic along Monroe Street.
- Cost considerations include two signalized intersections on Fuller.

Alternative 7: Monroe Street – Maplehurst Road/Harmony Drive – Fuller Road - Monterey Avenue

- Alternative 7 performed very well with regard to minimizing parking impacts and avoiding right-of-way/encroachment impacts.
- Alternative 7 does an exceptionally good job of providing direct access to the Clackamas Town Center. It also does a good job of leveraging planned improvements for Monterey (including full build-out of the street between Fuller Road and 82nd Avenue). Alternative 7 did not, however, perform well with respect to *improving* the bicycle/pedestrian system, since improvements along Monterey are already planned and funded.

- Safety concerns for this alternative include traffic volumes/speeds along Maplehurst Road and Fuller Road. In addition, the wide turning-radii at Maplehurst @ Monroe and Maplehurst @ 72nd and dangerous and would potentially require mode separation and turn realignment.
- East-bound cyclists wishing to access the I-205 Multi-Use Path must cross Monterey to get to the access point on the north-side of the street – this poses potential safety concerns and likely investments (such as rapid-flash beacons) to make crossing Monterey at the I-205 bicycle/pedestrian access point safer for active transportation users.
- Alternative 7 did not perform well with respect to supporting healthy and active communities, primarily due to significant out-of-direction travel, lengthy travel along Fuller Road, the crossing of several dangerous intersections, and a south-bound orientation.
- Cost considerations include a signalized intersection at Harmony/Fuller, as well as configuration issues with access to the I-205 Multi-Use Path.

Alternatives Analysis Cut-Sheets

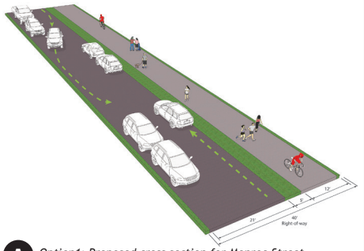
MONROE STREET NEIGHBORHOOD DESIGN PLAN

Alternative Route #1A: Monroe Street - Boyer Drive (Extended) - 85th Ave - Spencer Drive

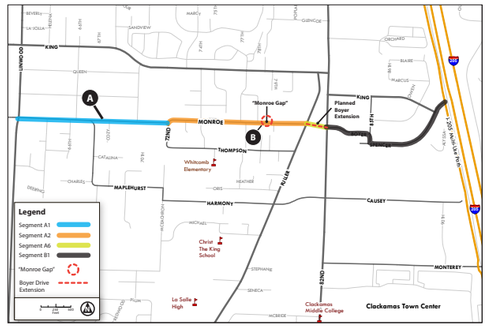
Monroe Gap improved for bicycles and pedestrians only

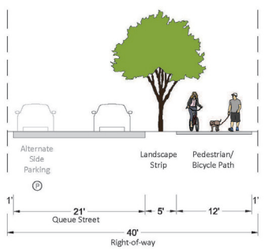
Alternative Route #1A runs along Monroe Street from SE Linwood Avenue to 82nd Avenue, then follows Boyer Drive, 85th Avenue and Spencer Drive to the I-205 Multi-Use Path. This alternative assumes the "Monroe Gap" is improved to provide pedestrian and bicycle-only access.

This is the shortest and most direct connection of all the alternatives being considered. It assumes construction of the planned Boyer Drive extension between Fuller Road and 82nd Avenue.

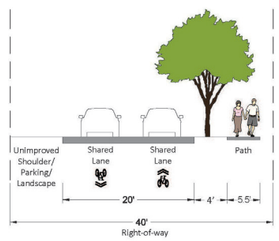


A *Option1: Proposed cross section for Monroe Street, Linwood to 72nd Avenue*





A *Option 1: Proposed cross section for Monroe Street, Linwood to 72nd Avenue (bike/ped path)*

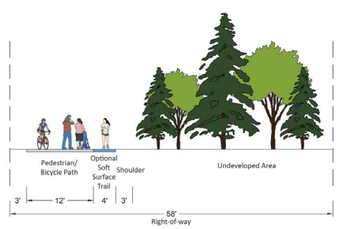


A *Option 2: Proposed cross section for Monroe Street, Linwood to 72nd Avenue (ped only path)*

Alternative Analysis Highlights

- Alternative #1A has greater potential to reduce difficult intersections and high-speed environments than other alternatives
- This route offers good access for both northbound and southbound bicycle riders on the I-205 Multi-Use Path
- Pedestrian safety is improved with a path on one side of the street
- Parking is preserved to create a "queuing street"

Path example from Gresham, OR



B *Shared-use path option for the "Monroe Gap"*

Safe Routes to School

- Alternative Route #1A does not pass directly by Whitcomb Elementary School, so it does not result in the adjacent safety improvements provided by some alternatives
- Monroe Street from Linwood Avenue to Maplehurst Road is within the Linwood Sojourner Elementary School hazard zone; pedestrian improvements on Monroe would help improve safety in that zone

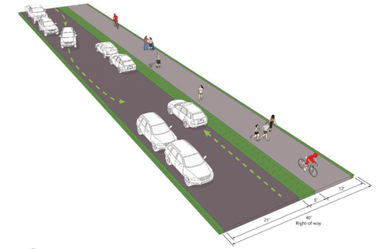
MONROE STREET NEIGHBORHOOD DESIGN PLAN

Alternative Route #1B: Monroe Street - Boyer Drive (Extended) - 85th Ave - Spencer Drive

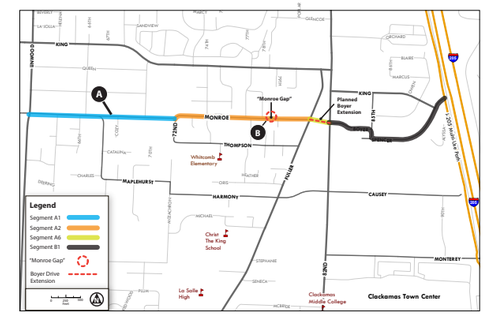
Full Build-out of Monroe Gap for autos

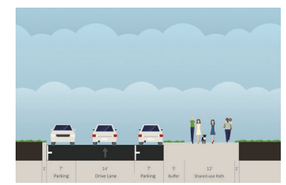
Alternative Route #1B runs along Monroe Street from SE Linwood Avenue to 82nd Avenue, then follows Boyer Drive, 85th Avenue and Spencer Drive to the I-205 Multi-Use Path. This alternative includes motor vehicle, bicycle, and pedestrian access through the "Monroe Gap."

This is the shortest and most direct connection of all the alternatives being considered. It assumes construction of the planned Boyer Drive extension between Fuller Road and 82nd Avenue.

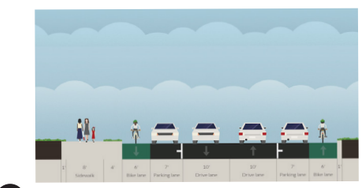


A *Proposed cross section for Monroe Street, Linwood to 72nd Avenue*





A *Proposed cross section for Monroe Street, Linwood to 72nd Avenue (bike/ped path)*

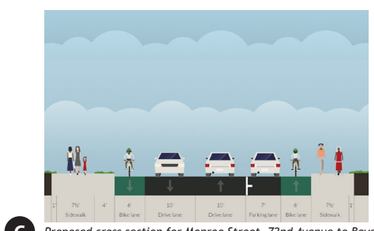


B *Full build-out option for the "Monroe Gap"*

Alternative Analysis Highlights

- This route offers good access for both northbound and southbound riders on the I-205 Multi-Use Path
- Alternative #1B is lower-performing than Alternative #1A with regard to creating a calmer street environment because it would increase vehicular traffic on Monroe Street
- Higher speeds and volumes require separated bicycle accomodations

Bike lane example from Milwaukie, OR



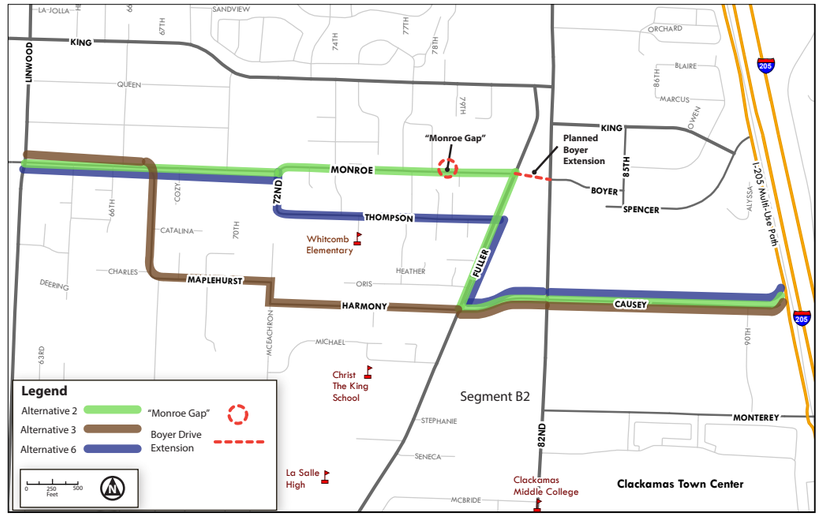
C *Proposed cross section for Monroe Street, 72nd Avenue to Boyer*

Safe Routes to School

- While Alternative Route #1B does not pass directly by Whitcomb Elementary School, it has the potential to draw motor vehicles away from Thompson Road where Whitcomb Elemntary is located
- Monroe Street from Linwood Avenue to Maplehurst Road is within the Linwood Sojourner Elementary School hazard zone; pedestrian improvements on Monroe Street would help improve safety in that zone

MONROE STREET NEIGHBORHOOD DESIGN PLAN

Fuller Road & Causey Avenue - Constraints and Challenges

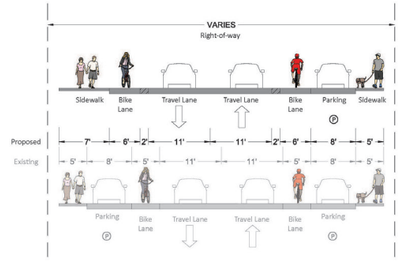


Fuller/Causey Intersection

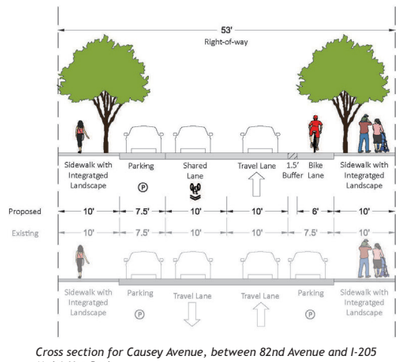
- A signalized crossing is needed for safe pedestrian and bicycle movement at the intersection of Fuller and Causey; this would add significant cost to alternatives utilizing the Fuller/Causey intersection

Fuller Constraints and Challenges

- Fuller is built out to the existing right-of-way, including substandard 5' bike lanes with no buffer. These do not provide an adequate level of comfort and protection for "interested but concerned" riders and families with children. Re-aligning the street to allow space for a protected bikeway requires parking removal on one side



Cross section of Fuller Road, from Thompson Road to Causey Avenue



Cross section for Causey Avenue, between 82nd Avenue and I-205 Multi-Use Path

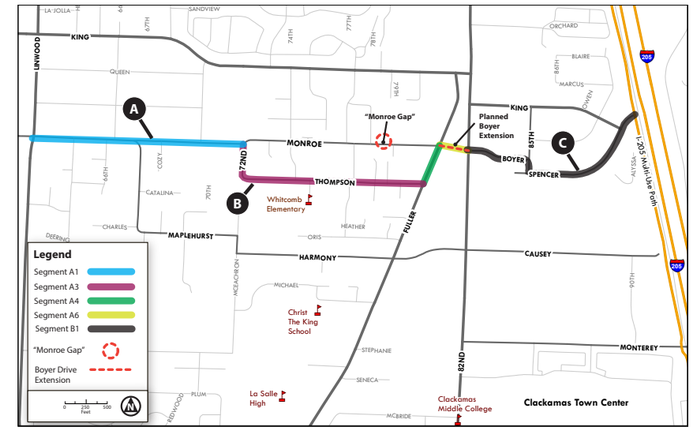
Causey Constraints and Challenges

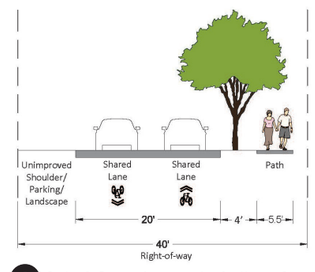
- Speeds, volumes and grade on Causey make uphill bike travel unsafe without a bike lane
- Parking is removed on south side to make space for the bike lane; no bike lane is provided on downhill (north) side because removal of parking on north side would eliminate highly-utilized parking and leave business and residents with no on-street spaces
- Downhill bicycle travel is accommodated in a shared lane, which is acceptable for experienced, confident riders but not desirable due to heavy traffic and conflict with parking
- Downhill shared lane does not serve "interested but concerned" bicyclists or families

MONROE STREET NEIGHBORHOOD DESIGN PLAN

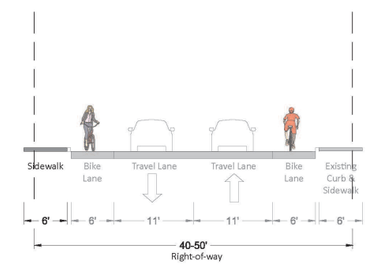
Alternative Route #5: Monroe Street - Thompson Road - Fuller Road - Boyer Drive (Extended) - 85th Ave - Spencer Drive

This route follows Monroe Street between Linwood Avenue and 72nd Avenue, then Thompson Road from 72nd Avenue to Fuller Road, Fuller Road to Boyer Drive, and Boyer Drive to 85th Avenue and Spencer Drive to connect to the I-205 Multi-Use Path. This alternative assumes the extension of Boyer





A *Option 2: Proposed cross section for Monroe Street, Linwood to 72nd Avenue*



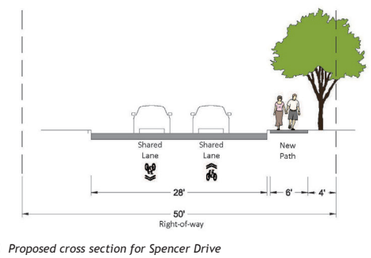
B *Proposed cross section for Thompson Road, from Whitcomb to Fuller (new sidewalk would require additional right-of-way)*

Alternative Analysis Highlights

- This route includes a signal at Thompson Road and Fuller Road
- Alternative #5 could require some right-of-way aquisition to complete sidewalks on both sides of the street
- Providing continuous bike lanes could impact school parking

Safe Routes to School

- Alternative #5 performed well on Safe Routes to School criteria because it is directly adjacent to Whitcomb elementary



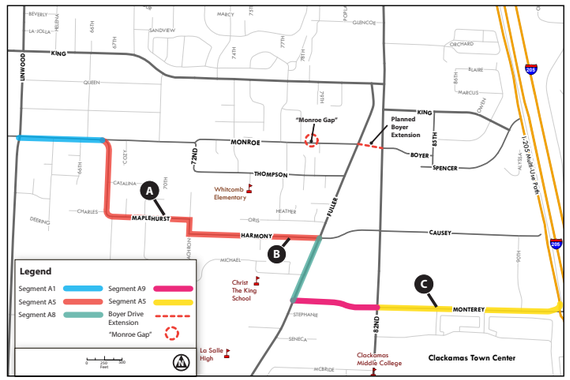
C *Proposed cross section for Spencer Drive*

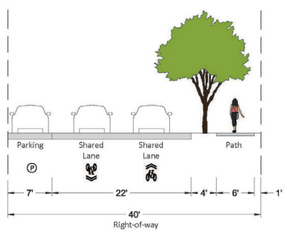
MONROE STREET NEIGHBORHOOD DESIGN PLAN

Alternative Route #7: Monroe Street - Maplehurst Road - Harmony Drive - Fuller Road - Stephanie Court - Monterey Avenue

This route follows Monroe between Linwood Avenue to Maplehurst Road, then follows Maplehurst to Harmony Drive to Fuller Road. The route goes south on fuller and turns onto Stephanie Court, which connects to Monterey Avenue, connecting to the I-205 Multi-Use Path.

This is the least direct route with the greatest number of turns and intersection crossings.





A *Proposed cross section for Maplehurst Road*

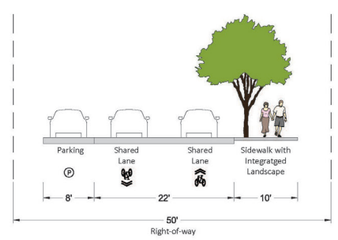
Alternative Analysis Highlights - Maplehurst

- Maplehurst and Harmony require more out-of-direction travel for pedestrians
- Currently, Maplehurst lacks sidewalks and has limited right-of-way
- Improving the existing multi-use path from Maplehurst to Whitcomb Elementary could provide safer walking access to the school

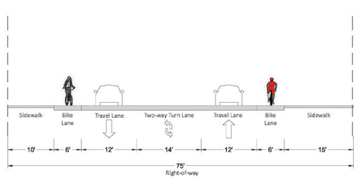
Alternative Analysis Highlights - Harmony & Fuller

- The Harmony/Fuller intersection presents increased conflicts for pedestrians and cyclists
- Widening the bike lane to meet County standards on Fuller Road will require parking removal on one side of the street

See previous cutsheets for more information on Fuller Road



B *Proposed cross section for Harmony Drive*



C *Proposed cross section for Monterey Drive*

Alternative Analysis Highlights - Monterey

- There is currently no direct access for eastbound cyclists on Monterey Avenue to reach the1-205 Multi-Use Path. This route would require installation of a Rectagular Rapid Flash Beacon (RRFB) or High-Intensity Activated Crosswalk (HAWK) beacon to enable cyclists to cross traffic safely when accessing the path
- This route performs worse than others with respect to northbound access for pedestrians or bicyclists traveling north to I-205 Multi-Use Path
- This route requires a lower level of system improvements because the bicycle improvements already exist along Monterey

CLACKAMAS COUNTY

Appendix D

Existing Conditions and Needs Memorandum

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MONROE NEIGHBORHOOD STREET DESIGN PLAN

TECHNICAL MEMORANDUM #2: NEEDS, CONSTRAINTS, AND POTENTIAL SOLUTIONS

September 11, 2015

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Introduction and Context

Located in northern Clackamas County, Monroe Street has been envisioned by local and regional governments as a primary active transportation route stretching east from the Trolley Trail in Milwaukie to the Interstate 205 Multi-Use Path located in the unincorporated portion of the County. This connection

would improve local access to two lines on the MAX regional light rail system -- the Green Line along I-205 and the newly completed Orange Line in Milwaukie -- and would provide safer bicycling and walking to and within the Clackamas Regional Center. Ultimately, the project would link downtown Milwaukie and the Clackamas Town Center, connecting local neighborhoods to schools, jobs, shopping and parks along the way.

The City of Milwaukie developed a concept design plan for the portion of Monroe Street within city limits, the Monroe Street Neighborhood Greenway Concept Plan, in early 2015. Clackamas County is now planning for the portion of the corridor from SE Linwood Avenue to I-205, a distance of 1.5 to 2 miles, depending on which of several route alternatives is chosen.

This technical memorandum describes the needs, constraints and potential solutions in the corridor, as well as potential design tools to address those needs. The purpose of this memorandum is not to select an alternative, but to describe the conditions and context in which that selection will be made.

Policy Context

The Clackamas County Transportation System Plan (TSP) identifies SE Monroe Street as a key east-west bicycle route connection. The Clackamas County Active Transportation Plan (ATP) designates Monroe as a Principal Active Transportation Route, and Metro's Regional Transportation Plan and Active Transportation Plan identifies Monroe as a Bicycle Parkway, that plan's highest-level bicycle classification. The City of Milwaukie has also designated the stretch of Monroe within city limits as a Neighborhood Greenway in the Milwaukie TSP.

A more detailed analysis of the policy context for the project is contained in the *Monroe Neighborhood Street Design Plan Policy Framework and Alternative Analysis Selection Criteria Memorandum* (August 2015). A list of relevant Clackamas County TSP projects is included as **Appendix C**.

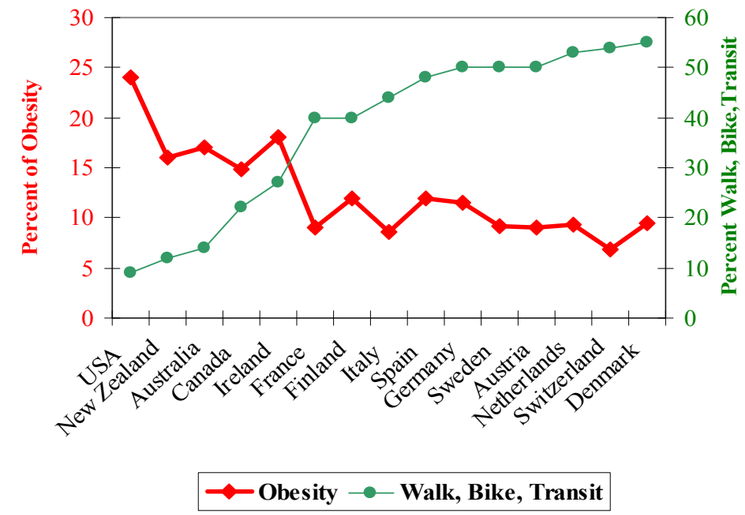
Project Objectives

The Monroe Neighborhood Street Design Plan project (Monroe Plan) is intended to support a healthy and active community by improving bicycle and pedestrian access in an area where dedicated facilities are infrequent and discontinuous. The plan will develop a neighborhood street design that improves safety for all modes of travel, but has a particular focus on creating safer and more comfortable conditions for pedestrians and cyclists. Plan elements will include stormwater management features (such as green street treatments) to address pavement runoff as well as crossing treatments at major intersections.

The Monroe Plan will also include a Safe Routes to School (SRTS) Plan for Whitcomb Elementary School, located on Thompson Street at 74th Avenue. The SRTS plan will identify sidewalk and bicycle gaps and deficiencies within the Whitcomb attendance area, and document road characteristics and intersection improvements conducive to increasing pedestrian and bicycle safety and comfort for school-age children.

Increasing Active Transportation to Improve Public Health

Throughout the U.S. and in Oregon, the rising rate of obesity (along with attendant conditions such as stroke, heart diseases and diabetes) has been identified as a critical public health issue. Numerous studies have documented lower obesity rates in places with higher active transportation levels, as shown in the chart below.



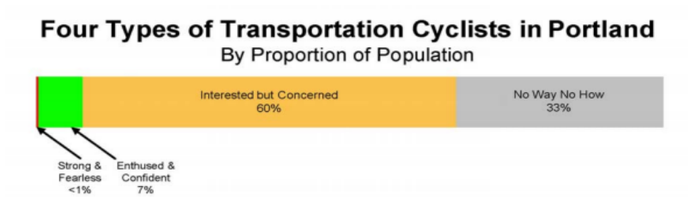
Obesity/Active Transportation Relationship Source (Source: Pucher and Dijkstra, 2003)

Both the Clackamas County Active Transportation Plan and the Metro Regional Active Transportation Plan articulate goals to increase walking and bicycling throughout the Portland Metro region to help improve public health in the region.

Safety and Comfort on Different Types of Streets

Throughout the U.S., surveys have found that the number one reason people do not ride bicycles is fear of being injured by motor vehicles. Different types of riders have a different level of tolerance for traffic; a few stronger, more experienced cyclists may be comfortable in conditions that the majority of riders would find intimidating.

A well-accepted "continuum of cyclists," developed in 2005 by the City of Portland, is shown in the following graphic:



Representing a tiny percentage of the population, the "Strong and the Fearless" are riders who are generally undeterred by roadway conditions.

"Enthused and Confident" cyclists are comfortable sharing the roadway with automotive traffic, but they prefer the safety and comfort of bicycle lanes and bicycle boulevards. This demographic rises as more bicycle facilities are put in place, but it is still a relatively small section of the population.

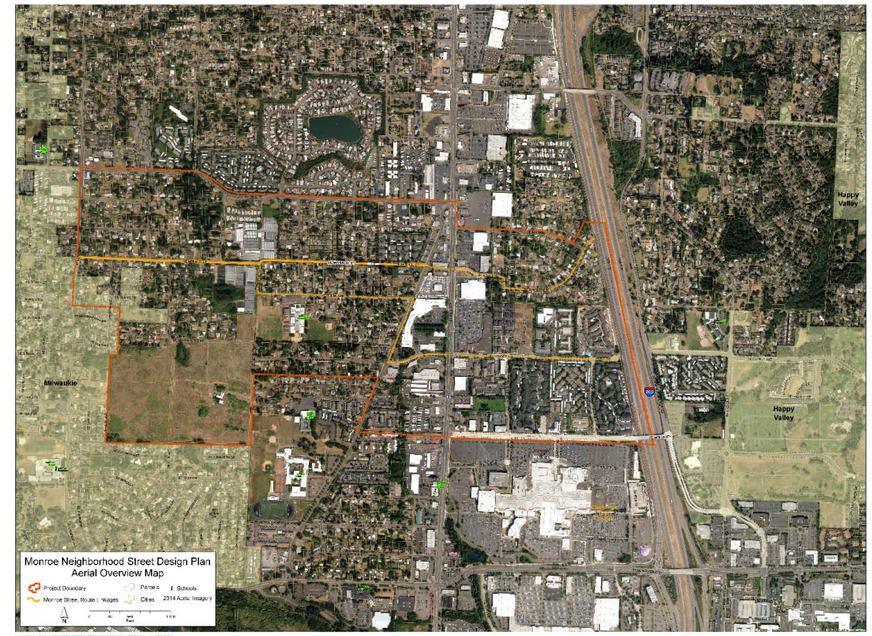
A much larger demographic is the "Interested but Concerned" group. These people are curious about bicycling, and often enjoy recreational riding on separated paths, but they are afraid to ride on streets with cars and trucks. They would ride if they felt safer on the roadways—if there were more quiet streets with few motorized vehicles and paths without any cars at all. Finally, about one-third of the population falls into the "No Way, No How" group that is currently not interested in bicycling at all.

As shown in the graphic above, increasing cycling among the "Interested but Concerned" group represents a huge opportunity to get more people more physically active. The challenge is to create facilities where ordinary people – including children, parents, and older adults – feel protected from the dangers of traffic.

The Monroe Plan project offers an opportunity to create a facility that, in addition to improving pedestrian connections and safety, attracts "Interested but Concerned" bicyclists. Different sections of the project area will require different treatments to achieve this objective. Lower-traffic sections lend themselves to "neighborhood greenway"-type treatments designed to create shared space for all users. These treatments help slow vehicle speeds and discourage cut-through traffic, creating a quiet neighborhood street environment that allows even vulnerable users (such as children and the elderly) to walk and bicycle safely and comfortably. Higher-traffic sections will likely require roadway treatments – such as paths, sidewalks and/or separated bike lanes – that separate pedestrians and bicyclists from cars.

Project Study Area

The Monroe Plan will consider a range of alternatives to provide a safe pedestrian and bicycle connection from the intersection of Monroe Street and Linwood Avenue and the I-205 Multi-Use Path. The map below illustrates the extent of the project study area; potential route options for the Monroe Neighborhood Street Design Plan are shown in yellow.



Note: Map shown above is a placeholder for final map showing all potential route alternatives.

Route Alternatives

This memorandum proposes six route alternatives for further analysis using previously-defined selection criteria.[1] The six proposed alternatives include the following:

Alternative 1: Monroe Street – Boyer Drive (Extended) – 85th Ave – Spencer Drive

Alternative 2: Monroe Street – Fuller Road – Causey Avenue

Alternative 3: Monroe Street – Maplehurst Road/Harmony Drive – Causey Avenue

Alternative 4: Monroe Street – Maplehurst Road/Harmony Drive – Fuller Road – Boyer Drive (Extended) – 85th Ave – Spencer Drive

Alternative 5: Monroe Street – Thompson Road – Fuller Road – Boyer Drive (Extended) – 85th Ave – Spencer Drive

Alternative 6: Monroe Street – Thompson Road – Fuller Road – Causey Avenue

These six alternatives were identified as potential pedestrian and bicycle routes that meet the Monroe Neighborhood Street Plan project goal of improving safety for all modes of travel, with a particular focus on pedestrians and cyclists. Monroe Street itself was given special consideration in light of its designation as a key bicycle and pedestrian link in the Clackamas County TSP, the Clackamas County Active Transportation Plan, and Metro's Active Transportation Plan.

Segments that Comprise Route Alternatives

While each of the six Monroe Neighborhood Street alternatives is distinct, all include one or more of nine separate segments between Linwood Avenue and the I-205 Multi-Use Path. For analysis purposes, these segments have been organized into two sections, with 82nd Avenue serving as the boundary between Section A (west of 82nd Avenue) and Section B (east of 82nd Avenue). Section A contains seven route segments (A1 – A7) between Linwood Avenue and 82nd Avenue (OR 213). Section B contains two segments (B1 and B2) between 82nd Avenue and the I-205 Multi-Use Path. A summarized list of the route segments, organized by section is provided below.

Section A Segments (Linwood Avenue to 82nd Avenue)

- Segment A1: Monroe Street between Linwood Avenue and 72nd Avenue
- Segment A2: Monroe Street between 72nd Avenue and Fuller Road
- Segment A3: Thompson Road between 72nd Avenue and Fuller Road
- Segment A4: Fuller Road between Monroe Street and Causey Avenue
- Segment A5: Maplehurst Road-Harmony Drive between Monroe Street and Fuller Road
- Segment A6: Boyer Drive (Extended) between Fuller Road and 82nd Avenue
- Segment A7: Causey Avenue between Fuller Road and 82nd Avenue

Section B Segments (82nd Avenue to I-205)

- Segment B1: Boyer Drive-85th Avenue-Spencer Drive between 82nd Avenue and the I-205 Multi-Use Path
- Segment B2: Causey Avenue between 82nd Avenue and the I-205 Multi-Use Path

[1] Refers to the selection criteria identified in the *Monroe Neighborhood Street Design Plan Policy Framework and Alternative Analysis Selection Criteria Memorandum* (August 2015).

Overview of Conditions in the Corridor

The cross-section and overall character of the Monroe Neighborhood Street corridor vary considerably throughout the study area, including both low-traffic residential streets and busier collector roadways.

Monroe Street itself has two separate functional classifications in the Clackamas County TSP. Between Linwood Avenue and 72nd Avenue, it is classified as a Collector street.[2] East of 72nd Avenue to Fuller Road, it is classified as a Connector.[3] This includes the discontinuous section of Monroe Street east of SE 78th Avenue known as the "Monroe Gap." which is accessible only to pedestrians.

West of 78th Avenue on Monroe, the public right of way is nearly 60' wide. The effective pavement width is approximately 30'. A mix of soft shoulder and hard curb and gutter runs along the length of Monroe, but sidewalks are mostly absent west of 78th Avenue (with the exception of a 200' orphan section just east of 74th Avenue). East of the gap at 78th Avenue, the street character is more urban with a consistent 5' sidewalk on the north side of the street to Fuller Road. The predominant land use is low-density single-family residential west of 78th Avenue; several multi-family housing complexes are located between the gap and Fuller Road.

Between 72nd and 78th Avenues, Monroe Street is a relatively quiet two-lane local residential street with low volumes and speeds. This is primarily due to the gap in the roadway just east of 78th Avenue, which acts as a natural traffic diverter. This discontinuous section diverts motorists to Thompson Road one block south to reach Fuller Road and points east. Currently, there is a narrow dirt path that does not meet Americans with Disabilities Act (ADA) standards and is accessible only to pedestrians and bicyclists who walk their bikes. The Clackamas County Development Agency has contemplated completing the road sometime in the future, making Monroe a continuous auto route through the neighborhood. However, some Public Advisory Committee and community members have stated a preference to improve the gap for pedestrians and bicyclists only, and leave it closed to automobiles.

[2] A Collector is defined in the TSP as "principal carrier within neighborhoods or single land use areas. Links neighborhoods with major activity centers, other neighborhoods, and arterials. Generally not for through traffic. Low to moderate volume; low to moderate speed."

[3] A Connector "collects traffic from and distributes traffic to local streets within neighborhoods or industrial districts. Usually longer than local streets. Low traffic volumes and speeds. Primarily serves access and local circulation functions. Not for through traffic in urban areas."

Traffic Speeds and Volumes

Although much of Monroe Street has higher traffic volumes and speeds today than are desirable for a neighborhood greenway, the community has expressed support in a community survey for lowering speeds and reducing the amount of traffic on the street. Moreover, the street parallels arterial routes (King Road and Harmony Road) onto which through-vehicle traffic can be potentially redirected. The table below shows traffic speeds and volumes in the project corridor by section.

Observed Weekday Speeds and Volumes by Route Segment

Applies to:	Observation Location	Total Volumes (vehicles per day)	85th Percentile Speed (miles per hour)
Segment A1: Monroe Street between Linwood Avenue and 72nd Avenue	Monroe Street *@ 64th Ave*	2,039	32 mph
	Monroe Street *@72nd Ave*	1,710	34 mph
Segment A2: Monroe Street between 72nd Avenue and Fuller Road	TBD	TBD	TBD
Segment A3: Thompson Road between 72nd Avenue and Fuller Road	Thompson Rd *@79th Ct*	2,390	30 mph
Segment A4: Fuller Road between Monroe Street and Causey Avenue	Fuller Road *@ Monroe St*	3,539	35 mph
Segment A5: Maplehurst Road-Harmony Drive between Monroe Street and Fuller Road	Harmony Drive *@ west of Fuller Rd*	1,031	32 mph
Segment A6: Boyer Drive Extended between Fuller Road and 82nd Avenue	Will be constructed in 2017		
Segment A7: Causey Avenue between Fuller Road and 82nd Avenue	Causey Avenue *@ 400' east of Fuller Rd*	5,048	29 mph
Segment B1: Boyer Drive-85th Avenue-Spencer Drive between 82nd Avenue and I-205 Multi-Use Path	TBD	TBD	TBD
Segment B2: Causey Avenue between 82nd Avenue and I-205 Multi-Use Path	Causey Avenue *@ 400' east of 82nd Avenue*	6,358	30 mph

Lack of Safe Pedestrian Facilities

Built in the early 1960s, subdivisions throughout the study area were constructed largely without sidewalks. Monroe Street and Thompson Road, which have public rights-of-way between 40' and 60' in this neighborhood, lack sidewalks with the exception of a short section on the south side of Thompson Road to improve pedestrian access to Whitcomb Elementary School from the east.

In many locations, features from adjoining front yards (such as hedges or fences), in addition to trees and utility poles, constrain the usable width of the street. As a result, people must walk along a narrow shoulder next to vehicles traveling 25-35 miles mph or faster, creating an uncomfortable environment that is especially inhospitable to people who use mobility devices such as wheelchairs. Except for disconnected sections built piecemeal as part of newer residential development, Maplehurst Road and Harmony Drive lack sidewalks.

East of 82nd, Spencer Drive also lacks sidewalks, but as a dead-end residential street it has considerably lower volumes. While 82nd Avenue, Fuller Road and Causey Avenue do have sidewalks, they are frequently narrow and adjacent to the roadway, creating an unwelcoming pedestrian environment. Most of the corridor is also missing ADA-compliant curb ramp treatments.

Lack of Continuous Bicycle Infrastructure

There are no continuous bicycle lanes traveling east-west through the study area. The closest facility is located three blocks north of Monroe on King Road, which terminates at 82nd Avenue (several blocks west of I-205). Bicycle lanes on King Road are the minimum standard width of 5'. With average (85th percentile) speeds on King exceeding 35 mph east of Linwood Avenue, these bike lanes may not be comfortable for less experienced cyclists.

Thompson Road has standard 5' bicycle lanes between Whitcomb Elementary School and Fuller Road. However, they do not continue further west along Monroe Street, and vehicles have been observed parked in the bicycle lane. Monroe itself lacks proper shoulders and has traffic volumes and speeds too high for low-stress shared conditions, with average daily traffic (ADT) volumes around 2,300 vehicles and average speeds exceeding 32 mph east of Linwood Avenue. There are no bicycle lanes on Monroe. However, the extension of Boyer Drive west to Fuller Road will include dedicated pedestrian and bicycle facilities, connecting Monroe Street to 82nd Avenue and points east.

Further south, Causey Avenue has traffic volumes exceeding 5,000 ADT east of 82nd Avenue, with only a few feet of westbound bicycle lane.

The north-south running I-205 Multi-Use Path is mostly complete between the Columbia River and Gladstone, with a short gap between 82nd Avenue and OR 212/224 south of Clackamas Town Center. In addition, there are north-south bicycle lanes along Fuller Road and 82nd Avenue, though these are discontinuous and only exist as far north as King Road and as far south as Clackamas Town Center. The dropping and adding of bicycle lanes, particularly at intersections and turn lanes, introduces potential conflicts between motor vehicles and bicyclists.

Difficult Crossings for All Modes

East-west travel for all modes can be challenging within the project area due to several crossings that present mobility and access barriers. The Linwood Avenue/Monroe Street intersection is two-way stop-controlled for Monroe Street traffic and can be difficult to cross due to heavy traffic on Linwood Avenue, lack of crosswalks and limited sightlines. Several collisions have been reported at that intersection, and the County's TSP has identified it as a safety focus intersection.

Further east, Fuller Road and 82nd Avenue are very wide streets that are difficult for pedestrians to cross and that lack midblock crosswalks or median refuge areas. 82nd Avenue's heavy traffic volumes (almost 30,000 ADT in 2013), numerous driveway access points and five-lane cross-section make for difficult crossing conditions. Marked crosswalks are located only at signalized intersections, which can be as much as a quarter mile apart.

Due to the high number of crashes along the entire 82nd Avenue corridor, Clackamas County (as well as Portland to the north) has identified 82nd Avenue candidate safety corridor. Crashes involving pedestrians and bicyclists on 82nd Avenue often result in serious injuries or fatalities.

I-205 also poses a major barrier to connectivity, with no crossings between Otty Road and Monterey Avenue, a distance of nearly one mile. This project is intended to improve access to the I-205 Multi-Use Path from points west, in order to make it easier for travelers to use the freeway overpasses.

Transportation Disadvantaged Populations

The highest population densities in unincorporated Clackamas County are located north of King Road between Linwood Avenue and 82nd Avenue, and east of 82nd Avenue between Causey Avenue and Otty Road.[4] These areas have been identified as having a high proportion of transportation disadvantaged populations, which have historically had significant unmet transportation needs or experienced disproportionate negative impacts from the transportation system.

Transportation disadvantaged populations are mapped by census block and calculated by considering the location of elderly populations, youth populations , low-income populations earning less than 200 percent of the poverty line, non-white and non-Hispanic populations, households with 0-1 vehicles, households where no adult speaks English well, and residential areas within 500' of a freeway or highway. The western part of the Greater Clackamas Regional Center/Industrial Area, particularly in the vicinity of SE King Road, has a high proportion of transportation disadvantaged areas. Clackamas County used this information to help identify new transportation projects in the most recent TSP update.

Access to transit is particularly important in transportation disadvantaged areas, where residents may have physical limitations, age-related limitations or economic circumstances that preclude driving to meet daily transportation needs.

The project study area is served by both light rail and bus service. The MAX Green Line along I-205 offers mid-day frequent service (defined as 15 minutes or better) between downtown Portland and Clackamas Town Center, but light rail service drops to 30-minute headways between Gateway and Clackamas in the evenings. A level of service analysis performed by Clackamas County found that bus service performs poorly with regards to service frequency. As part of the MAX Orange Line opening in Milwaukie and northern

[4] American Communities Survey 5-Year Estimates (2009 – 2013) indicates that Census Tract 216.01 has the highest population density within unincorporated Clackamas County (9,554.3 people per square mile).

Clackamas County in September 2015, TriMet is restructuring bus service in this area which will improve east-west transit service.

Providing safe, comfortable access to transit will be critical as service improves – and creating a network for residents to bicycle safely among key destinations will provide an important alternative means of mobility for those whose travel needs are outside the frequency and/or duration of transit service in the area.

Neighborhood Livability Concerns

Monroe Street is primarily a collector through the city of Milwaukie and Clackamas County and generally sees relatively high levels of through traffic, particularly during the afternoon peak period. Collector streets are intended as moderate-volume, moderate-speed streets that provide access and circulation within and between residential neighborhoods, commercial areas, and industrial areas.

Today, many motorists use Monroe in an effort to avoid congestion along Harrison Street and King Road, which can be especially heavy at 42nd Avenue and Linwood Avenue. Neighborhoods along Monroe have voiced concerns regarding the number of vehicles that travel through their communities, as well as the regularity of speeding traffic. Monroe east of Linwood Avenue has a speed limit of 25 mph, but average speeds are closer to 32 mph. The lack of bicycle and pedestrian facilities means residents must walk or bike along the edge of the roadway next to fast moving traffic, or avoid walking and bicycling entirely.

Lack of Street Connectivity

The study area is characterized by a disconnected street grid, which encourages through traffic to use King Road and Monroe Street/Thompson Road to access Fuller Road and 82nd Avenue from the west. While none of the street segments included as route alternatives have congestion above County performance standards, relatively high volumes on Linwood Avenue and King Road result in congestion and safety issues at the King/Linwood intersection.

Today, Monroe Street stops just east of SE 78th Avenue, where only pedestrians can travel along a narrow dirt path. Therefore, the predominant travel pattern is for motorists to use 72nd Avenue to travel one block between Monroe Street and Thompson Road. Occasionally, collisions occur along this S-curve. The roadway geometry also makes entering or exiting Monroe east of 72nd Avenue difficult due to poor visibility and the skew of the intersection.

Safe Routes to School: Whitcomb Elementary School

As part of the Monroe Plan, Clackamas County is partnering with Whitcomb Elementary School to develop a Safe Routes to School (SRTS) Action Plan. County and school staff are assessing area walking and bicycling conditions, identifying the safest routes to the school and solutions to help make those routes a reality. The Action Plan will use information gathered from travel assessments and student/parent surveys to develop recommended priority projects and activities for Whitcomb Elementary to promote safe walking and bicycling to school. The Action Plan, the first step in the process to apply for funding from the Oregon Safe Routes to School program for non-infrastructure projects and activities for K-8 grade schools, is scheduled to be completed in spring 2016.

Currently, students who live north of King Road or east of 82nd Avenue are bused to school due to hazardous crossings. An initial assessment by County staff of walking and bicycling conditions for students within these boundaries identified a number of needed improvements to make conditions safer, including the following:

- Marked crosswalks and signage in several locations, including the intersections of Fuller Road/Thompson Road, Fuller Road/Causey Avenue/Harmony Drive and Thompson Road/77th Avenue
- More continuous sidewalk coverage on Thompson Road, including the north side between Fuller Road and 72nd Avenue where none exists now, and on the south side west of the school
- Sidewalks along 72nd Avenue between Monroe Street and Thompson Road, where the S-curve creates hazardous walking conditions in the absence of sidewalks
- Sidewalks along 74th Avenue between Monroe Street and Thompson Road, where students often walk in the street because vehicles are parked on both sides of the roadway

There is a well-used, marked crosswalk at Thompson Road and 74th Avenue in front of the school. However, there are sight distance issues with motorists heading westbound in the uphill direction on Thompson Road approaching the school. Where the hill crests just east of 74th Avenue, It can be difficult for a motorist to see pedestrians crossing. Therefore, advance warning signage and a rapid flashing beacon may be considered to improve visibility and reduce travel speeds.

County staff have observed vehicles stopped in the shoulder in front of the elementary school, which obscures visibility to the west for motorists attempting to exit the school parking lot. While the curb is painted yellow within 15' to the west of the driveway to indicate on-street parking restrictions, its application is inconsistent, and it is not clear whether on-street parking is allowed anywhere along Thompson Road.

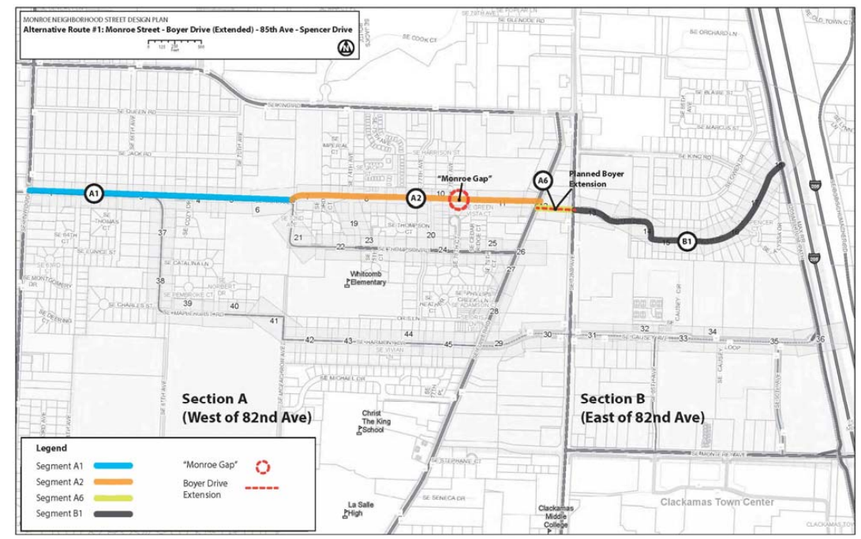
Some bicycle lane markings are present on Thompson Road between 74th Avenue and Fuller Road, although vehicles have been observed parked in the bicycle lane. The initial assessment also found that overgrown vegetation obscuring signage and visibility is an issue along Thompson Road.

To the south of the school, there is an informal walking path that leads to the corner of Maplehurst Road and McEachron Avenue. This path substantially reduces the access time from the south to the school for pedestrians, compared to following the street network. The County could potentially pave the path and make other improvements, although some neighbors have expressed concerns about that action. The entrance to the path on Maplehurst Road is located outside of the public right-of-way.

Summary of Proposed Route Alternatives

The following section provides short summaries for each of the six route alternatives being proposed for further analysis under the evaluation criteria and performance measures described in the Monroe Neighborhood Street Plan Policy Framework memo.[5]

Alternative 1: Monroe Street – Boyer Drive (Extended) – 85th Ave – Spencer Drive



Alternative 1 contains segments A1, A2, A6, and B1.

Alternative 1 runs along Monroe from SE Linwood Avenue to 82nd Avenue, then follows Boyer Drive, 85th Avenue and Spencer Drive to the I-205 Multi-Use Path. This is the shortest and most direct connection of all the alternatives being considered. It assumes construction of the planned Boyer Drive extension between Fuller Road and 82nd Avenue. This alternative includes two design options for closing the "Monroe Gap", discussed further below.

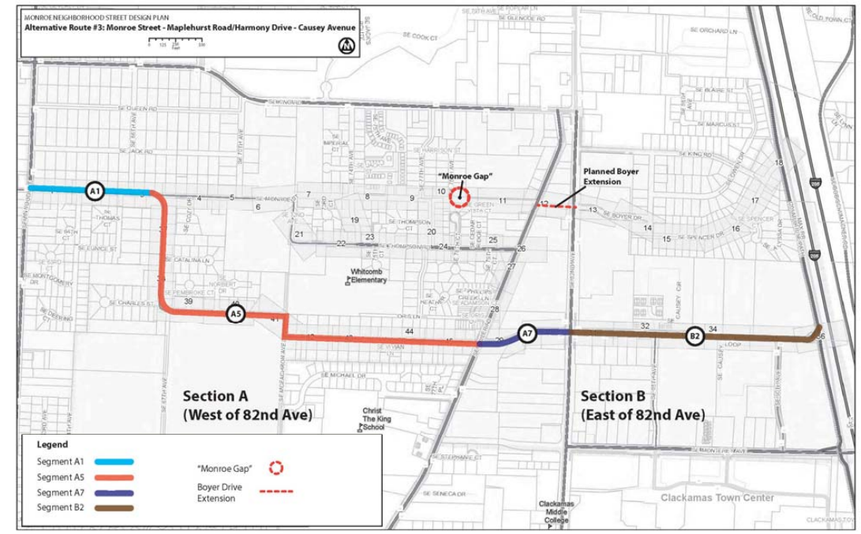
[5] Refers to the selection criteria identified in the *Monroe Neighborhood Street Design Plan Policy Framework and Alternative Analysis Selection Criteria Memorandum* (August 2015).

Alternative 2: Monroe Street – Fuller Road – Causey Avenue

Alternative 2 contains segments A1, A2, A4, A7, and B2.

Alternative 2 travels along Monroe between Linwood Avenue and Fuller Road, then follows Fuller Road south to Causey Avenue, and Causey Avenue between Fuller Road and the I-205 Multi-Use Path. This route alternative exhibits a z-shaped network path. This alternative also has two design options for closing the "Monroe Gap".

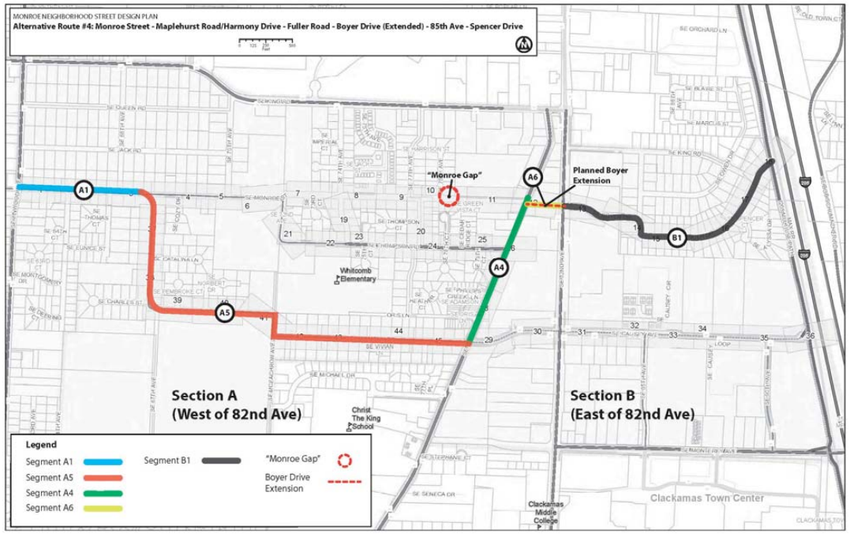
Alternative 3: Monroe Street – Maplehurst Road/Harmony Drive – Causey Avenue



Alternative 3 contains segments A1, A5, A7, and B2.

This alternative would travel from Monroe at Linwood Avenue to Maplehurst Road, and then continue south along Maplehurst/Harmony Drive to Fuller Road. At Fuller Road, Harmony Drive becomes Causey Avenue, which crosses 82nd Avenue before terminating at the I-205 Multi-Use Path.

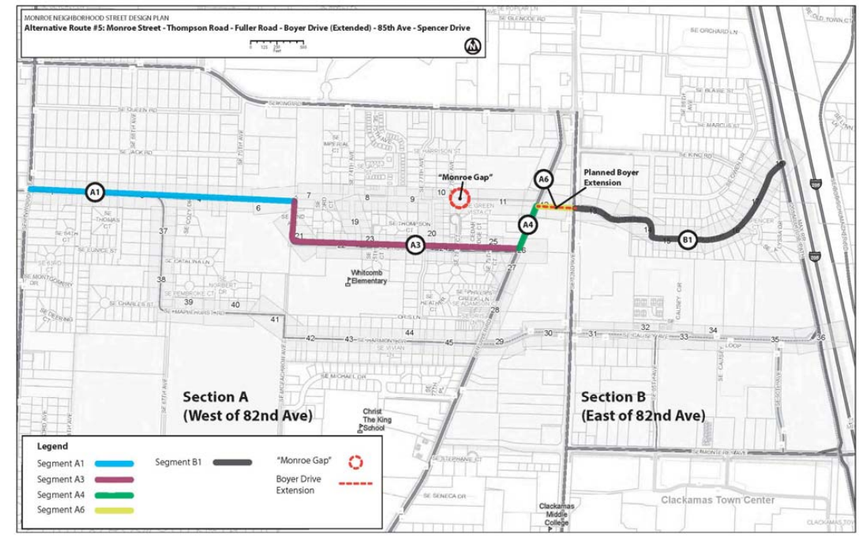
Alternative 4: Monroe Street – Maplehurst Road/Harmony Drive – Fuller Road – Boyer Drive (Extended) – 85th Ave – Spencer Drive



Alternative 4 contains segments A1, A5, A4, A6, and B1.

This route alternative runs on Monroe between Linwood Avenue and Maplehurst Road, then on Maplehurst Road/Harmony Drive from 72nd to Fuller Road, Fuller Road to Boyer Drive, and Boyer Drive to 85th Avenue and then Spencer Drive to connect with the I-205 Multi-Use Path. This U-shaped route is the longest the six alternatives. It also requires the most extensive travel along Fuller Road. This alternative assumes the extension of Boyer Drive.

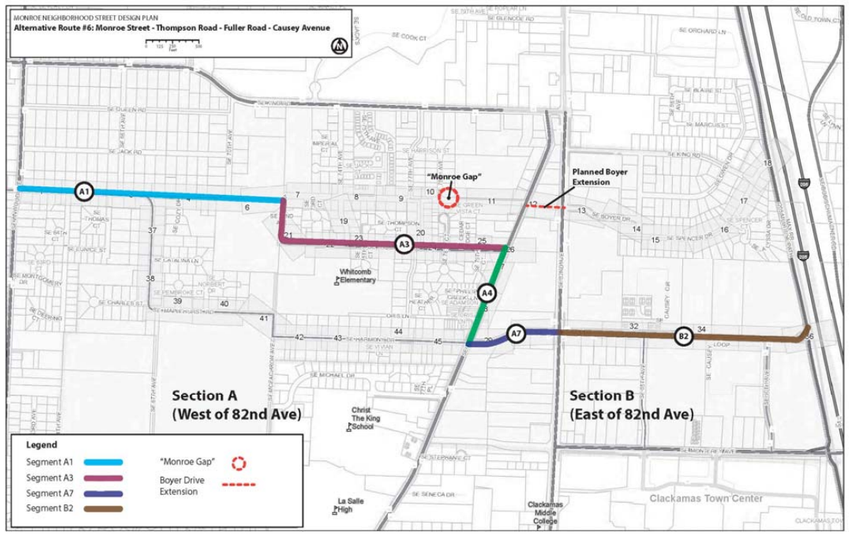
Alternative 5: Monroe Street – Thompson Road – Fuller Road – Boyer Drive (Extended) – 85th Ave – Spencer Drive



Alternative 5 contains segments A1, A3, A4, A6, and B1.

This route follows Monroe between Linwood Avenue and 72nd Avenue, then Thompson Road from 72nd Avenue to Fuller Road, Fuller Road to Boyer Drive, and Boyer Drive to 85th Avenue and Spencer Drive to connect to the I-205 Multi-Use Path. This alternative assumes the extension of Boyer Drive.

Alternative 6: Monroe Street – Thompson Road – Fuller Road – Causey Avenue



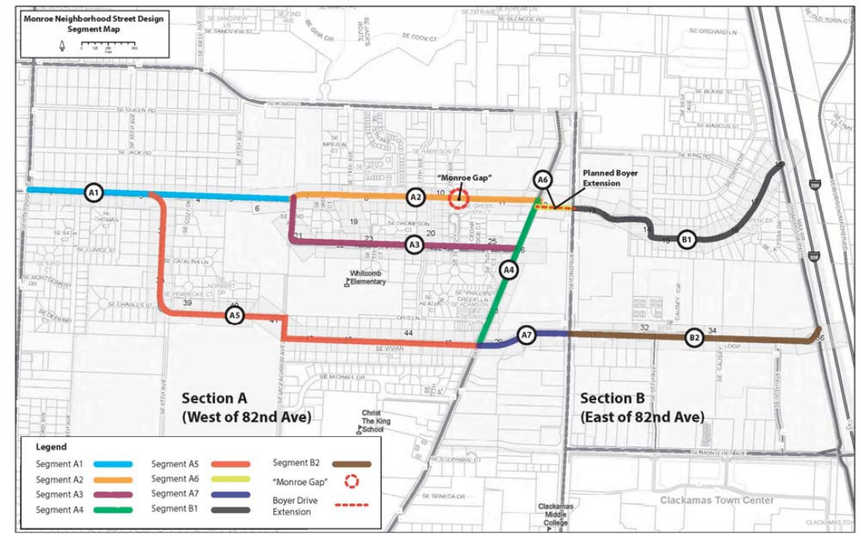
Alternative 6 contains segments A1, A3, A4, A7, and B2.

Alternative 6 runs along Monroe between Linwood Avenue and 72nd Avenue, then Thompson Road between 72nd Avenue and Fuller Road, Fuller Road between Thompson and Causey Avenue, and Causey Avenue between Fuller Road and the I-205 Multi-Use Path.

Segment-by-Segment Analysis: Needs, Constraints, and Potential Solutions

This section of the Needs Memorandum describes the individual segments that comprise the six route alternatives, summarizing the needs, opportunities and constraints therein. Potential design tools to address identified needs and opportunities are discussed for each segment. Existing conditions vary throughout the project corridor—and the applicable design tools for each section vary as a result.

The analysis is organized as follows:



Section A Segments (Linwood Avenue to 82nd Avenue)

- Segment A1: Monroe Street between Linwood Avenue and 72nd Avenue
  - *Design Option A1a: Completion of the Monroe Gap as Exclusive Bicycle/Pedestrian Facility*
  - *Design Option A1b: Completion of the Monroe Gap as Local Street Extension*
- Segment A2: Monroe Street between 72nd Avenue and Fuller Road
  - *Design Option A2a: Completion of the Monroe Gap as Exclusive Bicycle/Pedestrian Facility*
  - *Design Option A2b: Completion of the Monroe Gap as Local Street Extension*
- Segment A3: Thompson Road between 72nd Avenue and Fuller Road
- Segment A4: Fuller Road between Monroe Street and Causey Avenue
- Segment A5: Maplehurst Road-Harmony Drive between Monroe Street and Fuller Road
- Segment A6: Boyer Drive (Extended) between Fuller Road and 82nd Avenue
- Segment A7: Causey Avenue between Fuller Road and 82nd Avenue

Section B Segments (82nd Avenue to I-205)

- Segment B1: Boyer Drive-85th Avenue-Spencer Drive between 82nd Avenue and the I-205 Multi-Use Path
- Segment B2: Causey Avenue between 82nd Avenue and the I-205 Multi-Use Path

Needs and constraints are described for each segment, along with potential solutions. Detailed descriptions of particular tools can be found in **Appendix B**, which serves as a compendium of traffic calming, wayfinding and crossing treatments for bicycle and pedestrian infrastructure.

For in-depth descriptions of treatments for use on higher-volume streets, such as enhanced bicycle lanes and left turn bicycle boxes, the National Association of City Transportation Officials (NACTO) offers free, robust, online design guidance complete with diagrams, treatment benefits, typical applications, and suggested dimensions.[6] This is an important resource for jurisdictions working to improve bicyclist and pedestrian safety.

[6] Available at http://nacto.org/publication/urban-bikeway-design-guide.

Corridor-wide Tools

Certain tools are applicable to all segments throughout the project area, including the following:

Wayfinding Markings and Signage

Sharrows are pavement markings that help identify for all users the fact that bicyclists are expected to share the roadway and act as a reassurance symbol, informing riders that they are on the correct path. Wayfinding signs identify the street as a bicycle route, and often show approximate time and distance to nearby destinations (such as Clackamas Town Center, the Springwater Corridor trail, and local schools). Wayfinding signs can also direct bicyclists and pedestrians from arterial roadways to the Neighborhood Street and vice-a-versa. Sharrows and wayfinding signs are present along the length of Monroe Street in Milwaukie, although intermittently. Both sharrows and wayfinding signage are important active transportation elements, and the opportunity exists to apply them with greater frequency and consistency throughout the corridor.

Curb Extensions, Bioswales and Infiltration Basins

Installing permeable pavement shoulders, curbed bioswales or vegetated basins can result in a narrower-feeling street, slowing traffic while providing for stormwater infiltration. Curb extensions can also help delineate the pedestrian crossings at intersections. It is feasible to incorporate curb extensions into a street without providing curb and gutter along the entire street. ADA-compliant curb ramps could be added at intersections, with street parking accommodated between the bioswale.

Summary of Needs, Constraints, and Potential Solutions

The table on pages 23 and 24 summarizes the needs, constraints, and potential solutions corresponding to each of the nine route segments analyzed in the following sections.

Summary of Needs, Constraints, Opportunities, and Tools by Segment

Needs	Constraints	Opportunities	Potential Solutions
Segment A1: Monroe Street between Linwood Avenue and 72nd Avenue			
• Lower Motor Vehicle Speeds • Pedestrian Access and Visibility • Safe Route to School • Safe and Continuous Bike Route	• Limited available width • Crossing at Linwood Ave • Maplehurst Intersection Geometry • Koida Nursery Traffic	• Remove Double-Yellow Centerline • Narrow Width to Reduce Speeds • Integrate Stormwater Design • 70th Ave Improvement Project • Establish 70th Ave as Nursery Entrance • Wayfinding and Signage • Extent Whitcomb Elementary School Path • Boyer Drive Extension Project	• Neighborhood "Queue" Streets • Sidewalks and Pedestrian Paths • Crossing Signal Enhancements • Wayfinding Markings and Signage • Curb Extensions, Bioswales, and Infiltration Basins • Diversion to Reduce Traffic • Advisory Bicycle Lanes
Segment A2: Monroe Street between 72nd Avenue and Fuller Road			
• Pedestrian Facilities • Difficult Transition at 72nd Ave	• Poor Pavement Condition • Full Gap Closure Could Impact Livability	• Fuller Road Intersection Rebuilding • Reconfigure T-intersection at 72nd Ave • Improve Monroe Gap • Boyer Drive Extension Project	• Wayfinding and Signage • Narrow Roadway Width • Incorporate Stormwater Treatment
Segment A3: Thompson Road between 72nd Avenue and Fuller Road			
• Safety Concerns at 72nd Ave • Parking in Bicycle Lanes • High Volumes and Speeds • Discontinuous Bicycle Infrastructure	• Jog required at Fuller Road • Traffic Volumes and Bicycle Lanes Limit Traffic Calming Opportunities • Fuller Road Intersection Deficiencies	• Retrofit Curb Ramps for ADA Compliance • Rapid Flash Beacon at 74th Ave • Marked Crosswalk at 77th Ave • Intersection Enhancements at Fuller Road • Narrow Lane Widths to Install/Widen Bike Lane or Establish Bike Boulevard • Pedestrian and Bicycle Facilities West of 74th	• Wayfinding and Signage • Buffered Bicycle Lanes • Speed Cushions • Rectangular Rapid Flash Beacons
Segment A4: Fuller Road between Monroe Street and Causey Avenue			
• Lack of Marked Crosswalks • Door Zone Bicycle Lanes • Narrow Sidewalks	• High Travel Speeds • Out-of-Direction Travel	• On-Street Parking Capacity • Underutilized Right-of-Way • Narrow Lane Widths to Reduce Speeds • Signalization of Causey Ave	• Wayfinding and Signage • Wider Sidewalks • Pedestrian Enhancements • Protected or Buffered Bicycle Lanes • Left Turn Bicycle Boxes • Bicycle Signals and Leading Pedestrian/Bicycle Intervals

Segment A5: Maplehurst Road-Harmony Drive between Monroe Street and Fuller Road			
• Pedestrian Access and Visibility • Safe and Continuous Bike Route • Lack of Crosswalks or ADA Compliant Facilities	• Limited Available ROW • Circuitous Route	• Whitcomb Elementary School Access • Popular Bicycle Route	• Wayfinding and Signage • Traffic Calming • Pedestrian Facilities • Curb Extensions, Bioswales, and Infiltration Basins
Segment A6: Boyer Drive Extended between Fuller Road and 82nd Avenue			
• Safe Crossing at 82nd Ave • Cycle Track Transition at Intersections	• Potential Driveway Conflicts • Boyer Drive Construction Timeline • ODOT Jurisdiction over 82nd Ave • Long Wait Times at 82nd Ave	• Multimodal Improvements • Extend Bicycle Box to Accommodate Left-Turning Bicycles • Clackamas Regional Center MMA Project • Programmed Intersection Improvements	• Wayfinding and Signage • Bicycle Signals and Leading Pedestrian/Bicycle Intervals • Green Pavement Markings • Bicycle Detection • Median Refuge Islands • Tighter Corners
Segment A7: Causey Avenue between Fuller Road and 82nd Avenue			
• Discontinuous and Narrow Sidewalks • Lack of Bicycle Infrastructure • Safety Concerns at Intersections	• Philips Creek Bridge • ODOT Jurisdiction over 82nd Ave	• Complete/Rehabilitate Sidewalks • Improve ADA Accessibility • Reconfigure Lanes to Add Bike Facilities • Philips Creek Multi-Use Path Connections • Clackamas Regional Center MMA Project	• Wayfinding and Signage • Bicycle Signals and Leading Pedestrian/Bicycle Intervals • Bicycle Boxes • Green Pavement Markings • Bicycle Detection • Median Refuge Islands • Tighter Corners
Segment B1: Boyer Drive-85th Avenue-Spencer Drive between 82nd Avenue and I-205 Multi-Use Path			
• Bicycle Facilities on Boyer Drive • Lack of Sidewalks on 85th Ave • Collision Risk at 85th and Spencer	• Spencer Drive Grade • Allocation of Space on Boyer Drove • Multiple Turns Complicate Route	• Sufficient ROW to Add Infill Path • Less Busy Compared to Causey Ave • Requires Less Out-of-Direction Travel if headed North	• Wayfinding and Signage • Bicycle Lanes/Tracks • Treatments to Slow Downhill Bikes • All Way Stop Controls • Midblock Crosswalk and Median Refuge Islands
Segment B2: Causey Avenue between 82nd Avenue and I-205 Multi-Use Path			
• Bicycle Facilities on Causey Ave • Repaving and Sidewalk Repair • Missing Pedestrian Elements	• Very High Traffic Volumes • Narrow Cross-Section • Highly Utilized On-Street Parking	• Gentler Grade Compared to Spencer Drive • Nearby High Density Residential Development	• Wayfinding and Signage • Dedicated Bicycle Facilities • Traffic Calming • Curb Extensions • Midblock Crosswalks

Segment A1: Monroe Street between Linwood Avenue and 72nd Avenue

Segment A1 – Needs

Lower Motor Vehicle Speeds

This segment of Monroe acts as a through street for commuters, and is characterized by rolling hills and short sightlines. Despite qualities that would otherwise make Monroe a desirable street for expanded bicycle and pedestrian accommodations, the roadway has relatively fast motor vehicle traffic for a residential area. People who bike along Monroe generally cannot keep up with the speed of prevailing traffic, and lack of a shoulder makes for unsafe and uncomfortable bicycling conditions. Similarly, the lack of shoulder or sidewalks along most of the route makes walking along the street an unnerving pedestrian experience. Speed control is needed to create a safer and more inviting walking and bicycling environment.

Pedestrian Access and Visibility

Sidewalks are needed along this segment of Monroe. There are no sidewalks in this segment of Monroe except for the orphan section of sidewalk east of Maplehurst Road, which fosters a very unwelcoming pedestrian environment. There are no established pedestrian crossings within this section. Pedestrian visibility is a concern at several intersections, especially at the curve where Monroe transitions to 72nd Avenue.

Safe Route to School

A safe access route is also needed for students walking or biking to Whitcomb Elementary School just east of 72nd Avenue on Thompson.

Safe and Continuous Route for Bicyclists

This section has no bicycle-specific infrastructure or shoulder. High speeds make it difficult for people to use Monroe for low-stress bicycling. The centerline stripe along this entire segment makes it potentially even more challenging for drivers and bicyclists to share the road. A low-stress bicycle route is needed through this section of the project area.

Segment A1 – Constraints

Encroachment on Right-of-Way

One of the main constraints along this segment is the existence of encroaching features, both natural and human-made, that reduce the effective width of the roadway dedicated to bicycle and pedestrian infrastructure. Property owners have planted shrubs and hedges, and built fences and other structures within the County right-of-way (ROW), according to parcel maps. In addition, other features such as utility poles and mature trees are located in the ROW. The effective width of the pavement in this section is approximately 22'. Expanding the footprint of the roadway may impact ROW encroachments.

Crossing at Linwood Avenue

Monroe intersects with Linwood Avenue at the west end of the project area. Linwood Avenue is a relatively high-speed, high-volume roadway and its intersection with Monroe lacks sidewalks, corners, or crossing treatments. With poor sightlines from every angle, the intersection is considered difficult and dangerous by drivers, pedestrians and cyclists alike. Currently, this intersection is projected to fall below minimum traffic standards in the year 2035 for Monroe Street traffic only, assuming the existing two-way stop controlled intersection is preserved. The County has identified the area as a safety focus intersection, and with a need for crossing improvements for all users.

Maplehurst Road Intersection Geometry

The Monroe Street/Maplehurst Road intersection is a three-way intersection where Monroe traffic has the right-of-way and Maplehurst Road is stop-controlled. However, this intersection is not at a right angle, as Maplehurst Road curves to the northwest just south of Monroe, following the adjacent property lines. The skew of the intersection and extremely wide southwest curb radius means that motorists can take the turn at a very high rate of speed, potentially endangering the safety of pedestrians. For drivers waiting to turn onto Monroe, a large old-growth tree just east of intersection can obscure views of westbound traffic. Pedestrians on the south side of Monroe must navigate approximately 90'of pavement to cross the intersection of Maplehurst. Safety improvements are needed to protect pedestrians and bicyclists.

Koida Nursery Traffic

The Koida Nursery, located just east of 70th Avenue, attracts trips on Monroe. The nursery is located on both north and south sides of Monroe, causing increased vehicle trips across the street. Customers and freight trucks often use Monroe to access the nursery from the west throughout the day. In addition, nursery employees can cause increased traffic during peak commute periods. Although some off-street parking is available, employees and visitors often park along the shoulder of Monroe and surrounding streets, thereby limiting the ROW available for use by bicyclists and pedestrians.

Segment A1 – Potential Solutions

Remove Double-Yellow Centerline

Monroe Street has a double yellow centerline between Linwood Ave and Fuller Road. In general, federal and ODOT guidelines recommend a centerline where volumes exceed 3,000 vehicles per day (ODOT, 2011), which is greater than current volumes on Monroe. This presents an opportunity to consider removing the centerline, which poses several potential benefits. First, it encourages cyclists to follow a track closer to the center of the street away from the curb or parked cars. (Riding near the center deters unsafe passing maneuvers and avoids hazards such as opening car doors, right turn conflicts and road debris). Second, it encourages motorists to give more space when overtaking bicycles by eliminating the need to stay to the right of a double yellow line. Finally, removing the centerline signals to users that the street is a lower-speed, shared environment where all modes are equally prioritized.

Utilize Full Right-of-Way/Neighborhood "Queue" Streets

The existing right-of-way appears to be 40' wide which does not provide adequate width for the County standard for a collector. The County could apply the state's Neighborhood Street Design Guidelines to Monroe Street, which allow 14' to 16' of effective clear width on streets if there is on-street parking (State of Oregon, 2000). This is reduced from the effective 20' clear width mandated in the International Fire Code standards. However, the guidelines have been endorsed by the Office of the State Fire Marshal, Oregon Fire Chiefs Association and Oregon Fire Marshals Association. Expanding the footprint of the street to add bicycle and pedestrian infrastructure could potentially cause conflict with long-time residents who have planted or constructed features in the public ROW as an extension of their front yards.

This would create a "queuing street," lowering average speeds as motorists traveling in opposite directions take turns at pinch points. The effect would likely reduce traffic volumes by making Monroe less desirable as a through route. Such a design would require an exception from previously adopted County road standards. Currently, there is no formal on-street parking along Monroe, but new on-street parking or other features such as chicanes could be introduced to serve as traffic calming in strategic locations, while otherwise maintaining 20' clear width for fire truck access.

Provide Separated Pedestrian Accommodations

Milwaukie's Monroe Street Neighborhood Greenway Concept Design Plan recommended a north side permeable paved path between 42nd Avenue and Linwood Avenue to improve pedestrian access and safety. This path could be continued within the County section of Monroe or could switch to the south side as right-of-way allows.

Pedestrian facilities could include separated paths constructed with asphalt or permeable pavement and curb extensions at intersections. Curb extensions physically narrow the driving lane and create a shorter distance for pedestrian crossings while also creating an opportunity for stormwater treatment. Permeable pavement options are ADA-compatible and allow stormwater to infiltrate through the pavement instead of running off into the storm system.

One member of the Monroe Neighborhood Street Design Project Advisory Committee (PAC) suggested extending the path on the south side of Monroe east of Linwood Avenue in order to directly serve Whitcomb Elementary School, which is on the south side of Thompson Road. There may be opportunities further east to transition the path from the north to south side, such as the 72nd Avenue intersection.

Integrate Stormwater Design Treatments

As pedestrian and bicycle accommodation concepts and designs are developed, there will be various opportunities to integrate or separate stormwater treatment elements into these facilities. If conventional sidewalk and curb installation is not determined to be desirable or immediately feasible due to high cost, the County has an opportunity to consider alternative design treatments to accommodate pedestrians, handle stormwater, and calm traffic through multi-purpose green infrastructure. Examples include permeable pedestrian paths and landscaped curb extensions at intersections.

Establish 70th Avenue as Main Nursery Entrance

The 70th Avenue Improvement Project brought the street to a much higher standard of paving than Monroe, and presents an opportunity for the nursery to route all of its trucks to King Road via 70th Avenue, thereby avoiding the problematic Monroe Street/Linwood Avenue intersection.

Include bicycle and pedestrian improvements as part of the Boyer Drive Extension Project

This intersection will be rebuilt as part of the Boyer Drive Extension project, connecting Monroe Street directly to 82nd Avenue. Currently in the planning phase, this project will signalize the intersection, add marked crosswalks and realign Monroe slightly to the south to connect with Boyer Drive, thereby creating a new four-way intersection at Fuller Road. On-street parking on the east side of Fuller Road will be removed to install curb extensions at the northeast and southeast corners of the new intersection. All corners will include ADA-compliant curb ramps. There is also the possibility for a bicycle box to be installed at the east leg of the intersection.

Crossing Signal Enhancements

To aid in pedestrian and bicycle crossing, high-visibility marked crossings and advance signage could be installed to increase safety and comfort for vulnerable road users. A hybrid beacon is a special type of signalized crossing treatment used to warn and control traffic on a major street at an intersection with a minor street. The beacon is activated by a push-button and is used to help pedestrians and bicyclists cross a major street or highway at a marked crosswalk. This type of beacon could be an appropriate crossing treatment along collector roads with higher motor vehicle speeds and volumes.[7] Rectangular rapid flash beacons (RRFBs) are a lower-cost option that could help pedestrians and bicyclists cross at high-speed, high-volume intersections. RRFBs have yellow flashing lights activated via pushbutton or detection.

[7] The pedestrian volume thresholds required for this type of signal are significantly lower than for a traditional traffic signal.

Diversion to Reduce Traffic Volumes

Diversion is typically used where active transportation corridors on local streets intersect with higher-volume streets. Diverters restrict motor vehicle access into the neighborhood, but allow bicycles to continue straight through.[8] Diverters can incorporate curb extensions and green street features such as bioswales or infiltration basins. Median diverters can also create refuge areas for pedestrians and cyclists (provided the median island is wide enough).

Several types of semi-diverters may be considered to reduce traffic volumes and speed on this section of Monroe Street. A partial diverter completely restricts automobile movement in one direction (usually by prohibiting motorists from turning onto a neighborhood street off a major roadway), while permitting travel in the opposite direction. The partial diverter narrows the travel lane with curb extensions to discourage wrong-way driving. These features can be mountable to allow for emergency vehicle access.

A median diverter is a barrier in the median of a major cross-street where it intersects with a neighborhood greenway, blocking all through and left-turn motor vehicle traffic along the greenway in both directions, but providing cut-outs that permit through bicycle movement.

Snake diverters are mountable median diverters that reduce the volume of through traffic without narrowing the major cross-street. More elaborate median diverters are wider and incorporate refuge islands which provide a safe place for pedestrians and bicyclists to wait for a gap in traffic when crossing, while also narrowing the travel lanes along the cross-street to reduce speeds.

A right-in/right-out diverter has similar function to a snake median diverter, using islands to prevent through motor vehicle movements while permitting through bicycle access. These diverters typically are not designed to be mountable. The Monroe Street Greenway concept plan in Milwaukie recommended installing a median diverter at the Linwood Avenue intersection to reduce through traffic volumes and alleviate conflicts between roadway users.

A full diverter would completely prohibit motor vehicle access but allow pedestrians and bicyclists to continue unrestricted. They can be constructed to be permeable to emergency vehicles. A full diverter on Monroe at some point west of 72nd Avenue could be beneficial to reduce cut-through traffic and improve safety where numerous crashes have occurred at the S-curve, but would affect access to points east, including Whitcomb Elementary School. Koida Nursery traffic could use the upgraded 70th Avenue as primary access.

Advisory Bicycle Lanes

Advisory bicycle lanes are an experimental treatment that delineates space for bicyclists on roadways that are too narrow for standard bicycle lanes. Used primarily on lower-volume streets, advisory lanes are marked by a dashed line to the left and solid line to the right, giving bicyclists a space to ride but also allowing motorists to merge into them when necessary to pass oncoming traffic. Motorists must yield to bicycles in the advisory lanes, and must otherwise remain in the center travel lane. Because the street remains two-way, this narrow lane encourages motorists to be more cautious when negotiating passing vehicles. When advisory bicycle lanes are installed, the yellow centerline is removed.

[8] A good median diverter example is located on page 10 of the Washington County Neighborhood Bikeway Toolkit.

Segment A2: Monroe Street between 72nd Avenue and Fuller Road

East of 72nd Avenue, Monroe Street is a quieter two-lane local residential street with low volumes and speeds. This is primarily due to a gap in the roadway just east of 78th Avenue, which acts as a natural traffic diverter. This discontinuous section results in motorists diverting to Thompson Road one block south to reach Fuller Road and points east. Currently, there is a narrow dirt path that is not ADA-compliant and only accessible to pedestrians and bicyclists who walk their bikes. The Clackamas County Development Agency has contemplated completing the road sometime in the future, making Monroe the preferred route for through auto traffic in this neighborhood. However, some Public Advisory Committee and community members have stated a preference to improve the gap for pedestrians and bicyclists only, and leave it closed to automobiles.

Monroe Street is much wider in this section, with public ROW approaching 60' wide in some areas. The effective pavement width is also wider, at 30', compared to the more constrained area further west, which leaves sufficient room for on-street parking. There is a mix of soft shoulder and hard curb and gutter along Monroe, but sidewalks are mostly absent west of 78th Avenue with the exception of a 200' orphan section just east of 74th Avenue. East of the gap, the street character is more urban with a consistent 5' sidewalk on the north side of the street to Fuller Road. The predominant land use is low-density single-family residential west of 78th Avenue; several multi-family housing complexes are located between the gap and Fuller Road.

Segment A2 – Needs

Improved Pedestrian Facilities

Consistent with the section west of 72nd Avenue, Monroe is in need of new or improved pedestrian facilities. West of 78th Avenue, there are almost no pedestrian accommodations. East of the gap, there are narrow sidewalks directly adjacent to the curb and without ADA ramps. This sidewalk is generally in poor to fair condition; sidewalk rehabilitation and replacement could occur gradually as funding becomes available. The wider ROW width here offers an opportunity to repurpose the street to accommodate new pedestrian facilities, or expand the sidewalks toward the street with minimal impact on on-street parking. This would also narrow the street and, in turn, help calm traffic.

Safer Transition at 72nd Avenue

The existing intersection of Monroe Street and 72nd Avenue is difficult to negotiate for traffic entering or exiting the east leg of the intersection. Prevailing traffic uses the west and south legs, which have the right-of-way, while eastbound traffic continuing along Monroe must wait for northbound traffic on 72nd Avenue to clear before veering left. Traffic heading west on Monroe must also wait for an opening in traffic before turning. Visibility is a major problem at this intersection, and vehicles traveling the S-curve frequently exceed 25-30 mph, which can lead to collisions or close calls. There are no pedestrian accommodations (neither sidewalks nor crosswalks), resulting in a need for pedestrian safety improvements.

Segment A2 – Constraints

Poor Pavement Condition

The roadway surface at 77th Avenue is unimproved and would require complete reconstruction to allow through bicycle or automobile traffic.

Full Gap Closure Could Impact Livability

Monroe Street between 72nd and 78th avenues primarily serves local circulation and access. In an area that has no sidewalks or bicycle facilities, opening the gap for through automobile access would likely increase volumes on a street that is accustomed to relative quiet. It would also negatively impact pedestrian

conditions unless dedicated infrastructure was built throughout to close the current gap for motor vehicles. Such an investment would increase project costs significantly.

Segment A2 – Potential Solutions

Improve safety for pedestrians and bicyclists at the Fuller Road Intersection

The intersection of Monroe and Fuller Road is a three-way intersection, where Fuller Road traffic has right-of-way and Monroe traffic is stop-controlled. The curb radius at this intersection is wide, which allows right turning motorists to maintain higher speeds and sets up compromising safety conditions for bicyclists and pedestrians. Despite these current conditions, this intersection is planned to be rebuilt as part of the Boyer Drive Extension Project. This presents an opportunity to leverage existing plans and investments to make Monroe a safe and welcoming neighborhood street for all users.

Reconfigure T-Intersection at 72nd Avenue to improve safety

One option for reconfiguring the intersection is to install an all-way stop and marked crosswalks. However, this could lead to increased congestion on the prevailing route (west and south legs), which carry more traffic than the east leg.

Another option is to install a mini-roundabout at this intersection to keep traffic moving, but slow it to 10-15 mph. This solution would incorporate pedestrian crossings, reduce the severity of potential collisions and make it easier for vehicle or bicycle traffic to access Monroe east of 72nd Avenue. However, it would likely require easements or acquisitions from adjacent properties, including Koida Nursery.

Improve Monroe Gap

The Monroe Gap east of 78th Avenue should be improved at least to provide bicyclists and pedestrians uninterrupted access. A concrete or permeable paved pathway would need to be 12'-15' wide with ADA-compliant ramps and barriers installed on either side of the gap to accommodate two-way travel while preventing motorists from traversing this section (with the exception of emergency vehicles).

Developing the gap to full local street standards would allow automobile access and increase automobile volumes and speeds significantly along this section. This improvement would make Monroe east of 72nd Avenue unsuitable as a low-stress active transportation corridor.

Boyer Drive Extension Project

This intersection will be rebuilt as part of the Boyer Drive Extension project, connecting Monroe Street directly to 82nd Avenue. Currently in the planning phase, this project will signalize the intersection, add marked crosswalks and realign Monroe slightly to the south to connect with Boyer Drive, thereby creating a new four-way intersection at Fuller Road. On-street parking on the east side of Fuller Road will be removed to install **curb extensions** at the northeast and southeast corners of the new intersection. All corners will include ADA-compliant **curb ramps**. There is also the possibility for a **bicycle box** to be installed at the east leg of the intersection.

Narrow Roadway Width and Incorporate Stormwater Treatment

On-street parking is currently permitted on both sides of Monroe Street in this section, which makes the roadway feel spacious when parking lanes are unoccupied – and can lead to higher vehicle speeds. Installing curb extensions at intersections would narrow the roadway and provide a visual cue for motorists to slow down, while also reducing pedestrian crossing distance. Bioswales incorporated into the curb extensions could provide stormwater treatment opportunities and add "green" elements.

Bicycle Boxes

Bicycle boxes are dedicated areas at signalized intersections that allow bicyclists to pull in front of waiting traffic at red lights. Bicycle boxes help to reduce conflicts between right-turning motorists and straight-through bicycle riders (known as "right hook" collisions) and increase cyclist visibility at busy intersections.

They also provide the bicyclist a head start when the light turns green. Motorists cannot turn right on red at intersections when a bicycle box is present. Bicycle boxes could improve bicyclist safety and comfort on all corners of the Boyer Drive project intersection. Bicycle boxes would be particularly useful if Fuller Road is selected as part of the Monroe neighborhood street design, since bicycle riders will need a safe way to turn onto and off of Monroe.

Segment A3: Thompson Road between 72nd Avenue and Fuller Road

Thompson Road is a two-lane roadway and the continuation of Monroe Street east to Fuller Road past the S-curve where the road jogs south at 72nd Avenue. Whitcomb Elementary School is located at 74th Avenue. The public ROW width on Thompson Road varies between 40' to 50' and pavement width is generally 35'. Although the roadway is designed as a collector for through traffic, has almost identical traffic volume figures as Monroe west of 72nd Avenue (2,400 ADT at Fuller Road) and is built to a higher level of standard, the County designates Thompson as a local street instead of a collector street. Unlike Monroe, Thompson Road has conventional curbs and storm drainage, standard 6' bicycle lanes and a 5' sidewalk (curb-tight in some locations) on the south side of the street between Whitcomb Elementary School and Fuller Road. There is also a marked crosswalk at 74th Avenue for students and parents accessing the school from the north, although visibility is diminished for westbound motorists traveling uphill just before the intersection. The posted speed limit on Thompson Road is 25 mph, but there is a school zone speed limit of 20 mph between 7am and 5pm.

Segment A3 – Needs

Address Safety Concerns at 72nd Avenue

The S-curve where Monroe jogs south along 72nd Avenue to Thompson lacks any dedicated pedestrian or bicycle infrastructure and is a notable collision risk due to high speeds and poor visibility. The North Clackamas School District marks the curve as a hazard area and advises Whitcomb Elementary School students arriving from the west to walk on 74th Avenue and Monroe instead where traffic is calmer, although neither of those streets have sidewalks.

Eliminate Parking in Bicycle Lanes

During a recent tour of Thompson Road, the project team observed vehicles parked in the bicycle lane, forcing people on bikes to merge into the general travel lane and compromising user safety.

Reduce Relatively High Volumes and Speeds

While dedicated sidewalk and bikeway facilities are provided for most of this section, observed motor vehicle traffic volumes and speeds were slightly higher than what are considered comfortable for less confident roadway users on foot or bike. The presence of lightly traveled bicycle lanes contributes to the relatively wide-open nature of the roadway, which may encourage drivers to travel at faster speeds.

Address Discontinuous bicycle infrastructure

The bicycle lanes heading westbound end at Whitcomb Elementary School, meaning that bicycle riders must merge into traffic just before the roadway jogs north along 72nd Avenue. This compromises the safety of vulnerable road users and creates a high-stress environment. There is no signage warning motorists that bicycle riders will be merging into the travel lane.

Segment A3 – Constraints

Requires Jog at Fuller Road

Of the three main east-west corridors being considered in Section A, only Thompson Road does not continue east of Fuller Road, which would require bicycle riders heading east to the I-205 path to jog either to the north to reach the Boyer Drive extension or south to reach Causey Avenue. The lack of a direct route across

Fuller Road and 82nd Avenue increases the number of turns and out-of-direction travel; this may be disorienting to bicycle roadway users or may discourage them from using the corridor entirely.

Traffic Volumes and Bicycle Lanes Limit Traffic Calming Opportunities

The existing bicycle lanes are relatively well-suited for the nature of the roadway given the observed volume and travel speeds. However, because of the lack of on-street parking, there is less opportunity for the County to install traffic calming measures such as chicanes[9] or curb extensions to slow down traffic and reduce pedestrian crossing distance. Removing the lanes to install this infrastructure and implementing a shared-space environment like a bicycle boulevard would be incompatible with the current character of Thompson Road. However, speed cushions may be still be used to reduce travel speeds.

Fuller Road Intersection Deficiencies

The intersection of Thompson Road and Fuller Road is a three-way intersection, where Fuller Road traffic has right-of-way and Thompson Road traffic is stop controlled. This location has been the site of several collisions in recent years. Overgrown vegetation at the northwest corner of the intersection can interfere with the sightlines for motorists waiting to turn onto Fuller Road. The curb radius at this intersection is wide, which allows motorists to turn right at high speeds, compromising pedestrian and bicyclist safety. In addition, Fuller Road is approximately 40' to 48' wide between the curbs at Thompson Road, with the ROW slightly wider south of the intersection. However, due to the skew of the intersection, the actual distance to cross is 50' to 58', and there are no marked crosswalks.

Segment A3 – Potential Solutions

Retrofit Curb Ramps for ADA Compliance

Along Thompson Road, there are curb ramps along the south sidewalk but none are ADA-compliant. These ramps should be retrofitted to accommodate mobility devices.

Rectangular Rapid Flash Beacon at 74th Avenue

An initial County audit of facilities on Thompson Road for the SRTS plan identified 74th Avenue as a potential location for a rapid flash beacon or other crossing enhancements such as increased signage. Rectangular rapid flash beacons (RRFBs) are user-actuated amber lights that supplement warning signs at non-signalized intersections or mid-block crosswalks. They can be activated manually by a push button or passively by a pedestrian detection system. RRFBs use an irregular flash pattern that gets driver attention and encourages yielding to crossing pedestrians. This could be installed at 74th Avenue to aid students who are crossing Thompson Road to access Whitcomb Elementary School.
These improvements should be coupled with a new ADA-compliant landing on the north side of the street and potentially a new sidewalk or path on the east side of 74th Avenue to facilitate school access.

Marked Crosswalk at 77th Avenue

The County's SRTS audit identified a need for additional marked crossings along Thompson Road and suggested 77th Avenue as a potential location to improve crossing safety for pedestrians accessing from the north.

Intersection Enhancements at Fuller Road

Curb extensions could be installed at the northwest and southwest corners of the intersection, and the stop bar for Thompson Road traffic should be advanced in order to improve visibility and reduce vehicle turning speeds. This improvement would also significantly reduce the crossing distance for pedestrians. Marked crosswalks could be installed on all three sides of the intersection.

[9] Chicanes are a type a mid-block speed control treatment, consisting of offset curb extensions on residential or low volume downtown streets. This creates a weaving effect that slows traffic speeds considerably.

Narrow Lane Widths to Install/Widen Bike Lane or Establish Neighborhood Greenway

The travel lanes on Thompson Road are currently 11' wide and could be reduced by 1' in each direction to provide more space for bicycles on the street. The County's standards allow for travel lane widths between 10' to 12' on collectors. Research has shown that 10' travel lanes improve safety because they reduce the temptation for motorists to speed.

Alternatively, if actions can be taken to reduce through traffic on Thompson Road, the County could consider removing the centerline and bicycle lanes to establish a bicycle boulevard on this street.

Pedestrian and Bicycle Facilities West of 74th

Pedestrian and bicycle accommodations between Monroe Street and Thompson Road are desirable to reduce out-of-direction travel to Whitcomb Elementary School. An analysis of tax lot maps reveals that right-of-way may be available on 72nd Avenue to add a sidewalk. The nature of bicycle facilities in this section will depend on the scope of additional improvements that are made along the corridor.

Buffered Bicycle Lanes

Buffered bicycles lanes include a painted 2' buffer separating the bicycle lane from adjacent auto traffic. These could be striped along Thompson Road, which would establish greater separation between motor vehicles and vulnerable road users.

Speed Cushions to Reduce Speeds

Speed humps or cushions are a viable form of traffic calming to reduce travel speeds. Spacing humps between 300' and 500' apart is most effective at lowering the 85th percentile speed to the targeted range. These cushions could be installed with cutouts to accommodate emergency vehicles.

Segment A4: Fuller Road between Monroe Street and Causey Avenue

Fuller Road is a two-lane collector that runs diagonally on a southwest-to-northeast axis between King Road and Harmony Road. To the east are service and auxiliary entrances for the commercial properties that mostly front on 82nd Avenue one block east. On the west side is a mix of single-family residential and medium density multifamily housing. Furthermore, Fuller Road has significantly higher volumes south of Causey Avenue (6,285 ADT) compared to farther north (3,810 ADT at Monroe). The cross-section varies based on location, as the right-of-way varies from 60' at Monroe Street and Thompson Road to 80' just north of Causey Avenue. Pavement width is generally 40' to 48' across. There are two 11' travel lanes, curb-tight 5' sidewalks, standard 5' bicycle lanes and an east side curbside parking lane throughout the corridor. Where ROW is wider, there is also a west side parking lane. There is one, two-way stop intersection at Causey Avenue/Harmony Drive. However, there are no marked crosswalks along the corridor. The posted speed limit is 30 mph.

Due to a high incidence of crashes at the King Road/Fuller Road intersection, the County is currently designing an extension of Boyer Drive that will connect one block west from 82nd Avenue to the Fuller Road/Monroe Street intersection. Upon completion, the County plans to restrict access to right-in/right-out movements at King Road and make Boyer Drive the primary access point to Fuller Road from the north. The project is expected to be completed in 2017.

Segment A4 – Needs

Marked Crosswalks and Wide Curb Radii at Intersections

Fuller Road would be utilized for portions in four of the potential six route alternatives in Section A. Specifically, it would connect bicycle riders from Monroe Street, Thompson Road or Harmony Drive to either

Boyer Drive or Causey Avenue. This creates the need for well-designed intersections that accommodate pedestrian or bicycle traffic turning onto or off of Fuller Road. Currently, the intersections of Fuller Road at Monroe, Thompson and Causey do not have marked crosswalks and have wide curb radii that encourage higher turning speeds and increased crossing distance.

Wider Sidewalks

Fuller Road has curb-tight 5' sidewalks on both sides of the street. The west side of Fuller Road has residential land uses while the east side of the street is commercial. According to County design standards, sidewalks along commercially-zoned properties must be a minimum of 7' if they are adjacent to the curb; therefore the east sidewalk is below standard. Expanding sidewalks where ROW is available can increase pedestrian comfort.

Segment A4 – Constraints

Relatively High Travel Speeds

The current posted speed limit is 30 mph, but the relatively wide cross-section encourages motor vehicle operators to travel at higher speeds, which compromises safety for vulnerable road users. As driver speed increases, the cone of vision narrows and distance necessary to react and brake increases (City of Portland, 2015). Studies show that a pedestrian involved in a collision with a motor vehicle has a 45 percent likelihood of suffering fatal injuries at vehicle speeds between 30-35 mph and an 85 percent likelihood of fatal injuries at vehicle speeds exceeding 40 mph, compared to 5 percent for vehicle speeds at 20-25 mph.

Out-of-Direction Travel

For a pedestrian or bicyclist traveling east or west along the transportation corridor, deviating onto Fuller Road will require out-of-direction travel (because of the northeast-southwest orientation of the roadway), which will likely result in additional travel time and can cause potential confusion about the route. The need to jog onto Fuller Road requires turning across a relatively busy roadway which could be uncomfortable for less confident riders. Strong wayfinding, including signage and pavement markings, will be key to help roadway users orient themselves while traveling in the area.

Door Zone Bicycle Lanes

The current on-street bicycle lanes are 5' wide, which is narrower than the County standard of 6'. In addition, the lanes are adjacent to curbside parking, which is a significant dooring hazard for people on bicycles. Dooring is when a vehicle driver or passenger opens their car door directly in the path of a moving bicyclist, causing a collision, and is more likely to occur when bicycle lanes are directly situated next to a parking lane. This condition occurs the full length along the east side of the street and south of Thompson Road on the west side of the street.

Segment A4 – Potential Solutions

On-Street Parking Capacity

Most of Fuller Road between Monroe and Causey is fronted by commercial properties to the east and multi-family residential to the west. There are very few driveways that open onto Fuller Road and most of the residences have parking facilities available off-street. In addition, site visits have revealed that there could be excess parking supply in comparison with the current demand, which could be definitively determined with a parking utilization study to determine occupancy rates.

Existing parking lanes could be reconfigured to allow more space for bicycle and pedestrian facilities, and reduce conflicts. North of Thompson Street, Fuller has one existing parking lane that could be repurposed for moving traffic. To the south, one of the two parking lanes could similarly be removed to prioritize active transportation on the street.

Underutilized Right-of-Way

It may possible to retain on-street parking while making active transportation improvements. Depending on the location, there is generally 5' to 10' of ROW currently used by adjacent property owners, with over 20' available just north of Causey Avenue. The County could reclaim this ROW if funding was available for a more significant street reconstruction.

Narrow Lane Widths to Reduce Travel Speeds

The travel lanes are 11' wide and could be reduced by 1' in each direction to provide more space to accommodate bicycles on the street. The County's standards allow for widths between 10' and 12' on collectors. Research has shown that 10' travel lanes improve safety because they reduce the temptation for motorists to speed.

Signalization of Causey Avenue/Harmony Drive Intersection

Fuller Road is relatively wide at Causey Avenue/Harmony Drive, especially at the north leg of the intersection where Fuller Road is one lane wide in each direction with a left-turn lane for southbound Fuller Road traffic heading east on Causey. The intersection is stop controlled for Causey Avenue/Harmony Drive and relatively busy, with 6,300 ADT on Fuller Road just south of the intersection and almost 5,000 ADT on Causey Avenue just east. Although it does not yet meet Oregon Department of Transportation (ODOT) warrants for signalization, a traffic signal here would benefit cyclists needing to turn left from southbound Fuller Road to eastbound Causey. Currently, bicycle riders on Fuller need to merge left to use the left turn lane, a maneuver that can be difficult in heavy traffic and very uncomfortable for less experienced cyclists. With signalization, specific enhancements such as left turn boxes, standard bicycle boxes, leading pedestrian/bicycle intervals or bike signals could be installed to aid this movement.

Other Fuller Road/Causey Avenue/Harmony Drive Intersection Enhancements

To facilitate bicycle travel between Fuller Road and Causey Avenue, another option is to install a left turn bicycle box to allow people who bike to make a two-stage left turn by crossing the intersection and then stopping in the box ahead of traffic stopped on Harmony Drive but out of the path of moving traffic on Fuller Road. Here, they would wait for a break in traffic before continuing with their left turn to proceed east on Causey Avenue. The left turn box could potentially be installed even if the intersection remained unsignalized.

Alternatively, the County could stripe a specific left turn lane for bicycles (or pavement sharrows marking the recommended track for bicyclists in the general travel lane and left turn lane near the intersection) to alert motorists toward the presence of bicycle riders. Other enhancements may include curb extensions, especially at the northeast corner to narrow the crossing width (currently greater than 70' across Fuller Road) and make pedestrians more visible to motorists, marked crosswalks and rebuilt ADA-compliant curb ramps.

Wider Sidewalks

Clackamas County dictates a 7' sidewalk standard for collector streets in commercial areas, due to higher expected pedestrian activity. Implementing 7' or wider sidewalks would contribute to a more comfortable pedestrian environment.

Pedestrian Enhancements

The Monroe Street and Thompson Road intersections should be improved to facilitate pedestrian access and safety. Potential enhancements include ADA curb ramp retrofits, curb extensions to reduce vehicle turning speed and pedestrian crossing distance, and marked crosswalks on all legs of the intersection.

Protected or Buffered Bicycle Lanes

Protection for bicyclists provided by the existing substandard bicycle lanes could be enhanced by adding a painted or protected buffer to increase separation between people who bike and parked vehicles – and potentially one between bicycle riders and moving vehicles. Fuller Road is especially suited for protected bicycle lanes because there are relatively few driveway or street access points that create conflict between roadway users. Where parking is currently prohibited, a 2' to 3' painted buffer could be installed, potentially with vertical delineators such as candlestick wands and/or removable curbs, to create a 7' to 8' wide facility that meets County standards and increases separation to improve safety and comfort for cyclists. Installing a protected buffer would also discourage motorists from mistaking the bicycle lane for a parking lane.

Reconfiguring the cross-section to eliminate one of the two parking lanes south of Thompson Road (for example, the southbound parking lane) could provide space for the remaining parking lane to serve as a buffer for the northbound bicycle lane. A northbound parking-protected bicycle lane could consist of a 6'-7' bicycle lane plus a 3' buffer to protect moving cyclists from opening passenger doors and provide a passing space. This cross-section would eliminate dooring risk on one side of the street and greatly reduce risk on the other, while increasing segregation between modes and improving safety and comfort for all users.

At driveway entrances, green skip striping and signage should be used to denote the potential for conflicts and warn motorists of the presence of bicyclists. Parking restrictions should be applied within 20' to 30' of all driveway entrances to improve visibility.

Left Turn Bicycle Boxes

Left turn bicycle boxes enable bicycle riders to make two-stage left turns if they prefer not to make a vehicular left turn, whether they are less confident or if traffic volumes are too high to merge into the general travel lane. These bicycle boxes are situated on the far side of the intersection, in the shadow of the parking lane. A person who is bicycling northbound on Fuller and wants to make a left turn onto Monroe or Thompson westbound would use the bicycle box as a staging area to wait for traffic to clear before continuing their left turn. The major benefit of the bicycle box is to allow for riders to avoid merging in uncomfortable high-traffic situations, outside of the main travel path for vehicles and bicycles. These could also be installed at the Causey Avenue intersection, although they are better suited for signalized four-way intersections.

Bicycle Signals and Leading Pedestrian/Bicycle Intervals

Bicycle signals are traffic signals for bicycle riders, with signal heads that are smaller and distinctive from traditional signals. These signals are used when bicycle and automobile movements need to be completely separated for the purposes of safety. Right turns are prohibited when a bicycle signal is green.

Similarly, leading pedestrian or bicycle signal intervals provide pedestrians and bicyclists with a 5-second head start to enter the intersection before motorists receive a green signal. This helps them cross the intersection more easily, while also increasing their visibility to motorists. Right turns on red are prohibited with a leading interval.

A bicycle signal phase could be installed as a "scramble" signal to allow bike riders to make a left turn diagonally across the intersection while avoiding conflict from other traffic movements, which would have a red signal in all directions while bicyclists had a green signal. This would be the safest option, but would cause a slight delay to other travel modes at the intersection.

Segment A5: Maplehurst Road-Harmony Drive between Monroe Street and Fuller Road

Maplehurst Road-Harmony Drive is a residential connector street between Monroe Street and Fuller Road. This corridor includes a short section of McEachron Drive between Maplehurst Road and Harmony Drive. The street is mostly undeveloped with gravel shoulders, although there are intermittent sidewalks, curbs and storm drainage where newer development has occurred. Most of the surrounding land use is low-density residential. One major exception is the 34-acre agricultural parcel located where Maplehurst Road intersects Norbert Drive. The County's long-term plans include new housing development on this farmland, which could dramatically affect the character of the street and surrounding neighborhood.

For now, Maplehurst-Harmony remains mostly pastoral, with relatively low travel volumes and speeds. Total ROW ranges from 40' on Maplehurst Road to 50' on Harmony Drive, and total pavement width is approximately 22' to 24'. Where sidewalks have not been installed, the remainder of the ROW is occupied by informal on-street parking along gravel shoulders. There are three right-angle turns which are a potential crash risk at higher speeds, although the majority of nearby crashes have been reported at the eastern end of Harmony Drive, where there is a two-way stop-controlled intersection with Fuller Road and Causey Avenue. The posted speed limit is 25 mph.

Segment A5 – Needs

Pedestrian Access and Visibility

As on Monroe Street, there is no pedestrian infrastructure along most of Maplehurst-Harmony except for patchwork sidewalks adjacent to newer development. Pedestrian visibility is a concern at three locations where sightlines are reduced at right-angle turns. Maplehurst is also a key route for students walking to Whitcomb Elementary School from the south, and a safe route is needed for students walking or biking to the school.

Safe and Continuous Route for Bicyclists

This section currently has no bicycle-specific infrastructure and there is no shoulder available, although speeds and volumes are lower on Maplehurst-Harmony compared to Monroe. There is no centerline stripe along this entire segment, which is preferable on streets where slower speeds and shared-space operation between motorists and bicycle riders is desirable.

Crosswalks or ADA-Compliant Ramps

The Harmony Drive/Causey Avenue/Fuller Road intersection lacks marked crosswalks or ADA-compliant curb ramps on most corners of the intersection. In addition, pedestrians must cross 70' of pavement to get across Fuller Road due to the wide curb radius on the northeast corner.

Segment A5 – Constraints

Limited Available Right-of-Way

Similar to Monroe, the main constraint in this segment is limited right-of-way and encroachment from adjacent front yards into the public space. This is most apparent along Maplehurst between Monroe and Charles Street where the ROW is 40' wide. The effective width of the pavement in this section is approximately 22' to 24' and front yard ROW encroachments will be impacted if the roadway footprint is expanded.

More Circuitous Route

Maplehurst-Harmony is a less direct route than Monroe Street or Thompson Road, and would be more difficult to pair with the Boyer Drive/Spencer Drive segment in Section B. In addition, using Maplehurst-

Harmony would mean significant out-of-direction travel for riders intending to access the I-205 Multi-Use Path north toward Portland.

Segment A5 – Potential Solutions

Whitcomb Elementary School Access

A dirt path leading southwest from Whitcomb Elementary School to the corner of Maplehurst Road and McEachron Avenue is a popular access point for students walking to school and provides a safe option for students who otherwise would need to walk up to an additional three-quarter mile on streets without sidewalks. Improving this path would provide incentive for the County to prioritize pedestrian access improvements on Maplehurst-Harmony. Pedestrian accommodation may require a phased approach if conventional sidewalk and curb installation is not determined to be desirable or immediately feasible due to high cost. Pedestrian facilities could include separated paths constructed with asphalt or permeable pavement and curb extensions at intersections.

Popular Bicycle Route

During the PAC and TAC field trip, several participants mentioned that Maplehurst-Harmony is already a popular cycling route in the area due to the corridor's calm and pastoral setting, even though there is no dedicated bicycle infrastructure. Traffic volumes are lower than on Monroe-Thompson, and there is no double yellow centerline, making it easier for riders to share the road with motorists.

Traffic Calming

Possible traffic calming measures to lower vehicle speeds and volumes in this section include pavement markings, speed cushions, stormwater treatment facilities, curb extensions, diversion and a range of intersection treatments.

The speed limit could be reduced in conjunction with these measures. However, statutory reductions in speed limit have little effect on motorist behavior without making requisite changes to street design and committing to periodic traffic enforcement to compel drivers to slow down.

Pedestrian Facilities

A safe pedestrian facility along this section is critical to a successful project. An initial solution could include providing a pedestrian route along one side of the street – perhaps constructed initially as an asphalt pathway. An asphalt path could be constructed without the added costs of curb and gutter and underground stormwater collection.

Assuming a narrowed-width facility, the County owns enough right-of-way to construct sidewalks on both sides of Maplehurst-Harmony. However, many property owners, especially along Maplehurst Road, have planted shrubs or hedges or constructed walls and fences that either abut or encroach upon County right-of-way. Sidewalk construction would likely affect these encroachments. Further east, Harmony Drive has a 50' ROW, allowing for easier accommodation of pedestrian facilities.

Curb Extensions, Bioswales, and Infiltration Basins

Installing permeable pavement shoulders, curbed bioswales or vegetated basins can result in a narrower-feeling street, slowing traffic while providing for stormwater infiltration. Curb extensions can also help delineate the pedestrian crossings at intersections. It is feasible to incorporate curb extensions into a street without providing curb and gutter along the entire street. ADA-compatible curb ramps could be added at intersections, with street parking accommodated between the bioswale.

Segment A6: Boyer Drive Extended between Fuller Road and 82nd Avenue

Clackamas County is developing a $4 million road construction project to connect Monroe Street and Boyer Drive between Fuller Road and 82nd Avenue. This project will make goods and services on 82nd Avenue and near Clackamas Town Center more accessible for neighborhoods to the west, while improving safety in the vicinity of Fuller Road and King Road. This one-block section consists entirely of commercial land uses on both sides of the roadway. Once the project is complete in summer 2017, the prevailing traffic pattern between 82nd Avenue and Fuller Road will utilize the extended Boyer Drive. As a result, Fuller Road will be restricted to right-in/right-out access at King Road.

The project will consist of a new three-lane roadway with sidewalks, bicycle facilities in the form of a cycle track, landscaping and storm drainage facilities. The expected speed limit in this new section is 25 mph. Other project elements include redesigned intersections at Fuller Road and 82nd Avenue, as well as a slight realignment of Monroe Street to meet with Boyer Drive at Fuller Road.

Potential intersection enhancements at Fuller Road and 82nd Avenue include marked crosswalks, bicycle boxes, ADA-compliant curb ramps and signalization at Fuller Road. The newly built corners at the Fuller Road/Monroe Street/Boyer Drive intersection are expected to have fairly tight corner radii which is essential to reduce vehicle turning speeds, reduce pedestrian crossing distance and increase visibility.

It is important to note that the aforementioned project is resolving the largest outstanding need, which is the lack of a connection at this location. The following needs assessment will assume that the project will be constructed as currently proposed.

Segment A6 – Needs

Safe Crossing of 82nd Avenue and Fuller Road

Pedestrian conditions are expected to improve at the redesigned 82nd Avenue intersection, with new ADA-accessible curb ramps and marked crosswalks. However, curb radii will remain wide, which encourages motorists to take turns at higher speeds, compromising pedestrian safety while also requiring them to cross a longer distance. Currently, pedestrians must traverse 80' when crossing 82nd Avenue. There have been several collisions involving pedestrians along this section of 82nd Avenue. In addition to the planned improvements to this intersection, additional protections for pedestrians and cyclists crossing at 82nd Avenue and Fuller may be needed.

Cycle Track Transition at Intersections

The planned cycle track is intended to ramp down to street grade just before the 82nd Avenue and Fuller intersections. At these intersections, a bicycle box is proposed to allow bicycle riders to queue ahead of motor vehicle traffic waiting in front of the intersection, while moving the stop bar for motor vehicles further back and prohibiting right turns on red. Bicycle boxes are most effective when bicycle riders are approaching the intersection at a red light. In fact, this infrastructure may give riders a false sense of security when approaching at a stale green because right-turning motorists at 82nd Avenue and Fuller Road may not be expecting a person on a bicycle approaching from behind to their right, which can lead to possible "right-hook" collisions. It will be important that the proposed design does not put the ramp down to street level in a location where right-turning motorists may not expect to interact with bicycle riders.

Segment A6 – Constraints

Boyer Drive Construction Timeline

The anticipated planning, funding and construction timeline of the Monroe project is likely to take place over several years and will likely require a phased approach as funding sources are identified and secured. This may limit the opportunity to make additional improvements once construction of the Boyer Drive project is complete. Therefore, any proposed improvements proposed as a result of this project will likely need to be incorporated while the Boyer Drive project is in the engineering design phase (currently it is at 60% level of design).

ODOT Jurisdiction over 82nd Avenue Intersection

Boyer Drive crosses 82nd Avenue at one of only two signalized intersections within the entire study area. No median island is available to provide refuge for pedestrians needing extra time to cross the highway. Due to wide crossing distances and high traffic volumes and turning movements, the crossing is a significant barrier to active transportation. A balance between vehicle mobility and the mobility and access needs of other roadway users will need to be achieved. Because 82nd Avenue is a state highway, ODOT will actively review and provide guidance on potential modifications to the intersection signal or geometric design proposed as part of this project.

Segment A6 – Potential Solutions

Multimodal Improvements

While the Boyer Street project design has not been finalized, the presumed right-of-way is 67' wide. The cross-section includes a 12' path on both sides of the street, delineated by a painted line between a 6' one-way cycle track and a 6' bi-directional pedestrian path. The southbound path will include a 5' landscape buffer between the street and the path. The roadway will be 34' wide, with two 11' travel lanes and one 12' left turn lane. The travel lanes will include painted sharrows, indicating that faster cyclists will be allowed to use the roadway instead of the side-path.

A cycle track is a bicycle facility raised on a curb that can be at the same grade of the sidewalk or in between the sidewalk and roadway grades. This design offers greater separation from traffic than a standard striped bicycle lane, helping to encourage "interested but concerned" bicycle riders.

Extend Bicycle Box to Accommodate Left-Turn Bicycle Users

Because there is no parking lane on Boyer Drive, it would be difficult to accommodate a left turn bicycle box at the Fuller Road and 82nd Avenue intersections without coming into conflict with crosswalk users. However, a simple improvement would be to extend the bicycle box to occupy the space of the dedicated left-turn lane as well. This would allow riders to transition from the cycle track to the left-turn lane in front of waiting motorists (as long as the signal is red while approaching) without needing to make a two-stage left turn or take the lane for the entire block in order to safely make a vehicular left. A bicycle box should also be considered for westbound Boyer Drive at 82nd Avenue.

Clackamas Regional Center Multimodal Mixed-use Area (MMA)

As part of the Clackamas Regional Center MMA project, the County will be looking at alternative or supplementary performance standards, which may allow for context-specific treatments that respond to adjacent land uses. These alternative or supplementary standards present an opportunity to advance bicycle and pedestrian safety and connectivity.

Green Pavement Markings and Signage to Denote Conflict Areas

At major intersections and driveway entrances, green skip-stripe paint could be used for the bicycle facility to denote the potential conflicts between vulnerable road users and turning motorists. Signage should also be incorporated to alert all modes to be cautious and courteous when navigating these conflict points.

Bicycle Detection

Bicycle detection loops or poles placed at locations for cyclists to activate the signal are recommended.

Median Refuge Islands and Tighter Corners

Eliminating the northbound right turn only lane for 82nd Avenue traffic would provide space to install a raised median with refuge islands at the 82nd Avenue intersection for pedestrians and cyclists if they cannot cross the entire intersection in one signal cycle. This would help make crossing 82nd Avenue more inviting and easier, especially for people with disabilities. An example of this type of intersection treatment is shown in the photo to the right, from the NACTO *Urban Bikeway Design Guide* (2013). Narrowing the corner radii at the intersection would also reduce crossing distance for pedestrians and improve safety by reducing turning speeds. Special design considerations can be implemented to make sure that trucks can still negotiate right turns at the intersection.

Segment A7: Causey Avenue between Fuller Road and 82nd Avenue

Causey Avenue in Section A is a one-block long, three-lane collector street between Fuller Road and 82nd Avenue. Total ROW is generally 65' wide, while the overall cross-section consists typically of two 14' general travel lanes, a 16' wide center turn lane and two 5' to 10' landscaped sidewalks. Recorded travel volumes east of Fuller Road are relatively high at 5,000 ADT. The speed limit is not posted in this stretch but is presumed to be 25 mph, although actual observed speeds may be higher. The sidewalk is in poor shape and in need of repair. General land use is predominantly strip commercial on both sides, with the exception of the Clackamas Fire District station at the intersection of Causey Avenue and Fuller Road.

There is one stop-controlled intersection at Fuller Road and a signalized intersection at 82nd Avenue. At both locations there are two approach lanes at the intersection (at Fuller Road there is a through-left lane and a right turn only lane; at 82nd Avenue there is a left-turn-only lane and a through-right lane). In addition, there is also one relatively busy driveway access point for the adjacent shopping center which can lead to conflict between various travel modes.

Segment A7 – Needs

Continuous and Wider Sidewalks

The sidewalks in this section vary from 10' at the widest point to 5' across Phillips Creek, where they are further tightened by encroaching vegetation. West of the creek, crossing the north sidewalk is inaccessible for mobility devices due to a missing concrete panel and a tree and sign blocking the sidewalk. Pedestrians often walk in the street, which can be dangerous since volumes are relatively high at 5,000 ADT. The sidewalks also do not meet County standards for 7' wide facilities along collector streets in commercial zones. The *Clackamas Regional Center Pedestrian and Bicycle Plan* recommended repair and replacement of sidewalks on Causey Avenue west of 82nd Avenue to meet standard requirements.

Bicycle Infrastructure

Similar to the sidewalk issues, the existing cross-section does not provide safe passage for bicycle riders in this section where there are no existing bicycle facilities. Currently riders can choose to either take the lane or situate themselves near the curb in moderately heavy traffic. Both scenarios reflect a high-stress situation intimidating for all but the most confident riders.

Address Safety Concerns at Intersections

Roadway safety is a significant issue on Causey Avenue, with multiple crashes reported along this section and at both nearby intersections. The intersection with 82nd Avenue is likely the most difficult environment for active transportation besides the aforementioned sidewalk gaps. While the intersection has marked crosswalks, the wide curb radii decreases pedestrian visibility and allows vehicles to take turns at higher

speeds. Because 82nd Avenue is six lanes wide in this section, plus bicycle lanes, pedestrians crossing at the Causey Avenue intersection must traverse 85'. There are no ADA-compliant curb ramps at the intersection.

The *Clackamas Regional Center Pedestrian and Bicycle Plan* recommended installing new pedestrian amenities at the 82nd Avenue/Causey Avenue intersection, including sidewalk ADA ramps and covered shelters at nearby transit stops.

Segment A7 – Constraints

Phillips Creek Bridge

Widening sidewalks may require retrofitting or replacing the bridge over Phillips Creek. Due to the high cost, this would be a longer-term project unlikely to be advanced until the bridge is closer to the end of its useful life span.

ODOT Jurisdiction of 82nd Avenue Intersection

Causey Avenue crosses 82nd Avenue at one of only two signalized intersections within the entire study area. No median island is available to provide refuge for pedestrians needing extra time to cross the highway. Due to wide crossing distances and high traffic volumes and turning movements, the crossing is a significant barrier to active transportation. A balance between vehicle mobility and the mobility and access needs of other roadway users will need to be achieved. Because 82nd Avenue is a state highway, ODOT will actively review and provide guidance on potential modifications to the intersection signal or geometric design proposed as part of this project. In this instance, ODOT's stricter standards for maintaining vehicle throughput at intersections and accommodating truck turning movements may make it challenging to make significant improvements to the pedestrian and bicycle environment at Causey Avenue.

Segment A7 – Potential Solutions

Complete/Rehabilitate Sidewalks and Improve ADA Accessibility

The sidewalks should be improved to allow full ADA accessibility through the entire section, including adding ADA-compliant curb ramps. Long-term goals include widening the sidewalks to meet the County's clear width standards of 7' for collectors in commercial areas. Widening the sidewalk to the street side would be most feasible and cost effective; the existing pavement on Causey Avenue is 44' wide with one travel lane in each direction and a generously sized center turning lane, allowing ample space to widen the sidewalk on both sides. This would improve pedestrian safety and narrow the roadway, eliminating unused space that currently encourages higher speeds – but may be at the expense of providing bicycle lanes unless the center turn lane was removed.

Reconfigure Lanes to Add Bicycle Facilities

The *Clackamas Regional Center Pedestrian and Bicycle Plan* recommended adding bicycle lanes to this section of Causey Avenue. Narrowing the travel lanes from 14' to 10' and the center turn lane from 16' to 12' would provide 12' that could be purposed towards 6' bicycle lanes, while also encouraging reduced travel speeds. An extra 2' of space from the center turn lane could allow for 7' bicycle lanes that include a 2' painted or physical buffer to provide extra separation between bicycles and motorists.

Phillips Creek Multi-Use Path Connections

The County's TSP identifies a future multi-use path along Phillips Creek as a long-term project. If completed, this trail would provide another useful connection between the Monroe Street corridor and Clackamas Town Center, as well as other services along 82nd Avenue.

Clackamas Regional Center MMA Project

See correlating discussion under A6.

Bicycle Boxes

Bicycle boxes should be considered at the 82nd Avenue intersection for Causey Avenue traffic. Bicycle boxes are dedicated areas at signalized intersections that allow bicyclists to pull in front of waiting traffic at red lights. Bicycle boxes help to reduce conflicts between right-turning motorists and straight-through bicycle riders (known as "right hook" collisions) and increase cyclist visibility at busy intersections. They also provide the bicyclist a head start when the light turns green. Bicycle boxes are typically 14' wide rectangles located in front of the stop bar for motorists but behind the pedestrian crosswalk and are painted green to catch the attention of motorists. Motorists cannot turn right on red at intersections when a bicycle box is present.

Green Pavement Markings and Signage to Denote Conflict Areas

At major intersections and driveway entrances, green skip-stripe paint should be used for the bicycle facility to denote the potential conflicts between vulnerable road users and turning motorists. Signage should also be incorporated to alert all modes to be cautious and courteous when navigating these conflict points.

Bicycle Detection

Bicycle detection loops or poles placed at locations for cyclists to activate the signal are recommended.

Median Refuge Islands and Tighter Corners

Eliminating the northbound 'right turn only' lane would provide space to install a raised median with refuge islands at the 82nd Avenue intersection for pedestrians and cyclists if that they cannot cross the entire intersection in one signal cycle. This would help make crossing 82nd Avenue more inviting and easier, especially for people with disabilities. Narrowing the corner radii at the intersection will also reduce crossing distance for pedestrians and improve safety by reducing turning speeds. Special design considerations can be implemented to make sure that trucks can still negotiate right turns at the intersection.

Segment B1: Boyer Drive-85th Avenue-Spencer Drive between 82nd Avenue and I-205

Boyer Drive east of 82nd Avenue is a three-lane local street primarily serving adjacent commercial centers and the Boyer Meadows subdivision. Its total ROW width is 65', including two 13' travel lanes and one 14' center turn lane. In addition, the south sidewalk is 8' to 10' (with a 5' clear width in the wider section) while the north sidewalk is 8'. However, the north sidewalks ends just west of the 85th Avenue intersection. Traffic volumes and speeds are generally low but there are no bicycle facilities or marked crosswalks (except at the 82nd Avenue signalized intersection). Boyer Drive terminates at a three-way intersection with 85th Avenue; traffic on Boyer Drive has the right-of-way while 85th Avenue is stop-controlled.

This alignment briefly jogs south onto 85th Avenue for one block before turning east onto Spencer Drive. The 85th Avenue/Spencer Drive intersection has no stop control. Both of these facilities are local residential streets with low volumes and speeds, and each includes 50' of total ROW and 28' of pavement width. In addition, while both streets have on-street parking, curbs and drainage, neither street has sidewalks or bicycle facilities. Spencer Drive has a 0.3-mile moderate uphill climb (5.3 percent grade) until it dead-ends at the I-205 Multi-Use Path. The speed limit is 25 mph throughout this section.

Segment B1 - Needs

Bicycle Facilities on Boyer Drive

Boyer Drive has no bicycle lanes or any other infrastructure for bicycles. While volumes are relatively low, the street generally seems wide and overbuilt which can encourage motorists to increase speeds. Repurposing the existing space will help facilitate bicycle travel and could also help reduce speeds.

Sidewalks on 85th Avenue and Spencer Drive

85th Avenue and Spencer Drive lack pedestrian facilities, which forces local residents or trail users to walk in the street and can potentially be a hazard at corners when visibility is reduced. Both streets were constructed with storm drainage and curbs.

Reduce Collision Risk at 85th and Spencer Intersection

One member of the PAC who lives in the subdivision commented that the intersection of 85th Avenue and Spencer Drive is a safety trouble spot, primarily due to drivers not properly yielding. However, no incidents were reported in the vicinity between the years 2007 and 2010. The intersection has no stop control, although Spencer Drive dead-ends just west of the intersection, meaning that the north and east legs receive the dominant flow of movement.

Segment B1 – Constraints

Challenges Created by Spencer Drive Grade

The steep winding grade on Spencer Drive presents issues in both directions. First, in the uphill direction eastbound, it creates a noticeable differential in speeds between people who bike and drive along the street. For an individual using the Monroe Street corridor to access Clackamas Town Center via the I-205 path, it likely would not make sense to traverse up the hill on Spencer Drive only to pedal back downhill once on the trail. Second, and of more concern, is that the grade facilitates speeding by bicyclists in the downhill direction. This can lead to conflicts with residents backing out of driveways or with motorists at curves where visibility is reduced.

Allocation of Space on Boyer Drive

At 40' wide between curbs, Boyer Drive is slightly too narrow to accommodate bicycle lanes without either removing the center turning lane (to provide enough space for enhanced bicycle lanes) or reducing the width of the lane to 10' (to accommodate standard 5' bicycle lanes). Sharrow pavement markings may be adequate for this section, depending on measured volumes and speeds.

Multiple Turns Complicate Route

This alignment would require two quick right-hand turns in succession, which may make it more difficult for riders to follow the route. Wayfinding will be key in this section to direct bicyclists and pedestrians to the I-205 path.

Segment B1 – Potential Solutions

Sufficient ROW to Add Infill Path

There is up to 20' of available public right-of-way to add a concrete sidewalk or asphalt path on one or both sides of 85th Avenue and Spencer Drive. Because curbs and gutters already exist on both streets, retrofitting pedestrian facilities is not expected to be as costly nor to have a substantial impact on the neighborhood's character. However, much like in other neighborhoods, there has been considerable encroachment of front yards within this ROW which makes reclaiming this space for a pedestrian facility potentially difficult.

Less Busy Compared to Causey Avenue

This route has much lower traffic volumes and speeds than the other alternative in Section B (Causey Avenue) and is generally a more comfortable place to ride a bicycle today. This area will likely not need more substantial investment besides signage and sharrows.

Requires Less Out-of-Direction Travel If Heading North

For riders heading north on the I-205 Multi-Use Path towards Portland, the Spencer Drive route represents significantly less out-of-direction travel than the Causey Avenue alternative. Riders would also be able to connect at the Fuller Road MAX station to continue on their journey.

Bicycle Lanes and Cycle Tracks

Depending on how the existing lanes are resized or reconfigured, there should be enough room available for two standard bicycle lanes on Boyer Drive, with the potential of further enhancements such as a painted buffer and/or vertical delineators to create a low-stress environment for bicycling.

If the County was interested in pursuing a full street rebuild, the cycle track facility planned for the extension of Boyer Drive could be implemented in the existing section to create a uniform, consistent facility from Fuller Road to 85th Avenue. This would be an expensive project though, because the existing curbs would have to be moved inward toward the street and the sidewalks expanded to create the cycle track. The existing street trees would also need to be removed.

Treatments to Slow Downhill Bicycles on Spencer Drive

Several PAC members had concerns about the steep grades on Spencer Drive encouraging westbound riders to speed downhill, potentially endangering themselves and pedestrians. Several treatments could reduce the collision risk, including speed bumps and signage and pavement markings advising riders to slow down and watch for vehicles exiting from driveways. Horizontal or vertical deflection features such as pinch points and/or chicanes could calm traffic and reduce speeds for motorists, although they could present a danger to night-time bicyclists.

All Way Stop Controls

Boyer Drive has no stop control at the 85th Avenue intersection, which can endanger pedestrians crossing at the west leg who do not expect eastbound motorists to proceed through the intersection without stopping. Further, there is no stop control at the 85th Avenue/Spencer Drive intersection. It is recommended that all-way stop conditions at both intersections be considered to improve safety for all road users. Marked crosswalks and ADA-compliant curb ramps should also be considered.

Midblock Crosswalk and Median Refuge Islands

Boyer Drive is a superblock between 82nd Avenue and 85th Avenue, a distance of over 500'. The only intervening access points serve adjacent commercial development, but there is no marked crosswalk connecting them. Installing a midblock crosswalk in close proximity to commercial driveway entrances would help pedestrians access these developments without having to jaywalk or walk several feet out of direction to cross at the nearest intersection. A median refuge island would improve pedestrian visibility and allow people walking to cross Boyer Drive one direction at a time.

Segment B2: Causey Avenue between 82nd Avenue and I-205

Causey Avenue is a relatively busy 2-3 lane urban collector between 82nd Avenue and I-205 that serves a mix of commercial uses along 82nd Avenue and dense multifamily residential further east. The road dead-ends at the freeway, but through access is available to the south at 85th Avenue and 90th Avenue. As a result, volumes are high at 5,900 ADT and no dedicated bicycle facilities are available except for a 375' piecemeal section westbound installed as part of a newer development. Sidewalks are between 5'and 10' wide, although the wider sections are typically made up of a 5' landscaping zone and a 5' clear width zone. Except for the cul-de-sac area, most of the sidewalk is buffered from the street by landscaping. Curb extensions have been installed at the newer developments to reduce crossing distance and narrow the street. However, marked crosswalks are missing in some locations.

The total ROW along the street varies between 55' and 72', although pavement width is typically 35'except in locations where a left turn pocket has been provided at 85th Avenue or where three westbound approach lanes (one left-turn-only, one through lane, one right-turn-only lane) at the 82nd Avenue intersection. Two 10' general travel lanes are provided, in addition to two 7.5' parking lanes which are heavily utilized by nearby residents and visitors. Causey Avenue is 50' wide between the curbs at its widest point and 25' wide

at its narrowest. The street has a gradual half-mile long uphill climb (3.2 percent grade) until it dead-ends at the I-205 Multi-Use Path trailhead. The speed limit is posted at 25 mph throughout this section, but vehicle speeds are observed exceeding that limit

Segment B2 – Needs

Bicycle Facilities on Causey Avenue

Causey Avenue currently lacks bicycle lanes or any other bicycle infrastructure, which means that riders must share the narrow lane with drivers on a busy street where motorist speeds frequently exceed 25 mph. This creates a very high-stress environment and is compounded by the significant dooring hazard presented by the continuous on-street parking which is highly utilized throughout the day. To avoid these hazards, riders must take the lane, and can be subject to aggressive or menacing behavior from motorists that reduces usability for all but the strongest riders.

Repaving and Sidewalk Repair

The pavement surface along Causey Avenue is in poor shape, with ruts and potholes causing discomfort for all roadway users and potentially leading to increased repair costs and risk of single-vehicle collisions. Between 82nd Avenue and 90th Avenue, heaving sidewalks impact pedestrian accessibility and have been targeted by the County for recommended improvements.

Complete Missing Pedestrian Elements

This section has numerous driveways for access to adjacent commercial and residential developments. However, there are only a few formal street intersections which creates a superblock with large gaps between marked crosswalks. In addition, there are very few ADA-compliant curb ramps along this corridor.

Segment B2 – Constraints

Very High Traffic Volumes

Causey Avenue's level of activity reduces flexibility for implementing bicycle improvements. The *Clackamas Regional Center Pedestrian and Bicycle Plan* recommended installing bicycle boulevard treatments on between 82nd Avenue east to the I-205 Multi-Use Path with suggested project elements including left turn lane removal, curb extensions, raised crosswalks for traffic calming and bike sharrows. However, existing traffic volumes on Causey Avenue are too high to realistically support low-stress riding using a shared bike boulevard treatment. In addition, the eastbound grade is approximately 4%, coupled with short, steeper sections that slow cyclists considerably as they climb the hill, creating a disparity in speeds between motorists and bicycle riders. For a slower-moving cyclist, being overtaken in a shared space by faster vehicles can be uncomfortable—and in some instances unsafe.

Narrow Cross-Section

At 25' to 35' wide between curbs, Causey is too narrow to add dedicated bicycle facilities without reallocating parking lanes. In addition, lane dimensions are already at their usable minimum width which removes lane narrowing as a potential option.

Highly Utilized On-Street Parking

The parking lanes on Causey are routinely occupied by vehicles, which will likely make it politically difficult to repurpose a lane for dedicated bicycle facilities and creates a hazard for people who bike in the "door zone". The County currently does not institute demand management practices for these spaces, either by limiting the duration of parking, charging an hourly rate, or both. The County also does not run any kind of parking permit system.

Segment B2 – Potential Solutions

Gentler Grade Compared to Spencer Drive

Compared to Spencer Drive, the grade on Causey Avenue is gentler (3 percent vs 5 percent) although the length of the grade is longer (2,300' vs 1,500').

Nearby High Density Residential Development

Although the amount of vehicle traffic generated by surrounding land uses is high, selecting Causey Avenue as the active transportation route would most directly serve the densest part of the project study area and provide the greatest aggregate benefit to nearby community.

Dedicated Bicycle Facilities

Due to observed high volumes and speeds, a bicycle boulevard treatment is not recommended for Causey Avenue without implementing traffic diversion. Instead, dedicated bicycle lanes are more appropriate at this location, particularly in the uphill direction, and would be consistent with the County's proposed treatment west of 82nd Avenue. In the downhill direction, bicycle lanes are preferable but sharrow markings may suffice, as long as other traffic calming measures were implemented to reduce speeds. However, this would almost certainly require removing one or possibly both lanes of on-street parking, although the absence of single-family residences and relative scarcity of owner-occupied households may reduce neighborhood pressure to retain all parking.

Traffic Calming

Travel volumes and speeds are high in this section of Causey Avenue, and traffic calming measures will be necessary to create appropriate roadway conditions for a bicycle boulevard. Speed cushions, curb extensions, chicanes, pinch points and raised crosswalks are all potential treatments, but the roadway's current collector designation may limit the range of options available. The gradually increasing and sustained grade from 82nd Avenue to I-205 presents a real challenge for eastbound cyclists sharing the space with motorists. However, implementing these speed control measures could make low-stress shared operation in the downhill direction more feasible.

Curb Extensions and Midblock Crosswalks

Crossing enhancements such as curb extensions and midblock crosswalks are useful for increasing pedestrian visibility and reduce street crossing distance. ADA-compliant curb ramps are also recommended to improve accessibility.

Next Steps

As described above, different route alternatives for the Monroe Neighborhood Street Design Plan will lend themselves to different treatments along each route segment to improve safety and comfort for all travel modes, and particularly for pedestrians and bicyclists. Building on the segment-by-segment analysis of needs, opportunities, and constraints contained in this memo, the next step will be to apply the project Evaluation Criteria to each of the six route alternatives. Through a careful screening of each alternative and its associated route segments against project objectives, the evaluation criteria, and input from the TAC, PAC, and general public, a preferred alternative will be selected for final recommendation in the Monroe Plan. In addition, the TAC, PAC and general public will help determine which of the potential tools described herein will be included in the final Plan for the project. When completed in spring 2016, the plan will likely set out an approach to funding and implementing the improvements it describes.

Works Cited

City of Milwaukie. 2012. *Milwaukie Bicycle Wayfinding Signage Plan*. Available at http://nacto.org/wp-content/uploads/2012/06/City-of-Milwaukie-2009.pdf. Prepared by Alta Planning + Design, Portland, Oregon. Prepared for City of Milwaukie Public Service Facility, Milwaukie, Oregon.

Clackamas County. 2013. *Transportation System Plan*. Prepared by Clackamas County. Adopted December2013. Available at http://www.clackamas.us/transportation/tsp.html.

Clackamas County. 2015. *Active Transportation Plan*. Prepared by Clackamas County in conjunction with Kittelson and Associates. Adopted May 2015.

Clackamas County. 2013. *Roadway Standards.* Adopted February 2013. Available at: http://www.clackamas.us/transportation/documents/Roadway%20Standards%202013.pdf.

City of Portland. 2015. Portland's Neighborhood Greenway Assessment Report. Adoption date TBD. Available at: TBD.

Federal Highway Administration (FHWA). 2013. *Interim Approval for Optional Use of a Bicycle Signal Face (IA-16)*. Memorandum. Available at: http://mutcd.fhwa.dot.gov/resources/ interim approval/ia16/index.htm. U.S. Department of Transportation, Federal Highway Administration. December 24.

Oregon Department of Transportation (ODOT). 2009. Bike signal photograph. Available at http://www.pedbikesafe.org/BIKESAFE/countermeasures_detail.cfm?CM_NUM=55.

Oregon Department of Transportation (ODOT). 2011. *Traffic Line Manual*. Available at http://www.oregon.gov/ODOT/HWY/TRAFFIC-ROADWAY/docs/pdf/ TLM_Revision1_June2012.pdf. Revision 1 June 2012.

Oregon Metro. 2010. *Regional Transportation Functional Plan.* Available at: http://library.oregonmetro.gov/files//appendix_23_rtfp.pdf. September 8.

National Association of City Transportation Officials (NACTO). Undated. Volume management photograph. Available at http://nacto.org/cities-for-cycling/design-guide/bicycle-boulevards/volume-management/.

National Association of City Transportation Officials (NACTO). Undated. Bike box photograph. Available at http://nacto.org/cities-for-cycling/design-guide/intersection-treatments/bike-boxes/.

National Association of City Transportation Officials (NACTO). 2013. *Urban Bikeway Design Guide.* Second Edition. Available at http://nacto.org/cities-for-cycling/design-guide/. Island Press: Washington, D.C.

Pucher, John and Lewis Dijkstra. 2003. "Promoting Safe Walking and Cycling to Improve Public Health." *American Journal of Public Health*. September.

Appendix A:
Bicycle and Pedestrian Facility Tools

Excerpted From:

City of Portland Neighborhood Greenways Assessment Report (2015), Appendix C: Tools and Designs for Neighborhood Greenways……Pages 39 – 55

Milwaukie Transportation System Plan (2013), Chapter 6: Bicycle Element. Bicycle Facility Improvement Toolbox……Pages 6-3, 6-4, 6-5, 6-6, 6-7

Excerpt from City of Portland Neighborhood Greenways Assessment Report (2015), Appendix C: Tools and Designs for Neighborhood Greenways

The following tools are described as part of the Portland Bureau of Transportation's (PBOT) Neighborhood Greenway Assessment Report (2015). Descriptions are included here for reference.

AUTO SPEED REDUCTION ALONG NEIGHBORHOOD GREENWAYS

Speed bumps are the primary tool to manage auto speeds along neighborhood greenway routes where speeding is a problem. The desired 85th percentile operational speed on neighborhood greenways is 20 miles per hour (mph). This goal is supported by international research indicating a cyclist struck at 20 mph has less than 15 percent risk of fatality[1].

Research indicates that the spacing of speed bumps and speed tables should not exceed 350 feet in order to achieve the desired operating speed of 20 mph. The spacing of speed bumps should be reduced to as close as 300 feet apart in response to higher pre-project 85th percentile speeds. Reference Portland's 2013 Draft Traffic Manual, Section 3.1 – Traffic Calming, Speed Bumps for detail design guidance, unless otherwise stated. The following are examples of speed bumps used in Portland.

14-FOOT SPEED BUMP	
	14-foot speed bumps are used on Local Service streets to achieve residential speeds. They have a parabolic profile and maximum height of 3 inches. Worst-case fire engine delay per 14-foot speed bump is approximately 9.4 seconds.

1. Wramborg, P. (2005) "A New Approach to a Safe and Sustainable Road Structure and Street Design for Urban Areas," paper presented at Road Safety on Four Continents Conference, Warsaw, Poland.

22-FOOT SPEED BUMP (AKA SPEED TABLE)

22-foot speed bumps use two 6-foot parabolic ramps and a 10-foot flat section between the ramps, and 3-inch maximum height. The flat section reduces the slowing effect on motorists at the bump. 22-foot speed bumps are used on Neighborhood Collector streets not designated as Major Emergency Response routes and on Local Service streets with active transit routes. Worst-case fire engine delay per 22-foot speed bump is approximately 9.2 seconds. This photo shows the former marking standard.

RAISED CROSSWALKS

Raised crosswalks use the 22-foot speed bump profile and add the continental-style crosswalk marking. Type 1 raised crosswalks meet the curb, and the curb ramp is constructed to match the 3-inch speed bump height. Type 2 raised crosswalks, as shown here, have a 3-foot-wide tapered edge down to the roadside. See the Draft Traffic Manual Section 3.6 for design details.

SPEED CUSHIONS

Speed cushions are a "freight-friendly" version of the 14-foot speed bump. Channels are incorporated to permit freight trucks to straddle the narrower bump sections and, ideally, minimize delay. Estimated delay per device for a freight truck is under 2 seconds.

OFFSET SPEED BUMPS

Offset speed bumps have the same dimensions as standard 22-foot speed bumps but are split down the centerline of the street with the two halves separated. Offset speed bumps permit emergency response vehicles to bypass the bumps by placing one or both sides of the vehicle into the opposing traffic lane. This action can significantly reduce the delay to emergency response vehicles associated with driving both sides of the vehicle over a speed bump. Estimated delay per device for a freight truck is under 2 seconds. This photo is from Beaverton, Oregon.

Traffic circles have been used in the past to reduce vehicle speeds; however, research has shown that the speed-reduction effect of traffic circles is limited to within about 100 feet of the intersection at which they are placed. When placing speed bumps along a neighborhood greenway with existing traffic circles, it is permissible to place speed bumps within 200 feet of a traffic circle, or remove the circle to achieve a more uniform speed- bump spacing.

TRAFFIC CIRCLE, FORMER CURB

Portland first adopted traffic circles to address speeding concerns, but has found them to be of limited influence on speeds and expensive to construct. Traffic circles also are unwelcome by people biking due to a perception that people driving speed up to pass people biking before the circle. In testing, traffic circles presented the greatest delay to freight engines, at up to 10.7 seconds per circle. Existing traffic control is usually maintained after traffic circle construction. See the Draft Traffic Manual, Section 3.2, for design details.

TRAFFIC CIRCLE, CURRENT CURB

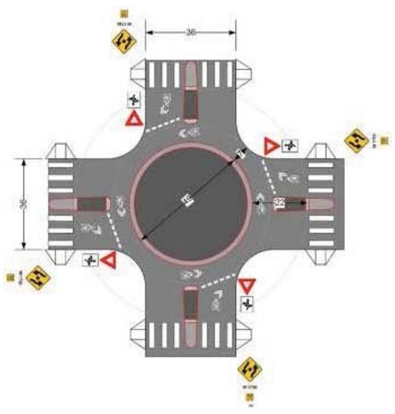
Current design standards have moved to a low curb, more similar to the truck apron of a modern roundabout.

Mini-roundabouts are a tool to reduce speeds at busier Local Service intersections. Mini-roundabouts used at minor intersections should use an automobile as the circular roadway design vehicle, so that speeds are reduced as much as possible. Reference Portland's 2013 Draft Traffic Manual, Section 3.3 - Traffic Calming, Roundabouts for detail design guidelines.

MINI-ROUNDABOUT, PORTLAND TEST SITE

Mini-roundabouts use all the design and operational features of a modern roundabout (deflection, low-speed operation, all-way yield), but do not have a central landscaped circular island. Instead the center island is all at truck-apron height. This permits mini-roundabouts to be used in constrained environments where truck and bus access is to be maintained.

BIKE MINI-ROUNDABOUT



A bike mini-roundabout would be designed so that only passenger vehicles and people biking could move around the central island on the roadway. All other vehicles would need to use some portion of the truck apron regardless of the desired travel path.

AUTO TRAFFIC VOLUME MANAGEMENT ALONG NEIGHBORHOOD GREENWAYS

PBOT has traditionally limited its use of access management due to concerns of diverting traffic to adjacent streets where it would be equally undesirable, as well as the impacts on convenient access. PBOT recommends minimal increase in auto traffic volumes on streets designated as neighborhood greenways where those automobile volumes are already below 1,000 average daily traffic (ADT). For streets currently above 1,000

ADT, the access management tools described below can bring traffic volumes to recommended levels. In certain cases, access management may not be the most desirable tool, and other roadway designs, education campaigns or enforcement actions could be implemented.

Access management devices are typically located at major cross streets and take the form of constructed barriers that limit access onto the neighborhood greenway route from the major cross-street by automobile traffic. Internal access management for automobiles should be considered when community amenities, such as parks or community centers, are located along a neighborhood greenway route near a major cross street or without other convenient access. Automobile access management devices can take several forms. They should permit access by people walking and biking, and accommodate the access needs of emergency response vehicles, if necessary. The following are examples of common access management devices, which can be combined to achieve greater restriction of access.

SOFT DIVERSION – PINCH POINTS

Pinch points introduce friction for automobile traffic. Instead of blocking one direction of access, two directions are constricted to a single lane, requiring opposing motorists to take turns passing through. The nature of this treatment makes it most appropriate for application along a neighborhood greenway, away from main road crossings.

CURB EXTENSION ALONE SEMI-DIVERTER

This is a curb extension that blocks vehicle entry to a street by closing off the parking lane and a portion of the entry lane on the entry street. Space is retained to permit bicycle entry as well as space for a freight truck to enter. The version depicted also incorporates a storm water swale in the curb extension. See the Draft Traffic Manual, Section 3.5, for design details.

CURB EXTENSION WITH ISLAND SEMI-DIVERTER

This curb extension blocks vehicle entry to a street by closing off the parking lane on the entry street. A freight-truck-mountable island is placed near the centerline with a 6-foot minimum space between the island and curb extension to permit bicycle entry. It is recommended that the island include vertical delineators to further discourage auto use. The version depicted also incorporates a storm water swale in the curb extension.

ISLAND SEMI-DIVERTER TYPE A

This island blocks vehicle entry to a street by closing off the parking lane and a portion of the entry lane on the entry street. Space is retained next to the centerline to permit bicycle entry, as well as space for a freight truck to enter. Space is retained next to the curb to permit drainage. The version depicted shows the common signing used to discourage motorist violations.

ISLAND SEMI-DIVERTER TYPE B

This is an island that blocks vehicle entry to a street by closing off the travel lane and a portion of the parking lane on the entry street. Space is retained next to the curb for drainage and to permit bicycle entry. The version depicted shows the common signing used to discourage motorist violations. Emergency responder access is via the opposing lane.

MEDIAN BARRIER, NON-MOUNTABLE

This island blocks vehicle entry to a street, eliminating left turns from the cross street - usually a major cross street - and uses a full-height (6-inch) curb for all sections of the island. The island also eliminates left turns from the side street, making the side street operate as "right in, right out" only. Gaps are retained for pedestrian and bike access. Left-turn emergency responder access is via the opposing lane. See the Draft Traffic Manual, Section 3.4, for design details.

MEDIAN BARRIER, MOUNTABLE

This is an island that blocks vehicle entry to a street, eliminating left turns from the cross street - usually a major cross street. The island also discourages left turns from the side street, making the side street operate as “right in, right out" only. Gaps are retained for pedestrian and bike access. Left-turn emergency responder access is via the opposing lane, or a lowered middle section (3- to 4-inch height curb with angle face). The lowered islands have less deterrence for motorists than a full-height curb.

MEDIAN BARRIER, SKINNY

While most medians will provide a refuge space for pedestrians and cyclists, on occasion there is not sufficient road width available. This location depicts enhancements with vertical delineation to deter violations. Left-turn emergency responder access is via the opposing lane.

DIAGONAL DIVERTER, IMPERMEABLE

A diagonal diverter breaks a standard four-leg intersection into two opposing left- or right-turn corners. The diagonal diverter shown here is accomplished with full curb and sidewalk connections, though small islands are also possible. Bicycle access is via widened ramps at the former corners (see next photo), while pedestrian pathways remain the same. Stop signs are frequently used at all approaches, since people biking may proceed after stopping and come out from behind vegetation. This feature requires an alternate emergency response route.

DIAGONAL DIVERTER BIKE ACCESS

Bike access at a diagonal diverter, combined with corner ramps.

DIAGONAL DIVERTER, PERMEABLE

With this low-cost diversion method, the placement of tall planters is used to prevent all automobile through movement at this right-offset intersection. The crosswalk is inside the planters, and the planters are spaced 4 to 5 feet apart. The planters are not secured to the roadway, and can be pushed aside by emergency vehicles if needed.

DIAGONAL DIVERTER, CUL-DE-SAC / DEAD END

Closure of a street at an intersection can be accomplished in a variety of ways, from temporary planters to small islands, or full curb and sidewalk connections. Frequently such closures include ramps with break-away posts to permit bicycle and freight truck access.

FULL DIVERTER, POCKET PARK

One of the most aesthetically pleasing, and most expensive, full diversion methods, pocket parks retain access for people walking and biking, with the addition of green space for the local community.

SHARED USE PATHS ON UNIMPROVED ROAD

Developing unimproved rights-of-way for non-motorized use is a good way to improve connectivity for cyclists and pedestrians without encouraging auto cut-through traffic.

CONTRA-FLOW BIKE LANE

Contra-flow bike lanes involve the conversion of a street (usually narrow) to one-way operation for auto traffic, with the placement of a bike only lane in the opposing direction. Parking removal is often needed, if not already in place. Reinforcement of the bike-only access may be necessary, using a small diversion island. Alternating contra-flow bike lanes along a corridor can effectively reduce auto traffic volumes at a low cost. On wider streets, changing the remaining parking to angle alignment can offset parking loss from the bike lane. Alternatively, the contra-flow bike lane can have a parking lane adjacent to it on wider streets, eliminating most parking loss.

ACCESS MANAGEMENT SIGNING EXAMPLES

ENHANCING CROSSING SAFETY AT BUSIER CROSS STREETS

While a neighborhood greenway may have the slowest speeds and fewest automobiles in the city, crossing busy arterial roadways presents a challenging, uncomfortable environment for people walking and bicycling. PBOT recommends a minimum crossing level-of-service guideline of 50 people walking and/or biking per hour, and a preferred goal of 100 per hour, when considering how to improve crossings at busier intersections on new neighborhood greenways. These guidelines are based on historical data showing that Portland's most popular bike boulevard routes are already achieving peak-hour demand levels in the 100+ cyclists per hour range.

Portland uses protocols identified in the National Cooperative Highway Research Program Report 562 (NCHRP 562), Improving Pedestrian Safety at Unsignalized Crossings (2006), to evaluate how to improve a crossing to achieve Portland's crossing service guidelines. As Portland has established service level targets, the data collection for current pedestrian and cyclist crossing use is eliminated from the standard protocols identified in NCHRP 562, making the analysis simpler. Standard crossing enhancements at busier intersections, in preferred ascending order, include:

- Signing and marking (minimum);
- Pedestrian refuge islands;
- Curb extensions;
- The addition of rapid lashing beacons to any of items 1-3;
- Combinations of items 2-4 in addition to item 1;
- Pedestrian hybrid beacons; and
- Full signalization with bike buttons or loops.

NEIGHBORHOOD GREENWAY MARKED CROSSING

In every case, marked crossings are added on both legs of the busier cross street. At two-lane crossings, near-right signing is added as a minimum. At multi-lane crossings, islands are common features and additional signing is usually added on the median and at the far right crossing as well. Multi-lane crossings also include advance stop bars and signing; and five-lane crossings include rapid flash beacons with refuge islands.

CROSSING SIGNS

Portland's standard sign for a neighborhood greenway crossing.

PEDESTRIAN REFUGE ISLANDS

Refuge islands are raised concrete islands at crosswalks that break a crossing into two halves. This permits people crossing to concentrate on a single direction of traffic and string together two opposing gaps that do not coincide by pausing at the island. This is especially helpful for the youngest and oldest pedestrians. See the Draft Traffic Manual, Section 3.4, for design details.

CURB EXTENSIONS

Curb extensions shorten the crossing distance, reducing exposure to cross-traffic and permitting the use of shorter gaps in traffic. Curb extensions also bring people walking and biking closer to the street centerline, increasing visibility between motorists and those wishing to cross. People crossing still must find gaps in two directions of traffic that coincide, a more difficult task for the youngest and oldest pedestrians. See the Draft Traffic Manual, Section 3.5, for design details.

BUFFERED BIKE LANE AND BICYCLE TURN BOX

When bike routes that share the roadway with auto traffic have to cross busier roads and a jog is involved, this treatment helps guide people biking and keep bicycle and auto traffic separated. A street-level treatment without vertical delineation is easier to maintain with standard equipment. This application also requires people biking to look back over their shoulder to check for conflicts, an action older cyclists may have difficulty with.

RAISED CYCLE TRACKS

Extended lengths of curb extensions can be used to provide a raised separated space where a neighborhood greenway must jog from one side of a busy street to another. The space created can be shared with pedestrians, or delineated for separate use as shown here. This application shows the contra-flow lane next to opposing traffic to prevent cyclist path crossover.

RAPID FLASHING BEACONS

Rapid flashing beacons are activated by push button and provide positive guidance to motorists that a person walking or biking wishes to cross but, as a flashing yellow beacon, do not require motorists to stop. Such beacons usually include a verbal warning to pedestrians that autos may not stop, and can include illumination that activates when the button is pushed.

PEDESTRIAN HYBRID BEACONS (PHB)

PHBs rest in "off" position. Once a button is actuated, they begin flashing yellow, go to solid yellow, then solid red, and require motorists to stop as with a standard signal. Once the crossing signal phase is complete, the motorist signal heads begin flashing red, permitting people driving to proceed if the path is clear, before going dark.

BIKE SIGNALS

Bike signals are added where there are potential conflicts between people driving and people biking using the same intersection. Common conflicts involve left-turning motorists and through cyclists. Less common is the diagonal cycle path at a signalized intersection.

FULL SIGNALS

Though uncommon, full signals are sometimes recommended at the busiest of crossings, particularly where other safety needs exist. This location includes a school crossing upgrade with a two-way cycle track connection.

PEDESTRIAN COUNTDOWN SIGNAL HEADS

Pedestrian countdown signal heads provide information to road users regarding remaining time before the signal will go to amber. This assists people walking and biking to determine if there is sufficient time to cross a street based on that user's abilities.

CYCLIST PUSH BUTTONS

When electronic warnings or traffic controls are installed at neighborhood greenway crossings, either inductive loops or push buttons at the roadside are provided so people biking can actuate the controls.

NEIGHBORHOOD GREENWAY WAYFINDING

The primary marking for neighborhood greenways is the shared roadway marking, aka sharrow. Portland uses guide sharrows, with a tail added to the standard chevron markings, to inform cyclists of a direction change along a neighborhood greenway. Sharrow legends are placed 25 to 50 feet from major cross streets and spaced at up to 250-foot intervals after that initial marking. Opposite-direction sharrows are typically placed at the mid- point of the first direction such that alternating directional sharrows are encountered every 125 feet along a neighborhood greenway. In advance of a direction change, or decision point, along the neighborhood greenway, the last sharrow will use the directional chevron to inform cyclists of the change of direction, or a pending decision point, where the neighborhood greenway intersects another bikeway.

The bike-person symbol with arrow legend is used on bike lanes, and the bike-person alone at bike median crossings. Guide signing of neighborhood greenways will occur in advance of major cross-streets and intersections with other bikeways. Guide signing will identify major destinations, distance to the tenth of a mile, and approximate time to achieve that distance at 8 mph.

STANDARD SHARROW

The standard shared lane marking, aka sharrow, is a bike symbol with a double chevron on top. The chevron can be rotated to the right or left side to indicate changes of direction, if turn sharrow markings are not used. Multiple chevrons can indicate crossing choices. Shown here is the former "dinner plate" marking that the sharrow replaced, and a previous version of the sharrow.

TURN SHARROW

Shown here is the right turn sharrow marking.

DECISION POINT SHARROW

Multiple chevrons can indicate direction choices.

BIKE LANE SYMBOL (BIKE PERSON + ARROW)

BIKE-PERSON SYMBOL AT MEDIAN

The bike-person symbol is used at standard-width medians to identify the gap for the exclusive use of people biking.

ROUTE GUIDE SIGNING

A standard bikeway guide signing showing destination, distance and time.

LOCATION DESTINATION GUIDE SIGNS

Local destination guide signing is intended to inform people biking on neighborhood greenways of nearby destinations or amenities on adjacent, parallel auto collector streets.

LOCAL DESTINATION GUIDE SIGNS

Artwork and other creative designs can enhance the street and highlight its unique function as a place for people.

Excerpt from Milwaukie Transportation System Plan (2013), Chapter 6: Bicycle Element. Bicycle Facility Toolbox

BICYCLE FACILITY IMPROVEMENT TOOLBOX

Types of Bicyclists

Bicyclists are a varied group of people with different skill levels, abilities, bicycling experience, and trip types. For example, there are everyday commuters, avid recreational riders, children going to school, and families riding around in their neighborhoods. Their needs and comfort level with the bicycle infrastructure in Milwaukie will vary as a result of these differences. The City needs to accommodate these different types of bicyclists by providing adequate facilities for all different types of riders.

Bicycle trips are typically longer than walking trips and shorter than motor vehicle trips, and are attractive at distances up to three miles. Bicycle facilities can generally be categorized as multiuse paths, cycle tracks, bike lanes, shared roadways, and neighborhood greenways. Each of these facilities serves a particular purpose for bicycle travel. Bike lanes, cycle tracks, and multiuse paths can all accommodate trips of up to three miles. However, if the trip is shorter, or if the destination or origin of the trip is not next to a roadway with a bike lane, many bicycle trips can also be made on local streets. Table 6-1 summarizes each of these facilities with a general description of the elements inherent to each facility.

Table 6-1 Bikeway Types

Bikeway	Description
Multiuse path	Off-street route, typically recreational-focused, which can be used by several transportation modes, including bicycles, pedestrians, and other nonmotorized modes (i.e., skateboards, roller blades, etc.).
Cycle track	Exclusive bike facility within the roadway, with elements of both a separated path and a bike lane. Separated from motor vehicle traffic by parked cars, bollards, landscaping, or other barriers.
Bike lane	Area within street right-of-way specifically designated for bicycle use.
Shared roadway	Roadways where bicyclists and autos share the same travel lane. May include a wider outside lane and/or bike boulevard treatment (priority given to through bikes on local streets).
Neighborhood greenway	Lower-order, lower-volume streets with various treatments to promote safe and convenient bicycle travel and enhance pedestrian travel as well. Usually accommodate bicyclists and motorists in the same travel lanes, often with no specific vehicle or bicycle lane delineation. Assign higher priority to through bicyclists, with secondary priority assigned to motorists. Also include treatments to slow vehicle traffic to enhance the bicycling environment.

Bicycle Facility Design Considerations

Multiuse Paths

As their name implies, multiuse paths are designed to accommodate many types of users, and are typically constructed along an independent path such as a stream or greenway. Paths can also be built parallel to a roadway, but are most effective when built independent of a road, separating bicyclists from auto traffic. The American Association of State Highway Transportation Officials (AASHTO)[1] and the Oregon Department of Transportation (ODOT)[2] state that mixed-use paths can be designed along roadways, provided several design considerations are met:

Figure 6-1 Multiuse Path

Photo credit: Vince Schreck, www.pdxfamilyadventures.com

- A minimum 5-foot buffer should be provided between the path and roadway to protect path users from conflicts with motorists.
- Relatively few vehicle/path user conflict points (e.g., cross-streets or driveways).
- The path can be terminated at each end onto streets with good bicycle/pedestrian facilities or onto another safe, well-designed path.
- The path should not take the place of bicycle/pedestrian facilities (e.g., sidewalks and bicycle lanes) on the parallel street.

Cycle Tracks

Cycle tracks can take a number of forms, depending on the nature of the existing street infrastructure. They combine some elements of a fully separated path with those of a bike lane in the roadway. The key element of a cycle track is that it uses parked cars, bollards, landscaping, curbing, or other barriers to provide some separation from motor vehicle traffic. Cycle tracks may be one-way or two-way, and they may be located at road level, sidewalk level, or an intermediate level. They are distinct from the sidewalk and are designed exclusively as bike facilities. A recommended minimum width is 7 feet, with an additional 2-ft "door zone" buffer (where adjacent to parked cars). Pavement markings on the cycle track provide guidance for bicyclists, as well as for motorists and pedestrians that may cross the cycle track at driveways or intersections.

Figure 6-2 Cycle Track

Photo credit: Michael O'Hare, www.citiesforpeople.net

There are currently no cycle tracks in Milwaukie, and no potential cycle track routes have been identified to date. However, this type of facility represents an option for future bike improvements that might be most appropriate in certain settings to provide safer bike routes in high-traffic corridors.

[1] *A Guide for the Development of Bicycle Facilities*, American Association of State Highway and Transportation Officials, 1999.
[2] *Oregon Bicycle and Pedestrian Plan, An Element of the Oregon Transportation Plan*, Oregon Department of Transportation, Adopted June 14, 1995.

Bike Lanes

When possible, bike lanes should be directly adjacent to the curb, rather than adjacent to parked cars or combined with sidewalks. The recommended width of six feet provides sufficient travel space and additional room for bicyclists to steer clear of the curb or parked cars while maintaining a comfortable distance from adjacent moving traffic. Wide bike lanes also enable bicyclists to maneuver around drainage grates, manhole covers, glass and debris. Provision of bike lanes also benefits motor vehicles, which gain greater shy distance/emergency shoulder area, and pedestrians, who gain a buffer between walking areas and moving vehicles. Where right-of-way is limited, the bike lane can be reduced to 5 feet. Alternatively, widening the curb travel lane (for example, from 12 feet to 14 or 15 feet) can provide better bicycle accommodations and a greater measure of safety as well. However, with higher-volume roadways (e.g., streets with more than 3,000 Average Daily Trips), dedicated bike lanes are much more desirable than wide outside lanes.

Figure 6-3 Bike Lane

Photo credit: LA-32 Neighborhood Council, http://la32nc.org/category/transportation/

The signing and marking of bike lanes should follow the *Manual on Uniform Traffic Control Devices* (MUTCD). Design features in the roadway can improve bicycle safety as well. For example, using curb storm drain inlets rather than catch basins significantly improves bicycle facilities.

Shared Roadways

Shared roadways can be designed to safely accommodate both bicycle and auto traffic. Figure 6-5 illustrates an example of an appropriate warning sign with a supplemental "Share the Road" plaque that may be used to draw more attention to the fact that slow-moving forms of transportation may be using the roadway. When used, the supplemental plaque must be installed below the warning sign on the same signpost. Directional pavement markings may also be considered on shared roadways to supplement the bicycle warning signs when desired. The pavement markings illustrated in Figure 6-5 below are typically called "Sharrows" or "Shared Lane Markings" and are utilized on bicycle travel routes that have on-street parking but no designated bike lanes. Sharrows are commonly used on streets where dedicated bike lanes are desirable but are not possible for any number of reasons. The marking helps to align bicyclists, to shift their travel pattern out of the direction of a parked car door opening into their travel path.

Figure 6-4 Shared Roadway

Photo credit: Portland Bureau of Transportation, www.portlandoregon.gov/transportation/

Figure 6-5 Bicycle Signs and Markings

Bicycle Warning Sign | "Share the Road" Plaque | Bike Route Sign | Bicycle Pavement Marking | Bicycle Wayfinding Signage

It should be noted, however, that while posting "Bike Route" signage for bicyclists is an acceptable way for the City to demarcate bike routes, such signs should be coupled with pavement markings and/or way finding signage for bicyclists to get the most value out of the City's investment. Although this is an adopted MUTCD sign, it does not provide much information. Adding wayfinding information such as distances to various destinations, directional arrows, and estimated travel times makes the sign much more useful. These signs are most effective when placed in useful locations, such as where a bike route makes a turn that is not intuitive to riders.

Neighborhood Greenways

The term "neighborhood greenway" has recently evolved from the "bike boulevard" concept of treatments, which improve the network of safe bicycle routes by generally utilizing streets with lower traffic volumes and vehicle speeds, such as minor collectors or local streets that pass through residential neighborhoods. The neighborhood greenway treatments also make these routes safer for pedestrians and motorists (for example, through inclusion of traffic-calming devices), while at the same time incorporating low-impact stormwater treatment measures such as bioswales and raingardens. The general traffic calming provided by neighborhood greenway improvements adds to neighborhood livability.

Figure 6-6 Neighborhood Greenway

Image credit: Bicycle Transportation Alliance/Owen Walz, owenwalzdesign.com

Traffic controls along a neighborhood greenway assign priority to bicyclists while encouraging through-vehicle traffic to use alternate parallel routes. Traffic calming and other treatments along the corridor reduce motor vehicle speeds so that motorists and bicyclists generally travel at the same speed, creating a safer and more comfortable environment for all users. Neighborhood greenways also incorporate treatments to facilitate safe and convenient crossings of major streets. Neighborhood greenways work best in well-connected street grids, where riders can follow reasonably direct and logical routes and where higher-order, parallel streets exist to serve through-vehicle traffic.

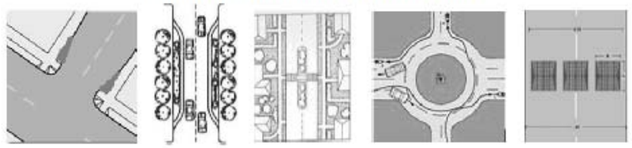
Milwaukie's neighborhood greenway network could be developed through a variety of improvements ranging from minor street enhancements (e.g., directional pavement markings) to larger-scale projects (e.g., intersection signalization). The various treatments fall into five major application levels based on their degree of physical intensity, with Level 1 representing the least physically intensive treatments that can be implemented at relatively low cost:

- **Level 1: Signage** (e.g., wayfinding and warning signs along and approaching the neighborhood greenway).
- **Level 2: Pavement markings** (e.g., directional pavement markings, shared lane markings).
- **Level 3: Intersection treatments** (e.g., signalization, curb extensions, refuge islands).
- **Level 4: Traffic calming** (e.g., speed humps, mini traffic circles).
- **Level 5: Traffic diversion** (e.g., choker entrances, traffic diverters).

Corridors targeted for higher-level applications would also receive relevant lower-level treatments. For instance, a street targeted for Level 3 applications should also include Level 1 and 2 applications as necessary. It should be noted that some applications might not be appropriate on all streets. In other words, it may not be necessary to implement all Level 2 applications on a particular street designated for Level 2 treatment in order to create a functional neighborhood greenway.

Figure 6-7 shows examples of some of the types of intersection treatments and traffic-calming measures that could be appropriate for application on neighborhood greenway routes. Some study and analysis is necessary to determine which measures would be most effective in specific locations. Within Chapter 11 Neighborhood Traffic Management, Table 11-1 provides more examples of traffic-calming measures.

Figure 6-7 Sample Traffic-Calming Measures



Bulbout **Choker** **Center Median** **Traffic Circle** **Speed Cushion**

Experience from other cities that have implemented neighborhood greenways shows that on-street vehicle parking can function as a traffic-calming measure. Drivers generally seem to slow down in response to the physical narrowing of the travel lane and the higher perceived risk of collision. In addition, parked cars create a barrier between moving cars on the street and pedestrians on the sidewalk. This barrier enhances both actual and perceived safety for pedestrians. Allowing or encouraging on-street vehicle parking can be one tool employed to make neighborhood greenways safe and pleasant for nonmotorized travel.

Bicycle Parking

Bicycle parking and storage facilities are an important component of an effective bicycle system. Lack of proper storage facilities discourages potential riders from traveling by bicycle. Bike racks should be located at significant activity generators including schools, parks, and commercial areas, as well as at major transit stops. Racks should be placed in highly visible locations and within convenient proximity to main building entrances. Bike racks should be designed to

Appendix C:
Relevant Clackamas County TSP Projects

Network Type	Priority	Project Type	Project Name	Project Description	From	To
Off-Street	20-Year	Capital	72nd Ave Multi-Use Path Connection	Construct multi-use path	Thompson Rd	Harmony Rd
Street	20-Year	Capital	85th Ave	Add sidewalks and bikeways	Causey Ave	Monterey Ave
Street	20-Year	Capital	Boyer Dr	Construct new 2 lane roadway with turn lanes at 82nd Avenue and Fuller Rd, bikeways and pedestrian facilities; install flashing yellow arrow for left turns on northbound and southbound approaches at 82nd Avenue intersection.	82nd Ave	Fuller Rd
Street	20-Year	Capital	Boyer Dr/85th Ave/ Spencer Dr	Add bikeways	82nd Ave	I-205 bike path
Street	20-Year	Capital	Causey Ave	Add bikeways and shared facility markings in accordance with the Active Transportation Plan.	Fuller Rd	I-205 bike path
Pedestrian	20-Year	Capital	Linwood Ave	Add pedestrian facilities in accordance with the Active Transportation Plan.	Monroe St	Johnson Creek Blvd
Street	20-Year	Capital	Monroe St	Add bikeways, pedestrian facilities and traffic calming in accordance with the Active Transportation Plan.	72nd Ave	Fuller Rd
Street	20-Year	Capital	Monroe St/72nd Ave/ Thompson Rd/Fuller Rd	Add bikeways and traffic calming in accordance with the Active Transportation Plan.	Linwood Ave	Causey Ave
Pedestrian	Preferred	Capital	Linwood Ave/Monroe St intersection	Add curbs/sidewalks, improve horizontal alignments	Location-specific	Location-specific
Pedestrian	Preferred	Capital	Monroe St/72nd Ave/ Thompson Rd	Add pedestrian facilities	Linwood Ave	Fuller Rd
Off-Street	Long-Term	Capital	I-205 Pedestrian/Bike Overpass	Construct a bike / pedestrian crossing over I-205 to connect transit services, businesses and residents in accordance with the Active Transportation Plan	Causey Ave	Sunnyside Rd
Off-Street	Long-Term	Capital	Phillips Creek Multi-Use Path	Construct multi-use path	Causey Ave	North Clackamas Regional Park Trail

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Appendix E

Traffic Summary

Appendix D contains speed and volume information for the Monroe Neighborhood Street Design study area collected by the Clackamas County Transportation Department through a third-party contractor between July and October, 2015. Street and intersection speeds and volumes were used to inform the Alternatives Analysis process as well as the final recommended concept design for the Monroe Neighborhood Street Design Plan.

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Peak Hour Insersection Surveys

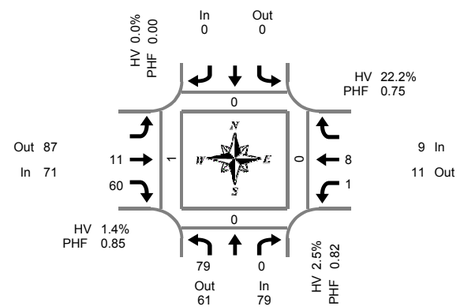
Total Vehicle Summary

All Traffic Data Services Inc.

Clay Carney
(503) 833-2740

SE 72nd Ave & SE Monroe St

Tuesday, April 28, 2015
4:00 PM to 6:00 PM



Peak Hour Summary
4:15 PM to 5:15 PM

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SE 72nd Ave				Southbound SE 72nd Ave				Eastbound SE Monroe St				Westbound SE Monroe St				Interval Total	Pedestrians Crosswalk			
	L		R	Bikes				Bikes		T	R	Bikes	L	T		Bikes		North	South	East	West
4:00 PM	17		0	0				0		1	13	0	0	6		0	37	0	0	0	0
4:15 PM	12		0	0				0		2	13	0	0	1		0	28	0	0	0	1
4:30 PM	24		0	0				0		4	17	0	1	2		0	48	0	0	0	0
4:45 PM	23		0	0				0		3	15	0	0	2		0	43	0	0	0	0
5:00 PM	20		0	0				0		2	15	0	0	3		0	40	0	0	0	0
5:15 PM	8		1	1				0		0	11	0	0	2		0	22	0	0	0	0
5:30 PM	23		0	0				0		8	19	0	0	0		0	50	0	0	0	0
5:45 PM	13		0	0				0		4	13	0	0	1		0	31	0	0	0	0
Total Survey	140		1	1				0		24	116	0	1	17		0	299	0	0	0	1

Peak Hour Summary
4:15 PM to 5:15 PM

By Approach	Northbound SE 72nd Ave				Southbound SE 72nd Ave				Eastbound SE Monroe St				Westbound SE Monroe St				Total
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	
Volume	79	61	140	0	0	0	0	0	71	87	158	0	9	11	20	0	159
%HV	2.5%				0.0%				1.4%				22.2%				3.1%
PHF	0.82				0.00				0.85				0.75				0.83

Pedestrians Crosswalk			
North	South	East	West
0	0	0	1

By Movement	Northbound SE 72nd Ave				Southbound SE 72nd Ave				Eastbound SE Monroe St			Westbound SE Monroe St				Total
	L		R	Total				Total		T	R	Total	L	T		Total	
Volume	79		0	79				0		11	60	71	1	8		9	159
%HV	2.5%	NA	0.0%	2.5%	NA	NA	NA	0.0%	NA	0.0%	1.7%	1.4%	#####	12.5%	NA	22.2%	3.1%
PHF	0.82		0.00	0.82				0.00		0.69	0.88	0.85	0.25	0.67		0.75	0.83

Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SE 72nd Ave				Southbound SE 72nd Ave				Eastbound SE Monroe St				Westbound SE Monroe St				Interval Total	Pedestrians Crosswalk			
	L		R	Bikes				Bikes		T	R	Bikes	L	T		Bikes		North	South	East	West
4:00 PM	76		0	0				0		10	58	0	1	11		0	156	0	0	0	1
4:15 PM	79		0	0				0		11	60	0	1	8		0	159	0	0	0	1
4:30 PM	75		1	1				0		9	58	0	1	9		0	153	0	0	0	0
4:45 PM	74		1	1				0		13	60	0	0	7		0	155	0	0	0	0
5:00 PM	64		1	1				0		14	58	0	0	6		0	143	0	0	0	0

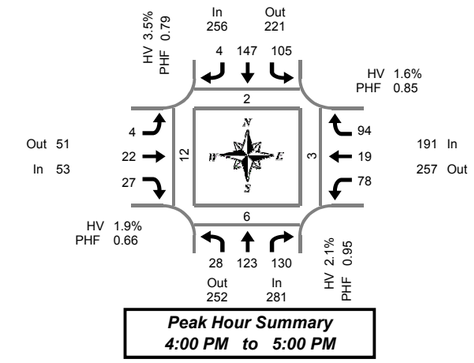
Total Vehicle Summary

All Traffic Data Services Inc.

Clay Carney
(503) 833-2740

SE Fuller Rd & SE Harmony Dr

Tuesday, April 28, 2015
4:00 PM to 6:00 PM



Peak Hour Summary
4:00 PM to 5:00 PM

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SE Fuller Rd				Southbound SE Fuller Rd				Eastbound SE Harmony Dr				Westbound SE Harmony Dr				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	7	31	35	0	26	27	4	0	0	5	3	0	19	5	17	0	179	0	1	0	1
4:15 PM	7	26	28	0	18	41	0	0	1	4	7	1	16	4	21	0	173	0	2	2	1
4:30 PM	7	28	39	0	39	42	0	0	1	10	9	0	22	5	29	0	231	2	3	0	6
4:45 PM	7	38	28	0	22	37	0	0	2	3	8	0	21	5	27	0	198	0	0	1	4
5:00 PM	4	28	25	0	25	40	2	0	0	5	2	0	14	5	21	0	171	0	0	1	1
5:15 PM	6	27	28	0	19	36	0	0	0	6	3	0	14	8	18	0	165	0	0	0	0
5:30 PM	7	29	31	0	30	50	3	0	2	8	6	0	22	5	18	1	211	0	1	0	0
5:45 PM	4	20	20	0	12	37	1	0	0	8	5	1	26	5	14	0	152	0	0	0	0
Total Survey	49	227	234	0	191	310	10	0	6	49	43	2	154	42	165	1	1,480	2	7	4	13

Peak Hour Summary
4:00 PM to 5:00 PM

By Approach	Northbound SE Fuller Rd				Southbound SE Fuller Rd				Eastbound SE Harmony Dr				Westbound SE Harmony Dr				Total
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	
Volume	281	252	533	0	256	221	477	0	53	51	104	1	191	257	448	0	781
%HV	2.1%				3.5%				1.9%				1.6%				2.4%
PHF	0.95				0.79				0.66				0.85				0.85

Pedestrians Crosswalk			
North	South	East	West
2	6	3	12

By Movement	Northbound SE Fuller Rd				Southbound SE Fuller Rd				Eastbound SE Harmony Dr				Westbound SE Harmony Dr				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	28	123	130	281	105	147	4	256	4	22	27	53	78	19	94	191	781
%HV	0.0%	1.6%	3.1%	2.1%	2.9%	4.1%	0.0%	3.5%	0.0%	0.0%	3.7%	1.9%	1.3%	0.0%	2.1%	1.6%	2.4%
PHF	1.00	0.81	0.83	0.95	0.67	0.88	0.25	0.79	0.50	0.55	0.75	0.66	0.89	0.95	0.81	0.85	0.85

Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SE Fuller Rd				Southbound SE Fuller Rd				Eastbound SE Harmony Dr				Westbound SE Harmony Dr				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	28	123	130	0	105	147	4	0	4	22	27	1	78	19	94	0	781	2	6	3	12
4:15 PM	25	120	120	0	104	160	2	0	4	22	26	1	73	19	98	0	773	2	5	4	12
4:30 PM	24	121	120	0	105	155	2	0	3	24	22	0	71	23	95	0	765	2	3	2	11
4:45 PM	24	122	112	0	96	163	5	0	4	22	19	0	71	23	84	1	745	0	1	2	5
5:00 PM	21	104	104	0	86	163	6	0	2	27	16	1	76	23	71	1	699	0	1	1	1

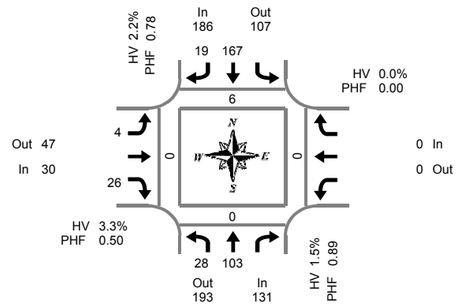
Total Vehicle Summary

All Traffic Data Services Inc.

Clay Carney
(503) 833-2740

SE Fuller Rd & SE Monroe St

Tuesday, April 28, 2015
4:00 PM to 6:00 PM



Peak Hour Summary
4:15 PM to 5:15 PM

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SE Fuller Rd				Southbound SE Fuller Rd				Eastbound SE Monroe St				Westbound SE Monroe St				Interval Total	Pedestrians Crosswalk			
	L	T		Bikes		T	R	Bikes	L		R	Bikes				Bikes		North	South	East	West
4:00 PM	4	22		0		41	3	0	4		4	0				0	78	2	0	0	1
4:15 PM	13	24		0		33	3	0	0		15	0				0	88	2	0	0	0
4:30 PM	7	23		0		57	3	0	2		2	0				0	94	1	0	0	0
4:45 PM	6	31		0		30	9	0	1		6	2				0	83	0	0	0	0
5:00 PM	2	25		0		47	4	0	1		3	0				0	82	3	0	0	0
5:15 PM	3	20		0		49	6	1	2		4	0				0	84	1	0	0	2
5:30 PM	4	26		0		44	11	0	2		4	0				0	91	2	0	0	0
5:45 PM	5	15		0		42	7	0	3		3	0				0	75	1	0	0	0
Total Survey	44	186		0		343	46	1	15		41	2				0	675	12	0	0	3

Peak Hour Summary
4:15 PM to 5:15 PM

By Approach	Northbound SE Fuller Rd				Southbound SE Fuller Rd				Eastbound SE Monroe St				Westbound SE Monroe St				Total
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	
Volume	131	193	324	0	186	107	293	0	30	47	77	2	0	0	0	0	347
%HV	1.5%				2.2%				3.3%				0.0%				2.0%
PHF	0.89				0.78				0.50				0.00				0.92

Pedestrians Crosswalk			
North	South	East	West
6	0	0	0

By Movement	Northbound SE Fuller Rd				Southbound SE Fuller Rd				Eastbound SE Monroe St				Westbound SE Monroe St				Total
	L	T		Total		T	R	Total	L		R	Total				Total	
Volume	28	103		131		167	19	186	4		26	30				0	347
%HV	3.6%	1.0%	NA	1.5%	NA	1.8%	5.3%	2.2%	0.0%	NA	3.8%	3.3%	NA	NA	NA	0.0%	2.0%
PHF	0.54	0.83		0.89		0.73	0.53	0.78	0.50		0.43	0.50				0.00	0.92

Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SE Fuller Rd				Southbound SE Fuller Rd				Eastbound SE Monroe St				Westbound SE Monroe St				Interval Total	Pedestrians Crosswalk			
	L	T		Bikes		T	R	Bikes	L		R	Bikes				Bikes		North	South	East	West
4:00 PM	30	100		0		161	18	0	7		27	2				0	343	5	0	0	1
4:15 PM	28	103		0		167	19	0	4		26	2				0	347	6	0	0	0
4:30 PM	18	99		0		183	22	1	6		15	2				0	343	5	0	0	2
4:45 PM	15	102		0		170	30	1	6		17	2				0	340	6	0	0	2
5:00 PM	14	86		0		182	28	1	8		14	0				0	332	7	0	0	2

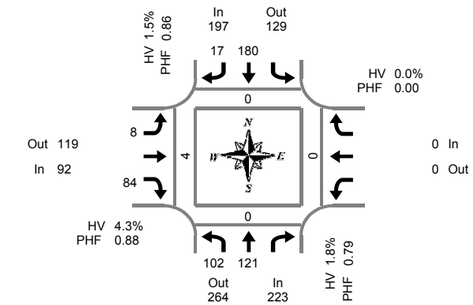
Total Vehicle Summary

All Traffic Data Services Inc.

Clay Carney
(503) 833-2740

SE Fuller Rd & SE Thompson Rd

Tuesday, April 28, 2015
4:00 PM to 6:00 PM



Peak Hour Summary
4:15 PM to 5:15 PM

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SE Fuller Rd				Southbound SE Fuller Rd				Eastbound SE Thompson Rd				Westbound SE Thompson Rd				Interval Total	Pedestrians Crosswalk			
	L	T		Bikes		T	R	Bikes	L		R	Bikes				Bikes		North	South	East	West
4:00 PM	24	23		0		38	4	1	2		11	0				0	102	0	0	0	1
4:15 PM	16	34		0		48	4	0	4		17	0				0	123	0	0	0	0
4:30 PM	26	28		0		53	4	1	2		23	0				0	136	0	0	0	3
4:45 PM	37	34		0		31	4	1	1		25	0				0	132	0	0	0	0
5:00 PM	23	25		0		48	5	0	1		19	0				0	121	0	0	0	1
5:15 PM	21	19		0		45	7	0	1		17	0				0	110	0	0	0	0
5:30 PM	30	27		0		47	8	0	4		31	0				0	147	0	0	0	0
5:45 PM	10	20		0		40	3	0	1		13	0				0	87	0	0	0	0
Total Survey	187	210		0		350	39	3	16		156	0				0	958	0	0	0	5

Peak Hour Summary
4:15 PM to 5:15 PM

By Approach	Northbound SE Fuller Rd				Southbound SE Fuller Rd				Eastbound SE Thompson Rd				Westbound SE Thompson Rd				Total
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	
Volume	223	264	487	0	197	129	326	2	92	119	211	0	0	0	0	0	512
%HV	1.8%				1.5%				4.3%				0.0%				2.1%
PHF	0.79				0.86				0.88				0.00				0.94

Pedestrians Crosswalk			
North	South	East	West
0	0	0	4

By Movement	Northbound SE Fuller Rd				Southbound SE Fuller Rd				Eastbound SE Thompson Rd				Westbound SE Thompson Rd				Total
	L	T		Total		T	R	Total	L		R	Total				Total	
Volume	102	121		223		180	17	197	8		84	92				0	512
%HV	2.9%	0.8%	NA	1.8%	NA	1.7%	0.0%	1.5%	0.0%	NA	4.8%	4.3%	NA	NA	NA	0.0%	2.1%
PHF	0.69	0.89		0.79		0.85	0.85	0.86	0.50		0.84	0.88				0.00	0.94

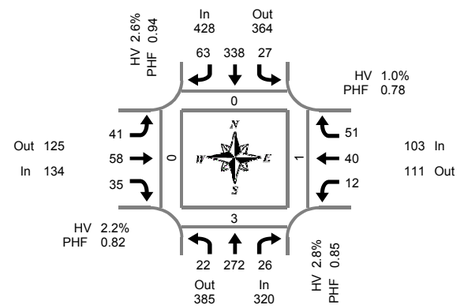
Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SE Fuller Rd				Southbound SE Fuller Rd				Eastbound SE Thompson Rd				Westbound SE Thompson Rd				Interval Total	Pedestrians Crosswalk			
	L	T		Bikes		T	R	Bikes	L		R	Bikes				Bikes		North	South	East	West
4:00 PM	103	119		0		170	16	3	9		76	0				0	493	0	0	0	4
4:15 PM	102	121		0		180	17	2	8		84	0				0	512	0	0	0	4
4:30 PM	107	106		0		177	20	2	5		84	0				0	499	0	0	0	4
4:45 PM	111	105		0		171	24	1	7		92	0				0	510	0	0	0	1
5:00 PM	84	91		0		180	23	0	7		80	0				0	465	0	0	0	1

Total Vehicle Summary

All Traffic Data Services Inc.

Clay Carney
(503) 833-2740



Peak Hour Summary
4:45 PM to 5:45 PM

SE Linwood Ave & SE Monroe St

Tuesday, April 28, 2015
4:00 PM to 6:00 PM

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SE Linwood Ave				Southbound SE Linwood Ave				Eastbound SE Monroe St				Westbound SE Monroe St				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	5	76	5	1	8	79	9	0	9	8	12	0	6	12	13	0	242	0	0	0	1
4:15 PM	4	60	8	0	9	77	14	0	10	14	8	0	1	7	11	0	223	0	1	0	0
4:30 PM	5	73	3	0	14	62	19	1	6	22	18	0	3	9	13	0	247	0	0	0	1
4:45 PM	7	56	5	1	9	83	18	0	7	15	11	0	3	10	14	0	238	0	2	0	0
5:00 PM	5	66	6	0	8	88	18	1	10	13	9	0	6	8	15	0	252	0	0	0	0
5:15 PM	1	76	4	2	3	88	10	0	10	11	7	0	1	9	4	0	224	0	1	0	0
5:30 PM	9	74	11	1	7	79	17	3	14	19	8	0	2	13	18	1	271	0	0	1	0
5:45 PM	4	56	3	1	8	65	10	2	3	12	6	0	4	10	10	0	191	0	0	0	0
Total Survey	40	537	45	6	66	621	115	7	69	114	79	0	26	78	98	1	1,888	0	4	1	2

Peak Hour Summary
4:45 PM to 5:45 PM

By Approach	Northbound SE Linwood Ave				Southbound SE Linwood Ave				Eastbound SE Monroe St				Westbound SE Monroe St				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	320	385	705	4	428	364	792	4	134	125	259	0	103	111	214	1	985	0	3	1	0
%HV	2.8%				2.6%				2.2%				1.0%				2.4%				
PHF	0.85				0.94				0.82				0.78				0.91				

By Movement	Northbound SE Linwood Ave				Southbound SE Linwood Ave				Eastbound SE Monroe St				Westbound SE Monroe St				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	22	272	26	320	27	338	63	428	41	58	35	134	12	40	51	103	985
%HV	0.0%	2.6%	7.7%	2.8%	7.4%	2.1%	3.2%	2.6%	0.0%	1.7%	5.7%	2.2%	0.0%	0.0%	2.0%	1.0%	2.4%
PHF	0.61	0.89	0.59	0.85	0.75	0.96	0.88	0.94	0.73	0.76	0.80	0.82	0.50	0.77	0.71	0.78	0.91

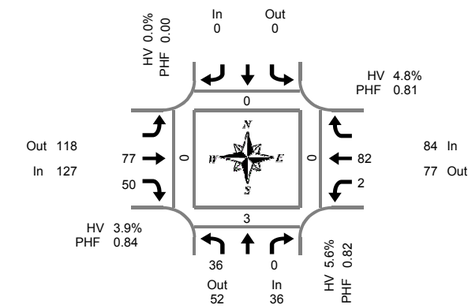
Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SE Linwood Ave				Southbound SE Linwood Ave				Eastbound SE Monroe St				Westbound SE Monroe St				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	21	265	21	2	40	301	60	1	32	59	49	0	13	38	51	0	950	0	3	0	2
4:15 PM	21	255	22	1	40	310	69	2	33	64	46	0	13	34	53	0	960	0	3	0	1
4:30 PM	18	271	18	3	34	321	65	2	33	61	45	0	13	36	46	0	961	0	3	0	1
4:45 PM	22	272	26	4	27	338	63	4	41	58	35	0	12	40	51	1	985	0	3	1	0
5:00 PM	19	272	24	4	26	320	55	6	37	55	30	0	13	40	47	1	938	0	1	1	0

Total Vehicle Summary

All Traffic Data Services Inc.

Clay Carney
(503) 833-2740



Peak Hour Summary
4:00 PM to 5:00 PM

SE Maplehurst Rd & SE Monroe St

Tuesday, April 28, 2015
4:00 PM to 6:00 PM

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SE Maplehurst Rd				Southbound SE Maplehurst Rd				Eastbound SE Monroe St				Westbound SE Monroe St				Interval Total	Pedestrians Crosswalk			
	L		R	Bikes				Bikes		T	R	Bikes	L	T		Bikes		North	South	East	West
4:00 PM	11		0	0				0		13	11	0	1	23		0	59	0	0	0	0
4:15 PM	7		0	0				0		20	12	1	0	11		0	50	0	1	0	0
4:30 PM	8		0	0				0		22	16	0	0	23		0	69	0	0	0	0
4:45 PM	10		0	0				0		22	11	0	1	25		0	69	0	2	0	0
5:00 PM	7		0	0				0		15	9	1	0	20		0	51	0	0	0	2
5:15 PM	7		1	0				0		15	5	0	0	13		1	41	0	0	0	0
5:30 PM	13		0	0				0		21	15	0	1	24		1	74	0	0	0	2
5:45 PM	10		1	0				0		15	9	0	1	12		0	48	0	0	0	1
Total Survey	73		2	0				0		143	88	2	4	151		2	461	0	3	0	5

Peak Hour Summary
4:00 PM to 5:00 PM

By Approach	Northbound SE Maplehurst Rd				Southbound SE Maplehurst Rd				Eastbound SE Monroe St				Westbound SE Monroe St				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	36	52	88	0	0	0	0	0	127	118	245	1	84	77	161	0	247	0	3	0	0
%HV	5.6%				0.0%				3.9%				4.8%				4.5%				
PHF	0.82				0.00				0.84				0.81				0.89				

By Movement	Northbound SE Maplehurst Rd				Southbound SE Maplehurst Rd				Eastbound SE Monroe St				Westbound SE Monroe St				Total
	L		R	Total				Total		T	R	Total	L	T		Total	
Volume	36		0	36				0		77	50	127	2	82		84	247
%HV	5.6%	NA	0.0%	5.6%	NA	NA	NA	0.0%	NA	5.2%	2.0%	3.9%	50.0%	3.7%	NA	4.8%	4.5%
PHF	0.82		0.00	0.82				0.00		0.88	0.78	0.84	0.50	0.82		0.81	0.89

Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SE Maplehurst Rd				Southbound SE Maplehurst Rd				Eastbound SE Monroe St				Westbound SE Monroe St				Interval Total	Pedestrians Crosswalk			
	L		R	Bikes				Bikes		T	R	Bikes	L	T		Bikes		North	South	East	West
4:00 PM	36		0	0				0		77	50	1	2	82		0	247	0	3	0	0
4:15 PM	32		0	0				0		79	48	2	1	79		0	239	0	3	0	2
4:30 PM	32		1	0				0		74	41	1	1	81		1	230	0	2	0	2
4:45 PM	37		1	0				0		73	40	1	2	82		2	235	0	2	0	4
5:00 PM	37		2	0				0		66	38	1	2	69		2	214	0	0	0	5

Speed/Volume Survey

Questions concerning this report call 503.742.4704
<http://www.clackamas.us/engineering/>

LOCATION : CAUSEY AVE EAST OF 82ND AVE/HWY 213
COORDINATES : 45.4412, -122.5774
WEATHER : MOSTLY CLOUDY ~ 55

Site: 13182743
3/12/2015
Thursday

Daily Speed

Combined Channels

mph	Total	0 - < 15	15 - < 20	20 - < 25	25 - < 30	30 - < 35	35 - < 40	40 - < 45	45 - < 50	50 - < 55	55 - < 60	60 - < 65	65 - < 70	70 - < 200	Avg.
12:00 AM	72	2	8	19	30	10	3	0	0	0	0	0	0	0	25.5
1:00 AM	36	1	6	6	18	5	0	0	0	0	0	0	0	0	25.1
2:00 AM	28	0	2	5	10	10	1	0	0	0	0	0	0	0	27.8
3:00 AM	29	0	1	6	11	7	4	0	0	0	0	0	0	0	28.6
4:00 AM	44	0	5	16	14	8	1	0	0	0	0	0	0	0	25.2
5:00 AM	88	0	6	21	34	19	7	1	0	0	0	0	0	0	27.5
6:00 AM	193	4	9	48	87	37	8	0	0	0	0	0	0	0	26.8
7:00 AM	264	3	16	76	104	57	7	0	1	0	0	0	0	0	26.6
8:00 AM	269	6	22	91	98	48	3	1	0	0	0	0	0	0	25.6
9:00 AM	260	6	34	85	107	26	2	0	0	0	0	0	0	0	24.7
10:00 AM	310	13	33	87	136	37	2	2	0	0	0	0	0	0	25.0
11:00 AM	320	7	18	95	144	48	6	0	2	0	0	0	0	0	26.1
12:00 PM	407	11	35	154	157	42	7	0	0	0	0	0	0	1	25.1
1:00 PM	411	7	33	145	173	49	4	0	0	0	0	0	0	0	25.1
2:00 PM	463	20	64	172	156	48	3	0	0	0	0	0	0	0	24.1
3:00 PM	465	24	59	167	155	52	7	0	0	0	0	0	0	1	24.4
4:00 PM	511	13	62	180	189	59	8	0	0	0	0	0	0	0	24.8
5:00 PM	433	15	41	164	164	42	7	0	0	0	0	0	0	0	24.6
6:00 PM	439	14	46	160	153	55	10	0	1	0	0	0	0	0	25.1
7:00 PM	405	10	58	152	150	34	1	0	0	0	0	0	0	0	24.2
8:00 PM	320	10	29	133	112	33	3	0	0	0	0	0	0	0	24.5
9:00 PM	253	5	37	77	101	28	3	2	0	0	0	0	0	0	24.8
10:00 PM	198	3	8	72	77	34	4	0	0	0	0	0	0	0	25.8
11:00 PM	140	1	8	53	49	27	2	0	0	0	0	0	0	0	26.0
Total	6358	175	640	2184	2429	815	103	6	4	0	0	0	0	2	25.1
%		2.8	10.1	34.4	38.2	12.8	1.6	0.1	0.1	0.0	0.0	0.0	0.0	0.0	

Average (Mean) 25.1 mph **Minimum** 10.0 mph **Maximum** 80.9 mph **Pace Range** 20.7 - 30.7 mph 4736 vehicles (74.5 %)

Percentile Speeds	10%	15%	50%	85%	90%
(mph)	19.0	20.5	25.2	29.6	31.0

Speeds Exceeded	25 mph	35 mph	45 mph	55 mph	65 mph	75 mph
	52.8 % (3359)	1.8 % (115)	0.1 % (6)	0.0 % (2)	0.0 % (2)	0.0 % (1)

CAUSEY AVE_82ND AVE_HWY 213_E.rdf 1

Questions concerning this report call 503.742.4704
http://www.clackamas.us/engineering/

LOCATION : CAUSEY AVE EAST OF FULLER
COORDINATES : 45.4416, -122.5732
WEATHER : SUNNY ~ 55

Site: 13182745
3/5/2015
Thursday

Daily Speed

Combined Channels

mph	Total	0 - < 15	15 - < 20	20 - < 25	25 - < 30	30 - < 35	35 - < 40	40 - < 45	45 - < 50	50 - < 55	55 - < 60	60 - < 65	65 - < 70	70 - < 200	Avg.
12:00 AM	33	0	2	14	14	3	0	0	0	0	0	0	0	0	25.5
1:00 AM	11	0	0	2	3	5	1	0	0	0	0	0	0	0	28.6
2:00 AM	14	0	2	5	6	1	0	0	0	0	0	0	0	0	25.1
3:00 AM	7	0	0	3	3	1	0	0	0	0	0	0	0	0	27.0
4:00 AM	13	0	0	2	7	3	1	0	0	0	0	0	0	0	28.4
5:00 AM	31	0	2	7	15	6	1	0	0	0	0	0	0	0	27.0
6:00 AM	96	1	3	34	43	12	3	0	0	0	0	0	0	0	26.2
7:00 AM	278	0	7	67	140	57	7	0	0	0	0	0	0	0	27.3
8:00 AM	275	1	9	92	126	45	2	0	0	0	0	0	0	0	26.4
9:00 AM	200	2	15	68	84	27	4	0	0	0	0	0	0	0	25.8
10:00 AM	242	5	21	96	98	20	2	0	0	0	0	0	0	0	24.9
11:00 AM	307	4	27	106	139	26	4	1	0	0	0	0	0	0	25.2
12:00 PM	335	5	36	115	143	32	4	0	0	0	0	0	0	0	25.2
1:00 PM	337	2	47	117	136	33	2	0	0	0	0	0	0	0	24.7
2:00 PM	452	14	69	180	159	27	1	1	0	0	0	0	1	0	23.9
3:00 PM	407	3	43	164	157	37	3	0	0	0	0	0	0	0	24.8
4:00 PM	464	12	70	153	194	33	2	0	0	0	0	0	0	0	24.3
5:00 PM	478	13	57	195	175	33	4	0	0	1	0	0	0	0	24.3
6:00 PM	360	5	40	143	145	25	2	0	0	0	0	0	0	0	24.6
7:00 PM	281	2	21	111	105	39	1	1	0	0	1	0	0	0	25.6
8:00 PM	164	1	6	50	79	20	7	1	0	0	0	0	0	0	26.6
9:00 PM	145	0	11	57	58	17	1	1	0	0	0	0	0	0	25.5
10:00 PM	73	0	6	18	36	12	1	0	0	0	0	0	0	0	26.4
11:00 PM	45	0	2	15	19	8	1	0	0	0	0	0	0	0	26.6
Total	5048	70	496	1814	2084	522	54	5	0	1	1	0	1	0	25.1
%		1.4	9.8	35.9	41.3	10.3	1.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	

Average (Mean) 25.1 mph **Minimum** 10.1 mph **Maximum** 66.0 mph **Pace Range** 20.2 - 30.2 mph 3933 vehicles (77.9 %)

Percentile Speeds	10%	15%	50%	85%	90%
(mph)	19.7	20.8	25.3	29.3	30.2

Speeds Exceeded	25 mph	35 mph	45 mph	55 mph	65 mph	75 mph
	52.9 % (2668)	1.2 % (62)	0.1 % (3)	0.0 % (2)	0.0 % (1)	0 % (0)

CAUSEY AVE_FULLER RD_E.rdf 1

Questions concerning this report call 503.742.4704
http://www.clackamas.us/engineering/

LOCATION : FULLER RD SOUTH OF CAUSEY
COORDINATES : 45.4402 N, -122.5826 W
WEATHER : RAINY ~ 45

Site: 13182813
2/5/2015
Thursday

Daily Speed

Combined Channels

mph	Total	0 - < 15	15 - < 20	20 - < 25	25 - < 30	30 - < 35	35 - < 40	40 - < 45	45 - < 50	50 - < 55	55 - < 60	60 - < 65	65 - < 70	70 - < 200	Avg.
12:00 AM	44	0	0	1	11	20	10	2	0	0	0	0	0	0	32.6
1:00 AM	17	0	1	4	2	6	3	1	0	0	0	0	0	0	30.0
2:00 AM	14	0	0	0	4	8	2	0	0	0	0	0	0	0	31.8
3:00 AM	18	0	0	1	4	10	3	0	0	0	0	0	0	0	31.6
4:00 AM	31	0	1	0	6	20	3	1	0	0	0	0	0	0	32.0
5:00 AM	51	0	1	0	11	21	16	1	1	0	0	0	0	0	32.7
6:00 AM	140	0	1	6	37	59	32	5	0	0	0	0	0	0	32.0
7:00 AM	549	6	3	44	208	229	50	8	0	1	0	0	0	0	30.0
8:00 AM	337	1	3	30	147	125	30	1	0	0	0	0	0	0	29.6
9:00 AM	228	0	4	25	91	85	22	1	0	0	0	0	0	0	29.6
10:00 AM	221	0	1	18	72	104	25	1	0	0	0	0	0	0	30.6
11:00 AM	282	5	8	38	81	119	25	6	0	0	0	0	0	0	29.4
12:00 PM	353	0	3	34	117	168	27	4	0	0	0	0	0	0	30.1
1:00 PM	345	1	6	32	135	128	40	2	1	0	0	0	0	0	29.9
2:00 PM	482	4	5	35	194	204	35	4	0	1	0	0	0	0	29.8
3:00 PM	538	4	8	25	216	234	44	4	0	2	1	0	0	0	30.2
4:00 PM	482	3	5	33	179	213	47	2	0	0	0	0	0	0	30.0
5:00 PM	496	2	4	31	129	259	63	5	0	0	0	2	0	1	31.1
6:00 PM	372	3	2	16	122	173	49	7	0	0	0	0	0	0	31.0
7:00 PM	268	0	3	15	94	116	38	2	0	0	0	0	0	0	30.7
8:00 PM	220	0	0	10	77	106	26	1	0	0	0	0	0	0	30.9
9:00 PM	157	0	0	9	51	73	22	2	0	0	0	0	0	0	31.0
10:00 PM	116	0	0	12	30	57	16	1	0	0	0	0	0	0	30.8
11:00 PM	58	0	0	2	22	24	8	2	0	0	0	0	0	0	31.4
Total	5819	29	59	421	2040	2561	636	63	2	4	1	2	0	1	30.4
%		0.5	1.0	7.2	35.1	44.0	10.9	1.1	0.0	0.1	0.0	0.0	0.0	0.0	

Average (Mean) 30.4 mph **Minimum** 10.3 mph **Maximum** 77.6 mph **Pace Range** 25.2 - 35.2 mph 4770 vehicles (82.0 %)

Percentile Speeds	10%	15%	50%	85%	90%
(mph)	25.2	26.2	30.5	34.5	35.1

Speeds Exceeded	25 mph	35 mph	45 mph	55 mph	65 mph	75 mph
	91.3 % (5310)	12.2 % (709)	0.2 % (10)	0.1 % (4)	0.0 % (1)	0.0 % (1)

13182813 NB SB 4400.rdf 1

Questions concerning this report call 503.742.4704
http://www.clackamas.us/engineering/

LOCATION : FULLER RD SOUTH OF KING
COORDINATES : 45.4454 N, -122.5798 W
WEATHER : RAINY ~ 45

Site: 13182814
2/5/2015
Thursday

Daily Speed

Combined Channels

mph	Total	0 - < 15	15 - < 20	20 - < 25	25 - < 30	30 - < 35	35 - < 40	40 - < 45	45 - < 50	50 - < 55	55 - < 60	60 - < 65	65 - < 70	70 - < 200	Avg.
12:00 AM	21	1	1	1	2	12	2	2	0	0	0	0	0	0	31.2
1:00 AM	16	0	2	3	7	3	1	0	0	0	0	0	0	0	26.7
2:00 AM	15	0	0	1	7	7	0	0	0	0	0	0	0	0	29.3
3:00 AM	16	0	1	3	4	5	2	1	0	0	0	0	0	0	29.3
4:00 AM	28	0	1	1	5	11	10	0	0	0	0	0	0	0	32.7
5:00 AM	41	1	1	4	4	18	12	1	0	0	0	0	0	0	32.1
6:00 AM	100	2	2	6	22	43	22	1	2	0	0	0	0	0	31.3
7:00 AM	340	4	15	19	101	146	46	9	0	0	0	0	0	0	30.3
8:00 AM	182	1	11	20	54	68	26	1	0	0	0	1	0	0	30.0
9:00 AM	111	2	5	8	23	55	16	2	0	0	0	0	0	0	30.4
10:00 AM	147	3	17	9	34	57	24	2	1	0	0	0	0	0	29.4
11:00 AM	164	4	7	20	53	54	25	1	0	0	0	0	0	0	29.3
12:00 PM	202	5	11	19	74	68	23	2	0	0	0	0	0	0	29.0
1:00 PM	217	4	22	21	62	82	23	3	0	0	0	0	0	0	28.7
2:00 PM	287	3	15	35	110	97	19	8	0	0	0	0	0	0	28.9
3:00 PM	299	10	19	27	92	113	33	3	0	1	0	0	0	1	29.1
4:00 PM	264	6	12	31	95	88	29	1	1	1	0	0	0	0	29.0
5:00 PM	283	6	12	21	102	102	37	3	0	0	0	0	0	0	29.5
6:00 PM	238	2	13	23	79	96	21	3	1	0	0	0	0	0	29.4
7:00 PM	157	0	7	19	52	58	21	0	0	0	0	0	0	0	29.5
8:00 PM	148	2	6	13	47	63	17	0	0	0	0	0	0	0	29.4
9:00 PM	106	5	11	5	33	41	10	1	0	0	0	0	0	0	28.4
10:00 PM	95	1	8	5	26	40	15	0	0	0	0	0	0	0	29.8
11:00 PM	62	0	6	10	15	20	10	1	0	0	0	0	0	0	28.9
Total	3539	62	205	324	1103	1347	444	45	5	2	0	1	0	1	29.5
%		1.8	5.8	9.2	31.2	38.1	12.5	1.3	0.1	0.1	0.0	0.0	0.0	0.0	

Average (Mean) 29.5 mph **Minimum** 10.0 mph **Maximum** 88.7 mph **Pace Range** 25.2 - 35.2 mph 2558 vehicles (72.3 %)

Percentile Speeds	10%	15%	50%	85%	90%
(mph)	21.4	24.5	30.0	34.5	35.8

Speeds Exceeded	25 mph	35 mph	45 mph	55 mph	65 mph	75 mph
	83.3 % (2948)	14.1 % (498)	0.3 % (9)	0.1 % (2)	0.0 % (1)	0.0 % (1)

13182814 SB NB 3112.rdf 1

All Traffic Data
15105 SE 17th St.
Vancouver, WA. 98683
503-833-2740

Site Code: 2
SE Harmony Dr W-O SE Fuller Rd

EB

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Not Classed	Total
04/30/15	0	1	1	0	0	0	0	0	0	0	0	0	0	0	2
01:00	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
02:00	0	0	1	0	1	0	0	0	0	0	0	0	0	0	2
03:00	0	1	1	0	0	0	0	0	0	0	0	0	0	0	2
04:00	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
05:00	0	2	1	0	0	0	0	0	0	0	0	0	0	0	3
06:00	0	8	4	0	1	0	0	0	0	0	0	0	0	0	13
07:00	0	39	6	0	0	0	0	0	0	0	0	0	0	0	45
08:00	0	14	5	0	3	0	0	0	0	0	0	0	0	0	22
09:00	0	26	7	0	0	0	0	0	0	0	0	0	0	0	33
10:00	0	22	4	0	0	0	0	0	0	0	0	0	0	0	26
11:00	0	18	4	0	1	0	0	0	0	0	0	0	0	1	24
12 PM	0	22	2	0	1	0	0	0	0	0	0	0	0	0	25
13:00	0	20	9	0	1	0	0	0	0	0	0	0	0	0	30
14:00	3	24	6	0	1	0	0	0	0	0	0	0	0	0	34
15:00	0	25	8	0	2	0	0	0	0	0	0	0	0	0	35
16:00	0	38	10	0	3	0	0	0	0	0	0	0	0	1	52
17:00	1	24	8	0	2	0	0	0	0	0	0	0	0	2	37
18:00	0	25	6	0	0	0	0	0	0	0	0	0	0	2	33
19:00	2	15	4	0	0	1	0	0	0	0	0	0	0	0	22
20:00	0	15	3	0	0	0	0	0	0	0	0	0	0	0	18
21:00	1	4	3	0	0	0	0	0	0	0	0	0	0	0	8
22:00	0	9	1	0	1	0	0	0	0	0	0	0	0	0	11
23:00	1	8	4	0	0	0	0	0	0	0	0	0	0	0	13
Total	8	360	100	0	17	1	0	0	0	0	0	0	0	6	492
Percent	1.6%	73.2%	20.3%	0.0%	3.5%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.2%	
AM Peak		07:00	09:00		08:00									11:00	
Vol.		39	7		3									1	
PM Peak	14:00	16:00	16:00		16:00	19:00								17:00	
Vol.	3	38	10		3	1								2	
Grand Total	8	360	100	0	17	1	0	0	0	0	0	0	0	6	492
Percent	1.6%	73.2%	20.3%	0.0%	3.5%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.2%	

All Traffic Data
15105 SE 17th St.
Vancouver, WA. 98683
503-833-2740

Site Code: 2
SE Harmony Dr W-O SE Fuller Rd

EB

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent	95th Percent
04/30/15	0	0	0	1	0	0	**1**	0	0	0	0	0	0	0	2	43	44
01:00	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	39	39
02:00	0	0	0	1	1	0	0	0	0	0	0	0	0	0	2	33	34
03:00	1	0	0	1	0	0	0	0	0	0	0	0	0	0	2	28	29
04:00	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	24	24
05:00	0	1	0	1	1	0	0	0	0	0	0	0	0	0	3	32	34
06:00	0	0	4	5	3	1	0	0	0	0	0	0	0	0	13	33	36
07:00	**3**	0	4	**21**	**13**	**4**	0	0	0	0	0	0	0	0	**45**	33	37
08:00	1	0	**8**	9	3	1	0	0	0	0	0	0	0	0	22	31	34
09:00	0	0	6	20	6	1	0	0	0	0	0	0	0	0	33	31	34
10:00	0	0	8	14	1	2	1	0	0	0	0	0	0	0	26	30	39
11:00	2	**3**	4	8	5	1	1	0	0	0	0	0	0	0	24	33	39
12 PM	2	1	9	7	4	0	**2**	0	0	0	0	0	0	0	25	32	41
13:00	1	1	5	14	7	1	1	0	0	0	0	0	0	0	30	33	37
14:00	1	2	**12**	10	8	1	0	0	0	0	0	0	0	0	34	32	34
15:00	1	2	6	15	9	1	1	0	0	0	0	0	0	0	35	33	36
16:00	2	3	8	**22**	**15**	1	1	0	0	0	0	0	0	0	**52**	33	34
17:00	**3**	1	11	11	6	**5**	0	0	0	0	0	0	0	0	37	34	38
18:00	2	1	4	18	7	1	0	0	0	0	0	0	0	0	33	32	34
19:00	1	**4**	10	5	2	0	0	0	0	0	0	0	0	0	22	28	32
20:00	0	0	5	9	4	0	0	0	0	0	0	0	0	0	18	31	33
21:00	0	1	4	3	0	0	0	0	0	0	0	0	0	0	8	28	29
22:00	0	0	2	5	4	0	0	0	0	0	0	0	0	0	11	32	34
23:00	0	3	1	4	5	0	0	0	0	0	0	0	0	0	13	33	34
Total	20	23	112	204	104	21	8	0	0	0	0	0	0	0	492		
Percent	4.1%	4.7%	22.8%	41.5%	21.1%	4.3%	1.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	07:00	11:00	08:00	07:00	07:00	07:00	00:00								07:00		
Vol.	3	3	8	21	13	4	1								45		
PM Peak	17:00	19:00	14:00	16:00	16:00	17:00	12:00								16:00		
Vol.	3	4	12	22	15	5	2								52		
Grand Total	20	23	112	204	104	21	8	0	0	0	0	0	0	0	492		
Percent	4.1%	4.7%	22.8%	41.5%	21.1%	4.3%	1.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			

15th Percentile :	21 MPH
50th Percentile :	27 MPH
85th Percentile :	32 MPH
95th Percentile :	36 MPH

Statistics

10 MPH Pace Speed :	21-30 MPH
Number in Pace :	316
Percent in Pace :	64.2%
Number of Vehicles > 55 MPH :	0
Percent of Vehicles > 55 MPH :	0.0%
Mean Speed(Average) :	27 MPH

Questions concerning this report call 503.742.4704
http://www.clackamas.us/engineering/

LOCATION : MONROE ST EAST OF LINWOOD
COORDINATES : 45.4446 N, -122.5967 W
WEATHER : MOSTLY CLOUDY ~ 45

Site: 13182939
1/27/2015
Tuesday

Daily Speed

Combined Channels

mph	Total	0 - < 15	15 - < 20	20 - < 25	25 - < 30	30 - < 35	35 - < 40	40 - < 45	45 - < 50	50 - < 55	55 - < 60	60 - < 65	65 - < 70	70 - < 200	Avg.
12:00 AM	13	0	0	2	6	3	2	0	0	0	0	0	0	0	29.3
1:00 AM	3	0	0	1	1	0	1	0	0	0	0	0	0	0	28.4
2:00 AM	9	0	1	1	6	1	0	0	0	0	0	0	0	0	26.1
3:00 AM	6	0	0	1	2	3	0	0	0	0	0	0	0	0	28.2
4:00 AM	4	0	0	1	2	0	1	0	0	0	0	0	0	0	28.6
5:00 AM	22	0	1	4	9	5	2	0	1	0	0	0	0	0	28.7
6:00 AM	58	0	1	16	18	18	4	1	0	0	0	0	0	0	28.4
7:00 AM	123	0	6	20	56	33	8	0	0	0	0	0	0	0	28.4
8:00 AM	88	1	7	13	49	15	3	0	0	0	0	0	0	0	26.9
9:00 AM	79	5	6	15	30	18	4	0	0	0	1	0	0	0	26.7
10:00 AM	79	2	4	23	35	13	1	0	0	0	0	0	0	1	26.6
11:00 AM	105	2	4	21	51	24	3	0	0	0	0	0	0	0	27.3
12:00 PM	156	4	4	41	66	33	7	1	0	0	0	0	0	0	27.1
1:00 PM	142	0	4	30	69	34	5	0	0	0	0	0	0	0	27.5
2:00 PM	179	1	4	35	91	45	3	0	0	0	0	0	0	0	27.6
3:00 PM	188	1	3	32	95	52	5	0	0	0	0	0	0	0	27.9
4:00 PM	199	3	10	49	88	38	11	0	0	0	0	0	0	0	26.9
5:00 PM	188	2	4	37	90	52	3	0	0	0	0	0	0	0	27.5
6:00 PM	142	0	5	33	69	33	2	0	0	0	0	0	0	0	27.3
7:00 PM	93	1	4	18	45	23	2	0	0	0	0	0	0	0	27.5
8:00 PM	66	0	1	21	34	9	1	0	0	0	0	0	0	0	26.8
9:00 PM	47	0	0	9	25	8	5	0	0	0	0	0	0	0	28.2
10:00 PM	31	0	0	4	16	9	0	2	0	0	0	0	0	0	28.7
11:00 PM	19	0	1	2	6	5	4	1	0	0	0	0	0	0	30.5
Total	2039	22	70	429	959	474	77	5	1	0	1	0	0	1	27.5
%		1.1	3.4	21.0	47.0	23.2	3.8	0.2	0.0	0.0	0.0	0.0	0.0	0.0	

Average (Mean) 27.5 mph **Minimum** 10.3 mph **Maximum** 84.6 mph **Pace Range** 22.7 - 32.7 mph 1621 vehicles (79.5 %)

Percentile Speeds	10%	15%	50%	85%	90%
(mph)	22.4	23.3	27.4	31.6	32.7

Speeds Exceeded	25 mph	35 mph	45 mph	55 mph	65 mph	75 mph
	74.4 % (1518)	4.2 % (85)	0.1 % (3)	0.1 % (2)	0.0 % (1)	0.0 % (1)

MONROE ST_LINWOOD AVE_E.rdf 1

All Traffic Data
15105 SE 17th St.
Vancouver, WA. 98683
503-833-2740

Site Code: 1
SE Monroe St W-O SE 72nd Ave

EB

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Not Classed	Total
04/30/15	0	4	0	0	0	0	0	0	0	0	0	0	0	0	4
01:00	0	3	1	0	0	0	0	0	0	0	0	0	0	0	4
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00	0	1	1	0	0	0	0	0	0	0	0	0	0	0	2
05:00	0	5	2	0	1	0	0	0	0	0	0	0	0	0	8
06:00	0	13	4	2	2	0	0	0	0	0	0	0	0	0	21
07:00	0	37	5	4	6	1	0	0	0	0	0	0	0	1	54
08:00	0	42	12	3	6	0	0	0	0	0	0	0	0	0	63
09:00	0	32	8	0	0	0	0	0	0	0	0	0	0	1	41
10:00	0	28	3	0	4	0	0	0	0	0	0	0	0	0	35
11:00	1	30	9	1	6	0	0	1	0	0	0	0	0	2	50
12 PM	0	31	14	1	1	0	0	1	0	0	0	0	0	0	48
13:00	2	41	11	0	4	1	0	0	0	0	0	0	0	1	60
14:00	0	42	13	5	3	0	0	1	0	0	0	0	0	0	64
15:00	0	50	10	1	4	0	0	1	0	0	0	0	0	1	67
16:00	0	55	15	1	1	0	0	0	0	0	0	0	0	3	75
17:00	1	54	13	2	2	0	0	0	0	0	0	0	0	0	72
18:00	0	65	12	1	3	0	0	0	0	0	0	0	0	0	81
19:00	0	37	9	0	2	0	0	0	0	0	0	0	0	1	49
20:00	0	24	9	0	2	0	0	0	0	0	0	0	0	0	35
21:00	0	14	4	0	1	0	0	0	0	0	0	0	0	0	19
22:00	0	15	4	0	0	0	0	0	0	0	0	0	0	1	20
23:00	0	13	2	0	0	0	0	0	0	0	0	0	0	0	15
Total	4	636	161	21	48	2	0	4	0	0	0	0	0	11	887
Percent	0.5%	71.7%	18.2%	2.4%	5.4%	0.2%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	1.2%	
AM Peak	11:00	08:00	08:00	07:00	07:00	07:00		11:00						11:00	
Vol.	1	42	12	4	6	1		1						2	
PM Peak	13:00	18:00	16:00	14:00	13:00	13:00		12:00						16:00	
Vol.	2	65	15	5	4	1		1						3	
Grand Total	4	636	161	21	48	2	0	4	0	0	0	0	0	11	887
Percent	0.5%	71.7%	18.2%	2.4%	5.4%	0.2%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	1.2%	

Page 1

All Traffic Data
15105 SE 17th St.
Vancouver, WA. 98683
503-833-2740

Site Code: 1
SE Monroe St W-O SE 72nd Ave

EB

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent	95th Percent
04/30/15	0	0	0	1	1	2	0	0	0	0	0	0	0	0	4	38	39
01:00	0	0	0	2	1	0	0	0	**1**	0	0	0	0	0	4	52	53
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	0	0	1	1	0	0	0	0	0	0	0	0	0	2	33	34
05:00	0	0	1	4	0	3	0	0	0	0	0	0	0	0	8	38	39
06:00	0	0	3	6	7	3	**2**	0	0	0	0	0	0	0	21	38	42
07:00	2	0	6	**22**	**20**	3	1	0	0	0	0	0	0	0	54	33	37
08:00	0	2	**15**	21	20	**5**	0	0	0	0	0	0	0	0	**63**	33	36
09:00	1	0	3	19	13	5	0	0	0	0	0	0	0	0	41	34	37
10:00	0	0	4	22	7	1	0	**1**	0	0	0	0	0	0	35	32	36
11:00	**3**	**3**	9	20	12	3	0	0	0	0	0	0	0	0	50	33	35
12 PM	0	0	**10**	18	14	5	1	0	0	0	0	0	0	0	48	34	38
13:00	**3**	1	8	30	13	4	1	0	0	0	0	0	0	0	60	33	37
14:00	1	0	8	**34**	16	5	0	0	0	0	0	0	0	0	64	33	36
15:00	3	**3**	9	27	18	6	0	**1**	0	0	0	0	0	0	67	34	38
16:00	3	0	0	25	34	13	0	0	0	0	0	0	0	0	75	35	38
17:00	0	0	5	26	25	**14**	**2**	0	0	0	0	0	0	0	72	36	39
18:00	2	0	7	31	**36**	4	1	0	0	0	0	0	0	0	**81**	34	36
19:00	1	0	5	20	20	1	0	1	**1**	0	0	0	0	0	49	33	37
20:00	0	0	6	12	11	4	2	0	0	0	0	0	0	0	35	35	40
21:00	0	0	3	7	8	1	0	0	0	0	0	0	0	0	19	33	35
22:00	1	0	1	8	10	0	0	0	0	0	0	0	0	0	20	33	34
23:00	0	0	2	6	6	1	0	0	0	0	0	0	0	0	15	33	36
Total	20	9	105	362	293	83	10	3	2	0	0	0	0	0	887		
Percent	2.3%	1.0%	11.8%	40.8%	33.0%	9.4%	1.1%	0.3%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	11:00	11:00	08:00	07:00	07:00	08:00	06:00	10:00	01:00						08:00		
Vol.	3	3	15	22	20	5	2	1	1						63		
PM Peak	13:00	15:00	12:00	14:00	18:00	17:00	17:00	15:00	19:00						18:00		
Vol.	3	3	10	34	36	14	2	1	1						81		
Grand Total	20	9	105	362	293	83	10	3	2	0	0	0	0	0	887		
Percent	2.3%	1.0%	11.8%	40.8%	33.0%	9.4%	1.1%	0.3%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%			

15th Percentile :	24 MPH
50th Percentile :	29 MPH
85th Percentile :	34 MPH
95th Percentile :	38 MPH

Statistics

10 MPH Pace Speed :	26-35 MPH
Number in Pace :	655
Percent in Pace :	73.8%
Number of Vehicles > 55 MPH :	0
Percent of Vehicles > 55 MPH :	0.0%
Mean Speed(Average) :	30 MPH

CLACKAMAS COUNTY

Questions concerning this report call 503.742.4704
http://www.clackamas.us/engineering/

LOCATION : THOMPSON WEST OF FULLER
COORDINATES : 45.4434, -122.5816
WEATHER : SUNNY ~ 55

Site: 13183105
3/4/2015
Wednesday

Daily Speed

Combined Channels

mph	Total	0 - < 15	15 - < 20	20 - < 25	25 - < 30	30 - < 35	35 - < 40	40 - < 45	45 - < 50	50 - < 55	55 - < 60	60 - < 65	65 - < 70	70 - < 200	Avg.
12:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11:00 AM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4:00 PM	197	6	10	42	115	23	1	0	0	0	0	0	0	0	26.1
5:00 PM	247	5	7	71	126	38	0	0	0	0	0	0	0	0	26.2
6:00 PM	159	2	2	34	91	29	1	0	0	0	0	0	0	0	27.1
7:00 PM	88	0	3	20	49	14	2	0	0	0	0	0	0	0	27.1
8:00 PM	80	3	1	21	41	13	1	0	0	0	0	0	0	0	26.4
9:00 PM	69	1	5	19	33	11	0	0	0	0	0	0	0	0	25.9
10:00 PM	23	1	0	4	13	5	0	0	0	0	0	0	0	0	26.6
11:00 PM	28	0	2	8	14	4	0	0	0	0	0	0	0	0	25.7
Total	891	18	30	219	482	137	5	0	0	0	0	0	0	0	26.4
%		2.0	3.4	24.6	54.1	15.4	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

Average (Mean) 26.4 mph **Minimum** 11.2 mph **Maximum** 36.6 mph **Pace Range** 22.0 - 32.0 mph 765 vehicles (85.9 %)

Percentile Speeds	10%	15%	50%	85%	90%
(mph)	22.2	23.0	26.8	30.1	30.8

Speeds Exceeded	25 mph	35 mph	45 mph	55 mph	65 mph	75 mph
	70.0 % (624)	0.6 % (5)	0 % (0)	0 % (0)	0 % (0)	0 % (0)

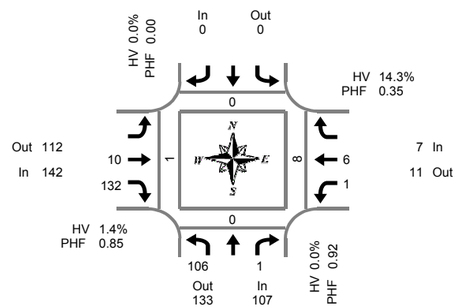
13183105 WB EB 4120.rdf 1

Additional Surveys for Monroe Street and Maplehurst Road

Total Vehicle Summary

All Traffic Data Services Inc.

Clay Carney
(503) 833-2740



SE 72nd Ave & SE Monroe St

Tuesday, September 15, 2015
4:00 PM to 6:00 PM

Peak Hour Summary
4:30 PM to 5:30 PM

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SE 72nd Ave				Southbound SE 72nd Ave				Eastbound SE Monroe St				Westbound SE Monroe St				Interval Total	Pedestrians Crosswalk			
	L		R	Bikes				Bikes		T	R	Bikes	L	T		Bikes		North	South	East	West
4:00 PM	26		0	0				0		0	16	0	0	2		0	44	0	0	0	0
4:15 PM	24		0	1				0		2	22	0	0	3		0	51	0	0	0	1
4:30 PM	29		0	0				0		4	31	0	0	1		0	65	0	0	0	0
4:45 PM	27		1	0				0		2	40	0	1	4		0	75	0	0	7	1
5:00 PM	24		0	0				0		3	27	0	0	1		0	55	0	0	1	0
5:15 PM	26		0	1				0		1	34	0	0	0		0	61	0	0	0	0
5:30 PM	27		0	2				0		3	22	0	0	2		0	54	0	0	0	0
5:45 PM	23		0	0				0		2	39	0	2	2		0	68	0	0	1	6
Total Survey	206		1	4				0		17	231	0	3	15		0	473	0	0	9	8

Peak Hour Summary
4:30 PM to 5:30 PM

By Approach	Northbound SE 72nd Ave				Southbound SE 72nd Ave				Eastbound SE Monroe St				Westbound SE Monroe St				Total
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	
Volume	107	133	240	1	0	0	0	0	142	112	254	0	7	11	18	0	256
%HV	0.0%				0.0%				1.4%				14.3%				1.2%
PHF	0.92				0.00				0.85				0.35				0.85

Pedestrians Crosswalk			
North	South	East	West
0	0	8	1

By Movement	Northbound SE 72nd Ave				Southbound SE 72nd Ave				Eastbound SE Monroe St				Westbound SE Monroe St				Total
	L		R	Total				Total		T	R	Total	L	T		Total	
Volume	106		1	107				0		10	132	142	1	6		7	256
%HV	0.0%	NA	0.0%	0.0%	NA	NA	NA	0.0%	NA	10.0%	0.8%	1.4%	0.0%	16.7%	NA	14.3%	1.2%
PHF	0.91		0.25	0.92				0.00		0.63	0.83	0.85	0.25	0.38		0.35	0.85

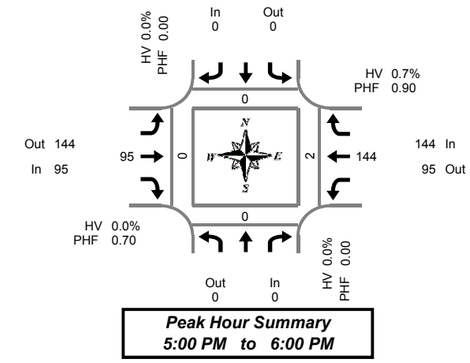
Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SE 72nd Ave				Southbound SE 72nd Ave				Eastbound SE Monroe St				Westbound SE Monroe St				Interval Total	Pedestrians Crosswalk			
	L		R	Bikes				Bikes		T	R	Bikes	L	T		Bikes		North	South	East	West
4:00 PM	106		1	1				0		8	109	0	1	10		0	235	0	0	7	2
4:15 PM	104		1	1				0		11	120	0	1	9		0	246	0	0	8	2
4:30 PM	106		1	1				0		10	132	0	1	6		0	256	0	0	8	1
4:45 PM	104		1	3				0		9	123	0	1	7		0	245	0	0	8	1
5:00 PM	100		0	3				0		9	122	0	2	5		0	238	0	0	2	6

Total Vehicle Summary

All Traffic Data Services Inc.

Clay Carney
(503) 833-2740



SE 74th Ave & SE Thompson Rd

Tuesday, September 15, 2015
4:00 PM to 6:00 PM

Peak Hour Summary
5:00 PM to 6:00 PM

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SE 74th Ave				Southbound SE 74th Ave				Eastbound SE Thompson Rd				Westbound SE Thompson Rd				Interval Total	Pedestrians Crosswalk			
				Bikes				Bikes		T		Bikes		T		Bikes		North	South	East	West
4:00 PM				0				0		18		0		28		0	46	0	0	0	0
4:15 PM				0				0		22		0		24		0	46	0	0	0	0
4:30 PM				0				0		28		0		30		0	58	0	0	0	0
4:45 PM				0				0		25		0		30		0	55	0	0	0	0
5:00 PM				0				0		22		0		32		0	54	0	0	0	0
5:15 PM				0				0		34		0		33		1	67	0	0	1	0
5:30 PM				0				0		19		0		39		1	58	0	0	0	0
5:45 PM				0				0		20		0		40		0	60	0	0	1	0
Total Survey				0				0		188		0		256		2	444	0	0	2	0

Peak Hour Summary
5:00 PM to 6:00 PM

By Approach	Northbound SE 74th Ave				Southbound SE 74th Ave				Eastbound SE Thompson Rd				Westbound SE Thompson Rd				Total
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	
Volume	0	0	0	0	0	0	0	0	95	144	239	0	144	95	239	2	239
%HV	0.0%				0.0%				0.0%				0.7%				0.4%
PHF	0.00				0.00				0.70				0.90				0.89

Pedestrians Crosswalk			
North	South	East	West
0	0	2	0

By Movement	Northbound SE 74th Ave				Southbound SE 74th Ave				Eastbound SE Thompson Rd				Westbound SE Thompson Rd				Total
				Total				Total		T		Total		T		Total	
Volume				0				0		95		95		144		144	239
%HV	NA	NA	NA	0.0%	NA	NA	NA	0.0%	NA	0.0%	NA	0.0%	NA	0.7%	NA	0.7%	0.4%
PHF				0.00				0.00		0.70		0.70		0.90		0.90	0.89

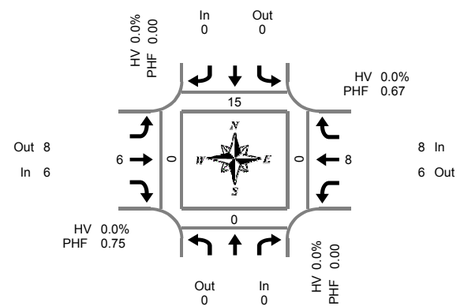
Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SE 74th Ave				Southbound SE 74th Ave				Eastbound SE Thompson Rd				Westbound SE Thompson Rd				Interval Total	Pedestrians Crosswalk			
				Bikes				Bikes		T		Bikes		T		Bikes		North	South	East	West
4:00 PM				0				0		93		0		112		0	205	0	0	0	0
4:15 PM				0				0		97		0		116		0	213	0	0	0	0
4:30 PM				0				0		109		0		125		1	234	0	0	1	0
4:45 PM				0				0		100		0		134		2	234	0	0	1	0
5:00 PM				0				0		95		0		144		2	239	0	0	2	0

Total Vehicle Summary

All Traffic Data Services Inc.

Clay Carney
(503) 833-2740



Peak Hour Summary
5:00 PM to 6:00 PM

SE 77th Ave & SE Monroe St

Tuesday, September 15, 2015
4:00 PM to 6:00 PM

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SE 77th Ave				Southbound SE 77th Ave				Eastbound SE Monroe St				Westbound SE Monroe St				Interval Total	Pedestrians Crosswalk			
				Bikes				Bikes		T		Bikes		T		Bikes		North	South	East	West
4:00 PM				0				0		0		0		2		0	2	1	0	0	0
4:15 PM				0				0		2		0		2		0	4	2	0	0	0
4:30 PM				0				0		1		0		1		0	2	7	0	0	0
4:45 PM				0				0		0		0		1		0	1	9	0	0	0
5:00 PM				0				0		2		0		1		0	3	6	0	0	0
5:15 PM				0				0		1		0		3		0	4	7	0	0	0
5:30 PM				0				0		2		0		3		0	5	1	0	0	0
5:45 PM				0				3		1		0		1		0	2	1	0	0	0
Total Survey				0				3		9		0		14		0	23	34	0	0	0

Peak Hour Summary
5:00 PM to 6:00 PM

By Approach	Northbound SE 77th Ave				Southbound SE 77th Ave				Eastbound SE Monroe St				Westbound SE Monroe St				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	0	0	0	0	0	0	0	3	6	8	14	0	8	6	14	0	14	15	0	0	0
%HV	0.0%				0.0%				0.0%				0.0%				0.0%				
PHF	0.00				0.00				0.75				0.67				0.70				

By Movement	Northbound SE 77th Ave				Southbound SE 77th Ave				Eastbound SE Monroe St				Westbound SE Monroe St				Total
				Total				Total		T		Total		T		Total	
Volume				0				0		6		6		8		8	14
%HV	NA	NA	NA	0.0%	NA	NA	NA	0.0%	NA	0.0%	NA	0.0%	NA	0.0%	NA	0.0%	0.0%
PHF				0.00				0.00		0.75		0.75		0.67		0.67	0.70

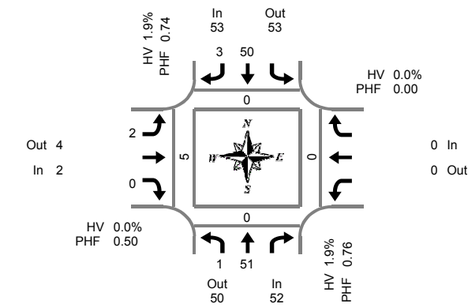
Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SE 77th Ave				Southbound SE 77th Ave				Eastbound SE Monroe St				Westbound SE Monroe St				Interval Total	Pedestrians Crosswalk			
				Bikes				Bikes		T		Bikes		T		Bikes		North	South	East	West
4:00 PM				0				0		3		0		6		0	9	19	0	0	0
4:15 PM				0				0		5		0		5		0	10	24	0	0	0
4:30 PM				0				0		4		0		6		0	10	29	0	0	0
4:45 PM				0				0		5		0		8		0	13	23	0	0	0
5:00 PM				0				3		6		0		8		0	14	15	0	0	0

Total Vehicle Summary

All Traffic Data Services Inc.

Clay Carney
(503) 833-2740



Peak Hour Summary
5:00 PM to 6:00 PM

SE Maplehurst Rd & SE Charles St

Tuesday, September 15, 2015
4:00 PM to 6:00 PM

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SE Maplehurst Rd				Southbound SE Maplehurst Rd				Eastbound SE Charles St				Westbound SE Charles St				Interval Total	Pedestrians Crosswalk			
	L	T		Bikes		T	R	Bikes	L		R	Bikes				Bikes		North	South	East	West
4:00 PM	0	15		0		6	1	0	0		0	0				0	22	0	0	0	0
4:15 PM	0	14		0		8	1	0	0		0	0				0	23	0	0	0	0
4:30 PM	0	5		0		9	2	0	1		0	0				0	17	0	0	0	0
4:45 PM	0	8		0		13	0	0	0		0	0				0	21	0	0	0	0
5:00 PM	0	15		0		16	2	0	1		0	0				0	34	0	0	0	2
5:15 PM	1	10		0		14	0	2	0		0	0				0	25	0	0	0	3
5:30 PM	0	9		0		10	1	1	1		0	0				0	21	0	0	0	0
5:45 PM	0	17		0		10	0	0	0		0	0				0	27	0	0	0	0
Total Survey	1	93		0		86	7	3	3		0	0				0	190	0	0	0	5

Peak Hour Summary
5:00 PM to 6:00 PM

By Approach	Northbound SE Maplehurst Rd				Southbound SE Maplehurst Rd				Eastbound SE Charles St				Westbound SE Charles St				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	52	50	102	0	53	53	106	3	2	4	6	0	0	0	0	0	107	0	0	0	5
%HV	1.9%				1.9%				0.0%				0.0%				1.9%				
PHF	0.76				0.74				0.50				0.00				0.79				

By Movement	Northbound SE Maplehurst Rd				Southbound SE Maplehurst Rd				Eastbound SE Charles St				Westbound SE Charles St				Total
	L	T		Total		T	R	Total	L		R	Total				Total	
Volume	1	51		52		50	3	53	2		0	2				0	107
%HV	0.0%	2.0%	NA	1.9%	NA	2.0%	0.0%	1.9%	0.0%	NA	0.0%	0.0%	NA	NA	NA	0.0%	1.9%
PHF	0.25	0.75		0.76		0.78	0.38	0.74	0.50		0.00	0.50				0.00	0.79

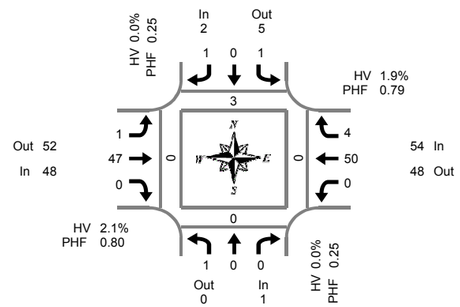
Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SE Maplehurst Rd				Southbound SE Maplehurst Rd				Eastbound SE Charles St				Westbound SE Charles St				Interval Total	Pedestrians Crosswalk			
	L	T		Bikes		T	R	Bikes	L		R	Bikes				Bikes		North	South	East	West
4:00 PM	0	42		0		36	4	0	1		0	0				0	83	0	0	0	0
4:15 PM	0	42		0		46	5	0	2		0	0				0	95	0	0	0	2
4:30 PM	1	38		0		52	4	2	2		0	0				0	97	0	0	0	5
4:45 PM	1	42		0		53	3	3	2		0	0				0	101	0	0	0	5
5:00 PM	1	51		0		50	3	3	2		0	0				0	107	0	0	0	5

Total Vehicle Summary

All Traffic Data Services Inc.

Clay Carney
(503) 833-2740



Peak Hour Summary
5:00 PM to 6:00 PM

SE Norbert Dr & SE Maplehurst Rd

Tuesday, September 15, 2015
4:00 PM to 6:00 PM

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SE Norbert Dr				Southbound SE Norbert Dr				Eastbound SE Maplehurst Rd				Westbound SE Maplehurst Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	0	0	0	0	0	0	1	0	0	8	0	0	0	12	1	0	22	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	8	0	0	0	14	0	0	22	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	1	8	0	0	0	6	0	0	15	0	2	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	12	0	0	0	8	1	0	21	7	4	3	0
5:00 PM	1	0	0	0	0	0	0	1	0	14	0	0	0	13	3	0	31	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	15	0	2	0	11	0	0	26	3	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	8	0	1	0	9	1	0	18	0	0	0	0
5:45 PM	0	0	0	0	1	0	1	0	1	10	0	0	0	17	0	0	30	0	0	0	0
Total Survey	1	0	0	0	1	0	2	1	2	83	0	3	0	90	6	0	185	10	6	3	0

Peak Hour Summary
5:00 PM to 6:00 PM

By Approach	Northbound SE Norbert Dr				Southbound SE Norbert Dr				Eastbound SE Maplehurst Rd				Westbound SE Maplehurst Rd				Total
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	
Volume	1	0	1	0	2	5	7	1	48	52	100	3	54	48	102	0	105
%HV	0.0%				0.0%				2.1%				1.9%				1.9%
PHF	0.25				0.25				0.80				0.79				0.85

Pedestrians Crosswalk			
North	South	East	West
3	0	0	0

By Movement	Northbound SE Norbert Dr				Southbound SE Norbert Dr				Eastbound SE Maplehurst Rd				Westbound SE Maplehurst Rd				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	1	0	0	1	1	0	1	2	1	47	0	48	0	50	4	54	105
%HV	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.1%	0.0%	2.1%	0.0%	2.0%	0.0%	1.9%	1.9%
PHF	0.25	0.00	0.00	0.25	0.25	0.00	0.25	0.25	0.25	0.78	0.00	0.80	0.00	0.74	0.33	0.79	0.85

Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SE Norbert Dr				Southbound SE Norbert Dr				Eastbound SE Maplehurst Rd				Westbound SE Maplehurst Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	0	0	0	0	0	0	1	0	1	36	0	0	0	40	2	0	80	7	6	3	0
4:15 PM	1	0	0	0	0	0	0	1	1	42	0	0	0	41	4	0	89	7	6	3	0
4:30 PM	1	0	0	0	0	0	0	1	1	49	0	2	0	38	4	0	93	10	6	3	0
4:45 PM	1	0	0	0	0	0	0	1	0	49	0	3	0	41	5	0	96	10	4	3	0
5:00 PM	1	0	0	0	1	0	1	1	1	47	0	3	0	50	4	0	105	3	0	0	0

All Traffic Data
15105 SE 17th St.
Vancouver, WA. 98683
503-833-2740

Site Code: 1
SE Maplehurst Rd N-O SE Charles St

NB

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent	95th Percent
09/15/15	0	0	1	2	0	0	0	0	0	0	0	0	0	0	3	28	29
01:00	0	0	0	0	**1**	0	0	0	0	0	0	0	0	0	1	34	34
02:00	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2	29	29
03:00	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	24	24
04:00	0	0	1	1	0	0	0	0	0	0	0	0	0	0	2	28	29
05:00	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2	29	29
06:00	1	1	8	5	0	0	0	0	0	0	0	0	0	0	15	27	29
07:00	0	5	**18**	6	0	0	0	0	0	0	0	0	0	0	29	26	28
08:00	1	11	13	2	0	0	0	0	0	0	0	0	0	0	27	24	26
09:00	0	**16**	6	5	0	0	0	0	0	0	0	0	0	0	27	25	28
10:00	**3**	9	12	6	1	0	0	0	0	0	0	0	0	0	31	26	29
11:00	2	9	13	**7**	1	0	0	0	0	0	0	0	0	0	**32**	27	29
12 PM	0	7	16	4	0	0	0	0	0	0	0	0	0	0	27	24	28
13:00	3	12	12	9	1	0	0	0	0	0	0	0	0	0	37	27	29
14:00	**5**	**16**	20	**12**	1	0	0	0	0	0	0	0	0	0	54	27	29
15:00	2	16	23	12	**2**	0	0	0	0	0	0	0	0	0	**55**	27	29
16:00	2	7	22	11	0	0	0	0	0	0	0	0	0	0	42	27	29
17:00	1	16	**30**	4	0	**1**	0	0	0	0	0	0	0	0	52	24	28
18:00	2	3	21	10	1	0	0	0	0	0	0	0	0	0	37	27	29
19:00	0	6	17	4	1	0	0	0	0	0	0	0	0	0	28	26	29
20:00	1	4	19	2	0	0	0	0	0	0	0	0	0	0	26	24	26
21:00	1	1	12	3	0	0	0	0	0	0	0	0	0	0	17	25	28
22:00	0	0	6	1	0	0	0	0	0	0	0	0	0	0	7	24	28
23:00	0	1	1	2	0	0	0	0	0	0	0	0	0	0	4	28	29
Total	24	140	272	112	9	1	0	0	0	0	0	0	0	0	558		
Percent	4.3%	25.1%	48.7%	20.1%	1.6%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	10:00	09:00	07:00	11:00	01:00										11:00		
Vol.	3	16	18	7	1										32		
PM Peak	14:00	14:00	17:00	14:00	15:00	17:00									15:00		
Vol.	5	16	30	12	2	1									55		
Grand Total	24	140	272	112	9	1	0	0	0	0	0	0	0	0	558		
Percent	4.3%	25.1%	48.7%	20.1%	1.6%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			

15th Percentile :	17 MPH
50th Percentile :	22 MPH
85th Percentile :	26 MPH
95th Percentile :	29 MPH

Statistics

10 MPH Pace Speed :	16-25 MPH
Number in Pace :	412
Percent in Pace :	73.8%
Number of Vehicles > 55 MPH :	0
Percent of Vehicles > 55 MPH :	0.0%
Mean Speed(Average) :	22 MPH

All Traffic Data
15105 SE 17th St.
Vancouver, WA. 98683
503-833-2740

Site Code: 1
SE Maplehurst Rd W-O SE Norbert Dr

EB

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent	95th Percent
09/15/15	0	0	0	1	1	**1**	0	0	0	0	0	0	0	0	3	37	39
01:00	0	0	0	1	0	1	0	0	0	0	0	0	0	0	2	38	39
02:00	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	29	29
03:00	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	24	24
04:00	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	24	24
05:00	1	0	1	2	1	0	0	0	0	0	0	0	0	0	5	31	33
06:00	3	3	7	3	0	0	0	0	0	0	0	0	0	0	16	26	28
07:00	4	3	**18**	**24**	**4**	0	0	0	0	0	0	0	0	0	**53**	29	31
08:00	0	2	10	12	2	1	0	0	0	0	0	0	0	0	27	29	34
09:00	**6**	**8**	11	8	2	0	0	0	0	0	0	0	0	0	35	27	30
10:00	2	5	10	9	0	0	0	0	0	0	0	0	0	0	26	27	29
11:00	3	3	16	10	1	0	0	0	0	0	0	0	0	0	33	28	29
12 PM	0	3	9	10	1	0	0	0	0	0	0	0	0	0	23	28	29
13:00	2	5	**20**	5	3	0	**1**	0	0	0	0	0	0	0	36	28	33
14:00	**5**	4	18	14	2	0	0	0	0	0	0	0	0	0	43	28	29
15:00	2	4	16	**24**	**7**	0	0	0	0	0	0	0	0	0	**53**	29	33
16:00	0	**9**	17	6	3	**1**	0	0	0	0	0	0	0	0	36	28	33
17:00	5	5	15	21	3	0	0	0	0	0	0	0	0	0	49	28	30
18:00	0	9	14	15	2	0	0	0	0	0	0	0	0	0	40	28	30
19:00	1	7	8	5	2	0	0	0	0	0	0	0	0	0	23	28	32
20:00	3	2	5	6	1	0	0	0	0	0	0	0	0	0	17	28	30
21:00	0	0	2	5	1	0	0	0	0	0	0	0	0	0	8	29	32
22:00	0	2	3	2	0	0	0	0	0	0	0	0	0	0	7	27	29
23:00	0	0	1	1	0	0	0	0	0	0	0	0	0	0	2	28	29
Total	37	74	203	185	36	4	1	0	0	0	0	0	0	0	540		
Percent	6.9%	13.7%	37.6%	34.3%	6.7%	0.7%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	09:00	09:00	07:00	07:00	07:00	00:00									07:00		
Vol.	6	8	18	24	4	1									53		
PM Peak	14:00	16:00	13:00	15:00	15:00	16:00	13:00								15:00		
Vol.	5	9	20	24	7	1	1								53		
Grand Total	37	74	203	185	36	4	1	0	0	0	0	0	0	0	540		
Percent	6.9%	13.7%	37.6%	34.3%	6.7%	0.7%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			

15th Percentile :	17 MPH
50th Percentile :	23 MPH
85th Percentile :	28 MPH
95th Percentile :	31 MPH

Statistics

10 MPH Pace Speed :	21-30 MPH
Number in Pace :	388
Percent in Pace :	71.9%
Number of Vehicles > 55 MPH :	0
Percent of Vehicles > 55 MPH :	0.0%
Mean Speed(Average) :	24 MPH

All Traffic Data
15105 SE 17th St.
Vancouver, WA. 98683
503-833-2740

Site Code: 1
SE Monroe St W-O SE 77th Ave

EB

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent	95th Percent
09/15/15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
02:00	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	29	29
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
05:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
06:00	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	12	14
07:00	1	1	**2**	0	0	0	0	0	0	0	0	0	0	0	4	23	24
08:00	**6**	1	0	0	0	0	0	0	0	0	0	0	0	0	7	14	18
09:00	6	**2**	1	0	0	0	0	0	0	0	0	0	0	0	**9**	19	22
10:00	3	1	0	0	0	0	0	0	0	0	0	0	0	0	4	17	19
11:00	1	2	0	**2**	0	0	0	0	0	0	0	0	0	0	5	28	29
12 PM	4	0	**3**	0	0	0	0	0	0	0	0	0	0	0	7	23	24
13:00	**5**	1	0	0	0	0	0	0	0	0	0	0	0	0	6	15	18
14:00	3	1	1	0	0	0	0	0	0	0	0	0	0	0	5	21	23
15:00	5	2	1	0	0	0	0	0	0	0	0	0	0	0	**8**	19	22
16:00	1	2	0	0	0	0	0	0	0	0	0	0	0	0	3	18	19
17:00	2	1	3	0	0	0	0	0	0	0	0	0	0	0	6	23	24
18:00	0	**3**	0	0	0	0	0	0	0	0	0	0	0	0	3	19	19
19:00	3	3	0	0	0	0	0	0	0	0	0	0	0	0	6	18	19
20:00	0	3	0	0	0	0	0	0	0	0	0	0	0	0	3	19	19
21:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
22:00	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	12	14
23:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
Total	44	23	11	3	0	0	0	0	0	0	0	0	0	0	81		
Percent	54.3%	28.4%	13.6%	3.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	08:00	09:00	07:00	11:00											09:00		
Vol.	6	2	2	2											9		
PM Peak	13:00	18:00	12:00												15:00		
Vol.	5	3	3												8		
Grand Total	44	23	11	3	0	0	0	0	0	0	0	0	0	0	81		
Percent	54.3%	28.4%	13.6%	3.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			

15th Percentile :	4 MPH
50th Percentile :	13 MPH
85th Percentile :	20 MPH
95th Percentile :	24 MPH

Statistics

10 MPH Pace Speed :	11-20 MPH
Number in Pace :	38
Percent in Pace :	46.9%
Number of Vehicles > 55 MPH :	0
Percent of Vehicles > 55 MPH :	0.0%
Mean Speed(Average) :	14 MPH

All Traffic Data
15105 SE 17th St.
Vancouver, WA. 98683
503-833-2740

Site Code: 1
SE Thompson Rd W-O SE 74th Ave

EB

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent	95th Percent
09/15/15	0	0	0	1	1	0	0	0	0	0	0	0	0	0	2	33	34
01:00	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	39	39
02:00	0	1	0	1	0	0	0	0	0	0	0	0	0	0	2	28	29
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	0	2	2	2	**2**	0	0	0	0	0	0	0	0	8	37	39
05:00	0	0	4	3	1	0	0	0	0	0	0	0	0	0	8	29	32
06:00	0	2	9	4	**3**	0	0	0	0	0	0	0	0	0	18	30	33
07:00	9	**27**	**14**	**6**	3	0	0	0	0	0	0	0	0	0	59	25	30
08:00	**31**	22	6	3	0	0	0	0	0	0	0	0	0	0	**62**	19	24
09:00	3	16	11	0	1	0	0	0	0	0	0	0	0	0	31	23	24
10:00	7	18	12	1	0	0	0	0	0	0	0	0	0	0	38	23	24
11:00	7	22	13	4	0	0	0	0	0	0	0	0	0	0	46	23	27
12 PM	8	13	13	4	0	0	0	0	0	0	0	0	0	0	38	24	27
13:00	8	27	12	6	0	0	0	0	0	0	0	0	0	0	53	24	27
14:00	**47**	**36**	11	1	0	0	0	0	0	0	0	0	0	0	**95**	19	23
15:00	10	31	24	9	**3**	0	0	0	0	0	0	0	0	0	77	25	29
16:00	7	29	42	12	3	0	0	0	0	0	0	0	0	0	93	25	29
17:00	8	21	**50**	15	0	0	0	0	0	0	0	0	0	0	94	25	28
18:00	3	11	28	**17**	2	0	0	0	0	0	0	0	0	0	61	27	29
19:00	3	4	20	9	0	0	0	0	0	0	0	0	0	0	36	26	29
20:00	0	3	16	7	1	0	0	0	0	0	0	0	0	0	27	27	29
21:00	1	2	9	6	0	0	0	0	0	0	0	0	0	0	18	27	29
22:00	0	0	4	6	0	0	0	0	0	0	0	0	0	0	10	28	29
23:00	0	1	7	5	0	0	0	0	0	0	0	0	0	0	13	28	29
Total	152	286	307	122	20	3	0	0	0	0	0	0	0	0	890		
Percent	17.1%	32.1%	34.5%	13.7%	2.2%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	08:00	07:00	07:00	07:00	06:00	04:00									08:00		
Vol.	31	27	14	6	3	2									62		
PM Peak	14:00	14:00	17:00	18:00	15:00										14:00		
Vol.	47	36	50	17	3										95		
Grand Total	152	286	307	122	20	3	0	0	0	0	0	0	0	0	890		
Percent	17.1%	32.1%	34.5%	13.7%	2.2%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			

15th Percentile :	13 MPH
50th Percentile :	20 MPH
85th Percentile :	25 MPH
95th Percentile :	29 MPH

Statistics

10 MPH Pace Speed :	16-25 MPH
Number in Pace :	593
Percent in Pace :	66.6%
Number of Vehicles > 55 MPH :	0
Percent of Vehicles > 55 MPH :	0.0%
Mean Speed(Average) :	20 MPH

Appendix F

Planning Level Costs

The following tables describe planning-level costs for implementing the Monroe Neighborhood Street Design Plan. Major design components are itemized and are accompanied by per-unit construction costs. Additional project costs include roadway and stormwater survey. Total estimated costs include a 30% contingency to account for unknown project costs at this conceptual design phase.

Order of Magnitude Cost Estimate, *Monroe Neighborhood Street Design Plan*

NO.	ITEM	UNIT	LENGTH	COST
1	Monroe St - Linwood Ave to 72nd Ave	Mi.	0.50	$501,320
2	Monroe St - 72nd Ave to Fuller Rd	Mi.	0.50	$378,790
3	SE 72nd Ave	Mi.	0.10	$85,950
4	Thompson Rd - SE 72nd to Fuller	Mi.	0.50	$861,840
5	Boyer Dr - 85th Ave, Spencer Dr	Mi.	0.35	$32,000
			SUBTOTAL	$1,859,900

ADDITIONAL COST	SUGGESTED	PERCENTAGE	COST
Construction Surveying	1.0-2.5%	2.5%	$46,498
Temporary Traffic Control	3.0-8.0%	3.0%	$55,797
Mobilization	8.0-10.0%	10.0%	$185,990
Erosion Control	0.5-2.0%	2.0%	$37,198
Contingency	30-40%	30.0%	$557,970
Escalation (per year)	0.5-2.0%	0.0%	$0
Construction Year	Unknown		
		TOTAL CONSTRUCTION COST (2016 Dollars)	$2,743,353

RIGHT OF WAY COST	UNIT	QUANTITY	UNIT COST	COST
New Right of Way Acquisition	SQ FT	0		$0
Structure(s)	Lump Sum	All		$0
ENGINEERING COSTS	**SUGGESTED**	**PERCENTAGE**	**UNIT COST**	**COST**
Design Engineering	15.0%	15.0%		$411,503
Construction Engineering	10.0%	10.0%		$274,335
City Costs (Permitting, Public Involvement, Management)	7.0%	7.0%		$192,035
			TOTAL ESTIMATED PROJECT COST	$3,621,225

Note: All figures are planning-level, order of magnitude cost estimates.

Concept-Level Cost Estimates of Recommended Improvements

Project Sections	Action	Timing	Estimated Cost
Monroe Street—Linwood to 72nd Avenue	Sawcut and add pavement to the south	Mid-term	$81,840
	Asphalt shared-use path	Mid-term	$90,000
	Chicanes	Mid-term	$170,000
	Curb ramp	Mid-term	$55,000
	Tabled intersection	Mid-term	$15,000
	Crosswalk markings	Mid-term	$7,800
	Speed cushion	Mid-term	$9,000
	Mini-roundabout	Mid-term	$22,000
	Centerline removal	Mid-term	$2,480
	Raised crosswalk	Mid-term	$9,000
	North side curb	Mid-term	$37,200
	Signs	Mid-term	$2,000
Monroe Street—72nd Avenue to Fuller Road	Sawcut and add pavement to the south	Mid-term	$66,990
	Asphalt shared-use path	Mid-term	$58,500
	Chicanes	Mid-term	$90,000
	Curb ramp	Mid-term	$30,000
	Stormwater/bioswale	Mid-term	$11,300
	Tabled intersection	Mid-term	$15,000
	Speed cushion	Mid-term	$6,000
	Crosswalk markings	Mid-term	$2,600
	Centerline removal	Mid-term	$1,400
	Raised crosswalk	Mid-term	$6,000
	North side curb	Mid-term	$21,000
	Signs	Mid-term	$2,000
	Sharrows	Mid-term	$2,000
	Concrete sidewalk	Mid-term	$66,000

Project Sections	Action	Timing	Estimated Cost
SE 72nd Avenue	Sawcut and add pavement to the east	Mid-term	$13,200
	Asphalt shared-use path	Mid-term	$18,000
	Speed cushion	Mid-term	$6,000
	Curb ramp	Mid-term	$5,000
	Pavement markings	Mid-term	$800
	Raised crosswalk	Mid-term	$3,000
	Concrete sidewalk	Mid-term	$33,000
	East side curb	Mid-term	$4,950
	Signs	Mid-term	$2,000
Thompson Road (with 74th and 77th Avenues)	Sawcut and add pavement to the south	Mid-term	$21,780
	Asphalt shared-use path	Mid-term	$23,760
	Rectangular rapid flashing beacon	Mid-term	$300,000
	Curb ramp	Mid-term	$40,000
	Stormwater/bioswale	Mid-term	$14,300
	Tabled intersection	Mid-term	$30,000
	Speed cushion	Mid-term	$15,000
	Centerline removal	Mid-term	$3,000
	Bike lane markings	Mid-term	$2,000
	Concrete sidewalk	Mid-term	$380,000
	North side curb	Mid-term	$30,000
	Signs	Mid-term	$2,000
Boyer Drive-85th Avenue-Spencer Drive	Concrete sidewalk	Mid-term	$17,500
	Curb ramp	Mid-term	$5,000
	Signs	Mid-term	$2,000
	Bike sharrow markings	Mid-term	$4,000
	Gateway signs	Mid-term	$3,500

Safe Routes to School: Creating an Action Plan

Instructions

Please read these instructions before completing the Action Plan.

Creating the Action Plan is the first step in the application process for Oregon Safe Routes to School funding, for both Infrastructure (engineering) and Non-Infrastructure (education and outreach, enforcement and evaluation) projects and activities for schools serving any grades from kindergarten up to 8th grade.

Who develops the Action Plan?

The Action Plan is created through a team-based process. With the conclusions drawn from the collected information, the team will be able to recommend priority projects and activities that the school, municipality and community can advance to promote safe walking and bicycling to school.

The template begins on Page 8.

SECTION 1: School information (for schools K-8)

The Plan is site-specific for your project. This section includes basic information about the school, including location, enrollment, and contact information for the Safe Routes to School Action Plan.

SECTION 2: Forming the School Team

The team is made up of a minimum of *three key partners*: the school principal; a parent who represents or has the endorsement of the school parent organization; and city, county or state staff representing the local road authority. An additional member should be a member of the local traffic safety committee, if one exists.

Additional community partners, whose backgrounds and affiliations represent a wide range of interests and expertise related to SRTS, should be included later in the planning process:

> School representatives – PTA/PTO/site council member; principal and/or other school staff such as nurse and/or PE teacher; students; district transportation coordinator; district facilities management *especially* if school property/buildings/maintenance will be an issue; school board member; safety patrol coordinator; bus driver; school crossing guard; etc.
>
> Local government -- Council or commission member; transportation or traffic engineer; public works representative; traffic safety committee member; local planner; law enforcement, emergency medical services or fire department; bicycle/pedestrian advisory committee; municipal or regional transit agency if applicable; etc.
>
> Community representatives -- neighborhood or community association members; chamber of commerce or business associations; bicycle/pedestrian advocates; public health professionals; local stakeholder community groups and non-profit organizations; rail, trucking industry representatives, if applicable; media or marketing representative; etc.

SECTION 3: Assessing the modes of student travel

There are a variety of possible activities that have provided past grant recipients with valuable information about the ability of students to walk and bike to and from school. These are the assessments required for the Oregon process:

- Mapping
- Walking and biking the routes within 1 mile of the elementary school (1.5 miles of the middle school)
- Surveying students and parents

Note: additional support information may be needed to support the projects proposed in your Infrastructure Application (e.g., traffic counts, crash data, speed studies, etc.). The team should rely upon the recommendations of local experts to determine what information may be needed.

Mapping

To understand the conditions around or on the school property, bring the team together to a mapping and brainstorming session where they can give input on conditions and possible solutions, in addition to helping to determine the best current and/or future routes (within one mile walking distance from residential neighborhoods to the elementary school, 1.5 miles of the middle school).

In preparation for the session, work with your school district and/or the local public works department to create **scatter maps** that indicate concentrations of where students live. Scatter maps provide useful information about the numbers of students living within the quarter-mile, half-mile, one-mile, and two-mile distances from the school site. They also bring forward where students live in relation to physical barriers (e.g., state highway, local roads, bridges, train tracks), shopping and food outlets, playing fields and community centers.

You may wish to include others who understand the travel habits of the students, such as the school crossing guards, law enforcement, school bus drivers, and other parents and students.

City maps may be found at: http://egov.oregon.gov/ODOT/TD/TDATA/gis/CityMaps.shtml

Maps may also be found at your school district website; Google.com; earth.google.com; Yahoo.com; Mapquest.com; or from your local public works department. **Please include copies of the maps as a supplement to this Plan.**

Walk and Bike Assessment

Once the team completes the mapping exercise, the team should walk and/or bike the routes to identify physical barriers. The team may want to follow their own format in assessing the "walkability" and the "bikeability" of the immediate school neighborhoods, or they may wish to use the linked checklists on the National SRTS Program website, under "Education:" http://www.saferoutesinfo.org/sites/default/files/walkabilitychecklist.pdf and http://www.saferoutesinfo.org/sites/default/files/bikabilitychecklist.pdf . Concentrate on streets you believe are critical to walking or bicycling to school, including parks, bike lanes, walkways or trails, and other public right-of-way facilities if they are or could be used by students to travel to and from school.

Walkability questions to consider: Are the sidewalks, paths and/or trails on school property connected to logical residential neighborhood access points? Is there room to walk? Are there sidewalks, or shoulders where there were no sidewalks? Are you able to cross safely where you can see and be seen by drivers? Does it feel safe to walk? Can students safely and conveniently reach unlocked school entry doors from these locations?

SECTION 3: Assessing the modes of student travel, continued

Pedestrian safety questions to consider: Does the school provide safety information and/or participate in events that promote safe walking and physical activity such as International Walk and Bike to School Day or walk-a-thons? Is there pedestrian safety guidance given to students who cross with the School Patrol or Adult Crossing Guard?

Bikeability questions to consider: Do you have safe bicycle routes? Are there paths, trails, wide sidewalks, low-traffic streets, bike lanes or good shoulders to ride safely with traffic? Does it feel safe riding with traffic? How was the surface that you rode on? How were the intersections that you rode through?

Bike safety and security questions to consider: Are visibly-placed bicycle racks available to students at the school? Are there enough to accommodate an increase in bicycles? Can students easily and safely access them? Are they sheltered from the weather? Are bikes in a secure location? Are there opportunities for students to learn about bicycle safety? Are students involved in after-school bike clubs or teams? Is helmet use encouraged?

Data Collection

It is vital to understand the travel patterns of the students at the school. An initial step in the assessment process will be to query the students and their parents about how their students arrive and depart from school. In order to collect consistent data, the Oregon SRTS Program has adopted two forms from the National Center for Safe Routes to School, the Student Travel Tally and the Parent Survey.

Detailed information and instructions for using the forms are found at http://www.saferoutesinfo.org/data-central/data-collection-forms

Student Tally

Teachers or volunteers will use this form to record specific information about how children arrive and depart from school. It is a hand-raise tally, conducted in each classroom (takes about 5-7 minutes to complete) for two days within one week (not on a Monday or Friday). The form for the tally can be downloaded from the National SRTS Program website: http://www.saferoutesinfo.org/program-tools/evaluation-student-class-travel-tally

If you need assistance in setting up an account, contact Julie Yip, Oregon SRTS Manager, 503-986-4196. Once data is entered, a downloadable summary report is immediately available at the same site.

Parent Survey

The Parent Survey collects information about factors, beliefs and attitudes that affect parents' decisions about their children walking and bicycling to school. The survey results will help your Team determine how to improve opportunities for children to walk or bike to school. Not only will the collected information allow comparison with the student tally results, but parent comments and identified concerns can lead to more involved discussion (potentially through focus groups) and evaluation (utilizing school team members such as from public works, health department, neighborhood associations, law enforcement).

For online and downloadable options of the Parent Survey, visit http://www.saferoutesinfo.org/program-tools/evaluation-parent-survey . If you need assistance in setting up an account, contact Julie Yip, Oregon SRTS Manager, 503-986-4196. Once data is entered, a downloadable summary report is immediately available at the same site.

SECTION 3: Assessing the modes of student travel, continued

Optional work to Section 3:

Additional Data Collection Activities

The following list includes other activities that have provided past grant recipients with valuable information about the ability of students to walk and bike to and from school. Please provide the results of any optional assessments conducted for the Plan.

Photographs and / or videos – tell the story that students do walk and/or bike to and from school. Take pictures or footage during BOTH arrival and departure times at the school. Decide in advance where the best vantage points will be to shoot the pictures to capture the representative images. Record locations and street directions, time of day, date. Present the pictures in an order that confirms your narrative and tells the story.

Interviews

School patrol or adult crossing guards; pupil transportation providers (school bus drivers, bus dispatchers); local law enforcement; local traffic or roadway engineers' familiar with the transportation system around the school

Observational survey

The School Team may wish to confirm the results of the Student Tally or may wish to do actual on-site observations of how students arrive and leave school.

This is a simple "tick mark" tally done by volunteer observers with clipboard and survey sheet at these areas:

- the school's bike rack area, if one exists
- at the crosswalks or pathways adjacent to the school
- at the bus and/or auto pick-up/drop-off area.

It is recommended that observations be made at least 15 minutes before the start of school until ten minutes after the bell rings. Reverse the process for after school. The observers record tick marks for each student observed as a Walker, Bicyclist, Other (for scooter, skateboard, in-line skates, wheelchairs), school or public bus rider, or motor vehicle rider. This should be repeated the same day at the end of school when children are leaving. Make sure the survey is dated, location noted, weather conditions noted, and the time periods of the survey.

This could be conducted for at least two days during a single week, not on Monday or Friday. The street assessments may bring up questions about the motoring environment on certain streets.

Traffic volume counts, posted speeds and actual speeds may be obtained from law enforcement or the local public works department to track motorist speeds and monitor traffic volume counts.

Traffic crash data may be obtained from your local public works department or the ODOT Transportation Safety Division Traffic Records Program. Crash data may also be available from your local law enforcement agency.

Crosswalk information may also be obtained from the School Safety Supervisor, school patrol members or adult crossing guards.

SECTION 4: Summarizing the findings

Using the information gathered in Section 3, it is now time for the School Team to analyze the collected maps, walking and biking audits and survey evaluation results to identify the barriers and hazards to children walking and bicycling to the school. Include:

- A list of physical barriers and hazards. (Examples: broken and uneven sidewalks; overgrown vegetation; narrow gravel shoulders and no bike lane or sidewalk on approach to school; in crosswalk from school, left or right-turn conflicts when pedestrians have the signal; school parking lot needs better pedestrian flow; bike racks in bad shape, not enough…)
- Evidence that there are households with students enrolled at the school who live within the mile walking distance for elementary school, or the 1.5 mile distance for middle school, who will benefit from proposed infrastructure enhancements. (Examples: printed scatter map, a map with hand-applied stickers showing enrolled students, correspondence from Pupil Transportation regarding households within the catchment area of school, etc.)
- A list of education/encouragement/enforcement barriers and hazards. (Examples: no crossing guard or school patrol at crosswalk across busy street; traffic exceeds 20 mph of school zone; walkable neighborhoods but parents prefer to drive students to school; no pedestrian safety information provided at school; no local enforcement.)

SECTION 5: Identifying the solutions and creating the Action Plan

Now that the issues have been identified, the School Team is ready to recommend solutions that make up the Action Plan. The expertise of the different School Team members and other interested parties and stakeholders will be especially valuable.

Careful consideration must be given for each SRTS component:

- *Engineering* – Creating operational and physical improvements to the infrastructure surrounding schools that reduce speeds and potential conflicts with motor vehicle traffic, and establish safer and fully accessible crossings, walkways, trails and bikeways. Engineering strategies are best used in conjunction with the remaining E's. Engineers typically like problem statements, not solutions. Your team identifies the problems; let the professionals suggest operational fixes.
  (Resource: National Center for Safe Routes to School website, http://www.saferoutesinfo.org/program-tools/search-resources *; search the keyword, "engineering."*
- *Education* – Teaching children about the broad range of transportation choices, instructing them in important lifelong bicycling and walking safety skills, proper walking and bicycling behaviors, and launching driver safety campaigns in the vicinity of schools.
  (Resource: the Oregon Safe Routes to School website, http://www.oregonsaferoutes.org/ *and the National Center for Safe Routes to School website,* http://www.saferoutesinfo.org/.
- *Encouragement* – Creating events, activities and ongoing programs to promote walking and bicycling and providing safe opportunities for parents and students to travel together and inspire each other.
  (Resource: the Oregon SRTS webpage, www.oregonsaferoutes.org ; at the national level, the National Center for Safe Routes to School website, http://www.saferoutesinfo.org/program-tools/search-resources and search under the keyword, "encouragement.")

- *Enforcement* – Partnering with local law enforcement to ensure traffic laws are obeyed within the 2-mile vicinity of schools (this includes enforcement of speeds, yielding to pedestrians and bicyclists on the road and in crossings) and initiating community enforcement such as crossing guard programs.
  (Resource: visit the Oregon Safe Routes to School website, http://www.oregonsaferoutes.org/ for local examples; visit the National Center for Safe Routes to School webpage, http://apps.saferoutesinfo.org/lawenforcement/ .
- *Evaluation* – Monitoring and documenting outcomes and trends through the collection of data, including the collection of data before and after the intervention(s).
  (Resource: visit the National Center for Safe Routes to School website, http://www.saferoutesinfo.org/program-tools/search-resources and type in keyword "evaluation.")

Guidance on the 5 E's is available online from the National Center for Safe Routes to School, http://www.saferoutesinfo.org/guide/index.cfm

SECTION 6: Submitting the Action Plan

Submit this completed document and all supplemental materials along with the Application for the Oregon Safe Routes to School Funding.

Implementation

Now that the School Team has completed and submitted the Action Plan, it is time to take action.

The process through which the Action Plan was created has given your new Safe Routes to School Task Force a chance to find out what resources and stakeholders are available to help achieve success. Even before your application is reviewed and possibly funded, there are undoubtedly activities that can begin immediately using existing staff, volunteers and resources.

In addition, the Safe Routes to School funds currently available from the federal government are most likely not enough by themselves to solve all of the needs of every Oregon community. They are intended to be a catalyst to build relationships, complete demonstration projects and show success, which will then inspire communities to find other resources.

Below are some of the tactics other communities have used to start a program without a large budget, or before acquiring dedicated Safe Routes to School funding:

Engineering

While there may be large projects that need to be funded, there are certainly smaller projects and activities that can be done without major funding. In fact, Safe Routes to School practitioners have found that it is often the smaller projects that can lead to early success, since they do not require lengthy planning and design phases, and can be integrated into a short program timeline.

Examples include: curb and crosswalk striping, minor repairs, pruning, signage, walking/biking route maps, arrival/departure improvements, bike racks, advanced limit lines, school zone changes, etc.

Various resources may already be accessible through local and state agencies. If agency staff are members of the School Team, they may have already offered help with certain projects.

Sometimes it is a matter of the "squeaky wheel getting the grease." Some projects may have already been planned, but just need to be fast-tracked.

(Resource: visit the National Center for Safe Routes to School website, http://www.saferoutesinfo.org/program-tools/search-resources and search the keyword, "engineering.")

Encouragement

If physical improvements are needed before children can safely walk or bike to school on a particular route, promote and/or organize fun walking and biking activities before, during or after school right on the school grounds or to/from an area nearby. These events and activities will help build excitement for walking and biking, so that when physical improvements are completed, there will be a ready audience of users.

Encouragement events will provide opportunities for students, parents and others to better understand local conditions, and to experiment with route options. This information can be used to develop a system of routes which can help define where engineering and enforcement work should take place. Maps can be created and made public when improvements are made.

Many parent barriers to walking and biking are based on personal safety, convenience and time. Also, with the rise in childhood obesity, walking and biking to school can be promoted as a solution to an inactive lifestyle. Encouragement activities are ideal for addressing these issues, in addition to creating community cohesiveness by bringing parents and neighbors together to help walk or bike kids to and from school. There is safety in numbers, especially when kids are accompanied by a trusted parent or other adult volunteer.

(Resource: for examples of local encouragement, visit the Oregon SRTS webpage, www.oregonsaferoutes.org , and at the national level, visit the National Center for Safe Routes to School website, http://www.saferoutesinfo.org/program-tools/search-resources and search under the keyword, "encouragement.")

Education

Classes or safety events such as bike rodeos, Safety Town, etc. are relatively inexpensive, and can be provided by school teachers, local volunteers or community groups such as bike clubs or university students, and by agencies such as police, health and fire departments.

Education events can also encourage students and parents to walk and bike to school.

(Resource: Oregon Safe Routes to School website, http://www.oregonsaferoutes.org/ ; National Center for Safe Routes to School website, http://www.saferoutesinfo.org/.)

Enforcement

Local police officials who are members of the School Team may be able to provide police services, or even additional services to help the Safe Routes to School effort. They may also be able to tell you how to get services from their department, or may advocate for services on behalf of the School Team.

Police services may not need to be funded through the Oregon Safe Routes to School program, since they may already have a local dedicated funding source.

More information on the Safe Routes to School and the 5E's of Education, Encouragement, Engineering, Enforcement and Evaluation can be found on the National Safe Routes to School website: *http://apps.saferoutesinfo.org/lawenforcement/*

Safe Routes to School: Creating an Action Plan

Template

Note: This document can be protected to prevent unintended changes to the form. If you wish to protect the template, go to the Forms toolbar (under VIEW, Toolbars, check the Forms toolbar). On the Forms toolbar, click on the LOCK symbol to enable protection. Click on the LOCK symbol to remove the protection.

SECTION 1: School information

School name:	**Whitcomb Elementary**				
Street address:	**7400 SE Thompson Road**				
City:	**Milwaukie**	State:	**OR**	ZIP:	**97222**
County:	**Clackamas County**	School district:	**North Clackamas School District**		
Type of school:	☒ Public school ☐ Private school ☐ Charter school				
School Web site (if any):	**www.nclack.k12.or.us**				
Total student enrollment:	**465**	Grades served:	**K-5**		
Percentage of total enrollment for each grade:					
Contact for Action Plan:	**Lori Mastrantonio**	Phone:	**503-742-4524**		
E-mail:	**LoriM@clackamas.us**				

SECTION 2: Forming the School Team

1. The key partners of the School Team are (Instructions, Page 1):

• School principal or designated school staff representative endorsed by the school district:	**Cathy Lehmann, Principal**
• A parent who represents or has the endorsement of a recognized school/parent organization or site council:	**Ryan Walker**
• City or county staff or representative endorsed by the local road authority: public works, planner, roadway engineer, etc.	**Christian Snuffin, Civil Engineer** **Scott Hoelscher, Transportation Planner**
• Member of the local traffic safety committee (if one exists):	**N/A**

2. Identify all other participants of the School Team (Instructions, Page 1):

• School or district representation: facilities, maintenance, pupil transportation, etc.	**Janet Alley, Deputy Director of Transportation - North Clackamas School District**
• Local government representation: council, commission, planner, law enforcement, EMS or fire department, bike/pedestrian advisory committee, transit agency, etc.	**Del Scharfenberg - Clackamas County Pedestrian/Bikeway Adviosry Committee**
• Community representation: neighborhood association, chamber of commerce or business association, bike/ped advocates, public health, community groups, non-profit organizations, rail, trucking industry, media, marketing, etc.	

SECTION 3: Assessing the modes of student travel

1. Briefly describe the school attendance area. Boundary maps may be available from the school district or can be downloaded and printed from the school website. If available, please include as supplemental information:

The attendance area for Whitcomb Elementary is bounded by I-205 on the east. Johnson Creek Boulevard is the northern boundary. The western boundary is less direct: from Johnson Creek Boulevard, the western boundary follows SE 73rd Avenue and then jogs around the eastern edge of the Giadanj Mobile Home Park. South of the mobile home park, the western boundary follows SE 72nd Avenue, Monroe Street and then bisects the large, undeveloped parcel west of Whitcomb Elementary as shown on the attached Attendance Area Map (Exhibit A). The southern boundary follows primarily SE Monterey Avenue. However, the west end of the southern boundary jogs south on Fuller and then due west between Christ the King School and LaSalle High School. The entire attendance boundary is shown on Exhibit A.

2. What is the school or the school district policy regarding students' mode of travel to school? Is there a "preferred method of travel" recommended by the school or the district's pupil transportation office? Are there any travel modes not allowed? Why?

The North Clackamas School District buses students, kindergarten through 8th grade who live more than 1 mile from their school and students 9th through 12th grade who live more than 1.5 miles from their school. There are no specific travel modes disallowed by Whitcomb Elementary School.

3. Does the school have a Supplemental Plan in place that allows students to be bused to school who live within the mile walking distance of the elementary school, or 1.5 miles for the middle school? If so, what are the health or safety reasons for the Plan?

The school district has historically made an assessment that allows students to be bused to school based on the following: usable width of shoulders, condition of the road shoulder, volume of traffic, type of street, terrain features affecting motorist visibility, width of the street, etc. The district is currently updating its walk zone analysis titled *2015-17 Walk Zone Project*. It's anticipated to be completed in 2017.

4. ☒ Mapping and brainstorming session held. Include copies of maps, including Scatter Maps, with Action Plan write-up.

We identified (check the statements that apply):

- ☒ the residential areas where students are known to walk and/or bike, within the one mile walking distance for elementary students or 1.5 mile distance for middle school students.
- ☒ the routes taken by students to and from school.
- ☒ the difficult street crossings and discussed possible alternate routes.
- ☒ off-road paths that are available for walking/biking to school.
- ☒ areas where School Patrol or Adult Crossing Guard assistance occurs or where it could be beneficial if provided.
- ☐ streets where heavy traffic congestion may be hazardous to walking and/or biking.
- ☒ the areas where School Bus transportation is available.
- ☐ the areas where Supplemental Busing for hazardous busing is available.
- ☒ the arrival/departure zone (for bus, staff and parent vehicles) and how the flow of traffic influenced the safety and convenience of students walking and biking to school.

5. We walked (or biked) around the routes students take to and from school (see Instructions, Page 3.):

a. What generalizations may be drawn from the information gathered on the "walkability" of the area around the school site?

The neighborhood around Whitcomb Elementary is characterized by older subdivisions that were platted and developed without sidewalks. Scattered sidewalk infill has occurred on some local neighborhood streets and there are sidewalks on arterial roadways - Fuller Road; King Road and SE 82nd Ave. The location of existing sidewalks is shown on the Sidewalk Inventory Map (Exhibit B). Although there are not continuious sidewalk facilities on local neighborhood roads, some streets are walkable due to the low traffic volumes. Because sidewalks were not constucted at the time of development, retrofiting will be expensive.

Safe walking to Whitcomb is also comprised by the presence of sidewalks on only one side of a primary walking route to the school - SE Thompson Road. There are continuous curb tight sidewalks on the south side of SE Thompson Road but no sidewalks on the north side. In addition, 74th Ave, a primary north-south street connecting Thompson Road and King Road, lacks sidewalks.

A portion of the walk zone for Whitcomb Elementary is east of Fuller Road. However, the lack of crosswalks and the relatively high speeds hinder the ability of students to walk to school from homes east of Fuller Road.

b. In what ways does the school promote pedestrian safety?

There is a designated area for parents to pick up and drop off students. There is a designated area for buses only to pick up and drop off students. An adult safety guard is present during student drop-off and pick-up in the parking lot to help ensure that students can safely maneuver their way to the school entrance from the parking area.

c. What generalizations may be drawn from the information gathered on the "bikeability" of the area around the school site?

Most of the streets around Whitcomb Elementary are classified as local streets on the County Road Functional Clasification Map. The area local streets are generaly low traffic streets which serve residential neighborhoods; they do not have separated bike facilities. The streets in the neighborhood that do have dedicated bike facilities are Fuller Road; King Road and Thompson Road. Existing facilities on these streets consist of narrow, substandard bike lanes. Due to the lack of off-street parking on the school property, vehicles often park within the bike lane on the south side of Thompson Road. During the November 17 am observational survey, Staff observed approximately 7 cars parked in the bike lane on the south side of Thompson. Staff notes the pavement is not painted with bike symbol stencils at this location which causes the bike lane to function as a road shoulder.In general, the bikeability around the school site is poor due to lack of street connectiviity and inadequate facilities for vulnerable users on the collector and arterial roadways.

d. Evaluate the bicycle facilities provided for the students' use:

County staff is not aware of bicycle facilities at Whitcomb Elementary School for students. No designated bike parking facilities on the school property were observed.

e. In what ways does the school promote bicycle safety?

County staff is not aware of any bicycle safety programs at Whitcomb Elementary School.

6. We conducted the In-Class Student Tally (see page 3 of Instructions) and this is how our students travel to and from school:

Travel Mode	Walk	Bike	School Bus	Family Vehicle	Carpool	Public Transit	Other
% of Students	13% am 16% pm	0.4 % am 0.4 % pm	59% a.m. 63% p.m.	25% am 17% pm	3% 3%	0% 0%	0%

7. We conducted the Parent Survey (see page 3 of Instructions).

Of the surveys that were returned, these are the TOP 5 Issues of parents whose students do NOT walk/bike to school:

- ☒ Distance
- ☐ Convenience of driving
- ☐ Time
- ☐ Before / after-school activities
- ☒ Traffic speed along route to school

- ☒ Traffic volume along route
- ☐ Adults to walk / bike with
- ☐ Sidewalks or pathways
- ☒ Safety of intersections & crossings
- ☐ Crossing guards
- ☒ Violence or crime
- ☐ Weather or climate

Section 4: Summarizing the findings

1. List the physical environmental barriers and hazards. (See Instructions, Page 5.)

Barriers and Hazards
Lack of continuous sidewalks - Sidewalk inventory performed at the start of the project showed that most streets lack sidewalks. See attached sidewalk map.
Lack of sidewalks on north side Thompson Road - the principal route to school.
Lack of any pedestrian or bicycle facilities on Monroe.St.
Lack of Crosswalks: One crosswalk located on Thompson at 74th Ave. near school property. Additional crosswalks should be considered at intersection of Fuller - Thompson and Fuller and Harmony. Parent surevey noted poor crosswalk markings as a barrier. Marked crosswalk is needed at Thompson Road and 77th.
Afternoon congestion - conflicts in the drop-off and pick-up areas results in a long queue of cars in school parking lot.
Bicycle facilities: vehicle parking in Thompson Road bike lanes create hazard. Bike lanes function more as a road shoulder due to lack of marking and vehicle parking.
Intersection sight distance: parking on Thompson Road limits intersection sight distance at school driveway and Thompson present potential conflicts between cars and bicycles.
Lack of adequate pedestrian connections from the south necesssitates use of Thompson Road.
Traffic Speeds: posted at 25 mph but observed speeds higher. Comment receieved during parent survey indicated that people drive too fast on Thompson to allow children to walk to school.
School Zone: wider school zone on Thompson should be considered. Parent survey - suggestion that Fuller Road needs a school zone all the way to King Road.

2. List the education/encouragement/enforcement barriers and hazards. (See Instructions, Page 5.)

Crossing guard -no crossing guard stationed at the Thompson St. crosswalk leading to the school property. A crossing guard should be stationed daily at the Thompson Road crosswalk.
Bike parking needed.
The lack of a strategy for encouraging childern to walk or bike to school is barrier at Whitcomb Elementary. There is no exsiting program to encourage walking and biking to school. County and School district should consider education and encouragement programs to raise awarness and encourage kids who want to walk or bike to school. The "Walking School Bus or Bicycle Train" (an adult supervised and led walk or bicycle ride) is one example of a tool that could be implemented fairly easily.

Section 5: Identifying the solutions and making the Action Plan

See Instructions, Pages 5-6, for details on how to complete this section, and consider the “Five E’s” in your response.

A. List the physical improvements and possible strategies for implementation. Provide evidence that there are students who live within the proposed project area who will benefit from proposed improvements

Quick Fixes

1) Vegetation removal at Thompson and Fuller.

2) No parking zone on Thompson.

Near Term Improvements:

School Zone signs on Thompson Road - advance crossing signs (MUTCD - S1-1; W16-9P

School zone is currently signed "SCHOOL DAYS 7AM-5PM. Look into whether a flasher would be appropriate.

Crosswalk improvements on Thompson Road at school property: landing on the north side.

Vehicle parking on Thompson - hinders sight distance to the west for vehicles exiting the school parking lot. Consider no parking zones on Thompson. Thompson vehicle parking also obstructs bike lane.

Potential crosswalk modifications for enhanced visibility: double up the School Crossing signs; replace yellow signs with fluorescent green signs.

A popular crossing location is at Thompson and Fuller, consider installing crosswalk treatment at this location.

Sight distance at Thompson and Fuller obstructed by trees/vegetation.

Crosswalk at Fuller and Harmony Drive.

Long Term Investments

Sidewalks on north side of Thompson Road

School Parking - Whitcombs off-street parking lot is at capacity which necessitates on-street parking on Thompson. Perhaps shared parking arrangement with church property to the east – Thompson Road Bible Fellowship.

Sidewalks on 74th Ave - popular walking route.

Oris Lane (unimproved ROW located south of Thompson) could be utilized as a school bus drop off in the future if it is improved. Oris Lane intersects with SE Fuller Road. Could relieve congestion on Thompson.

Landing area needed for people waiting for bus – 82nd and Glencoe.

Glencoe – need sidewalks between 82nd and 79th. Poor facilities (no sidewalks, decent waiting area) for children in the Glencoe area.

Lighting in Whitcomb school parking lot needed.

Pedestrian pathway at Mceachron and Maplehurst - improve access point: paved entrance; walkway to school.

B. List the needed safety enforcement/educational/encouragement programs and possible strategies for improvement:

There is potential to increase walking and biking to Whitcomb Elementary through various educational and encouragement strategies. Possible strategies and programs include:

Informational brochures: informational brochures / leaflets documenting the benefits of walking and biking could be distributed at the beginning of the school year. A map showing the safe walking and biking routes to Whitcomb could also be passed out to students.

Bicycle Transportation Alliance (BTA) Walk + Bike Youth Education program: The BTA teaches courses in 4-7 grade classrooms on bike safety and education.

Bicycle Rodeo: County staff has previously conducted "Bicycle Rodeos" to teach children basic handling, safety skills and rules of the road. This is an effective way to encourage biking to school.

C. Prioritize the strategies. Assign a time schedule for implementing these strategies. If there are areas earmarked for improvements, include maps identifying those areas:

Clackamas County has completed a street design for Thompson Road as part of the Monroe Neighborhood Street Design Plan. The design includes a shared-use path along south side of Thompson Road terminating at the eastern boundary of the school property. Additional improvements along Thompson Road east of the school property to Fuller Road include but are not limited to bicycle lanes, limited parking, speed bumps, improved/enhanced crossings, and sidewalks. Some of these improvements are part of Clackamas County's Transportation System Plan.

Section 6: Submitting the Action Plan

Submit this completed Action Plan Template and all supplemental materials including any optional collected information, along with the Safe Routes to School Application.

Optional Assessments Page – Not Required

You may use this page to record additional information for the school team's use.

1. ☐ Pictures and/or video footage were taken to document the barriers and hazards.

2. If information was gathered by interviewing additional sources, check all that apply:

   ☐ school patrol or crossing guard or safety supervisor
   ☐ law enforcement
   ☐ school bus driver or dispatcher
   ☐ local roadway or traffic safety engineer
   ☐ city or county planner

   Highlight information learned:

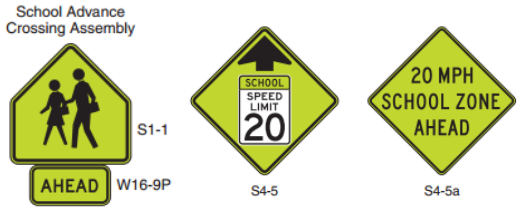
3. ☐ Check here if Observational Survey was completed.

   This is how our students travel to and from school:

Travel Mode	Walk	Bike	School Bus	Family Vehicle	Carpool	Public Transit	Other
# of Students							

4. Record any additional information gathered, such as traffic volume data, speed study data, etc.

Whitcomb Safe Routes to School: Infrastructure Projects

Whitcomb Safe Routes to School - Engineering		
ID #	***Project Recommendation & Location***	***Notes***
Immediate Term – Quick Fixes		
1-A	At least one parking space west of the school exit driveway will be removed along Thompson Rd to improve sight distance. The current condition is a safety concern as cars exit the onsite school parking area	
2-A	Engineering to evaluate school zone signs on SE Thompson Rd east and west of Whitcomb Elementary 	Engineering will evaluate the need for additional school signs and/or changing the type and location of existing signs.
3-A	Upgrade crosswalk directly north of the school at SE Thompson Rd and SE 74th Ave	Pavement repainting and installation of fluorescent yellow green sign assembly needed. Consider doubling up signs for enhanced visibility (i.e., install on both sides of the road for both approach directions).
4-A	Explore shared parking arrangement with Thompson Road Bible Fellowship Church.	South and west portion of church property may have available parking for elementary school staff. This could potentially free up some onsite school parking spaces.
5-A	Place temporary Radar Speed Monitor Sign on Thompson Rd	Effective at calming, slowing traffic.
6-A	Bike lane stencil pavement markings on SE Thompson Rd	New intermittent bike lane symbols would reinforce use of bike lanes space for cyclists. Engineering will evaluate location and use of bike lane stencil pavement markings on Thompson Rd.
7-A	Provide bicycle parking facilities for the school	
Near Term – Projects within 1-5 years		
1-B	Install *School Zone Flashing Beacon*	Improved signage (installation of flashing beacon on school zone speed limit) would increase visibility and effectiveness of school zone.
2-B	Crosswalk at SE Thompson Rd and SE 74th Ave: install short section of sidewalk and curb ramp on the north side and curb ramp on south side.	Short section of sidewalk and curb ramp on north side would allow students to enter crosswalk safely.
3-B	New marked crosswalk across south leg of SE Thompson Rd and SE Fuller Rd	Engineering details and features of crosswalk to be determined.

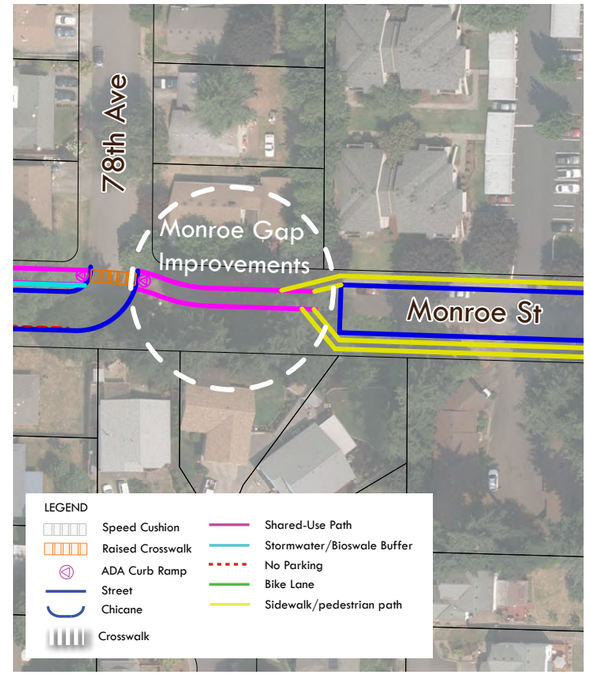
4-B	New crosswalk at SE Harmony Dr/SE Fuller Rd/Causey Avenue	Analysis needed by Engineering to determine if warranted. Consider use of refuge island. Details and features of crosswalk to be determined
5-B	Traffic calming on SE Thompson Rd	Speed cushions are recommended.
Long Term – Projects with a 5-10 (or longer) horizon		
1-C	Construct pedestrian facility on SE Thompson Rd between SE 72nd Ave and SE Fuller Rd	North side of street only.
2-C	Construct Sidewalks on SE 74th Ave between King Rd and Thompson Rd	Primary N-S route to school.
3-C	Improve Oris Lane as a shared use path.	Extent of proposed path improvement – between SE 77th Ave and school property.
4-C	Upgrade pedestrian accessway at SE Maplehurst Rd and SE Mceachron Ave and develop walkway to school building from access gate.	Facility upgrades at this location may encourage walking and biking to school.
5-C	Pedestrian facilities on Monroe St between SE Linwood Ave and 72nd Ave sidewalk or pedestrian side path	Facility type is a shared-use path on one side of road or sidewalks.
6-C	Install pedestrian facility on SE 77th Ave between SE Thompson Rd and SE Oris Ln.	Primary north-south route between Thompson Rd and Oris Lane.
7-C	Pedestrian facilities on SE 72nd Ave between SE Monroe St and SE Thompson Rd	Facility type is a shared-use path on one side of road.

Note: Infrastructure project list based on the following: Parent Survey; Mapping Exercise; meetings with school and district officials; meeting with Madres de Corazon parent organization; walking/driving tour of the area and staff observations during morning and afternoon drop off and pick up.

Design Elements

Section A: Monroe Street—Linwood Avenue to Fuller Road

The Monroe Gap



Monroe Gap as it exists during the writing of this plan. Photo: CH2M (2015)

Figure 4.11 Conceptual rendering of Monroe Gap. Bollards prevent automobiles from driving through while preserving emergency vehicle access. The 12-foot path is bordered by natural landscaping on both sides.

Monroe Gap Improvements

The *Monroe Neighborhood Street Design Plan* recommends that the Monroe Gap just east of 78th Avenue be improved to accommodate an enhanced bicycle and pedestrian-only connection to the I-205 Multi-Use Path and regional trail systems A 12-foot path follows the roadway centerline through the Gap itself.

Design considerations for improving the Monroe Gap could include guidelines for improving safety in public spaces, such as Crime Prevention Through Environmental Design (CPTED) principles.[7] 'Flexible' bollards that can be removed or lowered to allow emergency vehicle access will restrict vehicle access through the Gap. Alternative path treatments through the Gap should also be considered, including pervious pavement and stormwater management features. The County may also explore opportunities to engage community-based partners and residents to help landscape and maintain the Gap.

The Clackamas Regional Center Design Plan in the Clackamas County Comprehensive Plan envisions a road improvement connecting Monroe to 82nd Avenue in the long term. In addition, the future functional classification of the road is identified as a Connector in the County Transportation System Plan. The 20-year Capital Improvement Plan, however, does not include a vehicular access improvement project making this connection. The projects in the 20-year Capital Improvement Plan focus on pedestrian and bikeway improvements in this area. Since a vehicular connection was not identified as needed within the 20-year timeframe, the Monroe Design Plan recommends improving the "Monroe Gap" for bicycles and pedestrians only at this time. If, based on traffic conditions, improving vehicle circulation and connectivity becomes necessary in the future, connecting the eastern section of Monroe Street with the section west of the gap for automobile traffic could occur. The existing 60-foot right-of-way could be utilized to design a cross-section that safely accommodates all modes of transportation.

7. http://www.cpted.net/

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Appendix B

SUMMARY OF SUPPORTING DOCUMENTS

CITIZEN INVOLVEMENT

Citizen and Agency Involvement Program.

Clackamas County Citizen Involvement Program. Comprehensive Plan Chapter 2.

Committee for Citizen Involvement Bylaws.

Committee for Citizen Involvement Roster.

Community Planning Organization Leaders. Lists and maps of CPO areas.

NATURAL RESOURCES AND ENERGY

Clackamas County Energy Project Publications, 1983:

1. An Energy Anthology
2. Clackamas County Energy Use and Supply Background Data
3. Clackamas County Energy Management Plan
4. Technical Memorandum, Energy Emergency Planning
5. Technical Memorandum, County Buildings
6. Technical Memorandum, County Motor Fleet
7. Technical Memorandum, County Organization

Clackamas County Resources Atlas, Clackamas County Dept. of Environmental Services, Planning Division. Includes maps of the following:

General Resources

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Agricultural Land Types and Major Production Areas

Forest Zones and Vegetative Types

Cubic Foot Forest Site Classes

Forest Ownerships

Urban Forest Cover

Detailed SCS Soil Mapping Index

Unique National and Scenic Features

Open Urban Land Inventory

Park and Recreation Facilities; Historic and Cultural Sites

Fisheries and Wildlife Habitats

Aggregate Sites

Groundwater Studies Index

Geologic Hazards, Northwest Clackamas County

River Corridors, Existing Conditions and Management Strategies

Precipitation and Physiography

Draft Third Biennial Energy Plan, Action Plan and Recommendations, Oregon Department of Energy, October 1988.

Environmental Geology of the Kellogg Creek-Mt. Scott Creek and Lower Clackamas River Drainage Areas, Northwestern Clackamas County, Oregon, M.S. Thesis, Matthew John Brunego, March, 1978.

Federal Land Resource/Management Plans - Mt. Hood National Forest, Draft EIS, U.S. Forest Service, 1988; and Eastside Salem District Planning Area Land Use Plan (Clackamas Unit), Bureau of Land Management, 1982.

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Fish and Wildlife Habitat Protection Plan for Clackamas County, Oregon Department of Fish and Wildlife, 1979.

Geologic Hazards of the Bull Run Watershed, Multnomah and Clackamas Counties, Oregon, Oregon Bulletin 82. Oregon Department of Geology and Mineral Industries, 1974.

Geology and Geologic Hazards of Northwestern Clackamas County, Oregon Bulletin 99, Oregon Department of Geology and Mineral Industries, 1979.

Geology and Ground Water of the Molalla-Salem Slope Area, Northern Willamette Valley, Oregon, U.S. Geological Survey, 1967.

Ground Water Resources in the French Prairie Area, Northern Willamette Valley, Oregon, U.S. Geological Survey, 1967.

Ground Water Resources in the East Portland Area, Oregon, U.S. Geological Survey, 1965.

Lakes of the Mt. Hood National Forest, Oregon Dept. of Fish and Wildlife and U.S. Forest Service, N.D.

National Wetlands Inventory, U.S. Dept. of the Interior, Fish and Wildlife Service, Individual Quad Maps Covering Clackamas County, 1981 to date.

1980 Major Water Tables Aquifers Map, supplied by Oregon Dept. of Environmental Quality, N.D.

1984 Census of Agriculture, U.S. Dept. of Commerce, Bureau of the Census, Vol. 1, part 36.

Oregon Air Quality, 1988 Annual Report, Dept. of Environmental Quality, Air Quality Control Division, Portland, Oregon.

Oregon Natural Areas Clackamas County, Oregon, Natural Heritage Program, the Nature Conservancy, 1977.

Oregon Nongame Wildlife Management Plan (Revised Draft), Oregon Dept. of Fish and Wildlife, June, 1984.

Oregon Outdoor Recreation "SCORP '83", State Parks and Recreation, Oregon Dept. of Transportation, 1983.

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Oregon's Statewide Assessment of Nonpoint Source Problems, Oregon Dept. of Environmental Quality, 1978.

Planning Background Report, Energy; Clackamas County Dept. of Environmental Services, Planning Division.

Planning Background Report, Natural Hazards; Clackamas County Dept. of Environmental Services, Planning Division.

Planning Background Report, Natural Resources; Clackamas County Dept. of Environmental Services, Planning Division.

Planning Background Report, Rivers; Clackamas County Dept. of Environmental Services, Planning Division.

Preliminary Willamette River Greenway, Royston, Hanamoto, Beck and Abey, 1974.

Regional Urban Wildlife Habitat Maps, U.S. Army Engineer District Portland Corps of Engineers, 1978.

Review of Land, Water, Air Quality and Noise Control, 1980-88, Clackamas County Planning and Economic Development Division, 1988.

Rock Material Resources of Clackamas, Columbia, Multnomah and Washington Counties, Oregon, Oregon Dept. of Geology and Mineral Industries, 1978.

State Comprehensive Outdoor Recreation Plan, Technical Documents I, II, and III; ODOT, Parks and Recreation Branch.

Timber for Oregon's Tomorrow, Oregon State University School of Forestry, Beuter, John H.; Johnson, K. Norman; Scheurman, H. Lynn; Research Bulletin 19, January 1976.

U.S. Dept. of Agriculture Forest Service, "Timber Resource Statistics for Northwest Oregon," Basset, Patricia M.; preliminary copies of unpublished report, 1979.

Water Resources Data for Oregon 1976, 1977, U.S. Geological Survey.

Well Hydrographs Clackamas County, Oregon, Oregon Water Resources Dept., unpublished.

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Wilderness Management Plan for the Table Rock Wilderness (Draft), U.S. Dept. of the Interior, Bureau of Land Management, 1986.

Willamette Greenway Plan, Bureau of Planning, Portland, Oregon, November, 1987.

The Willamette River Greenway, Oregon State Parks and Recreation Branch, Dept. of Transportation.

LAND USE

Comprehensive Plan, Clackamas County, Oregon, Planning Dept., Clackamas County, August, 1974.

Comprehensive Plan, Clackamas County, Oregon, Planning Dept., Clackamas County, June, 1980.

Comprehensive Plan Update, The Sunnyside United Neighbors, June 30, 1988, Revised August 22, 1988.

Comprehensive Plan, Clackamas County, Oregon, Planning Dept., Clackamas County, June 1992.

Let's Build A Revised Comprehensive Plan for Clackamas County, Dept. of Environmental Services, Clackamas County, January, 1979.

Sunrise Center Task Force, Clackamas County, December, 1987.

Clackamas County Rural Cities Population Coordination Background Report and Forecasts, Clackamas County, *Final: March 12, 2013*.

TRANSPORTATION

5 Year Transportation Capital Improvement Plan, Fiscal Years 1996-2000, Clackamas County, July, 1996.

Capital Improvement Plan, 5-Year Capital Improvement Program, FY 1998/99 to 2002/03, 20-Year Long Range Transportation Plan, 1998 to 2008, December 1998.

Getting There by Bike, Metropolitan Services District, Metro, 1988.

Handbook for Environmental Quality Elements of Land Use Plans, Air Quality, Oregon Dept. of Environmental Quality, 1978.

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I-5/Canby/Highway 213 Access Improvement Study, Clackamas County Dept. of Transportation and Development, 1987.

Oregon Action Plan for Transportation, Oregon Dept. of Transportation, 1989.

Planning Background Report: Transportation, Clackamas County Dept. of Environmental Services, Planning Division, 1979.

Planning With Transit, Tri-Met, 1979.

Public-Private Task Force on Transit Finance, Policy Report, Barney and Worth, Inc., 1988.

Regional Bicycle Plan, Metropolitan Service District, August 1983.

Regional Transportation Plan, Metropolitan Service District, 1989.

Six-Year Highway Improvement Program 1989-1994, Oregon Dept. of Transportation, 1988.

State of Oregon Bicycle Master Plan, Oregon Dept. of Transportation, Highway Division, March 15, 1988.

Oregon Bicycle and Pedestrian Plan, Oregon Department of Transportation, Highway Division, June 14, 1995.

Sunnyside I-205 Split Diamond Interchange, Clackamas County Dept. of Transportation and Development, 1988.

Sunnyside Road, (I-205 to SE 172nd Avenue) Environmental Assessment. Clackamas County, August 21, 1998.

Sunrise Corridor Reconnaissance Study, Oregon Dept. of Transportation, Highway Division, Region 1, 1987.

A Systems Analysis of Major Regional Transportation Corridors, MSD, 1979.

Transportation Involvement Program, Metropolitan Service District, 1987.

Transportation Plan Background Document, Clackamas County Dept. of Transportation and Development, September 2013.

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Clackamas County Transportation Safety Action Plan, Kittelson & Associates, July 2013.

Clackamas County ITS (Intelligent Transportation System) Action Plan, DKS Associates, May 2011.

Tri-Met Five-Year Transit Development Plan, Tri-Met, 1987.

SE 172nd Avenue/ SE190th Drive Corridor Management Plan, Appendix A - Environmental Baseline Report, MB&G, Inc., September 20, 2011

SE 172nd Avenue/ SE190th Drive Corridor Management Plan, Appendix B – Analysis of Preferred Alternative

SE 172nd Avenue/ SE190th Drive Corridor Management Plan, Appendix C – 15% Design Plans, Alignment Alternative AT2, Clackamas County, October 24, 2011

SE 172nd Avenue/ SE190th Drive Corridor Management Plan, Appendix E – Corridor Centerline Survey, November 10, 2011

Clackamas County Active Transportation Plan, Appendices A through F

Monroe Neighborhood Street Design Plan, 2016

HOUSING

Background Report for the Clackamas County Comprehensive Plan Update 1989, Goal 10 - Housing, Clackamas County Dept. of Transportation and Development, Economic Development Section, 1989.

Plan for Community Development, Clackamas County Dept. of Environmental Services, Planning Division, 1979.

The Regional Forecast, Population, Housing and Employment Forecast to 1995 and 2010, Metropolitan Service District, 1989.

PUBLIC FACILITIES AND SERVICES

Clackamas County School Directory 1988-1989, Education Service District, 1988.

Table 5-3a 20-Year Capital Projects

Project ID	Map	Project Name / Street Name	Segment / Locations	Project Description
1000	County-wide	ITS Plan Program	N/A	Develop a program to support the implementation of the County's ITS Plan and support the County's efforts to make improvements to traffic operations based on the ITS Plan. Deploy traffic responsive signal timing, ramp metering, traffic management equipment for better routing of traffic during incidents along the three key ODOT corridors - I-205, I-5, 99E. Install signal controller upgrades and update County ITS plan.
1001	County-wide	Transportation Safety Action Plan Program	N/A	Develop a program to support the implementation of the County's TSAP and support the County's efforts to make improvements based on the outcomes of the road safety audits and other safety studies.
1002	5-11a	122nd Ave	Eagle Glen Dr to Hubbard Rd	Perform road safety audit or transportation safety review to identify appropriate safety improvements
1003	5-11a	122nd Ave	Sunnyside Rd to Hubbard Rd	Fill gaps in pedestrian facilities, turn lanes at Mather Rd
1004	5-11a	122nd Ave	Sunnyside Rd to Timber Valley Dr	Add bikeways and turn lanes at major intersections
1005	5-11a	132nd Ave	Sunnyside Rd to OR 212	Add bikeways, pedestrian facilities, traffic calming and turn lanes at major intersections
1006	5-11a	142nd Ave	Sunnyside Rd to OR 212	Add bikeways and pedestrian facilities
1007	5-11a	72nd Ave Multi-Use Path Connection	Thompson Rd to Harmony Rd	Construct multi-use path
1008	5-11a	82nd Dr	OR 212 to Lawnfield Rd	Fill in bikeway~~s~~ and pedestrian facilities gaps
1009	5-11a	85th Ave	Causey Ave to Monterey Ave	Add sidewalks and bikeways. Perform Pedestrian Safety Audit to verify lighting, crosswalk striping and signing at Causey Ave.
1010	5-11a	92nd Ave	Johnson Creek Blvd to Emmert View Ct	Fill gaps in pedestrian facilities
1011	5-11a	97th Ave / Mather Rd	Lawnfield Rd to Summers Ln	Add bikeways, pedestrian facilities and eastbound left turn lanes at Mather Rd / Summers Ln
1012	5-11a	Boyer Dr	OR 213 to Fuller Rd	Construct new 2 lane roadway with turn lanes at OR 213 and Fuller Rd, bikeways and pedestrian facilities; install flashing yellow arrow for left turns on northbound and southbound approaches at OR 213 intersection.
1013	5-11a	Boyer Dr / 85th Ave / Spencer Dr	OR 213 to I-205 bike path	Add bikeways in accordance with the Active Transportation Plan.
1014	5-11a	Causey Ave	Fuller Rd to I-205	Add bikeways and shared facility markings in accordance with the Active Transportation Plan.
1015	5-11a	Clackamas Industrial area multi-modal improvements	N/A	Complete bike and pedestrian connections within the Clackamas Industrial area on Jennifer St., Evelyn St., 106th Ave, 122nd Ave, 130th Ave and 135th Ave.
1016	5-11a	Clackamas Regional Center Bike/Pedestrian Corridors	N/A	Construct pedestrian and bike improvements as described in the Clackamas Regional Center Pedestrian / Bicycle Plan
1017	5-11a	Clackamas Town Center Alternative Performance Standards Study	Clackamas Regional Center	Develop alternative performance standards for the intersections within the Clackamas Regional Center.
1018	5-11a	Clackamas Town Center Circulation Plan	West of the Town Center	Study area circulation and create plan
1019	5-11a	Flavel Dr	Alberta Ave to County boundary	Add bikeways in accordance with the Active Transportation Plan.

Table 5-3a 20-Year Capital Projects

Project ID	Map	Project Name / Street Name	Segment / Locations	Project Description
1020	5-11a	Fuller Rd	Otty St to Johnson Creek Blvd	Add pedestrian facilities, turn lanes, on-street parking, central median and landscaping.
1021	5-11a	Fuller Rd / King Rd Improvements	Fuller Rd / King Rd intersection	Restrict access to right-in/right-out only
1022	5-11a	Harmony Rd	OR 213 to OR 224	Construct bikeways and pedestrian facilities. Linwood Ave to Aquatic Center, construct in accordance with the Active Transportation Plan. Provide left turn movement for cyclists from Harmony Rd to CCC Harmony Campus and a pedestrian crossing.
1023	5-11a	Harmony Rd	Railroad Ave / Linwood Ave / Harmony Rd	Railroad crossing and intersection improvements based on further study of intersection operations including bikeways and pedestrian facilities to be undertake jointly by the City of Milwaukie and the County
1024	5-11a	Harmony Rd / Sunnyside Rd	Harmony Rd / Sunnyside Rd / OR 213 intersection	Extend queue storage and double left turn lanes on westbound approach and rebuild median, including pedestrian island; extend queue storage on eastbound approach and install median; convert to right-in-right-out accesses on frontage road.
1025	5-11a	I-205 Multi-Use Path Connection	Between Sunnyside Rd and Sunnybrook Blvd	Construct ADA compliant access to the commercial area from the I-205 Multi-Use Path
1026	5-11a	I-205 Multi-Use Path Gap	OR 224/OR 213 to OR 212	Study the I-205 multi-use path gap to create a plan for connection and path completion in accordance with the Active Transportation Plan
1027	5-11a	Johnson Creek Blvd	55th Ave to I-205	Perform road safety audit or transportation safety review to identify appropriate safety improvements
1028	5-11a	Johnson Creek Blvd	Johnson Creek Blvd near 79th Pl	Add signal to either Johnson Creek Blvd and 79th Pl or 80th Ave
1029	5-11a	Johnson Creek Blvd	55th Ave to Bell Ave	Widen to 3 lanes with bikeways and pedestrian facilities
1030	5-11a	Johnson Creek Blvd	Johnson Creek Blvd / OR 213 intersection	Extend westbound left-turn lane and rebuild median; install dual northbound and southbound left-turn lanes
1031	5-11a	Johnson Creek Blvd	OR 213 to 92nd Ave	Add pedestrian facilities with a crossing near 77th Ct, restripe for bikeways. Analyze for turn lane improvements at 92nd Ave.
1032	5-11a	Johnson Rd	SE Lake Rd to North Clackamas Park Trail	Identify bike/pedestrian connections to fill gaps along 82nd Ave
1033	5-11a	Lake Rd	Lake Rd / International Way intersection	Add northbound right-turn lane
1034	5-11a	Linwood Ave	Monroe St to Johnson Creek Blvd	Add pedestrian facilities in accordance with the Active Transportation Plan.
1035	5-11a	Monroe St	Linwood Ave ~~72nd Ave~~ to Fuller Rd	Add bikeways, pedestrian facilities and traffic calming in accordance with the Active Transportation Plan
1036	5-11a	~~Monroe St /~~ 72nd Ave / Thompson Rd ~~/ Fuller Rd~~	~~Linwood Ave~~ Monroe St to ~~Causey Ave~~ Fuller Rd	Add bikeways, pedestrian facilities and traffic calming in accordance with the Active Transportation Plan
1037	5-11a	Monterey Ave	Stevens Rd to Bob Schumacher Rd	Construct collector roadway with bikeways and pedestrian facilities
1038	5-11a	Monterey Ave	OR 213 to Fuller Rd	Construct new 2 lane extension with pedestrian facilities and bikeways. Install flashing yellow arrow for left-turns on northbound and southbound approaches at OR 213 intersection.
1039	5-11a	North Clackamas Regional Park Trail	Linwood Ave to North Clackamas Park Complex	Construct multi-use path
1040	5-11a	North Clackamas Regional Parks Trail	OR 213 to Linwood Ave	Construct multi-use path

Table 5-3a 20-Year Capital Projects

Project ID	Map	Project Name / Street Name	Segment / Locations	Project Description
1041	5-11a	Otty Rd	OR 213 to 92nd Ave	Improve to minor arterial standard consistent with Fuller Road Station Plan; improve curb radius; add turn lanes, on-street parking, central median, landscaping, bikeways and pedestrian facilities. Install pedestrian crossings between Fuller Rd and I-205 and near 91st Ave.
1042	5-11a	Otty St	Otty St / OR 213 / Otty Rd	Realign Otty St with Otty Rd at OR 213; install dual westbound left-turn lanes; install flashing yellow arrow for left-turns on northbound and southbound approaches.
1043	5-11a	Southwest Connector Multi-Use Path	North Clackamas Aquatic Center access road to 82nd Ave	Construct multi-use path in accordance with the Active Transportation Plan.
1044	5-11a	Springwater Rd	OR 224 to Hattan Rd	Widen to 3 lanes with shoulders (in accordance with the Active Transportation Plan between Clackamas River Dr and Gronlund Rd) and pedestrian facilities; bridge remains two lanes
1045	5-11a	Sunnyside Rd	93rd Ave to 126th Ave	Perform road safety audit or transportation safety review to identify appropriate safety improvements
1046	5-11a	Sunnyside Rd	Sunnyside Rd / Stevens Rd intersection	Intersection improvements, such as additional turn lanes, turn lane extensions, and/or signal timing modifications
1047	5-11a	Tolbert St Overcrossing	82nd Dr to Industrial Way	Construct new 2 lane overcrossing with bikeways and pedestrian facilities
1048	5-11b	282nd Ave	US 26 to OR 212	Perform road safety audit or transportation safety review to identify appropriate safety improvements
1049	5-11b	Amisigger Rd / Kelso Rd	OR 224 to Kelso / Richey Rd	Add paved shoulders; turn lanes at Amisigger/OR 212 and Kelso/Richey; smooth curves.
1050	5-11b	Arrah Wanna Blvd	US 26 to Fairway Ave	Add paved shoulders
1051	5-11b	Cazadero Multi-Use Trail	Community of Boring to City of Estacada	Construct multi-use path in accordance with the Active Transportation Plan.
1052	5-11b	Compton Rd	US 26 to 352nd Ave	Perform road safety audit or transportation safety review to identify appropriate safety improvements
1053	5-11b	Dodge Park Rd Bridge	~192 feet south of Pipeline Rd	Replace bridge nearing the end of its useful life and include paved shoulders
1054	5-11b	Eagle Creek Rd	Firwood Rd to Duus Rd	Perform road safety audit or transportation safety review to identify appropriate safety improvements
1055	5-11b	Eagle Creek Rd	Currin Rd to Duus Rd	Remove horizontal curve, relocate intersection, add paved shoulders and turn lanes at major intersection; investigate speed zone south of Currin Rd
1056	5-11b	Fairway Ave	Arrah Wanna Blvd to Salmon River Rd	Add paved shoulders
1057	5-11b	OR 211	OR 211 / Judd Rd intersection	Realign roadway
1058	5-11b	Richey Rd	Kelso Rd to OR 212	Add paved shoulders and left turn lane at Richey Rd and OR 212
1059	5-11b	Welches Rd	US 26 to Birdie Ln	Add paved shoulders; add pedestrian facilities in Welches rural center
1060	5-11c	Aldercrest Dr	Thiessen Rd to Oatfield Rd	Perform road safety audit or transportation safety review to identify appropriate safety improvements
1061	5-11c	Concord Rd	River Rd to Oatfield Rd	Fill gaps in pedestrian facilities
1062	5-11c	Concord Rd	River Rd to Oatfield Rd	Add turn lanes at major intersections
1063	5-11c	Courtney Ave	OR 99E to Oatfield Rd	Fill gaps in pedestrian facilities and bikeways
1064	5-11c	Courtney Ave	River Rd to OR 99E (McLoughlin Blvd)	Construct pedestrian facilities / complete gaps on the south side; add bikeways
1065	5-11c	Harold Ave	Concord Rd to Roethe Rd	Add pedestrian facilities and traffic calming

Table 5-3a 20-Year Capital Projects

Project ID	Map	Project Name / Street Name	Segment / Locations	Project Description
1066	5-11c	Hull Ave	Wilmot St to Tims View Ave	Fill gaps in pedestrian facilities
1067	5-11c	Jennings Ave	Webster Rd to OR 99E	Perform road safety audit or transportation safety review to identify appropriate safety improvements
1068	5-11c	Jennings Ave	River Rd to Oatfield Rd	Widen to 2-lane urban minor arterial standard with bikeway and pedestrian facilities infill
1069	5-11c	Oak Grove Blvd	Oatfield Rd to River Rd	Fill gaps in pedestrian facilities and bikeways
1070	5-11c	Oatfield Rd	Jennings Ave to Lake Rd	Perform road safety audit or transportation safety review to identify appropriate safety improvements
1071	5-11c	Oatfield Rd	Oatfield Rd / Park Rd intersection	Install traffic signal and add turn lanes
1072	5-11c	Oatfield Rd	Oatfield Rd / McNary Rd intersection	Add southbound and eastbound left-turn lanes
1073	5-11c	Park Ave	River Rd to OR 99E (McLoughlin Blvd)	Add pedestrian facilities
1074	5-11c	River Rd	Lark St to Courtney Ave	Add pedestrian facilities
1075	5-11c	River Rd	Oak Grove Blvd to Risley Ave	Fill gaps in bikeways in accordance with the Active Transportation Plan and fill gaps in pedestrian facilities
1076	5-11c	School Pedways	Johnson Rd / Clackamas Rd / Webster Rd	Fill gaps in pedestrian facilities on Johnson Rd, Clackamas Rd and Webster Rd within 1/4 mile of schools
1077	5-11c	Thiessen Rd	Thiessen Rd / Aldercrest Rd intersection	Add turn lanes on Thiessen Rd; consider converting to two-way stop controlled
1078	5-11c	Torbank Rd	River Rd to Trolley Trail	Fill gaps in pedestrian facilities
1079	5-11d	65th Ave	65th Ave / Elligsen Rd / Stafford Rd intersection	Construct roundabout
1080	5-11d	Advance Rd	53rd Ave to 43rd Dr	Grade and sight distance improvements
1081	5-11d	Borland Rd	Tualatin city limits to Stafford Rd	Add paved shoulders in accordance with the Active Transportation Plan and turn lanes at major intersections
1082	5-11d	Borland Rd	Stafford Rd to West Linn city limits	Add paved shoulders in accordance with the Active Transportation Plan
1083	5-11d	Carman Dr	Lake Oswego city limits to Roosevelt Ave	Add bikeways and pedestrian facilities; analyze for turn lanes
1084	5-11d	Childs Rd	Sycamore Ave to 65th Ave	Transfer roadway to local jurisdiction
1085	5-11d	French Prairie Bridge	Willamette River near I-5	Construct a bridge in accordance with the Active Transportation Plan
1086	5-11d	Rosemont Rd	Stafford Rd to West Linn	Add paved shoulders and turn lanes at major intersections
1087	5-11d	Stafford Rd	I-205 to Boeckman Rd / Advance Rd	Perform road safety audit or transportation safety review to identify appropriate safety improvements
1088	5-11d	Stafford Rd	Rosemont Rd to I-205	Add paved shoulders in accordance with the Active Transportation Plan and turn lanes at major intersections
1089	5-11d	Stafford Rd	Stafford Rd / Childs Rd intersection	Install traffic signal and southbound and northbound turn lanes or roundabout
1090	5-11d	Stafford Rd	Rosemont Rd to I-205	Perform road safety audit or transportation safety review to identify appropriate safety improvements
1091	5-11d	Tonquin Trail	Willamette River through Wilsonville	Construct bike / pedestrian facilities pursuant to the Tonquin Trail Master Plan

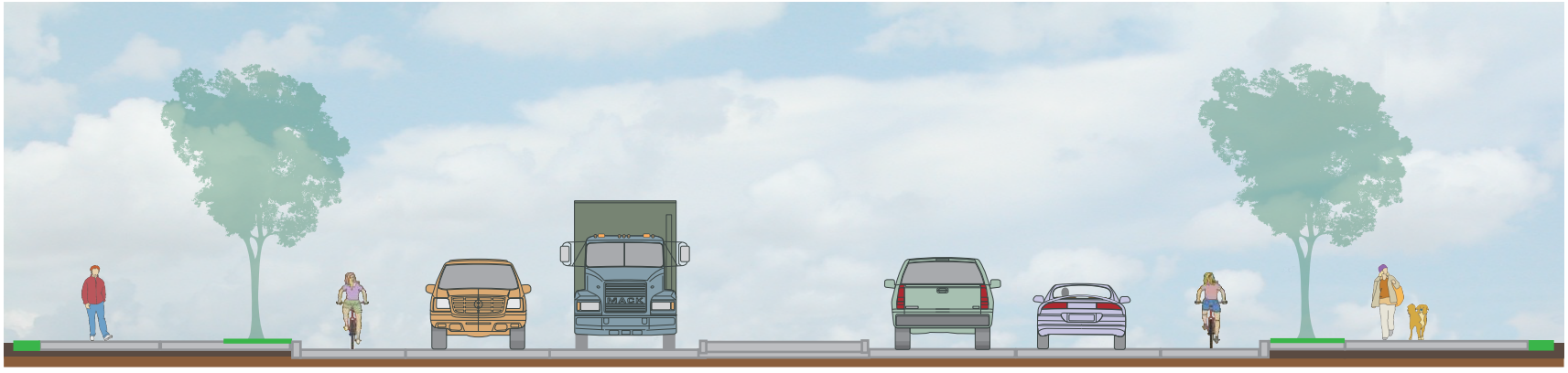
Table 5-3a 20-Year Capital Projects

Project ID	Map	Project Name / Street Name	Segment / Locations	Project Description
1092	5-11d	Wilsonville Rd / Ladd Hill Rd	Wilsonville Rd / Ladd Hill Rd	Install Collision Countermeasure System
1093	5-11e	Airport Rd	Airport Rd / Miley Rd intersection	Install traffic signal
1094	5-11e	Barlow Rd	Barlow Rd / OR 99E intersection	Add dual left-turn lanes on southbound Barlow Rd
1095	5-11e	Beavercreek Rd	Lower Highland Rd to Butte Rd	Perform road safety audit or transportation safety review to identify appropriate safety improvements
1096	5-11e	Beavercreek Rd	Ferguson Rd to Spangler Rd	Perform road safety audit or transportation safety review to identify appropriate safety improvements
1097	5-11e	Beavercreek Rd	Henrici Rd to Yeoman Rd/Steiner Rd	Add paved shoulders in accordance with the Active Transportation Plan and turn lanes at major intersections.
1098	5-11e	Beavercreek Rd	Beavercreek Rd / Leland Rd / Kamrath Rd intersection	Construct roundabout with additional analysis
1099	5-11e	Canby-Marquam Highway	Canby-Marquam Hwy / Lone Elder Rd intersection	Reconstruct intersection; install northbound left-turn lane and southbound right-turn lane
1100	5-11e	Canby-Marquam Highway	~1,900 ft south of Barnards Rd	Replace bridge nearing the end of its useful life with 2-lane structure including paved shoulders
1101	5-11e	Clarkes Four Corners Intersection	Beavercreek Rd / Unger Rd	Reconstruct intersection
1102	5-11e	Emerald Necklace Trail	To Canby Ferry	Extend Molalla Forest Rd to Locust St in accordance with the Active Transportation Plan.
1103	5-11e	Ferguson Multi-Use Path	Thayer Rd to Ferguson Rd	Multi-use path to connect Ferguson Rd to Thayer Rd
1104	5-11e	Fischers Mill Rd	Fischers Mill / Hattan Rd intersection	Install eastbound left-turn lane
1105	5-11e	Graves Rd/Passmore Rd/Mulino Rd/ OR 213	Graves Rd/Passmore Rd/Mulino Rd/ OR 213	Work in conjunction with the Molalla River School District, ODOT and community stake-holders to complete a safety audit to look at all options for the safe movement of Mulino Elementary School students in relation to the adjacent transportation system. Utilize the results from the audit to develop a list of projects and/or programs to maximize safety for all users.
1106	5-11e	Greater Arndt Rd/I-5/Canby Access Feasibility Study	Southwest County in the vicinity of Arndt Rd/I-5/Canby	Conduct an alternatives analysis and land use study to identify and consider roadway improvements to address access to I-5 within the Southwest County and address capacity deficiencies.
1107	5-11e	Hattan Rd	Hattan Rd / Gronlund Rd intersection	Install southbound right-turn lane
1108	5-11e	Henrici Rd	Beavercreek Rd to Ferguson Rd	Add paved shoulders and turn lanes at major intersections. Remove horizontal and vertical curves
1109	5-11e	Holly St	Territorial Rd to Canby Ferry	Add paved shoulders in accordance with the Active Transportation Plan.
1110	5-11e	Hult Rd	OR 211 to Unger Rd	Re-open and improve Hult Rd
1111	5-11e	Klang's Mill Bridge	~1,000 ft north of OR 211	Replace bridge nearing the end of its useful life
1112	5-11e	Lone Elder Rd Bridge	~5,800 feet east of Barlow Rd	Replace bridge (nearing the end of its useful life) and include paved shoulders
1113	5-11e	Maplelane Rd	Beavercreek Rd to Ferguson Rd	Perform road safety audit or transportation safety review to identify appropriate safety improvements
1114	5-11e	Meridian Rd	Meridian Rd / Whiskey Hill Rd intersection	Limit access/egress points to and from school on NE corner of intersection

Table 5-3a 20-Year Capital Projects

Project ID	Map	Project Name / Street Name	Segment / Locations	Project Description
1115	5-11e	Molalla Ave Flooding	Just south of city of Molalla	Construct bridge to resolve flooding issues
1116	5-11e	Mulino Rd	Mulino Rd / 13th Ave	Relocate intersection to south away from railroad trestle
1117	5-11e	OR 170	OR 99E to Macksburg Rd	Perform road safety audit or transportation safety review to identify appropriate safety improvements
1118	5-11e	Redland Rd	OR 213 to Hattan Rd	Perform road safety audit or transportation safety review to identify appropriate safety improvements
1119	5-11e	Redland Rd	Redland Rd / Springwater Rd intersection	Perform road safety audit or transportation safety review to identify appropriate safety improvements
1120	5-11e	Redland Rd	Redland Rd / Holly Rd intersection	Install traffic signal and westbound and northbound left-turn lanes or roundabout
1121	5-11e	Redland Rd	Redland Rd / Ferguson Rd intersection	Construct roundabout
1122	5-11e	Ridge Rd	~1 miles north of Lower Highland Rd	Fix sinkhole
1123	5-11e	Springwater Rd	Springwater Rd / Clackamas River Dr intersection	Install signal at Clackamas River Dr
1124	5-11e	Springwater Rd	400 ft east of Hattan Rd	Construct bridge to accommodate paved shoulders
1125	5-11e	Springwater Rd	Hattan Rd to Bakers Ferry Rd	Add paved shoulders in accordance with the Active Transportation Plan and turn lanes at major intersections
1126	5-11e	Township Rd	Central Point Rd to Canby City limit	Add paved shoulders and turn lanes at major intersections
1127	5-11e	Union Mills Rd	OR 213 to OR 211	Add turn lanes at major intersections
1128	5-11e	Union Mills Rd	OR 213 to OR 211	Construct a shoulder on the south side of the roadway
1129	5-11e	Upper Highland Rd	Beavercreek Rd to Lower Highland Rd	Perform road safety audit or transportation safety review to identify appropriate safety improvements
1130	5-11c	Oetkin Rd - Naef Rd	Thiessen Rd to River Rd	Construct bike boulevard consistent with the Active Transportation Plan
1131	5-11c	River Rd	Park Ave to Glen Echo Ave	Construct buffered bike lane in accordance with the Active Transportation Plan.
1132	5-11a	Bob Schumacher Rd	Otty Rd to Sunnyside Rd	Investigate improved striping including centerline rumble stripe.
1133	5-11a	97th Ave	Sunnybrook Blvd to Mather Rd	Investigate improved striping including outside fog lines and rumble striping. Verify lighting, drainage and surface friction.
1134	5-11a	92nd Ave	Phillips Pl	Install a pedestrian crossing near Phillips Pl
1135	5-11a	Otty St	80th Ave	Install a pedestrian crossing near 80th Ave
1136	5-11a	Fuller Rd	Boyer Dr to Sunnyside Dr	Install pedestrian crossings near Boyer Dr, Causey Ave, Stephanie Ct and Southgate St

Figure 5 - 1a
Typical Urban Major Arterial Cross Section



	Pedestrian facility	Landscape strip and curb with street trees	Bikeway	Travel lane	Travel lane	Left turn lane and raised median with vegetation	Travel lane	Travel lane	Bikeway	Landscape strip and curb with street trees	Pedestrian facility	
Back of sidewalk: ~~1'-2'~~ 6" Minimum	6' - 15'	5'6" - 7'6"	~~6'~~ 8'	10' - 12'	10' - 12'	12' - 14'	10' - 12'	10' - 12'	~~6'~~ 8'	5'6" - 7'6"	6' - 15'	Back of sidewalk: ~~1'-2'~~ 6" Minimum

paved width: 6~~4~~8' - 78'

ROW: ~~88~~92' - 12~~46~~'

Notes:

1. This standard cross section shall apply except where a Special Transportation plan in Chapter 5 specifies a different cross section.
2. For more detailed information on the implementation of this Cross Section - see the Zoning and Development Ordinance and/or the County Roadway Standards.
3. Cross section may vary to accommodate *Regional Transportation Functional Plan 3.08.110 Street System Design* or to accommodate topographical or environmental constraints.
4. ~~Within the range stated, p~~Precise dimensions of typical paved width shall be determined by Engineering based upon adjacent land use, vehicle traffic volume, existing travel lane width, design speed and ~~crash history~~ safety. See Roadway Standards for more information.
5. Medians, pedestrian refuges, islands, curb extensions, parking, left turn lanes or right turn lanes shall be provided per the Comprehensive Plan, Capital Improvement Projects or as warranted by Roadway Standards. These improvements may require additional right-of-way.

Figure 5 - 1b
Typical Urban Minor Arterial Cross Section

Back of sidewalk: ~~1'-2'~~6" Minimum

Pedestrian facility	Landscape strip and curb with street tree	Parking	Bikeway	Travel lane	Optional: Travel lane	Optional: Left turn lane and raised median with vegetation	Optional: Travel lane	Travel lane	Bikeway	Parking	Landscape strip and curb with street tree	Pedestrian facility
6' - 10'	5'6" - 7'6"	7' - 8'	6' - 8'	10' - 12'	10' - 12'	12' - 14'	10' - 12'	10' - 12'	6' - 8'	7' - 8'	5'6" - 7'6"	6' - 10'

Back of sidewalk: ~~1'-2'~~6" Minimum

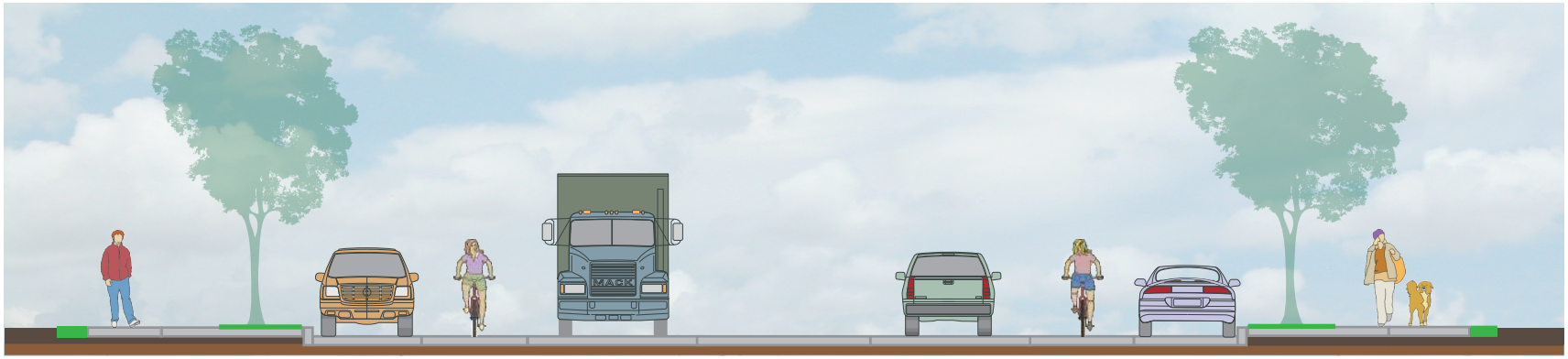
paved width: 4~~8~~6' - 94'

ROW: 7~~2~~4' - 13~~2~~0'

Notes:

1. This standard cross section shall apply except where a Special Transportation plan in Chapter 5 specifies a different cross section.
2. For more detailed information on the implementation of this Cross Section - see the Zoning and Development Ordinance and/or the County Roadway Standards.
3. Cross section may vary to accommodate *Regional Transportation Functional Plan 3.08.110 Street System Design* or to accommodate topographical or environmental constraints.
4. ~~Within the range stated, p~~Precise dimensions of typical paved width shall be determined by Engineering based upon adjacent land use, vehicle traffic volume, existing travel lane width, design speed and ~~crash history~~ safety. See Roadway Standards for more information.
5. Medians, pedestrian refuges, islands, curb extensions, parking, left turn lanes or right turn lanes shall be provided per the Comprehensive Plan, Capital Improvement Projects or as warranted by Roadway Standards. These improvements may require additional right-of-way.

Figure 5 - 1c
Typical Urban Collector Cross Section



	Pedestrian facility	Landscape strip and curb with street tree	Parking	Bikeway	Travel lane	Optional: Left turn lane and raised median with vegetation	Travel lane	Bikeway	Parking	Landscape strip and curb with street tree	Pedestrian facility	
Back of sidewalk: ~~1'-2'~~6" Minimum	6' - 10'	5'6" - 7'6"	7' - 8'	6' - 8'	10' - 12'	11' - 13'	10' - 12'	6' - 8'	7' - 8'	5'6" - 7'6"	6' - 10'	Back of sidewalk: ~~1'-2'~~6" Minimum

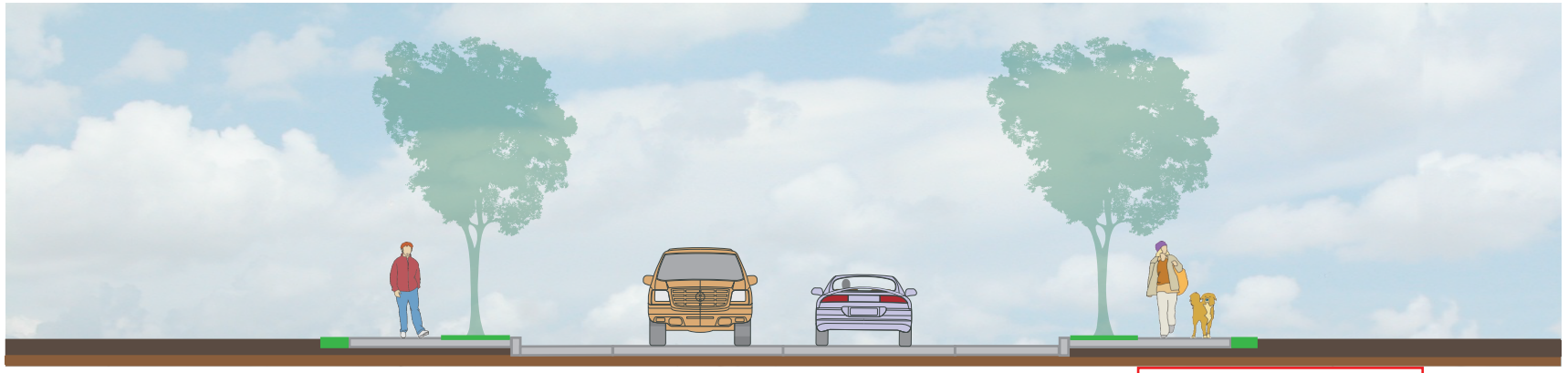
paved width: 4~~8~~6' - 69'

ROW: ~~6~~70' - 10~~7~~5'

Notes:

1. This standard cross section shall apply except where a Special Transportation plan in Chapter 5 specifies a different cross section.
2. For more detailed information on the implementation of this Cross Section - see the Zoning and Development Ordinance and/or the County Roadway Standards.
3. Cross section may vary to accommodate *Regional Transportation Functional Plan 3.08.110 Street System Design* or to accommodate topographical or environmental constraints.
4. ~~Within the range stated, p~~Precise dimensions of typical paved width shall be determined by Engineering based upon adjacent land use, vehicle traffic volume, existing travel lane width, design speed and ~~crash history~~ safety. See Roadway Standards for more information.
5. Medians, pedestrian refuges, islands, curb extensions, parking, left turn lanes or right turn lanes shall be provided per the Comprehensive Plan, Capital Improvement Projects or as warranted by Roadway Standards. These improvements may require additional right-of-way.

Figure 5 - 1d
Typical Urban Connector Cross Section



Travel lanes and parking width were combined into one element.

	Pedes-trian facility	Landscape strip and curb with street trees	Travel Lanes and Parking	Landscape strip and curb with street trees	Pedes-trian facility	
Back of sidewalk: ~~1'-2'~~6" Minimum	5' - 7'	~~5'6"~~ 6'	32' - 42'	~~5'6"~~ 6'	5' - 7'	Back of sidewalk: ~~1'-2'~~6" Minimum

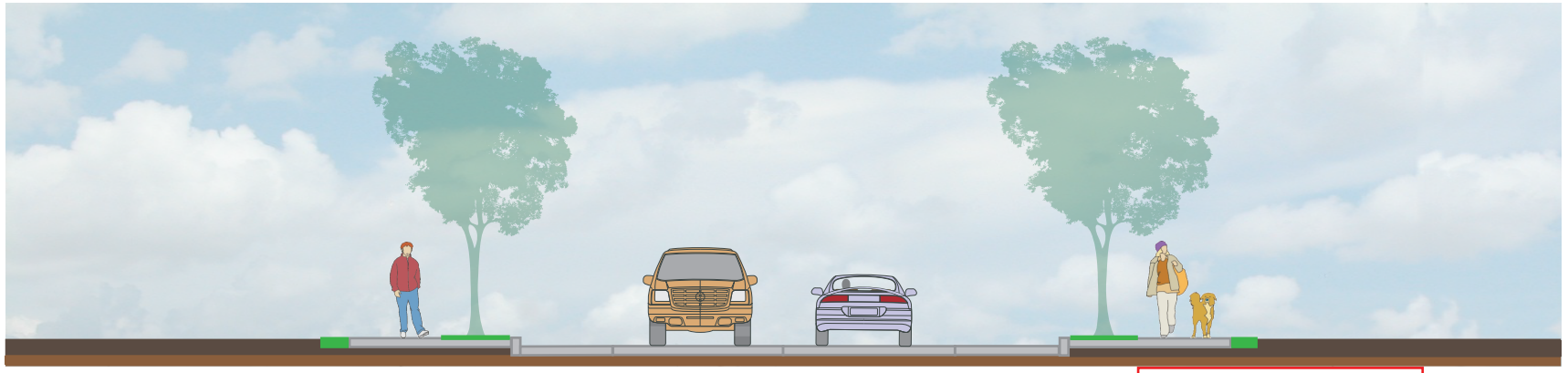
paved width: 3~~4~~2' - 42'

ROW: 54~~60~~' - 68~~72~~'

Notes:

1. This standard cross section shall apply except where a Special Transportation plan in Chapter 5 specifies a different cross section.
2. For more detailed information on the implementation of this Cross Section - see the Zoning and Development Ordinance and/or the County Roadway Standards.
3. Cross section may vary to accommodate *Regional Transportation Functional Plan 3.08.110 Street System Design* or to accommodate topographical or environmental constraints.
4. ~~Within the range stated, p~~Precise dimensions of typical paved width shall be determined by Engineering based upon adjacent land use, vehicle traffic volume, existing travel lane width, design speed and ~~crash history~~ safety. See Roadway Standards for more information.
5. Medians, pedestrian refuges, islands, curb extensions, parking, left turn lanes or right turn lanes shall be provided per the Comprehensive Plan, Capital Improvement Projects or as warranted by Roadway Standards. These improvements may require additional right-of-way.
6. If necessary, parking may be reduced to one side of the street. Under no circumstances will the paved width be less than 20'.

Figure 5 - 1e
Typical Urban Local Cross Section



Travel lanes and parking width were combined into one element.

	Pedes-trian facility	Landscape strip and curb with street trees	Travel Lanes and Parking	Landscape strip and curb with street trees	Pedes-trian facility	
Back of sidewalk: ~~1'-2'~~6" Minimum	5' - 7'	5' 6" ~~6'~~	32' - 42'	5' 6" ~~6'~~	5' - 7'	Back of sidewalk: ~~1'-2'~~6" Minimum

paved width: 3~~4~~2' - 42'

ROW: 54~~60~~' - 68~~72~~'

Notes:

1. This standard cross section shall apply except where a Special Transportation plan in Chapter 5 specifies a different cross section.
2. For more detailed information on the implementation of this Cross Section - see the Zoning and Development Ordinance and/or the County Roadway Standards.
3. Cross section may vary to accommodate *Regional Transportation Functional Plan 3.08.110 Street System Design* or to accommodate topographical or environmental constraints.
4. ~~Within the range stated, p~~Precise dimensions of typical paved width shall be determined by Engineering based upon adjacent land use, vehicle traffic volume, existing travel lane width, design speed and ~~crash history~~ safety. See Roadway Standards for more information.
5. Medians, pedestrian refuges, islands, curb extensions, parking, left turn lanes or right turn lanes shall be provided per the Comprehensive Plan, Capital Improvement Projects or as warranted by Roadway Standards. These improvements may require additional right-of-way.
6. If necessary, parking may be reduced to one side of the street. Under no circumstances will the paved width be less than 20'.

File No. ZDO-259
Proposed Active Transportation Plan Amendments
Draft Date 9/1/16

(P5) Monroe Neighborhood Street~~Greenway~~

Route Summary

Extent:	~~Highway 99 to I-205~~Highway 99E to I-205 Multi-Use Path
Total Length:	~~4.1~~ 4.1 miles
Environment:	Suburban
Proposed Facility Type(s):	~~Neighborhood Greenway~~Neighborhood Greenway, Multi-Use Path, Bike Lanes, Sidewalks
Expected Pedestrian Use:	Utilitarian and recreational pedestrians
Expected Bicycle User Group:	Utilitarian and recreational bicyclists

Route Description

Located in northern Clackamas County, ~~The~~ Monroe Street ~~Route~~ has long been envisioned as a primary east-west active transportation route connecting the Clackamas Town Center with Downtown Milwaukie. Monroe Street provides connections to the ~~future~~ MAX Orange Line, the MAX Green Line, the I-205 Multi-Use Path, and a number of parks and schools. ~~In general, increased separation between motorists and pedestrians should be considered by providing a separate sidewalk on at least one side of the street along the length of this route. This route is characterized by low traffic and low speed streets. There are bike lanes on the portion of the route along Fuller Street.~~Many streets in this area lack dedicated pedestrian facilities. The lack of sidewalks force residents and visitors to walk in the street to access their homes. Likewise, bicycle infrastructure is discontinuous throughout the Monroe Street corridor. Due to the lack of bicycle facilities on Monroe Street or 72nd Avenue cyclists must share the road with fast moving vehicles, creating an unsafe environment for all transportation modes.

Proposed Facility Type

The existing street cross-sections and overall character vary throughout the corridor. Existing streets include both low-traffic, local residential streets and busier collector roadways. Due to the different conditions, the recommended bicycle and pedestrian facilities vary throughout study area. Major design elements include a grade-separated multi-use path; bike lanes; cycle track; traffic calming elements; sidewalks and sharrow pavement markings in places where traffic speeds and volumes are low. ~~Neighborhood greenway treatments such as wayfinding and traffic calming are planned for this route. Milwaukie plans to develop the portion of SE Monroe Street within its city limits into a neighborhood~~

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~~greenway. Likewise, Clackamas County plans to develop a neighborhood greenway street design and connections to the Clackamas Regional Center area for the segment of Monroe Street in unincorporated Clackamas County.~~

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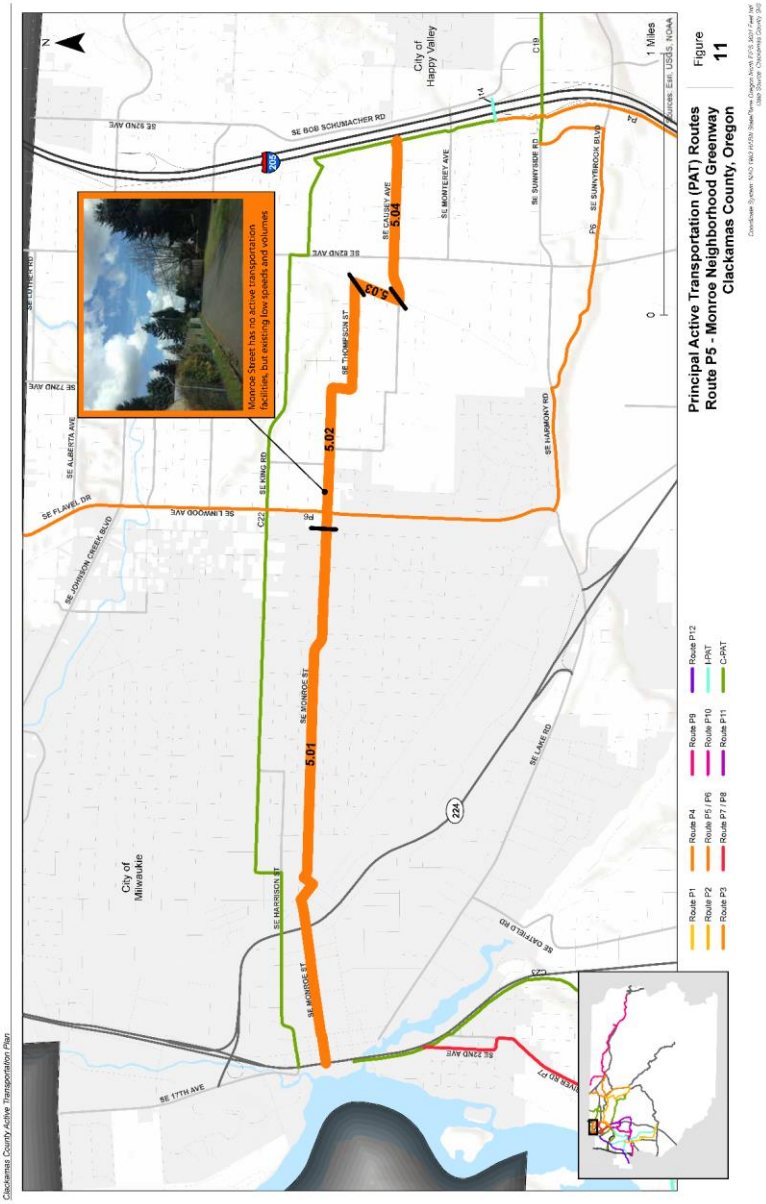

Figure 1111: Route P5 – Monroe Neighborhood Greenway

Project Segments

- ~~**(5.01) SE Monroe Street between Highway 99 and SE Linwood Avenue**: This section in Milwaukie is being planned as a neighborhood greenway.~~
- ~~**(5.02) SE Monroe Street from SE Linwood Avenue to SE Causey Avenue:** Beginning at Linwood Avenue, the ATP recommends continuing a bike boulevard treatment along Monroe Street. The route then turns right to utilize existing bike lanes on Fuller Road. Sidewalk construction is needed on one side.~~
- ~~**(5.03) SE Fuller Road between Monroe Street and Causey Avenue**: This section within unincorporated Clackamas County is served by bike lanes and sidewalks on at least one side of the road.~~
- ~~**(5.04) SE Causey Avenue from SE Fuller Road to I-205 Path:** This four-block section has significantly increased housing density and vehicle traffic. Consideration should be given to improve active transportation user comfort through traffic calming, such as speed humps and shared lane markings. For the one block between SE Fuller Road and SE 82nd Avenue, the travel lanes and center turn lane should be narrowed to accommodate bike lanes. The county has considered removing the left turn lane at 85th Avenue, which could also be part of this project.~~

From 2015-2016 the County engaged in an effort to develop a conceptual plan for the bicycle and pedestrian improvements that will make Monroe Street a safe, functional active transportation route. The resulting *Monroe Neighborhood Street Design Plan* (Design Plan) includes design details for the various street segments as well as information on the planning process and public participation. The Design Plan provides a vision and general design framework for the Monroe Principal Active Transportation Route; design details and refinement will need to be finalized as the plan moves into the surveying and engineering phase.

For planning purposes, the Monroe Street route has been divided into the following 10 segments.

- **(5.01) SE Monroe Street – Highway 99 to SE Linwood Ave**: In 2014-15 Milwaukie conducted a public process to develop a concept plan for a neighborhood greenway for the section of Monroe Street within the city limits. The resulting *Monroe Street Neighborhood Greenway Plan* outlines the improvements to make the street safer for pedestrians, bicyclists, vehicles and neighborhood residents.

- **(5.02) SE Monroe Street – SE Linwood Ave to 72nd Avenue:** There are no existing sidewalk or bicycle facilities between Linwood Avenue and 72nd Avenue. The recommended design for this segment is a 12' shared-use path on the north side of Monroe Street. The path includes intermittent vegetated buffers to provide increased physical separation between active transportation users and motorists, traffic calming benefits and parking spaces within buffer inlets and stormwater management benefits.

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- **(5.03) SE Monroe Street – 72nd Avenue to 77th Avenue**: The Design Plan recommends a mini-roundabout at the intersection of Monroe Street and 72nd Avenue and a 10 foot path between 72nd Avenue and 77th Avenue. Raised crossings are included at each of the three legs of the mini-roundabout. Sharrow pavement markings are included for bicyclists east of 72nd Avenue since traffic speeds and volumes are low. On-street parking is maintained on the south side of Monroe between 72nd and 74th Ave.

- **(5.04) SE Monroe Street – 77th Avenue to Fuller Road:** Between 77th Avenue and Fuller Road the *Design Plan* calls for the roadway at 78th Avenue be improved for bicycle and pedestrian access only. East of the gap, sidewalks and sharrow pavement markings are proposed on the north and south side of Monroe Street. Approximately 200 feet from Fuller Road, the recommended design along Monroe Street transitions from shared space sharrow markings and parking on both sides to bike lanes and no parking on both sides.

- **(5.05) 72nd Avenue – Monroe Street to Thompson Road**: 72nd Avenue between Monroe Street and Thompson Road serves as a transition between the Monroe Street shared-use path and pedestrian facilities along Thompson Road. The *Design Plan* recommends continuation of the shared-use path on the west side of 72nd Avenue and sidewalks and conventional bike lanes along the east side to accommodate users traveling west and north.

- **(5.06) Thompson Road – 72nd Avenue to 74th Avenue:** A shared-use path on the south side of the street is the recommended design for Thompson Road between 72nd Avenue and 74th Avenue. To facilitate safe student crossings, a raised crosswalk and pedestrian activated rectangular rapid-flashing beacon are recommended at the intersection of 74th Avenue and Thompson Road.

- **(5.07) Thompson Road – 74th Avenue to Fuller Road**: The recommended design for Thompson Road between 77th Avenue and Fuller Road consists of sidewalks and bicycle lanes on both sides of the street. Speed bumps are proposed at key locations throughout this segment to reduce speeding in the vicinity of Whitcomb Elementary School. The recommended bicycle lane on the south side of Thompson Road is additionally protected from vehicle traffic by a 5-foot vegetated buffer that will eliminate the possibility of vehicles stopping or parking in the bicycle lane.

- **(5.08) Boyer Drive – Fuller Road to 82nd Avenue:** To improve connectivity for residents going to and coming from the Town Center area, Clackamas County is planning an extension of Boyer Drive from 82nd Avenue to Fuller Road. Improvements will include a new two-lane road with sidewalks, cycle track, landscaping, lighting, storm drainage facilities and a new signal at the Fuller/82nd intersection.

- **(5.09) Boyer Drive – 82nd Avenue to 85th Avenue**: The plan for this segment recommends continuous bike lanes and sidewalks along both sides of the Boyer Drive to improve connections to area businesses destinations for pedestrians and bicyclists.

- **(5.10) Spencer Drive – 85th Avenue to I-205 Multi-Use Path:** The easternmost portion of the Monroe Street corridor travels along Spencer Drive, a low-speed, low-volume residential street.

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Few changes are needed to provide safe pedestrian and bicycle accommodations, but sharrow pavement markings are proposed throughout this segment to encourage safe shared use.

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Table 11~~8~~: Monroe Neighborhood Street ~~Greenway~~ (P5) Project List

~~Project Number~~	~~Project Name~~	~~Extent~~	~~Length (Miles)~~	~~Existing Facility~~	~~Proposed Facility~~	~~Reason for Project~~	~~Constraints~~	~~Planning Considerations~~	~~Estimated Cost~~
~~5.01~~	~~SE Monroe Street~~	~~Hwy 99 to Linwood Avenue~~	~~2.08~~	~~-~~	~~-~~	~~-~~	~~-~~	~~This section is within the City of Milwaukie and currently planned as a neighborhood greenway.~~	~~-~~
~~5.02~~	~~SE Monroe Street~~	~~Linwood Avenue to SE Causey Avenue~~	~~1.0~~	~~-~~	~~Neighborhood greenway, add sidewalk to one side~~	~~Provides a continuous low-stress connection between the planned Milwaukie Bike Boulevard and the Clackamas Town Center/I-205 Path~~	~~None~~	~~Clackamas County has jurisdiction over the roadway east of Linwood. There is an opportunity to provide a pedestrian/bicycle connection cut-through at 78th Avenue. Wayfinding signage is needed at 72nd Avenue to keep people on the neighborhood bikeway.~~	~~$1,235,000~~
~~5.03~~	~~SE Fuller Road~~	~~SE Monroe Street to SE Causey Avenue~~	~~0.36~~	~~Bike Lane/Sidewalk~~	~~-~~	~~-~~	~~-~~	~~-~~	~~-~~
~~5.04~~	~~SE Causey Avenue~~	~~SE Fuller Road to I-205 Path~~	~~0.62~~	~~Sidewalk~~	~~Neighborhood greenway /bike lane~~	~~Provides continuous low-stress connection between the planned Milwaukie Bike Boulevard and the Clackamas Town Center/I-205 Path~~	~~None~~	~~On-street parking is in high demand.~~ ~~The crossing at Fuller and Causey will need to be improved to facilitate a safe and comfortable crossing with a high visibility crosswalk and active warning beacons~~ ~~Lane narrowing on Causey between SE 82nd Avenue and Fuller will allow for the addition of bike lanes.~~	~~$7,000~~

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Segment Number	Street Segment	Extent	Length (Miles)	Existing AT Facility	Proposed Facility	Existing ROW	Planning Considerations
5.01	Monroe Street	Hwy. 99E to Linwood	2.25	Short sections of bike lanes-sidewalks on east end	Neighborhood Greenway	Variable	See Monroe Street Neighborhood Greenway Concept Plan for design details
5.02	Monroe Street	Linwood to 72nd Ave	0.47	None	Multi-Use Path	40 feet	Plan recommends path on north side. South side path may also be feasible.
5.03	Monroe Street	SE 72nd Ave to 77th Ave	0.22	Short sidewalk segment on north side	Pedestrian Path / Sharrows	60 feet	Section is not a county-maintained road; county will need to assume maintenance following improvements.
5.04	Monroe Street	77th Ave. to SE Fuller Road	0.21	North side sidewalks between Gap and Fuller.	West of Gap: Pedestrian Path/Sharrows East of Gap: Sidewalks/Sharrows	60-65 feet	Section is not a county-maintained road; county will need to assume maintenance following improvements.
5.05	72nd Avenue	Monroe Street to Thompson Road	0.08	None	Multi-Use Path on west side. Sidewalk and bike lanes on east side.	40 feet	Due to ROW constraints and to minimize potential conflicts between active transportation users and motorists, parking is eliminated in this section.
5.06	Thompson Road	72nd Ave to 74th Ave	0.12	Sidewalks on north side	South Side: Multi-Use Path. North Side: Sidewalks-Bike lanes	40-50 feet	Parking is maintained in front of Whitcomb School to accommodate student pick-up and drop-off.
5.07	Thompson Road	74th Ave to Fuller Rd	0.30	Sidewalks on north side	Sidewalks / Bike Lanes	45-50 feet	High speeds are a primary concern along this section of the corridor. Speed bumps are proposed at key locations to reduce speeding near the Whitcomb Elementary.
5.08	Boyer Drive	Fuller Road to 82nd Ave	0.06	None	Sidewalks /cycle track	65 feet	To minimize right-hook collisions, a bike box is proposed at the intersection of Boyer and 82nd Ave.
5.09	Boyer Drive	82nd Ave to 85th Ave	0.09	Sidewalks	Bike lanes	65-80 feet	Section of road is built-out with three travel lanes and sidewalks. The Design Plan recommends re-stripping from 82nd Ave. to 85th Ave.

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Segment Number	Street Segment	Extent	Length (Miles)	Existing AT Facility	Proposed Facility	Existing ROW	Planning Considerations
5.10	Spencer Drive	85th Ave to I-205 Path	0.30	None	Sharrows/wayfinding signage	50 feet	The Design Plan recommends consideration for signage and or a gateway treatment at the intersection of Spencer Drive and the I-205 Path.

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