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PARK AVENUE NEIGHBORHOOD & STATION AREA PLAN

RECOMMENDED PLAN APPENDICES

CLACKAMAS COUNTY | OREGON DEPARTMENT OF TRANSPORTATION

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Appendix A: Park Avenue Regulatory Framework

DATE: February 8, 2011

TO: Shari Gilevich, Gail Curtis

FROM: Anneke Van der Mast, Alex Dupey, AICP

SUBJECT: Park Avenue Light Rail Station Area Regulatory and Policy Framework

PROJECT: **Park Avenue Light Rail Station Plan**

COPIES: File

Introduction

This memo documents the relevant state, regional, and local transportation and land use plans and policies, and identifies how they influence planning and design of the Park Avenue station area. The purpose of this review is to ensure that the project has the necessary compatibility, consistency, and compliance required by state and regional law and ODOT policy and to guide project development. The purpose of the project is to develop a Park Avenue Light Rail Station Area Plan that establishes land uses and a multimodal transportation network supportive of transit uses around the planned Park Avenue light rail station.

The relevant transportation and land use plans, regulations, and ordinances that were reviewed to provide a regulatory framework are listed below. These include:

- Statewide Planning Goal 12 (Transportation), OAR 660, Division 12 and the Transportation Planning Rule
- Oregon Transportation Plan
- Oregon Highway Plan
- OAR Chapter 734, Division 51 (Highway Approaches, Access Control, Spacing Standards, and Medians)Metro Urban Growth Management Functional Plan
- Metro Regional Transportation Plan
- Metro Regional Transportation Functional Plan
- Clackamas County Comprehensive Plan
- Clackamas County Comprehensive Plan, Chapter 10, McLoughlin Corridor Plan
- Clackamas County Zoning Code

These plans and policies were reviewed to provide the governing regulatory framework for the project and are included in matrix format as Attachment A. The first column of the matrix identifies the plan or policy and includes a summary of its purpose; the second column contains excerpts of the relevant goal and policies; the third column provides information on whether the plan or policy can and or will need to be amended to accommodate any inconsistencies that may exist between the developed Park Avenue Light Rail Station Area Plan and the plan or policy; and the fourth column identifies how the policy is relevant to the project.

Other plans and policies were reviewed for informational and contextual purposes. These include:

- McLoughlin Area Plan (Phase I Vision Framework, May 2010, Phase II in process)
- Oak Grove Transportation Growth Management Plan (June 1995)
- TriMet Station Area Assessments (I-205, East Portland Stations, multiple years)
- Portland to Milwaukie LRT Station Area Best Practices Assessments and Recommendations, (September 2009)

Plans and Policy Framework

Regulatory Documents

The following documents are relevant to the Park Avenue Neighborhood and Station Area Plan. Specific goals, policies, and development regulations are described in Attachment A.

Statewide Planning Goal 12 (Transportation), OAR 660, Division 12 and the Transportation Planning Rule: *Goal 12, Transportation, requires cities, counties, metropolitan planning organizations (MPOs), and the Oregon Department of Transportation (ODOT) to provide and encourage a safe, convenient, and economic transportation system. This is accomplished through development of Transportation System Plans (TSPs) based on inventories of local, regional, and state transportation needs. Goal 12 is implemented through OAR 660, Division 12, the Transportation Planning Rule (TPR). The TPR contains numerous requirements governing transportation planning and project development.*

> **Relevance:** The project's purpose is to establish land uses and a multimodal transportation network that will be supportive of transit uses around the planned light rail station off McLoughlin Boulevard. The plan will likely result in changes to land use regulations, including zone changes and comprehensive plan policies. These changes will be evaluated to determine whether they would significantly affect existing or planned transportation facilities.

Oregon Transportation Plan (OTP)*: The OTP is the state's long-range multimodal transportation plan. The OTP is the overarching policy document among a series of plans that together form the state TSP. The OTP considers all modes of Oregon's transportation system as a single system and addresses the future needs of Oregon's airports, bicycle and pedestrian facilities, highways and roadways, pipelines, ports and waterway facilities, public transportation, and railroads. The current OTP assesses state, regional, and local public and private transportation facilities through 2030. The OTP establishes goals, policies, strategies, and initiatives that address the core challenges and opportunities facing Oregon. It also provides the framework for prioritizing transportation improvements based on varied future revenue conditions. The 1992 OTP established a vision of a balanced, multimodal transportation system and called for an expansion of ODOT's role in funding non-highway investments. The current OTP, adopted in 2006, supersedes the 1992 OTP and furthers these policy objectives with an emphasis on maintaining the assets in place, optimizing the existing system performance, creating sustainable funding, and investing in strategic capacity enhancements.*

> **Relevance:** The project's purpose is consistent with the OTP. The project will provide multimodal options and improve the quality of the station area by providing a mix of uses and modes of travel. The OTP is primarily implemented through the Regional Transportation Plan (RTP) and local transportation system plans.

Oregon Highway Plan (OHP): *The OHP establishes policies and investment strategies for Oregon's state highway system over a 20-year period and refines the goals and policies found in the OTP. Policies in the OHP emphasize the efficient management of the highway system to increase safety and to extend highway capacity, partnerships with other agencies and local governments, and the use of new techniques to improve road safety and capacity. These policies also link land use and transportation, set standards for highway performance and access management, and emphasize the relationship between state highways and local road, bicycle, pedestrian, transit, rail, and air systems.*

Relevance: The OHP has several policies that could affect the project and several standards that are directly applicable to the project. The expectation is that the Park Avenue Neighborhood and Station Area Plan will be developed to be consistent with the OHP. McLoughlin Boulevard, also referred to as OR 99E, is a state highway. The OHP designates OR 99E as a District Highway. District Highways are defined in the OHP as: "*facilities of county-wide significance and function largely as county and city arterials or collectors. They provide connections and links between small urbanized areas, rural centers and urban hubs, and also serve local access and traffic. The management objective is to provide for safe and efficient, moderate to high-speed continuous-flow operation in rural areas reflecting the surrounding environment and moderate to low-speed operation in urban and urbanizing areas for traffic flow and for pedestrian and bicycle movements. Inside STAs, local access is a priority. Inside Urban Business Areas, mobility is balanced with local access.*"

According to Table 7, Maximum Volume to Capacity Ratios Within Portland Metropolitan Region in the OHP, the mobility standard for Corridors (which according to footnote b in the table applies to 99E from Milwaukie to Oregon City) and Inner and Outer Neighborhoods (which applies to the neighborhoods east and west of 99E in the project area) is .99 for the first hour and .99 for the second hour. However, the mobility standard for Station Communities, the designation which will be recommended as a part of the Park Avenue Neighborhood and Station Area Plan, is1:1 for the first hour and .99 for the second hour.

Policy 1B, Land Use and Transportation and specifically, Action 1B.5 states: "Develop and improvement plans that support compact development including but not limited to highway segment designations….". Methods to implement this Action outlined in the OHP are:

- Parallel and interconnected local roadway networks to encourage local automobile trips off the state highway;
- Transit, bicycle and pedestrian facilities, including street amenities that support these modes;
- Design and orientation of buildings and amenities that accommodate pedestrian and bicycle use as well as automobiles use;
- Provision of public and shared parking;
- Infill and redevelopment;
- Expansion of intensive urban development guided away from state highways rather than along state highways; and
- Other supporting public investments that encourage compact development and development within centers.

Oregon Highway Plan Policy 1B includes highway categories designated by land use in addition to the highway classification (described above). None of the highway segment types have been formally applied to this segment of highway. The land use character of the existing highway best resembles the Urban Business Area (UBA) which is described in the OHP as: a highway segment designation that may be applied to existing areas of commercial activity or future nodes or various types of centers of

commercial activity within urban growth boundaries or urban unincorporated community boundaries on District, Regional or Statewide Highways where vehicular accessibility is important to continued economic viability. Highways that have posted speeds of 35 miles per hour or less are permitted access spacing standards that reflect the dual objectives of providing local access to meet the needs of abutting properties while maintaining existing speeds to move through traffic. For highways posted greater than 35 miles per hour, the UBA designation is available as recognition that vehicular accessibility and circulation are often as important as pedestrian, bicycle and transit accessibility, but a management plan is required to ensure that these objectives are balanced. Safe and regular street connections are encouraged. Transit turnouts, sidewalks and bicycle lanes are accommodated.

There are also Special Transportation Area designations for highway segments including downtown Milwaukie and Oregon City. The STA designations are intended for traditional downtown centers and desirable to communities due to the slower travel speeds that sometimes result from the STA designation and associated land uses to help support pedestrian movement. The project area does not likely have the land use characteristics to support a STA designation.

OAR Chapter 734, Division 51 (Highway Approaches, Access Control, Spacing Standards and Medians): *OAR 734-051 governs the permitting, management, and standards of approaches to state highways to ensure safe and efficient operation of the state highways.*

Relevance: ODOT permits related to the access to the highway, operations and standards of the highway, as outlined in OAR 734-051 will not likely apply to the station area because access to the light rail station and area properties is expected to occur off of public streets. An ODOT approach permit is not required for access on public streets. Direct access to the highway from private property is limited and is based on the OAR access spacing standards and property rights.

Metro Urban Growth Management Functional Plan: *The Functional Plan implements the 2040 Growth Concept and the Regional Framework Plan. The Functional Plan requires cities and counties to designate boundaries for the 2040 Growth Concept Design Types, including the Portland Central City, Regional Centers, Town Centers, and Station Communities.*

The purpose of the Functional Plan is to implement regional goals and objectives adopted by the Metro Council as the Regional Urban Growth Goals and Objectives (RUGGO), including the Metro 2040 Growth Concept and the Regional Framework Plan. The comprehensive plan changes and related actions, including implementing regulations, required by this Functional Plan as a component of the Regional Framework Plan, shall be complied with by cities and counties as required by Section 5(e)(2) of the Metro Charter. The 2040 Growth Concept Map identifies the project area as both "Corridors" (McLoughlin) and "Neighborhood" (surrounding McLoughlin).

Station Communities: *Station communities are nodes of development centered around a light-rail or high capacity transit station that feature a high-quality pedestrian environment. They provide for the highest density outside centers. Station communities encompass an area approximately one-half mile from a station stop.*

Corridors: *Corridors are major streets that serve as key transportation routes for people and goods. Examples of corridors include the Tualatin Valley Highway and 185th Avenue in Washington County,*

Powell Boulevard in Portland and Gresham and McLoughlin Boulevard in Clackamas County. Corridors are served extensively by transit.

Neighborhoods: *Under the 2040 Growth Concept, most existing neighborhoods will remain largely the same. Some redevelopment can occur so that vacant land or under-used buildings could be put to better use. New neighborhoods are likely to have an emphasis on smaller single-family lots, mixed uses and a mix of housing types including row houses and accessory dwelling units. The growth concept distinguishes between slightly more compact inner neighborhoods, and outer neighborhoods, with slightly larger lots and fewer street connections.*

Relevance: Currently, the 2040 Growth Concept Map designates the project area as a Corridor surrounded by (Inner) Neighborhoods. The Park Avenue Neighborhood and Station Area Plan will help implement Metro's 2040 Growth Management Concept station community designation for the project area.

Section 3.07.170 of the Functional Plan recommends average densities for housing and employment for each of the 2040 Growth Concept design types. The recommendation for Station Communities is 45 persons per acre (the recommendation for Corridors is 25 persons per acre and Inner Neighborhoods is 14 persons per acre). Local adoption of a Station Community boundary will be recommended as a part of the Park Avenue Neighborhood and Station Area Plan. The local boundary adoption will be followed by a recommendation from Clackamas County to Metro to adopt the locally-designated Station Community boundary as part of the 2040 Growth Concept Plan. This action will help implement the 2040 Growth Concept Plan and allow the station area to be eligible for Metro funds. The Nature in the Neighborhoods grant awarded to TriMet in 2010 for station design improvements will be integrated into the station area plan to ensure that both meet the UGMFP requirements.

Metro Regional Transportation Plan (RTP): *On June 10, 2010, the Joint Policy Advisory Committee on Transportation (JPACT) and the Metro Council approved the 2035 RTP for the purpose of completing a federal and state-required air quality conformity analysis of the proposed system. The RTP introduces the concept of organizing the region's multi-modal transportation improvements by mobility corridors. The Portland-Milwaukie corridor is identified as one of the mobility corridors in the RTP. The plan proposes a high functioning and integrated transportation system where residents have safe and realistic options for multimodal travel; walking, biking, and riding transit. Proposed projects include high-capacity transit connections within the region.*

Relevance: The project's purpose—to establish land uses and a multimodal transportation network that will be supportive of transit uses around the planned light rail station off McLoughlin Boulevard—is consistent with and will implement the RTP purpose and intent. The RTP identifies transit supportive development patterns as including:

- An urban form and densities that generate a high number of transit riders.
- A mix of uses, and a balance of jobs and housing, that creates a place where activity occurs at least 18 hours a day.
- Well-designed streets and buildings that encourage pedestrian movement.
- Streets that can accommodate 40-foot buses.

- Safe, direct and convenient pedestrian and bicycle access, within communities and to transit stops.

Recommended projects included within the plan's implementation measures may include projects that will also need to be added to the RTP. Implementation measures will also include recommendations for amendments to Clackamas County planning and capital documents.

Metro Regional Transportation Plan- High Capacity Transit (HCT) System Plan: *The Regional HCT System Plan is designed to focus on the frequent, fast and high capacity element of the public transit system; other transit system functions, including local bus, paratransit, streetcar, and frequent bus are included in the RTP. High capacity transit is characterized by exclusive right-of-way and routes with fewer stops.*

The HCT System Plan report summarizes the results of outreach and data analysis intended to provide guidance for the region's long-term investments in high capacity transit. The prioritized high capacity transit corridors and discussion of improvements to the existing system are based on planned land uses, community values, environmental benefits, economic potential, and deliverability. In addition, the report covers the main components addressed during the HCT System Plan process, including public outreach, high capacity transit corridor evaluation, system considerations, and best practices for high capacity transit. The HCT System Plan report also outlines the concept of the system expansion targets for future HCT expansions. Draft expansion targets include:

System Expansion Plan: Quantitative Measures	
Measure	*Description*
Density of People	*Current households and jobs per net acre within ½ mile*
Density of ULI Businesses	*Number of ULI Businesses within ½ mile*
Transit Oriented Zoning	*Assigning values to regional zoning classifications within ½ mile*
Average Block Size	*Density of acres of blocks within ½ mile*
Sidewalk Coverage	*Completeness of sidewalk infrastructure within ½ mile*
Bicycle Facility Coverage	*Access to bicycle infrastructure measured as distance to nearest bicycle facility within ½ mile*
Transit Connectivity	*Bus frequency within ½ mile of corridor*
System Expansion Plan: Qualitative Measures	
Measure	*Description*
Housing & Transportation Affordability	*Demonstrating that potential transit investment will serve communities with high rate of cost burdened households*
Parking Requirements	*Demonstrating that corridor meets or exceeds Title 4 of the RTFP.*
Local Funding Mechanisms	*Demonstrating that funding mechanisms are in place in corridor communities that could help fund capital or operations to support transit investment, including urban renewal, tax increment financing, local improvement district, parking fees, or other proven funding mechanisms.*
Equity	*Looking at low-income, minority, senior and disabled populations within corridor.*

Relevance: The connection from the planned Park Avenue Station south to Oregon City is currently a *Next Phase* corridor. Attachment A describes the specific evaluation measures used to assess whether a corridor can support future transit investment. Currently, the corridor does not support extending

HCT to Oregon City compared to other regional corridors that have been identified as near term priorities.

Several changes in the corridor will need to occur prior to the Milwaukie to Oregon City corridor being elevated to a *Near Term Regional Priority Corridor.* These changes in the corridor would be guided by the system expansion policy. Station area and neighborhood planning for Park Avenue will improve the corridor, but a strong station area at Park Avenue is only one part of the solution because the entire corridor will also need to be addressed from both land use and transportation perspectives, with supportive land use multimodal connectivity in place to support consideration for a higher HCT prioritization. ***Metro RTFP:*** *The Regional Transportation Functional Plan (RTFP) implements the Goals and Objectives in section 2.3 of the Regional Transportation Plan (RTP). Cities and counties of the region will carry out the Goals and Objectives in their comprehensive plans; transportation system plans (TSPs), other land use regulations, and transportation project development.*

Relevance: The RTFP offers direction for counties and cities to update their TSPs and associated regulations. The RTFP provides detailed guidelines to implement the Goals and Objectives of the RTP. As the Park Avenue Plan progresses and transportation improvements are identified for inclusion into county planning and transportation documents, the project will need to ensure that they are consistent with County policies and design guidelines that implement the RTFP which are excerpted in Attachment A.

Clackamas County Comprehensive Plan: *The basic aim of the Comprehensive Plan is to organize and coordinate the complex interrelationships among people, land, resources, and facilities in such a way as to protect the future health, safety, quality of life, and welfare of Clackamas County residents.*

Relevance: Attachment A identifies specific goals and policies relevant to the project. Attachment B shows the adopted McLoughlin Corridor Plan cross sections for the project area. The project is consistent with the goals of the Clackamas County Comprehensive Plan, which identifies SE McLoughlin Boulevard as a high capacity transit corridor. The Clackamas County Comprehensive Plan identifies a high capacity transit route generally following SE McLoughlin Boulevard from the Portland city limits to Oregon City. The project is also consistent with the Urbanization Goals of the Comprehensive Plan. Much of the area around the station is zoned residential. However, limited Neighborhood Commercial uses may be allowed if they meet the criteria identified. New zoning designations may be appropriate and recommended as part of the project in order to meet the policy intent of compact, mixed-use neighborhoods. Additionally, the County is nearing completion of its Station Community policy and design guidelines that will be relevant as new land uses are proposed through the neighborhood and station planning process.

Clackamas County Zoning Code: *The purpose of the zoning code is to implement the goals and policies of the Clackamas County Comprehensive Plan and to provide methods of administration and enforcement of the provisions identified within the zoning code.*

Relevance: Most of the project area is zoned low density residential, with commercial zoning along McLoughlin. Low density residential does not allow for mixed-use development. However, it does allow for small areas of neighborhood commercial pending review by a Hearings Officer. The zoning code does not yet have clearly identified transit oriented development standards, but the County has a proposed "Station Community Mixed Use" zone to be applied to around the existing light rail station

at Fuller Road and I-205. This transit-oriented, mixed use zone will be the basis for future zoning in other station communities. New zoning designations may be appropriate and recommended as part of the project. Additionally, any development proposals will need approval from the Oak Lodge Sanitary District, which has development ordinance requirements.

Clackamas County also is proposing amendments to numerous sections of the Zoning and Development Ordinance to include standards for more sustainable development practices that would be implemented through the existing development review process. The policy proposals were based on the goals and tasks identified in the Action Plan for a Sustainable Clackamas County adopted by the Board of County Commissioners in Nov. 2008.

The main sustainability policy proposals that could be applicable to future development in the Park Avenue station area include Site and Building Design, Roads and Connectivity, and Parking and Loading, a new section that separates parking and loading standards from road standards.

(See web page http://www.clackamas.us/transportation/planning/zdoproposed.jsp under ZDO-224.)

Other Plans, Policies, and Studies Reviewed

The following plans, policies, and studies were reviewed for informational purposes to provide an overall planning context for the project area. The documents identify an overall community vision for the greater project area from past planning exercises as well as information on existing station areas on what makes stations and station areas successful.

McLoughlin Area Plan (Phase I Vision Framework May 2010, Phase II beginning winter 2011)

Clackamas County initiated a McLoughlin Area Plan for the area between SE River Road and Gladstone, which includes the project area. The first phase of the process was completed in the summer of 2010 and was focused on developing the community's vision for the area. A second phase will include planning, programming, and project development of the area along SE McLoughlin Boulevard. The key guiding principles for development of the McLoughlin Area Plan that were established in the Phase I Vision Framework included: Economic Vitality, Transportation, Social, Design, Environmental, and Administrative. The vision is: "In the future, our community fabric of thriving neighborhoods, shops, restaurants and services is green and sustainable; healthy and safe; woven together by walkable tree-lined streets, trails, natural areas and open spaces; and strengthened by our diversified local economy, great educational opportunities and engaged citizens."

Phase 2 of the plan will begin in early 2011 and several individuals are involved in both this planning process and the Park Avenue Neighborhood and Station Area Plan process. It will be important to coordinate the efforts of both processes to ensure that they results are aligned.

Oak Grove Transportation Growth Management Plan Draft, June 1995

This draft plan developed by Clackamas County recommends direction for new growth and development for Oak Grove over the next 50 years, with a mixture of services, employment, and housing in a single, concentrated, walkable area. The study area of the plan includes the project area, which is adjacent to the study area's northern boundary. The plan provides recommendations around three main components of growth management: Action Plan 1 Transportation, which includes walkways, bicycle and transit plan, and street network and standards; Action Plan 2 Downtown Design and Revitalization, which includes a market plan and vision for the commercial core; and Action Plan 3 Land Use and Redevelopment, which provides criteria for selection of preferred land use alternative and Comprehensive Plan

Recommendations. This planning effort provides valuable background information but was never adopted by the County and therefore, has no legal relevance.

TriMet Station Area Evaluations and Recommendations (I-84 and I-205)

Station area assessments have been completed for several other stations along the existing LRT system, which provide insight into planning for the Park Avenue Neighborhood and Station Area Plan. The goals of these evaluations were to assess whether station locations and alignment should be revised (if not already constructed) to accommodate future development and identify future implementation measures to advance planning and development objectives. Relevant recommendations include:

- **Station Design/Station Connections:** The design and location of stations can directly influence the number of people who use them. A station that has poor quality pedestrian connections will attract fewer riders than a station with high quality connections. For developers and businesses, fewer riders mean fewer tenants and fewer retail customers. Attention to station elements such as location, pedestrian connections, visibility, convenience, and safety will improve the ability of the station to attract people and development.

- **Joint Development:** If TriMet, or a partner agency, owns land, there is the opportunity to participate in and direct its development. The advantages that flow from direct participation include the opportunity for a return on the agency's investment in light rail transit (LRT), transit oriented development that improves ridership, and control over use and design of the development.
- **Advocacy and Deal Making:** Most of the development opportunities are on private property, outside of the direct control of any public agency. In order to achieve its development objectives, the County and TriMet need to be aggressive facilitators of private development. A wide range of activities are possible, but at a minimum these activities should include: identifying and resolving regulatory impediments; providing market information to developers and property owners; helping owners seek out financial tools available from public agencies; and assisting property owners with site planning and design to ensure that future development is supportive of transit objectives. Advocacy and deal making are the strategies that should be pursued in the next phase of a development program.

Finally, any station area needs to have a strong identity to make it successful. The station area should provide:

- Be a high quality urban environment with good urban design;
- Have a coherent vision that establishes a functional land use pattern that promotes density and creates convenient, comfortable pedestrian and bicycle connections;
- Creates a place, not a project, that provides adequate, but not too much parking;
- Integrates well with other transit; and
- Identifies and creates supportive public policies and focuses public investments to support real estate investments.

Portland to Milwaukie LRT Station Area Best Practices Assessments and Recommendations, September 2009

The purpose of the Portland to Milwaukie Light Rail Station Assessment was to establish a foundation for public and private actions that will maximize the community benefits for each station community. Thirteen station areas were reviewed, including the Park Avenue Station. An Assessment of ideal characteristics identified the following characteristics for Park Avenue, as well as the lack of a mix of transportation-supportive land uses in the station area:

Good Connections

- There is a connected network of sidewalks that provides access to platform from several different routes.
- Future trolley trail project will provide good connections.

Opportunities for Development

- Under existing zoning, there is limited transit-oriented redevelopment potential.
- There are underutilized commercial sites south of the station along SE McLoughlin Boulevard.
- Future development opportunities at park-and-ride facilities should be maximized.
- Site size is limited, but additional land could be assembled.

Portland to Milwaukie LRT Draft and Final Environmental Impacts Statements

The Portland-Milwaukie Light Rail Project completed the planning phase of this project with the publication of the Final Environmental Impact Statement (October 2010) and issuance of the Record of Decision (November 2010). Over the course of completing the draft and final environmental impact statements, the project assessed a variety of alignment options and station locations. Final design has begun on the project, which will begin construction in 2011 and continue through early 2015.
Local jurisdictions approved the light rail's route, terminus and station locations by adopting a Locally Preferred Alternative in July 2008.

Summary and Conclusion

The existing state, regional and county policy strongly supports compact development with a mix of land uses adjacent light rail stations. The Park Avenue Neighborhood and Station Area Plan will help implement Metro's 2040 Growth Management Concept station community designation and will identify the station community boundary.

The existing state, regional and county policy strongly supports compact development with a mix of land uses near light rail stations. Key policy objectives are to provide safe and efficient pedestrian and bicycle access to the station and nearby transit oriented development with higher levels of activity than currently exist. McLoughlin Boulevard is a Metro 2040 corridor and neighborhood and designated as a District Highway by the Oregon Highway Plan, an element of the Oregon Transportation Plan. The Clackamas County Comprehensive Plan Urbanization Goal implements the state and regional policy with policies for infill and for mixed-use development in areas of transit and pedestrian facilities. The existing low-density residential character of the project area with commercial along the highway is not consistent with the compact development, mixed-land use policy objectives.

Attachment A: Regulatory Planning Framework Matrix

Plan or Policy	Specific Applicable Section (s)	Amendment Process (if applicable)	Project Relevance
State			
Statewide Planning Goal 12 (Transportation), OAR 660, Division 12 and the Transportation Planning Rule Goal 12, Transportation, requires cities, counties, metropolitan planning organizations (MPOs), and the Oregon Department of Transportation (ODOT) to provide and encourage a safe, convenient, and economic transportation system. This is accomplished through development of Transportation System Plans (TSPs) based on inventories of local, regional, and state transportation needs. Goal 12 is implemented through OAR 660, Division 12, the Transportation Planning Rule (TPR). The TPR contains numerous requirements governing transportation planning and project development.	OAR 660 Division 12 660-012-0000 Purpose: 3.(c) Within metropolitan areas, coordinated land use and transportation plans are intended to improve livability and accessibility by promoting changes in the transportation system and land use patterns. A key outcome of this effort is a reduction in reliance on single occupant automobile use, particularly during peak periods. To accomplish this outcome, this division promotes increased planning for alternative modes and street connectivity and encourages land use patterns throughout urban areas that make it more convenient for people to walk, bicycle, use transit, use automobiles, travel more efficiently, and drive less to meet their daily needs. The result of applying these portions of the division will vary within metropolitan areas. Some parts of urban areas, such as downtowns, pedestrian districts, transit-oriented developments and other mixed-use, pedestrian-friendly centers, will be highly convenient for a variety of modes, including walking, bicycling and transit, while others will be auto-oriented and include more modest measures to accommodate access and circulation by other modes. 660-012-0010 Transportation Planning: (1) As described in this division, transportation planning shall be divided into two phases: transportation system planning and transportation project development. Transportation system planning establishes land use controls and a network of facilities and services to meet overall transportation needs. Transportation project development implements the TSP by determining the precise location, alignment, and preliminary design of improvements included in the TSP. (2) It is not the purpose of this division to cause duplication of or to supplant existing applicable transportation plans and programs. Where all or part of an acknowledged comprehensive plan, TSP either of the local government or appropriate special district, capital improvement program, regional functional plan, or similar plan or combination of plans meets all or some of the requirements of this division, those plans or programs may be incorporated by reference into the TSP required by this division. Only those referenced portions of such documents shall be considered to be a part of the TSP and shall be subject to the administrative procedures of this division and ORS Chapter 197. 660-012-0016 Coordination with Federally-Required Regional Transportation Plans in Metropolitan Areas: (1) In metropolitan areas, local governments shall prepare, adopt, amend and update transportation system plans required by this division in coordination with regional transportation plans (RTPs) prepared by MPOs required by federal law. Insofar as possible, regional transportation system plans for metropolitan areas shall be accomplished through a single coordinated process that complies with the applicable requirements of federal law and this division. Nothing in this rule is intended to make adoption or amendment of a regional transportation plan by a metropolitan planning organization a land use decision under Oregon law. 660-012-0045(2) The TPR requires local governments to adopt land use regulations consistent with state and federal requirements "to protect transportation facilities, corridors and sites for their identified functions" (OAR 660-012-0045(2)). This policy is achieved through a variety of measures, including: • Access control measures, which are consistent with the functional classification of roads and consistent with limiting development on rural lands to rural uses and densities; • Standards to protect future operations of roads; • A process for coordinated review of future land use decisions affecting transportation facilities, corridors or sites; • A process to apply conditions to development proposals in order to minimize impacts and protect transportation facilities, corridors or sites; • Regulations to provide notice to ODOT of land use applications that require public hearings, involve land divisions, or affect	The TPR is an overarching administrative rule that does not address project or area specifics. Local jurisdictions TSPs must be consistent with the TPR.	The project's purpose is to establish land uses and a multimodal transportation network that will be supportive of transit uses around the planned light rail station off McLoughlin Boulevard. The plan will likely result in changes to land use regulations, including zone changes and comprehensive plan policies. These changes will be evaluated to determine whether they would significantly affect existing or planned transportation facilities

Attachment A: Regulatory Planning Framework Matrix

Plan or Policy	Specific Applicable Section (s)	Amendment Process (if applicable)	Project Relevance
	private access to roads; and 660-012-0060 Plan and Land Use Regulation Amendments (1) Where an amendment to a functional plan, an acknowledged comprehensive plan, or a land use regulation would significantly affect an existing or planned transportation facility, the local government shall put in place measures as provided in section (2) of this rule to assure that allowed land uses are consistent with the identified function, capacity, and performance standards (e.g. level of service, volume to capacity ratio, etc.) of the facility.		
Oregon Transportation Plan (OTP) The OTP is the state's long-range multimodal transportation plan. The OTP is the overarching policy document among a series of plans that together form the state TSP. The OTP considers all modes of Oregon's transportation system as a single system and addresses the future needs of Oregon's airports, bicycle and pedestrian facilities, highways and roadways, pipelines, ports and waterway facilities, public transportation, and railroads. The current OTP assesses state, regional, and local public and private transportation facilities through 2030. The OTP establishes goals, policies, strategies, and initiatives that address the core challenges and opportunities facing Oregon. It also provides the framework for prioritizing transportation improvements based on varied future revenue conditions. The 1992 OTP established a vision of a balanced, multimodal transportation system and called for an expansion of ODOT's role in funding non-highway investments. The current OTP, adopted in 2006, supersedes the 1992 OTP and furthers these policy objectives with an emphasis on maintaining the assets in place, optimizing the existing system performance, creating sustainable funding, and investing in strategic capacity enhancements.	Goal 3 – Economic Vitality: To promote the expansion and diversification of Oregon's economy through the efficient and effective movement of people, goods, services and information in a safe, energy efficient and environmentally sound manner. Strategy 3.3.2 Integrate transportation planning and investments with state and local economic development strategies and plans. Goal 4 – Sustainability: To provide a transportation system that meets present needs without compromising the ability of future generations to meet their needs from the joint perspective of environmental, economic and community objectives. This system is consistent with, yet recognizes differences in, local and regional land use and economic development plans. It is efficient and offers choices among transportation modes. It distributes benefits and burdens fairly and is operated, maintained and improved to be sensitive to both the natural and built environments. Policy 4.1 – Environmentally Responsible Transportation System It is the policy of the State of Oregon to provide a transportation system that is environmentally responsible and encourages conservation and protection of natural resources. Policy 4.3 – Creating Communities It is the policy of the State of Oregon to increase access to goods and services and promote health by encouraging development of compact communities and neighborhoods that integrate residential, commercial and employment land uses to help make shorter trips, transit, walking and bicycling feasible. Integrate features that support the use of transportation choices. Strategy 4.3.1 Support the sustainable development of land with a mix of uses and a range of densities, land use intensities, and transportation options in order to increase the efficiency of the transportation system. Support travel options that allow individuals to reduce vehicle use. Strategy 4.3.2 Promote safe and convenient bicycling and walking networks in communities. Fill in missing gaps in sidewalk and bikeway networks, especially to important community destinations such as schools, shopping areas, parks, medical facilities, and transit facilities. Strategy 4.3.5 Reduce transportation barriers to daily activities for those who rely on walking, biking, rideshare, car-sharing and public transportation by providing: Access to public transportation and the knowledge of how to use it. Facility designs that consider the needs of the mobility-challenged including seniors, people with disabilities, children and non-English speaking populations. Goal 7 – Coordination, Communication and Cooperation: To pursue coordination, communication and cooperation among transportation users, providers and those most affected by transportation activities to align interests, remove barriers and bring innovative solutions so the transportation system functions as one system. Policy 7.2 – Public/Private Partnerships It is the policy of the State of Oregon to maintain, expand, and provide tools to encourage partnerships to improve efficiency in the delivery of transportation facilities and services benefiting the state transportation system and the state's citizens. Partners include transportation providers, public agencies, and private businesses at all levels across jurisdictions and ownerships. Policy 7.3 – Public Involvement and Consultation It is the policy of the State of Oregon to involve Oregonians to the fullest practical extent in transportation planning and implementation in order to deliver a transportation system that meets the diverse needs of the state.	The OTP is a broad, overarching guidance document that does not address project or area specifics. Local jurisdiction's TSPs must be consistent with the OTP.	The project's purpose is consistent with the OTP. The project will provide multimodal options and improve the quality of the station area by providing a mix of uses and modes of travel. The OTP is primarily implemented through the Regional Transportation Plan (RTP) and local transportation system plans.

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Oregon Highway Plan (OHP) The OHP establishes policies and investment strategies for Oregon's state highway system over a 20-year period and refines the goals and policies found in the OTP. Policies in the OHP emphasize the efficient management of the highway system to increase safety and to extend highway capacity, partnerships with other agencies and local governments, and the use of new techniques to improve road safety and capacity. These policies also link land use and transportation, set standards for highway performance and access management, and emphasize the relationship between state highways and local road, bicycle, pedestrian, transit, rail, and air systems.	Goal 1. System Definition Policy 1A: State Highway Classification System It is the policy of the State of Oregon to develop and apply the state highway classification system to guide ODOT priorities for system investment and management. Policy 1B – Land Use and Transportation This policy recognizes the role of both State and local governments related to the state highway system: • State and local government must work together to provide safe and efficient roads for livability and economic viability for all citizens. • State and local government must share responsibility for the road system. • State and local government must work collaboratively in planning and decision-making relating to transportation system management. It is the policy of the State of Oregon to coordinate land use and transportation decisions to efficiently use public infrastructure investments to: • Maintain the mobility and safety of the highway system; • Foster compact development patterns in communities; • Encourage the availability and use of transportation • alternatives; • Enhance livability and economic competitiveness; and • Support acknowledged regional, city and county transportation system plans that are consistent with this Highway Plan. Policy 1F: Highway Mobility Standards It is the policy of the State of Oregon to use highway mobility standards to maintain acceptable and reliable levels of mobility on the state highway system. These standards shall be used for: • Identifying state highway mobility performance expectations for planning and plan implementation; • Evaluating the impacts on state highways of amendments to transportation plans, acknowledged comprehensive plans and land use regulations pursuant to the Transportation Planning Rule (OAR 660-12-060); and • Guiding operations decisions such as managing access and traffic control systems to maintain acceptable highway performance. Policy 1G: Major Improvements It is the policy of the State of Oregon to maintain highway performance and improve safety by improving system efficiency and management before adding capacity. ODOT will work in partnership with regional and local governments to address highway performance and safety needs. Goal 2. System Management: To work with local jurisdictions and federal agencies to create an increasingly seamless transportation system with respect to the development, operation, and maintenance of the highway and road system that: • Safeguards the state highway system by maintaining functionality and integrity; • Ensures that local mobility and accessibility needs are met; and • Enhances system efficiency and safety. Goal 3. Access Management: To employ access management strategies to ensure safe and efficient highways consistent with their determined function, ensure the statewide movement of goods and services, enhance community livability and support planned development patterns, while recognizing the needs of motor vehicles, transit, pedestrians and bicyclists. Policy 3A: Classification and Spacing Standards It is the policy of the State of Oregon to manage the location, spacing, and type of road and street intersections and approach roads on state highways to assure the safe and efficient operation of state highways consistent with the classification of the highways.	The OHP is a broad, overarching guidance document that does not address project or area specifics.	The OHP has several policies that could affect the project and several standards that are directly applicable to the project. The expectation is that the Park Avenue Neighborhood and Station Area Plan will be developed to be consistent with the OHP. McLoughlin Boulevard, also referred to as OR 99E, is a state highway. The OHP designates OR 99E as a District Highway. District Highways are "facilities of county-wide significance and function largely as county and city arterials or collectors. They provide connections and links between small urbanized areas, rural centers and urban hubs, and also serve local access and traffic. The management objective is to provide for safe and efficient, moderate to high-speed continuous-flow operation in rural areas reflecting the surrounding environment and moderate to low-speed operation in urban and urbanizing areas for traffic flow and for pedestrian and bicycle movements. Inside STAs, local access is a priority. Inside Urban Business Areas, mobility is balanced with local access". According to Table 7,Maximum Volume to Capacity Ratios Within Portland Metropolitan Region in the OHP, the mobility standard for Corridors (which according to footnote b in the table applies to 99E from Milwaukie to Oregon City) and Inner and Outer Neighborhoods (which applies to the neighborhoods east and west of 99E) is .99 for the first hour and .99 for the second hour. However, the mobility standard for Station Communities which designation will be recommended as a part of the Park Avenue Neighborhood and Station Area Plan is1:1 for the first hour and .99 for the second hour Policy 1B, Land Use and Transportation and specifically, Action 1B.5 states: "Develop and improvement plans that support compact development including but not limited to highway segment

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			designations.”. Methods outlined in the OHP are: • Parallel and interconnected local roadway networks to encourage local automobile trips off the state highway; • Transit, bicycle and pedestrian facilities, including street amenities that support these modes; • Design and orientation of buildings and amenities that accommodate pedestrian and bicycle use as well as automobiles use; • Provision of public and shared parking; • Infill and redevelopment; • Expansion of intensive urban development guided away from state highways rather than along state highways; and • Other supporting public investments that encourage compact development and development within centers.
OHP – Highway Segment Designations	To reflect ODOT’s interest in focusing growth in more compact development patterns, Policy 1B adopts the highway segment designations of Special Transportation Areas (STAs), Urban Business Areas (UBAs), and Commercial Centers. These highway segments are tools to implement more compact community development patterns. In implementing Policy 1B, particularly highway segment designations, ODOT recognizes that the policy will be applied under different conditions and may result in some instances where ODOT action may precede local planning implementation: • Existing conditions that meet the policy objectives; • Existing conditions which do not meet the policy objectives. In these circumstances, the policy will be used to gain closer levels of compliance with the objectives and/or actions. In cases where existing conditions are generally static, • the policy will be used to ensure that development patterns do not continue in a manner contrary to this policy and will seek out ways to move in the direction of the policy. • A mixture of existing non-compliant conditions and new proposals, projects or developments where higher levels of compliance with the objectives and/ or actions would be desirable. In these circumstances, ODOT, the affected local government, and affected parties need to work out a way to best achieve compliance with the objectives and/or actions. • New conditions or development where there is the ability to fully comply with the policy objectives and/or actions.	General Process and Implementation Resources: The process for designating highway segments begins with the identification of an area in a local transportation system plan, facility plan, downtown plan, or other adopted plan. Through communication and cooperation, the local jurisdiction and ODOT reach agreement on the specifics of the designation. ODOT will not proceed without written support for the designation. Once the parties have reached agreement, the Oregon Transportation Commission will formally designate the segment, whereupon the Oregon Highway Plan map will be amended to reflect the designation. The overall process is designed to reflect the planning efforts of local governments while still giving certainty to both ODOT and local governments regarding community development and transportation planning and project development.	Oregon Highway Plan Policy 1B includes highway categories designated by land use in addition to the highway classification (described above). None of the highway segment types have been formally applied to this segment of highway. The land use character of the existing highway best resembles the Urban Business Area (UBA) which is (ADD). There are Special Transportation Area designations for highway segments associated with downtown Milwaukie and Oregon City. The STA designations are intended for traditional downtown centers and desirable to communities due to the slower travel speeds that sometimes result from the STA designation and associated land uses to help support pedestrian movement. The project area does not likely have the land use characteristics to support a STA designation.

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		Policy 1B provides the framework for supporting rules, standards, policies, and guidance information. Reference to this supporting material is necessary for implementation of Policy 1B	
OAR Chapter 734, Division 20 (Traffic Control)and Division 51 (Highway Approaches, Access Control, Spacing Standards and Medians) OAR 734-051 governs traffic control, including speed and signals. OAR 734-051 governs the permitting, management, and standards of approaches to state highways to ensure safe and efficient operation of the state highways.	734-020 identifies the process for determining speed, signal modifications and new signals along OR 99E. New signals are addressed in 734-020-0040. The purpose of this section is to provide an evaluation and approval process for new signals on state highways. 734-051-0020 Purpose and Applicability of Rules (1) The purpose of Division 51 rules is to provide a safe and efficient transportation system through the preservation of public safety, the improvement and development of transportation facilities, the protection of highway traffic from the hazards of unrestricted and unregulated entry from adjacent property, and the elimination of hazards due to highway grade intersections. These rules establish procedures and criteria used by the Department to govern highway approaches, access control, spacing standards, medians and restriction of turning movements in compliance with statewide planning goals and in a manner compatible with acknowledged comprehensive plans and consistent with Oregon Revised Statutes (ORS), Oregon Administrative Rules (OAR), and the 1999 Oregon Highway Plan (OHP). OAR 734-051 policies address the following: • How to bring existing and future approaches into compliance with access spacing standards, and ensure the safe and efficient operation of the highway • The purpose and components of an access management plan • Requirements regarding mitigation, modification, and closure of existing approaches as part of project development • Change of Use of an Approach, Temporary Approaches, Restricted Use Approaches, Access Management Spacing Standards for Approaches, Deviations from Access Management Spacing Standards, Mitigation Measures, Design of Approaches, Removal of Approaches	There are various types of permits that may need to be applied for if there are changes to highway approaches, access control, spacing, standards, and medians.	ODOT permits related to the access to the highway, operations and standards of the highway, as outlined in OAR 734-051 will not likely apply to the station area because access to the light rail station and area properties is expected to occur off of public streets. An ODOT approach permit is not required for access on public streets. Direct access to the highway from private property is limited and is based on the OAR access spacing standards and property rights.
Regional			
Metro Urban Growth Management Functional Plan The Functional Plan implements the 2040 Growth Concept and the Regional Framework Plan. The Functional Plan requires cities and counties to designate boundaries for the 2040 Growth Concept Design Types, including the Portland Central City, Regional Centers, Town	TITLE 1: REQUIREMENTS FOR HOUSING AND EMPLOYMENT ACCOMMODATION 3.07.110 Purpose and Intent: One goal of the Framework Plan is the efficient use of land. Title 1 intends to use land within the UGB efficiently by increasing its capacity to accommodate housing and employment. Title 1 directs each city and county in the region to consider actions to increase its capacity and to take action if necessary to accommodate its share of regional growth as specified in this title. TITLE 6: CENTRAL CITY, REGIONAL CENTERS, TOWN CENTERS AND STATION COMMUNITIES 3.07.610 Purpose and Intent: The success of the 2040 Growth Concept depends upon the maintenance and enhancement of the Central City, Regional and Town Centers and Station Communities as the principal centers of urban life in the region. Title 6 intends to	Not applicable. Cities and counties comprehensive plans and land use regulations must comply with the functional plan	The plan will help implement Metro's 2040 Growth Management Concept station community designation. Station communities are defined as: "…Nodes of development centered on a light rail or high-capacity transit station that feature a high quality pedestrian environment that feature a variety of shops and services. They

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Centers, and Station Communities. The purpose of the Functional Plan is to implement regional goals and objectives adopted by the Metro Council as the Regional Urban Growth Goals and Objectives (RUGGO), including the Metro 2040 Growth Concept and the Regional Framework Plan. The comprehensive plan changes and related actions, including implementing regulations, required by this Functional Plan as a component of the Regional Framework Plan, shall be complied with by cities and counties as required by Section 5(e)(2) of the Metro Charter. The 2040 Growth Concept Map identifies the project area as both “Corridors” (McLoughlin) and “Neighborhood” (surrounding McLoughlin). Corridors Corridors are major streets that serve as key transportation routes for people and goods. Examples of corridors include the Tualatin Valley Highway and 185th Avenue in Washington County, Powell Boulevard in Portland and Gresham and McLoughlin Boulevard in Clackamas County. Corridors are served extensively by transit. Neighborhoods Under the 2040 Growth Concept, most existing neighborhoods will remain largely the same. Some redevelopment can occur so that vacant land or under-used buildings could be put to better use. New neighborhoods are likely to have an emphasis on smaller single-family lots, mixed uses and a mix of housing types including row houses and accessory dwelling units. The growth concept distinguishes between slightly more compact inner neighborhoods, and outer neighborhoods, with slightly larger lots and fewer street connections.	enhance Centers by encouraging development in these Centers that will improve the critical roles they play in the region and by discouraging development outside Centers that will detract from those roles. As used in this title, the term "Centers" includes the Central City, Regional and Town Centers and Station Communities. TITLE 12: PROTECTION OF RESIDENTIAL NEIGHBORHOODS 3.07.1210 Purpose and Intent: Existing neighborhoods are essential to the success of the 2040 Growth Concept. The intent of Title 12 of the Urban Growth Management Functional Plan is to protect the region’s residential neighborhoods. The purpose of Title 12 is to help implement the policy of the Regional Framework Plan to protect existing residential neighborhoods from air and water pollution, noise and crime and to provide adequate levels of public services. 3.07.1230 Access to Commercial Services A. In order to reduce air pollution and traffic congestion, and to make commercial retail services more accessible to residents of Inner and Outer Neighborhoods, a city or county may designate in its comprehensive plan and land use regulations one or more Neighborhood Centers within or in close proximity to Inner and Outer Neighborhoods to serve as a convenient location of commercial services. B. To ensure that commercial development serves the needs of the residents of Inner and Outer Neighborhoods but does not generate excessive traffic, noise or air pollution, a city or county that designates a Neighborhood Center shall adopt limitations on the scale of commercial services in Neighborhood Centers. In a Neighborhood Center, a city or county shall not approve: 1. A commercial retail use with more than 20,000 square feet of gross leasable area in a single building; or 2. Office commercial uses with more than 10,000 square feet of gross leasable area in a single building or on a single lot or parcel. TITLE 13: NATURE IN NEIGHBORHOODS 3.07.1310 Intent: The purposes of this program are to (1) conserve, protect, and restore a continuous ecologically viable streamside corridor system, from the streams’ headwaters to their confluence with other streams and rivers, and with their floodplains in a manner that is integrated with upland wildlife habitat and with the surrounding urban landscape; and (2) to control and prevent water pollution for the protection of the public health and safety, and to maintain and improve water quality throughout the region.		provide for the highest density of development outside of city centers. Station communities encompass an area approximately one-half mile from a station stop.” Local adoption of a Station Community boundary will be recommended as a part of the Park Avenue Neighborhood and Station Area Plan. The local boundary adoption will be followed by a recommendation from Clackamas County to Metro to adopt the locally-designated Station Community boundary as part of the 2040 Growth Concept Plan. This action will help implement the 2040 Growth Concept Plan and allow the station area to be eligible for Metro funds. Section 3.07.170 of the Functional Plan recommends average densities for housing and employment for each of the 2040 Growth Concept design types. The recommendation for Station Communities is 45 persons per acre (the recommendation for Corridors is 25 persons per acre and Inner Neighborhoods is 14 persons per acre). The Nature in the Neighborhoods grant awarded to TriMet in 2010 for station design improvements will be integrated into the station area plan to ensure that both meet the UGMFP requirements.
Metro Regional Transportation Plan (RTP) On June 10, 2010, the Joint Policy Advisory Committee on Transportation (JPACT) and the Metro Council approved the 2035 RTP for the purpose of completing a federal and state-required air quality conformity analysis of the proposed system. The RTP is arranged by	In the 2035 RTP, the policies place significant emphasis on prioritizing investments in the Design Types of the 2040 Growth Concept and on RTP investments such as light rail, as shown in the following goals and objectives. Goal 1 Foster Vibrant Communities and Efficient Urban Form: Land use and transportation infrastructure decisions are linked to promote an efficient and compact urban form that fosters vibrant communities; optimizes public investments; and supports jobs, schools, shopping, services, recreation opportunities and housing proximity. Objective 1.1 Compact Urban Form and Design: Use transportation investments to reinforce growth in and multi-modal access to	Local conditions will be addressed through city and county TSPs, and will require additional analysis and improvements to provide an adequate transportation system. The following processes may be used to update the RTP to include such changes:	The project’s purpose—to establish land uses and a multimodal transportation network that will be supportive of transit uses around the planned light rail station off McLoughlin Boulevard—is consistent with and will implement the RTP purpose and intent. The RTP

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high priority mobility corridors, which provide a framework for how the goals and policies of the RTP are to be implemented. The Portland-Milwaukie corridor is identified as one of the mobility corridors in the RTP. The plan proposes a high functioning and integrated transportation system where residents have safe and realistic options for multimodal travel; walking, biking, and riding transit. Proposed projects include high-capacity transit connections within the region.	2040 Target Areas and ensure that development in 2040 Target Areas is consistent with and supports the transportation investments. Goal 2 Sustain Economic Competitiveness And Prosperity: Multi-modal transportation infrastructure and services support the region's well-being and a diverse, innovative, sustainable and growing regional and state economy through the reliable and efficient movement of people, freight, goods, services and information within the region and to destinations outside the region. Objective 2.1 Provide for reliable and efficient multi-modal local, regional, interstate and intrastate travel and market area access through a seamless and well-connected system of throughways, arterial streets, freight services, transit services and bicycle and pedestrian facilities, consistent with the Regional System Concepts.	1. Amendments resulting from local TSPs: new roadway, transit, bikeway, pedestrian, freight and demand management projects necessary to meet the objectives of the RTP shall be accompanied by an demonstration of consistency with the RTP.	identifies transit supportive development patterns as including: • An urban form and densities that generate a high number of transit riders. • A mix of uses, and a balance of jobs and housing, that creates a place where activity occurs at least 18 hours a day. • Well---designed streets and buildings that encourage pedestrian movement. • Streets that can accommodate 40---foot buses. Safe, direct and convenient pedestrian and bicycle access, within communities and to transit stops. Recommended projects included within the plan's implementation measures may include projects that will also need to be added to the RTP. Implementation measures will also include recommendations for amendments to Clackamas County planning and capital documents.
Metro Regional Transportation Plan- High Capacity Transit (HCT) System Plan The Regional HCT System Plan is designed to focus on the frequent, fast and high capacity element of the public transit system; other transit system functions, including local bus, paratransit, streetcar, and frequent bus are included in the RTP. High capacity transit is characterized by exclusive right-of-way and routes with fewer stops. The HCT System Plan report summarizes the results of outreach and data analysis intended to provide guidance for the region's long-term investments in high capacity transit. The prioritized high capacity transit corridors and discussion of improvements to the existing system are based on planned land uses, community values, environmental benefits, economic potential, and deliverability. In addition, the report covers the main	An outcomes-based evaluation approach, in which three areas of benefit are stressed: community, environment and economy. Additionally, a deliverability account was added to determine a corridor's near-term readiness. Within each category, several measures were used to assess near-term and long-term benefits and impacts of implemented HCT investments. The evaluation approach aligns specific HCT plan recommendations with the hierarchy of regional planning objectives. • 2040 Growth Concept (vision) • 2035 Regional Transportation Plan (implementing the 2040 Growth Concept) • Regional High Capacity Transit Plan (supporting RTP Goals) High Capacity Transit System Plan evaluation criteria: Community C1 Supportiveness of existing land uses C2 Local aspirations C3 Placemaking and urban form C4 Ridership generators	Local action descriptions: Local actions would be structured to help local jurisdictions move their project toward targets set for project advancement. Some or all of the following actions could be taken to advance a project, depending on the tier placement: Develop corridor problem statement: The corridor problem statement defines the purpose of and establishes goals for the proposed HCT investment (i.e., congestion mitigation, economic development, etc.). It assesses the role of the project in addressing other regional transportation priorities and identifies opportunities for integration with other transportation system improvements in the corridor.	The connection from the planned Park Avenue Station south to Oregon City is currently a Next Phase corridor, which means that several changes in the corridor will need to occur prior to the Milwaukie to Oregon City corridor being elevated to a Near Term Regional Priority Corridor. Station area and neighborhood planning for Park Avenue will improve the corridor, but a strong station area at Park Avenue is only one part of the solution because the entire corridor will also need to be addressed from both land use and transportation perspectives,

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components addressed during the HCT System Plan process, including public outreach, high capacity transit corridor evaluation, system considerations, and best practices for high capacity transit in the United States and around the world.	C5 Support of regional 2040 Growth Concept C6 Integration with regional transit system C7 Integration with other land uses* C8 Congestion avoidance benefit** C9 Equity benefit C10 Health (promotion of physical activity)** C11 Safety and security*** C12 Housing and transportation benefit C13 Transportation efficiency or travel time benefit to individual user** C14 Transportation efficiency or travel time benefit to all corridor users** Environment EN1 Reduction in emissions and disturbance** EN2 Risk of natural resources disturbance EN3 Risk of 4(f) resource disturbance*** Economy EC1 Transportation efficiency (operating cost per rider)** EC2 Transportation efficiency (annual capital and operating cost per rider)** EC3 Employment served EC4 Vacant and rebuilding/redevelopment land Deliverability D1 Total project capital cost (exclusive and nonexclusive right of way options) D2 Capital cost per mile (exclusive and nonexclusive right of way options) D3 Operating and maintenance cost** D4 Total corridor ridership** D5 Funding potential**	• Define corridor extent; • Assess corridor against system expansion targets; • Create ridership development, land use, and transit oriented development plans for centers and stations; • Assess mode and function of HCT; • Create multimodal station access and parking plan; • Assess financial feasibility and identify methods, including incentives to finance existing and future infrastructure improvements.	with supportive land use multimodal connectivity in place to support consideration for a higher HCT prioritization. Currently, the corridor does not support extending HCT to Oregon City compared to other regional corridors that have been identified as near term priorities.
Metro RTFP The Regional Transportation Functional Plan (RTFP) implements the Goals and Objectives in section 2.3 of the Regional Transportation Plan (RTP). Cities and counties of the region will carry out the Goals and Objectives in their comprehensive plans, transportation system plans (TSPs), other land use regulations, and transportation project development.	TITLE 1: TRANSPORTATION SYSTEM DESIGN 3.08.110 Street System Design A. To ensure that new street construction and re-construction projects are designed to improve safety, support adjacent land use and balance the needs of all users, including bicyclists, transit vehicles, motorists, freight delivery vehicles and pedestrians of all ages and abilities, city and county street design regulations shall allow implementation of: 1. Complete street designs as set forth in Creating Livable Streets: Street Design Guidelines for 2040 (2nd Edition, 2002), or similar resources consistent with regional street design policies; 2. Green street designs as set forth in Green Streets: Innovative Solutions for Stormwater and Street Crossings (2002) and Trees for Green Streets: An Illustrated Guide (2002) or similar resources consistent with federal regulations for stream protection; and 3. Transit-supportive street designs that facilitate existing and planned transit service pursuant subsection 3.08.120B. B. City and county local street design regulations shall allow implementation of: 1. Pavement widths of less than 28 feet from curb-face to curb-face; 2. Sidewalk widths that include at least five feet of pedestrian through zones; 3. Landscaped pedestrian buffer strips, or paved furnishing zones of at least five feet, that include street trees; 4. Traffic calming devices, such as speed bumps and cushions, woonerfs and chicanes, to discourage traffic infiltration and excessive speeds; 5. Short and direct right-of-way routes and shared-use paths to connect residences with commercial services, parks, schools, hospitals, institutions, transit corridors, regional trails and other neighborhood activity centers; and	Each city and county shall update its TSP to incorporate regional and state transportation needs identified in the 2035 RTP and its own transportation needs. When a city or county proposes to amend its comprehensive plan or its components, it shall consider the strategies in subsection 3.08.220A as part of the analysis required by OAR 660-012-0060.	The RTFP offers direction for counties and cities to update their TSPs and associated regulations. The RTFP provides detailed guidelines to implement the Goals and Objectives of the RTP. As the Park Avenue Plan progresses and transportation improvements are identified for inclusion into county planning and transportation documents, the project will need to ensure that they are consistent with County policies and design guidelines that implement the RTFP.

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	6. Opportunities to extend streets in an incremental fashion, including posted notification on streets to be extended. G. To protect the capacity, function and safe operation of existing and planned state highway interchanges or planned improvements to interchanges, cities and counties shall, to the extent feasible, restrict driveway and street access in the vicinity of interchange ramp terminals, consistent with Oregon Highway Plan Access Management Standards, and accommodate local circulation on the local system to improve safety and minimize congestion and conflicts in the interchange area. Public street connections, consistent with regional street design and spacing standards in this section, shall be encouraged and shall supercede this access restriction, though such access may be limited to right-in/right-out or other appropriate configuration in the vicinity of interchange ramp terminals. Multimodal street design features including pedestrian crossings and on-street parking shall be allowed where appropriate. 3.08.120 Transit System Design B. City and county TSPs shall include a transit plan, and implementing land use regulations, with the following elements to leverage the region's investment in transit and improve access to the transit system: 2. The following site design standards for new retail, office, multi-family and institutional buildings located near or at major transit stops shown in Figure 2.15 in the RTP: a. Provide reasonably direct pedestrian connections between transit stops and building entrances and between building entrances and streets adjoining transit stops; b. Provide safe, direct and logical pedestrian crossings at all transit stops where practicable; c. At major transit stops, require the following: i. Locate buildings within 20 feet of the transit stop, a transit street or an intersecting street, or a pedestrian plaza at the stop or a street intersection; ii. Transit passenger landing pads accessible to disabled persons to transit agency standards; iii. An easement or dedication for a passenger shelter and an underground utility connection to a major transit stop if requested by the public transit provider; and iv. Lighting to transit agency standards at the major transit stop. v. Intersection and mid-block traffic management improvements as needed and practicable to enable marked crossings at major transit stops. 3.08.130 Pedestrian System Design B. As an alternative to implementing section 3.08.120(B)(2), a city or county may establish pedestrian districts in its comprehensive plan or land use regulations with the following elements: 1. A connected street and pedestrian network for the district; 2. An inventory of existing facilities, gaps and deficiencies in the network of pedestrian routes; 3. Interconnection of pedestrian, transit and bicycle systems; 4. Parking management strategies; 5. Access management strategies; 6. Sidewalk and accessway location and width; 7. Landscaped or paved pedestrian buffer strip location and width; 8. Street tree location and spacing; 9. Pedestrian street crossing and intersection design; 10. Street lighting and furniture for pedestrians; and 11. A mix of types and densities of land uses that will support a high level of pedestrian activity. C. City and county land use regulations shall require new development to provide on-site streets and accessways that offer reasonably direct routes for pedestrian travel. 3.08.140 Bicycle System Design A. City and county TSPs shall include a bicycle plan, with implementing land use regulations, for an interconnected network of bicycle routes within and through the city or county. The plan shall include: 4. Provision for bikeways along arterials, collectors and local streets, and bicycle parking in centers, at major transit stops shown in Figure 2.15 in the RTP, park-and-ride lots and associated with institutional uses; and		

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	5. Provision for safe crossing of streets and controlled bicycle crossings on major arterials. 3.08.220 Transportation Solutions A. Each city and county shall consider the following strategies, in the order listed, to meet the transportation needs determined pursuant to section 3.08.210 and performance targets and standards pursuant to section 3.08.230. The city or county shall explain its choice of one or more of the strategies and why other strategies were not chosen: 1. TSMO strategies, including localized TDM, safety, operational and access management improvements; 2. Transit, bicycle and pedestrian system improvements; 3. Traffic-calming designs and devices; 4. Land use strategies in OAR 660-012-0035(2) to help achieve the thresholds and standards in Tables 3.08-1 and 3.08-2 or alternative thresholds and standards established pursuant to section 3.08.230; 5. Connectivity improvements to provide parallel arterials, collectors or local streets that include pedestrian and bicycle facilities, consistent with the connectivity standards in section 3.08.110 and design classifications in Table 2.6 of the RTP, in order to provide alternative routes and encourage walking, biking and access to transit; and 6. Motor vehicle capacity improvements, consistent with the RTP Arterial and Throughway Design and Network Concepts in Table 2.6 and section 2.5.2 of the RTP, only upon a demonstration that other strategies in this subsection are not appropriate or cannot adequately address identified transportation needs. B. A city or county shall coordinate its consideration of the strategies in subsection A with the owner of the transportation facility affected by the strategy. Facility design is subject to the approval of the facility owner. C. If analysis under subsection 3.08.210A indicates a new regional or state need that has not been identified in the RTP, the city or county may propose one of the following actions: 1. Propose a project at the time of Metro review of the TSP to be incorporated into the RTP during the next RTP update; or 2. Propose an amendment to the RTP for needs and projects if the amendment is necessary prior to the next RTP update.		

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Plan or Policy	Specific Applicable Section (s)	Amendment Process (if applicable)	Project Relevance
Local			
Clackamas County Comprehensive Plan The basic aim of the Comprehensive Plan is to organize and coordinate the complex interrelationships among people, land, resources, and facilities in such a way as to protect the future health, safety, quality of life, and welfare of Clackamas County residents.	Chapter 4 – Land Use URBANIZATION The goals and policies in the following section address the designation of lands for urban uses, conversion of lands from Urban Reserve to Future Urban plan designations, and County actions regarding Future Urban Study areas and Urban Reserve areas. GOALS Clearly distinguish Urban and Urban Reserve areas from non-urban areas. Encourage development in areas where adequate public services and facilities can be provided in an orderly and economic way. Insure an adequate supply of land to meet immediate and future urban needs. Provide for an orderly and efficient transition to urban land use. Distinguish lands immediately available for urban uses from Future Urban areas within Urban Growth Boundaries. POLICIES 3.0 Land use planning for urban areas shall integrate all applicable policies found throughout the Plan including the following: a. Locate land uses of higher density or intensity to increase the effectiveness of transportation and other public facility investments. b. Encourage infilling of Immediate Urban Areas with a minimum of disruption of existing neighborhoods (see infill policies in the Housing Chapter). c. Enhance energy conservation and transportation system efficiency by locating opportunities for housing near work and shopping areas. d. Integrate developments combining retailing, office, and medium and high density housing at places with frequent transit service and pedestrian facilities. URBAN GROWTH CONCEPT Growth Concept Design Types The locations of the following design types are identified on the Clackamas County Urban Growth Concept Map: (Map IV-8) or as described below: (5/27/04) Corridors: Areas located along streets which have existing or planned high quality transit service and feature a high quality pedestrian environment, convenient access to transit and increased residential and employment densities. The intent of the Corridor designation is to encourage increased densities by facilitating zone and plan changes in specific locations. In addition, it provides guidance for development review to implement a high quality pedestrian environment. GOALS Provide for a compact urban form, integrating the built environment, transportation network, and open space, that: • Minimizes the amount of Urban Growth Boundary expansion required to accommodate expected population and employment growth in the next 20 years. • Efficiently uses public services including transportation, transit, parks, schools, sewer and water. • Distinguishes areas for intensive development from areas appropriate for less intensive development. • Preserves existing stable and distinct neighborhoods by focusing commercial and residential growth in mixed use centers and corridors. • Develops mixed use centers and corridors at a pedestrian scale and with design features and public facilities that support pedestrian, bicycle and transit trips. • Maintains the rural character of the landscape between the Urban Growth Boundary and neighboring cities.	The Park Avenue Park Avenue Light Rail Station Area Plan, if adopted, could become a Community Plan or part of a Community Plan incorporated into Chapter 10 of the Comprehensive Plan, Community Plans and Design Plans. Clackamas County currently has recommended amendments to Chapter 4 to “Station Communities” as a Growth Concept Design Type in Chapter 4.	A identifies specific goals and policies relevant to the project. Attachment B shows the adopted McLoughlin Corridor Plan cross sections for the project area. The project is consistent with the goals of the Clackamas County Comprehensive Plan, which identifies SE McLoughlin Boulevard as a high capacity transit corridor. The Clackamas County Comprehensive Plan identifies a high capacity transit route generally following SE McLoughlin Boulevard from the Portland city limits to Oregon City. The project is also consistent with the Urbanization Goals of the Comprehensive Plan. Much of the area around the station is zoned residential. However, limited Neighborhood Commercial uses may be allowed if they meet the criteria identified. New zoning designations may be appropriate and recommended as part of the project in order to meet the policy intent of compact, mixed-use neighborhoods. Additionally, the County is nearing completion of its Station Community policy and design guidelines that will be relevant as new land uses are proposed through the neighborhood and station planning process.

Plan or Policy	Specific Applicable Section (s)	Amendment Process (if applicable)	Project Relevance
	POLICIES The Policies that apply to all the Corridor Design Type Areas include: 2.1 Provide for both employment and housing, including mixed use. 2.2 Provide for a high level of bus usage, with land uses and transportation facilities to support bus use. 2.3 Encourage and support pedestrian travel with supportive land uses, frequent street connections, and sidewalks and pedestrian-ways. 2.4 Provide for vehicular traffic and auto-oriented uses, while expanding the share of trips via transit and other modes. 2.5 Enhance connectivity between neighborhoods adjacent to the Corridor Design Type Area and the Corridor Street. Neighborhoods 8.0 The Neighborhood Design Type designation is applied as shown on Map IV-8. Policies that apply to the Neighborhood Areas include: 8.1. Development of areas planned for residential, commercial and industrial uses within Neighborhood Design Type Areas shall be guided by the urban land use policies outlined in the Land Use Chapter in the Comprehensive Plan. 8.2 Areas designated as Low Density Residential shall achieve the densities as outlined in the Low Density Residential policy section. RESIDENTIAL Low Density Residential POLICIES 1.0 The following areas may be designated Low Density Residential if any of the following criteria are met: 1.1. Areas where a need for this type of housing exists. 1.2. Areas which are currently developed at low density and where little need exists for redevelopment. 1.3. Areas where transportation is limited to collectors and local streets. 1.4. Areas where sensitivity to the natural environment or natural hazards indicate a reduced density. 2.0 Determine the density of development by zoning. Zoning of Immediate Urban Low Density Residential areas and conversion of Future Urban areas to Immediate Urban low density residential shall include zones of 2,500 through 30,000 square feet. The following factors guide the determination of the most appropriate zone: 2.3 Availability of transit: Land within walking distance (approximately one quarter mile) of a transit stop should be zoned for smaller lots.		

Plan or Policy	Specific Applicable Section (s)	Amendment Process (if applicable)	Project Relevance
	2.4 Proximity to jobs, shopping and cultural activities: Areas in proximity to trip generators shall be considered for smaller lots. 2.5 Location of 2,500 and 5,000 square foot lots: Location of 2,500 and 5,000 square foot lots may be allowed in Corridor design type areas and where permitted by Community and Design Plans located in Chapter 10. 2.6 Need for neighborhood preservation and variety: Areas which have historically developed on large lots where little vacant land exists should remain zoned consistent with the existing development pattern. Otherwise, unless physical or service problems indicate to the contrary, areas of vacant land shall be zoned for lots of 8,500 square feet or smaller. 3.0 Through zoning, Neighborhood Commercial uses may be allowed in the Low Density residential plan designation areas according to the criteria in the Commercial Section of this Chapter. Medium Density Residential 21.0 The following areas may be designated Medium Density Residential when at least the first two criteria are met: a. Areas where a need for this type of housing exists. b. Areas with access to a major or minor arterial or collector. Siting should not result in significant traffic increase on local streets serving low density residential areas. c. Areas located near or adjacent to commercial areas, employment concentrations or transit stops. d. Areas of deteriorating dwellings or structures in neighborhoods to stimulate private investment, infilling and redevelopment, as long as one or more of the preceding criteria apply. 24.0 Through zoning, Neighborhood Commercial uses may be allowed in the Medium Density Residential Plan-designated areas according to the criteria in the Commercial Section of this chapter. 25.0 Encourage variations in density on different parts of a large site and promote a variety in housing type, ownership and design. 29.0 Require pedestrian access to nearby schools, transit stations, commercial, recreational and employment areas to be convenient and improved to standards determined through design review. High Density Residential 44.0 The following areas may be designated High Density Residential when at least the first three criteria are met: a. Areas located either adjacent to or within proximity to major shopping centers, employment concentrations and/or major transit centers. b. Areas with access to a street designated as a major or minor arterial or collector. Siting should not result in significant traffic increase on local streets serving low density residential areas. 48.0 Through zoning, Neighborhood Commercial uses may be allowed in the High Density Residential Plan-designated areas according to the criteria in the Commercial Section of this chapter. 49.0 Allow office, and service commercial uses oriented to on-site residents. Such uses, including food and beverage establishments and professional offices, should be integrated with the residential development. 50.0 Allow existing commercial uses to remain or improve in High Density Residential areas as long as such uses are integrated with surrounding development.		

Plan or Policy	Specific Applicable Section (s)	Amendment Process (if applicable)	Project Relevance
	54.0 Require pedestrian access to nearby schools, transit stations, commercial, recreational and employment areas to be convenient and improved to standards determined through design review. POLICIES Neighborhood Commercial 1.0 The Neighborhood Commercial district may be applied to sites within residential areas which either have an historical commitment to neighborhood commercial uses, or satisfy all the following criteria: 1.1 The conditional use criteria of the Zoning and Development Ordinance. 1.2 The new site, or expanded site, is necessary to provide convenience commercial uses which are not currently available within the service area. "Service area", for purposes of this policy, shall be either: a. The readily accessible area within 2000 feet of the proposed site; or b. A defined area with a minimum of 500 existing or potential dwelling units which are closer to the proposed site, and have as good or better access to the proposed site, than to existing commercial sites considering distance and topographical barriers. Potential dwelling units shall be determined on the basis of existing zoning. 1.3 Each Neighborhood Commercial site should be a maximum of one acre in size. To allow clustering of convenience uses, additional area may be added up to a maximum total area of two acres. 1.4 Sites shall have direct access to a street of at least a collector classification and preferably an arterial. 1.5 Sites should not include more than one quadrant of an intersection. If more than one quadrant is approved, it shall be shown that undue traffic congestion will not result. 1.6 Sites shall be developed with uses allowed by the Neighborhood Commercial district within two years of the action of the County tentatively approving the zone change, unless a time extension is granted. 2.0 Determine permitted uses by zoning. Zoning of Neighborhood Commercial areas shall be consistent with this Plan and the stated purpose of compatible zoning districts. Timing of zoning district application shall be in accord with the orderly development of the County. 3.0 Cluster buildings in Neighborhood Commercial areas to prevent strip development and require buildings to be compatible in design and scale with the surrounding neighborhood. 4.0 Require in all Neighborhood Commercial development and redevelopment a minimum of 15 percent of the total developed area to be in landscaping. 5.0 Require all Neighborhood Commercial developments to be subject to the design review process. 6.0 Require that improvements to streets be made when necessary prior to or concurrent with Neighborhood Commercial development. Bicycle/pedestrian facilities shall be provided. Community Commercial 7.0 The following areas may be designated Community Commercial when the first or all of the other criteria are met: a. Areas having an historical commitment to commercial uses.		

Plan or Policy	Specific Applicable Section (s)	Amendment Process (if applicable)	Project Relevance
	b. Areas which are separated from similar commercial uses by a least one-half mile. Each Community Commercial area should not exceed 10 acres. c. Areas having direct access to a street of at least a minor arterial classification. Siting should not result in significant traffic increase on local streets serving residential areas. d. Areas which do not increase an existing commercial strip. 8.0 Determine permitted uses through zoning. Zoning of Community Commercial areas shall be consistent with this Plan and the stated purpose of compatible zoning districts. Timing of zoning district application shall be in accord with the orderly development of the County. 9.0 Require in Community Commercial development and redevelopment a minimum of 15 percent of the total developed area to be in landscaping. 10.0 Require all developments to be subject to the design review process. 11.0 Require improvements to streets and/or transit access when necessary prior to or concurrent with development. 12.0 Require sidewalks and bicycle facilities. 13.0 Limit and define access to facilitate efficient and safe traffic movements. Joint access and provisions for vehicular and pedestrian movement between developments shall be required when necessary. 14.0 Require curbs, drainage controls, underground utilities and street lighting. General Commercial 34.0 The following areas may be designated General Commercial when either the first or all of the other criteria are met: a. Areas having an historical commitment to commercial uses. b. Areas necessary to serve the shopping needs of County residents. c. Areas having access to a street of at least a major arterial classification or transit trunk route. Siting should not result in significant traffic increase on local streets serving residential areas. d. Areas which do not increase an existing commercial strip or create new strips. e. Areas where adverse effects, such as traffic and noise, will have a minimal effect on adjacent neighborhoods or can be minimized through on-site improvements. f. Areas near employment centers. 35.0 Determine permitted uses through zoning. Zoning of General Commercial areas shall be consistent with this Plan and the stated purpose of compatible zoning districts. Timing of zoning district application shall be in accord with the orderly development of the County. 36.0 Require in General Commercial development and redevelopment a minimum of 15 percent of the total developed area to be in landscaping.		

Plan or Policy	Specific Applicable Section (s)	Amendment Process (if applicable)	Project Relevance
	37.0 Require all developments to be subject to the design review process. 38.0 Require improvements to streets and/or transit access when necessary prior to or concurrent with development. 39.0 Require sidewalks and bicycle facilities. 40.0 Limit and define access to facilitate efficient and safe traffic movements. Joint access and provisions for vehicular and pedestrian movement between developments shall be required when necessary. 41.0 Require curbs, drainage controls, underground utilities and street lighting. Chapter 5 - Transportation GENERAL TRANSPORTATION GOALS • Create a safe, efficient and effective transportation system—with multiple modes—that balances the needs of the economy, protection of the environment, conservation of natural resources, and protection of neighborhoods. • Schedule transportation system improvements to coincide with the needs of new development. TRANSIT GOALS • Develop an integrated transit system that complements and supports the road, pedestrian, and bicycle system and encourages the use of alternative transportation modes within, to, and from the County's urban areas. Encourage transit ridership through development of a transit system that is fast and comfortable at low cost. • Encourage land use patterns, development designs and street and pedestrian/bikeway improvements that support transit. • Provide transit for people who cannot use or do not have adequate private transportation. Provide transit that is accessible to people with disabilities. • Develop a transit system that supports residential, commercial and industrial development to help reduce new investment in roadway capacity. • Develop a transit system that meets the County's local needs. • Develop a system of light rail transit (LRT) routes to serve selected corridors in the north urban area of the County. Standards and Criteria for Major Transit Streets and Major Transit Stops 15.0 Major Transit Streets, for the purpose of setting standards for orientation of development to transit, shall be those streets planned for High Capacity Transit and Primary Bus as shown on Map V-6, as well as any other street that receives 20 minute or better service at the PM traffic peak. 16.0 Major Transit Stops shall be any transit stop along a Major Transit Street where that stop is within 250 feet of the centerline of an intersection with a public or private street. Orientation of buildings to transit at Major Transit Stops shall be accomplished by siting new commercial buildings as close as possible to transit, with a door facing the transit street or side street, and with no parking between the building and front property lines. 17.0 Pedestrian access should be provided connecting transit centers or transit stops on bus routes, with centers of employment, shopping or medium to high density residential areas within one-quarter mile of these routes. PEDESTRIAN AND BICYCLE FACILITIES VISION Create an environment which encourages people to bicycle and walk on networked systems that facilitate and promote the enjoyment		

Attachment A: Regulatory Planning Framework Matrix

Plan or Policy	Specific Applicable Section (s)	Amendment Process (if applicable)	Project Relevance
	of bicycling and walking as safe and convenient transportation modes.		
Clackamas County Comprehensive Plan, Chapter 10, McLoughlin Corridor Plan This plan focuses on designing aspects of the street for greater safety, aesthetics, and utility, especially including a landscaping strip between the curb and sidewalk.	GOALS • Design and improve McLoughlin to serve the needs of travelers by all modes of transportation along and across the roadway. • Design McLoughlin to serve a balance between regional through traffic and local access for business and residents. • Design McLoughlin to serve regional and local traffic, including public transportation, bicycle and pedestrian travel. • Enhance safety for all travel modes and improve the aesthetic appeal of McLoughlin. • Create a high quality pedestrian environment, convenient access to transit, and mix of land uses that implement the "Corridor" design type. • Enhance pedestrian safety, especially pedestrian crossings near schools. Land Use 1.0 The Growth Concept design type "Corridor", as defined in Chapter 4 and displayed on Map X-MC-1, shall be applied along McLoughlin Boulevard. 2.0 The Corridor design type is applied to properties within the McLoughlin Corridor Study area that have the following Comprehensive Plan designations: GC-General Commercial, SHD-Special High Density, HDR-High Density Residential, MHDR-Medium High Density Residential, and MDR-Medium Density Residential and are no more than 650 feet from the McLoughlin Boulevard Right-of-Way. 3.0 Corridor Policies 2.1-2.5 stated in Chapter 4: Urban Growth Concept shall be applicable within the Corridor design type area. 4.0 Office and commercial developments shall integrate with adjacent neighborhoods by providing, at minimum, excellent pedestrian access. 5.0 A range of land use designations may be applied within the designated Corridor design type area. Land use designations that provide primarily for employment and shopping, and land use designations that provide primarily for multi-family residences shall be considered. Land Use Designations applicable in the Corridor design type area are: 5.1 Commercial and Office designations that may be applied include: General Commercial, Retail Commercial, Office Commercial and Office Apartment. Any site designated for a commercial use shall be located adjacent to McLoughlin. 5.2 Multifamily designations that may be applied include: Special High Density, High Density, Medium High Density and Medium Density Residential. Multifamily designations should generally be located so as to form a buffer between commercial uses adjacent to McLoughlin and low density residential areas. 5.3 When applying for a Comprehensive Plan map amendment to a multi-family designation in the McLoughlin Corridor the applicant's property shall have access to a street designated as a major or minor arterial, collector, connector or local. Siting should not result in significant traffic increase on local streets serving low density residential areas. Transportation 9.0 Apply the typical cross sections as shown on Figure X-MC-1 a and b. Map X-MC-2 shows where the various cross sections generally apply. These cross sections for the area of the roadway adjacent to a development (generally sidewalks and landscaping strips) shall be required during development review.	Not applicable. The project should be consistent with guidelines.	The design plan for the McLoughlin Corridor suggests strategies supporting higher density redevelopment along SE McLoughlin Boulevard and residential neighborhoods to the west and identifies improvements to intersections, including the intersection of SE McLoughlin Boulevard and SE Park Avenue. Cross sections for McLoughlin Boulevard area included as Attachment B
Clackamas County Zoning Code The purpose of the zoning code is to implement the goals and policies of the Clackamas County Comprehensive Plan and to provide methods of administration and enforcement of the provisions identified within the zoning code.	301 URBAN LOW DENSITY RESIDENTIAL (R-2.5, R-5, R-7, R-8.5, R-10, R-15, R-20, R-30) (11/13/08) 301.01 PURPOSE This section implements the policies of the Comprehensive Plan for existing and future Low Density Residential areas, which include: A. Provide and protect residential land for families who desire to live in a low density environment. B. Protect the character of existing low density neighborhoods.	C. Final Approval: A Neighborhood Commercial zone change shall automatically become final if, within two years of the County's action approving the proposed zone change, one of the following is accomplished: 1. A building permit application for a structure(s) to house an allowed use has been approved and has not expired, or	Most of the project area is zoned low density residential, with commercial zoning along McLoughlin. Low density residential does not allow for mixed-use development. However, it does allow for small areas of neighborhood commercial pending review by a Hearings Officer. The zoning code does not have clearly identified transit oriented development standards. New zoning designations may be appropriate and

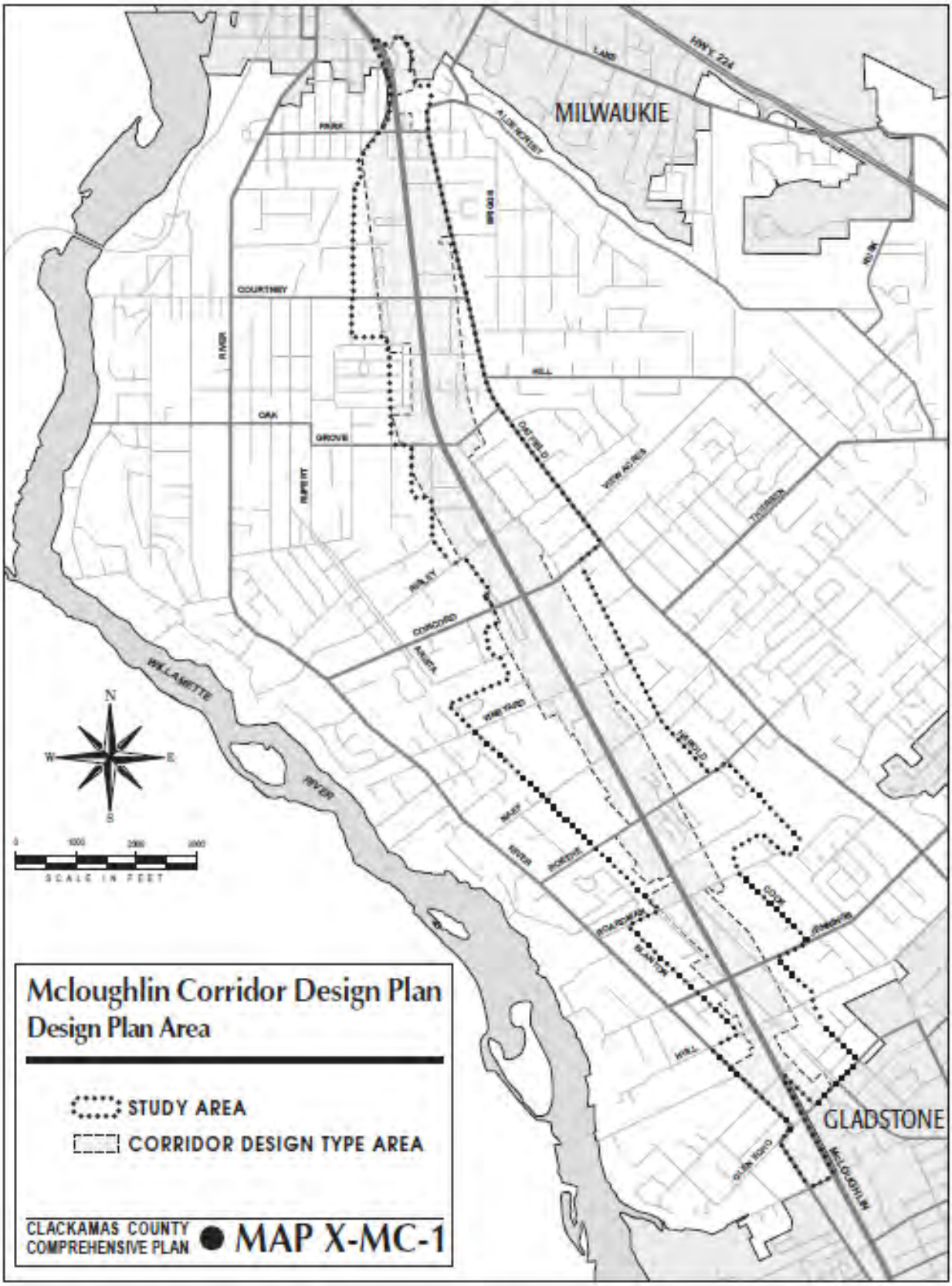
Plan or Policy	Specific Applicable Section (s)	Amendment Process (if applicable)	Project Relevance
	C. Provide for development within the carrying capacity of hillsides and environmentally sensitive areas. 302 MEDIUM DENSITY RESIDENTIAL DISTRICT (MR-1) (12/20/07) 302.01 PURPOSE This section is adopted to implement the policies of the Comprehensive Plan for Medium Density Residential areas. (3/24/05) 302.06 CONDITIONAL USES 7. Multi-use developments, subject to Section 1016; (11/30/06) 303 HIGH DENSITY RESIDENTIAL (HDR) 303.01 PURPOSE This Section is adopted to implement the policies of the Comprehensive Plan for high density residential areas, which include provision for residential development at densities which are supportive of public service and facility capacities in locations with good access to employment, shipping areas, open space, and public transportation. 303.05 LIMITED USES Within a Design Plan area, office, retail, and service uses may be included in a High Density Residential development subject to the provisions set forth below: 501 NEIGHBORHOOD COMMERCIAL (NC) (12/20/07) 501.01 PURPOSE This section is adopted to implement the policies of the Comprehensive Plan for Neighborhood Commercial areas. The intent of these provisions is to provide for convenience commercial needs of residential neighborhoods in locations easily accessible to these neighborhoods with minimal negative impacts. 501.02 AREAS OF APPLICATION Sites may be zoned Neighborhood Commercial in areas planned for residential use, subject to Hearings Officer review under the provisions of Section 1300, when criterion "A" or criteria "B" and "C", below, are satisfied: A. Preexisting Uses: The site, prior to the adoption of this Section, was occupied by, and had an historical commitment to, neighborhood commercial uses. Additions of land area to a preexisting site shall be subject to criteria B and C, below. (5/3/82) B. New Sites/Expansion of Preexisting Sites: New sites and property adjacent to any existing Neighborhood Commercial site may be tentatively zoned Neighborhood Commercial when all the following criteria are satisfied: (2/3/88) 1. Criteria under Section 1203.01, B-E for conditional uses. 2. The new site, or expanded site, is necessary to provide convenience commercial uses which are not currently available within the service area. "Service area," for purposes of this provision, shall be either: a. The readily accessible area within 2000 feet of the proposed site; or	2. An existing building on the site has been occupied by a use allowed in the district and site improvements have been approved and installed as necessary to satisfy the development standards in this Ordinance. As stated in the memo, the County has a proposed “Station Community Mixed Use” zone to be applied to the existing light rail station at Fuller Road and I-205. This transit-oriented, mixed use zone will be the basis for future zoning in other station communities. A goal in the Park Avenue project is to develop a station community zone that has mixed-use as a primary use. This policy would provide that Section 1016, Multi-use Development through approval of a conditional use, would not apply in a station area.	recommended as part of the project.

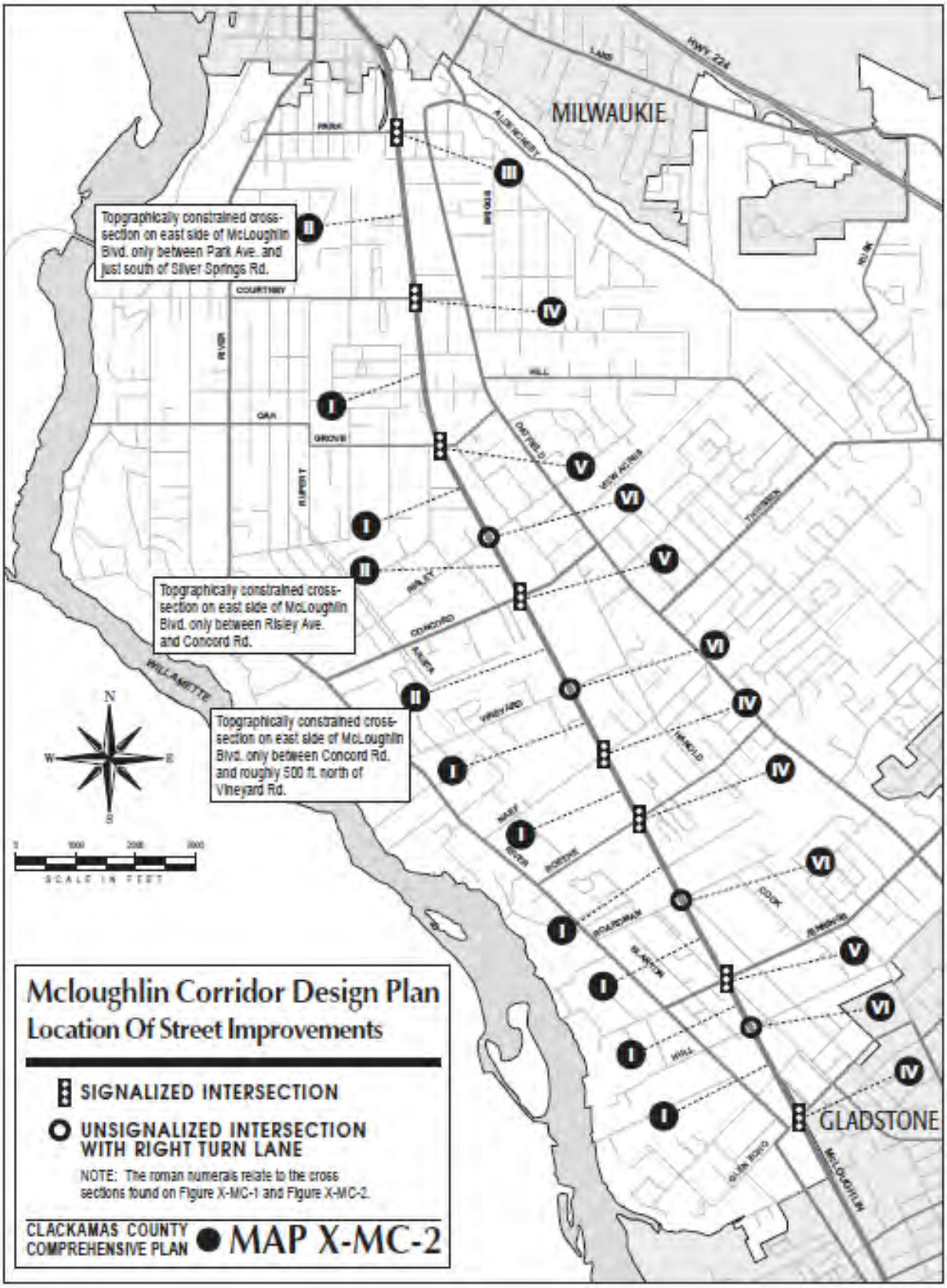
Attachment A: Regulatory Planning Framework Matrix

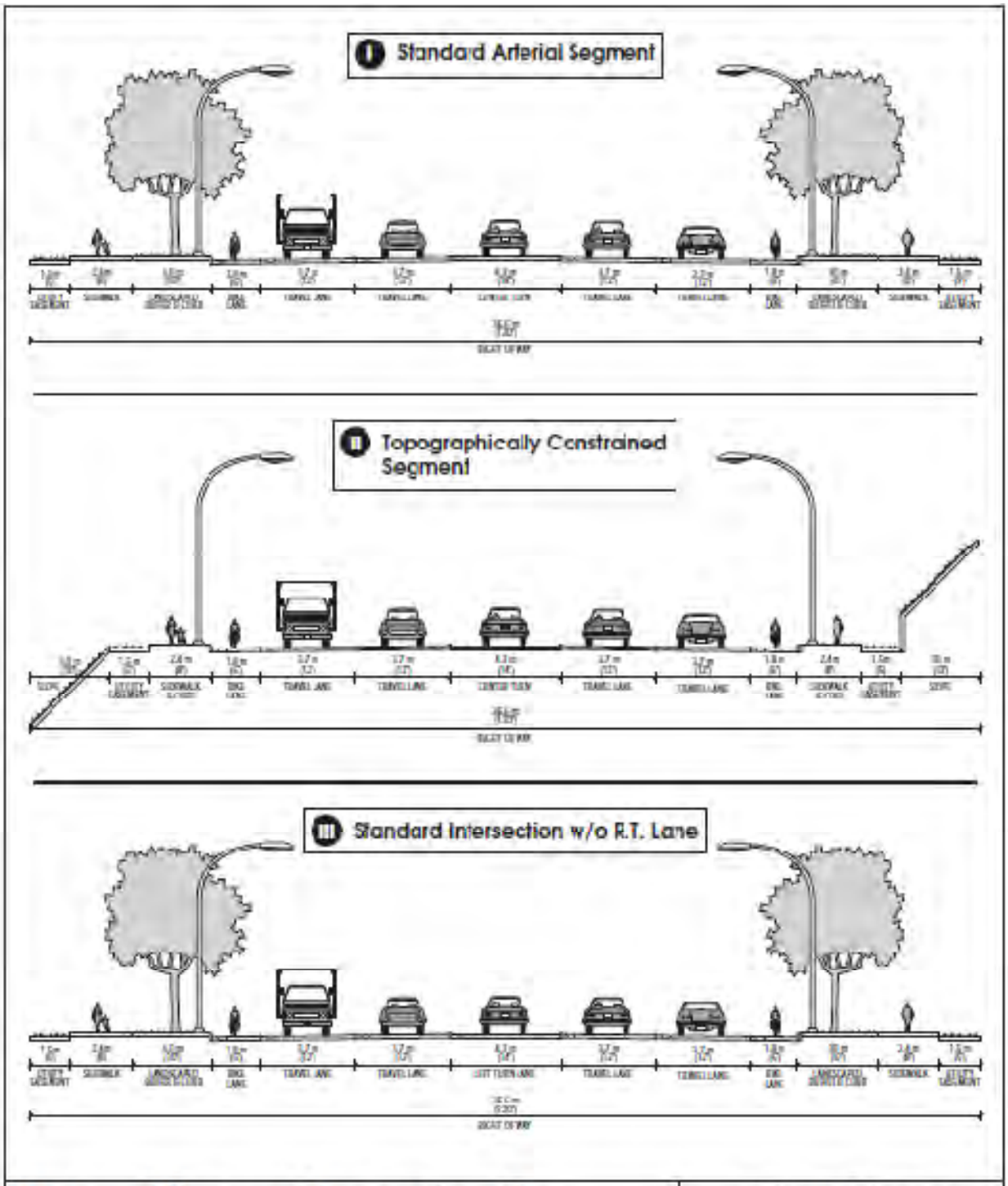
Plan or Policy	Specific Applicable Section (s)	Amendment Process (if applicable)	Project Relevance
	b. A defined area with a minimum of 500 existing or potential dwelling units which are closer to the proposed site, and have as good or better access to the proposed site, than to existing commercial sites considering distance and topographical barriers. Potential dwelling units shall be determined on the basis of existing zoning. 3. The site should be a maximum of one (1) acre in size. To allow clustering of convenience uses, additional area may be added, up to a maximum total area of two (2) acres. 4. The site shall have access to a street of at least a collector classification. 5. The site should not include more than one quadrant of an intersection. If more than one quadrant is proposed, the applicant must show that undo traffic congestion will not result. 6. The site is located within an area designated low-, medium-, or high density residential on the Comprehensive Plan. 503 GENERAL COMMERCIAL DISTRICT (C-3) (12/20/07) 503.01 PURPOSE This section is adopted to implement the policies of the Comprehensive Plan for General Commercial areas. (12/21/06) 503.03 PRIMARY USES 503.06 CONDITIONAL USES 6. Multi-use developments, subject to Section 1016. (5/22/03) 1016 MULTI-USE DEVELOPMENT (6/29/06) 1016.01 PURPOSE A. To implement the goals and policies of the Comprehensive Plan for multi-use developments. B. To accommodate and encourage innovation and design excellence in the development of multi-use centers containing a mixture of different uses in close proximity. C. To insure functionally coordinated, aesthetically pleasing and cohesive site planning and design which maximizes the benefits of multi-use to all individual components of the development. D. To insure compatibility of multi-use developments with the surrounding area and minimize off-site impacts associated with the development. E. To provide for the development of sites that, because of their strategic location, can be developed to a higher and better land use development pattern than would otherwise be allowed in the underlying zoning district. F. To provide focal points for various levels of transportation service (roads, transit, etc.) that can better serve areas of mixed uses and higher concentrations of development. G. To recognize the need for a higher level of economic activity, development and employment which multi-use developments generally provide in a community. H. To accommodate the changing land use and economic dynamics of the region, including the decentralization of many businesses and services into subregional centers to better serve their clients. I. To recognize and accommodate the need to provide for cultural, social and entertainment interests of the larger		

Plan or Policy	Specific Applicable Section (s)	Amendment Process (if applicable)	Project Relevance
	community. J. To recognize the increasing importance of tourism on the economy of the County, and provide for a variety of attractions and tourist-related services to increase the County's share of this market. K. Facilitate the economic objectives of the Comprehensive Plan, and other adopted County plans. 1016.02 AREA OF APPLICATION The provisions of this section for Multi-Use Developments may be applied to sites within the Urban Growth Boundary when the sites satisfy the following conditions, and the specific development plan satisfies the criteria under 1016.03: A. The underlying district allows Multi-Use Developments as a conditional use. B. The ownerships or parcels are large enough to satisfy the dimensional requirements under 1016.08B. C. The property and affected area is presently provided with adequate public facilities, services and transportation networks to support the use, or such facilities, services and transportation networks are planned to be provided to accommodate the development of the property. D. The site is suited to and desirable for a mix of different categories of use, one or more of which is not allowed outright in the underlying district, considering location, size, shape, access, topography, transportation networks existing or planned for the area, visibility, natural features and existence of improvements and uses which support the higher intensity use of the site associated with Multi-Use Developments. E. The use of the site for multi-use will not substantially limit, impair or preclude the use of surrounding properties for uses allowed in the underlying districts. 1016.03 PROCEDURE FOR REVIEW OF A MULTI-USE DEVELOPMENT A. Conditional Use: A Multi-Use Development shall be a conditional use, subject to public hearing review under the provisions of Section 1300. Approval shall be granted when the applicant demonstrates that the site and master plan satisfy the requirements of this Section. B. Conceptual Approval/Master Plan: Application for a Multi-Use Development shall include a master plan for the entire property for which the conditional use is requested. The master plan shall address the standards and requirements of this Section, and shall be reviewed by the Design Review Committee pursuant to the provisions of Section 1102.		

Attachment B: McLoughlin Corridor Plan




MILWAUKIE
GLADSTONE
HWY 224
PARK
COURTNEY
RIVER
OAK
GROVE
RUPERT
HILL
RILEY
CONCORD
WILLAMETTE
VINEYARD
RIVER ROAD
BOARDMAN
COOK
ROBERTS
GLEN ROCK
MCLOUGHLIN
Topgraphically constrained cross-section on east side of McLoughlin Blvd. only between Park Ave. and just south of Silver Springs Rd.
Topgraphically constrained cross-section on east side of McLoughlin Blvd. only between Risley Ave. and Concord Rd.
Topgraphically constrained cross-section on east side of McLoughlin Blvd. only between Concord Rd. and roughly 500 ft. north of Vineyard Rd.
N
W
E
S
SCALE IN FEET
Mcloughlin Corridor Design Plan
Location Of Street Improvements
SIGNALIZED INTERSECTION
UNSIGNALIZED INTERSECTION WITH RIGHT TURN LANE
NOTE: The roman numerals relate to the cross sections found on Figure X-MC-1 and Figure X-MC-2.
CLACKAMAS COUNTY COMPREHENSIVE PLAN
MAP X-MC-2

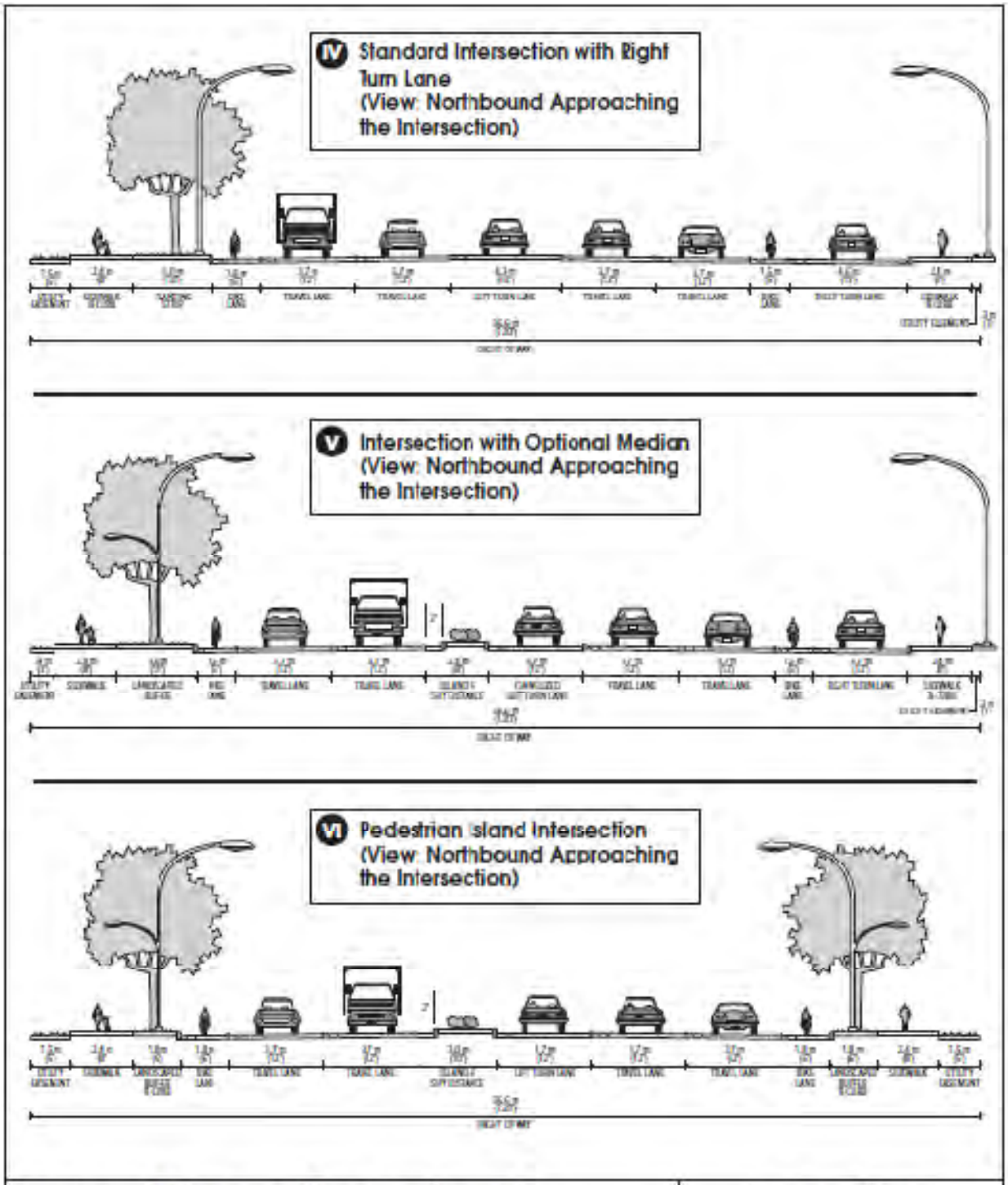


McLoughlin Corridor Design Plan
Street Cross Sections

I CROSS SECTION LOCATION (See Map X-MC-2)

CLACKAMAS COUNTY
COMPREHENSIVE PLAN

FIGURE X-MC-1



McLoughlin Corridor Design Plan
Street Cross Sections

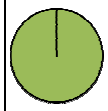
I CROSS SECTION LOCATION (See Map X-MC-2)

CLACKAMAS COUNTY
COMPREHENSIVE PLAN

FIGURE X-MC-2

Appendix B: Project Objectives and Evaluation Criteria

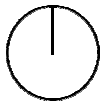
PARK AVENUE STATION NEIGHBORHOOD PLAN
Project Objectives and Evaluation Criteria

 **Alternative meets evaluation criterion**

Alternative mostly meets evaluation criterion

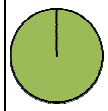
Alternative somewhat meets evaluation criterion

Alternative barely meets evaluation criterion

 **Alternative does not meet evaluation criterion**

Project Objectives	Evaluation Criteria	Alternative 1	Alternative 2
STATION AREA CHARACTER	**The design concept:**		
Reinforce/develop a unique neighborhood identity	• Builds upon characteristics that make the Oak Grove area unique and desirable (i.e. Trolley Trail, streams, wetlands, trees and views to the West Hills and area mountains)		
Provide for a variety of housing types to support a range of incomes and ages. **(A3)**	• Provides transit oriented development that is designed to encourage walking and biking		
	• Defines development node(s) to reinforce a neighborhood-scale character and to provide nearby neighborhood services **(D4)**		
	• Introduces features to break up McLoughlin Blvd's strip commercial character		
Determine station boundary to increase eligibility for infrastructure funding.	• Identifies a Station Area Boundary (as defined by Metro Title 6) to reinforce the area identity and increase eligibility for infrastructure funding)		
	• Identifies opportunities sustainable infrastructure (e.g. green streets)		
Identify and reinforce natural and distinctive elements, such as streams and wetlands, trees and historic places, which make the Oak Grove area unique and desirable. **(E1-3)**	• Incorporates the Urban Green design concepts for the Trolley Trail and light rail station **(E, D2)**		
	• Natural resources are enhanced and incorporated into the neighborhoods **(D5)**		
	• Preserves the historic components of the area **(D5)**		

PARK AVENUE STATION NEIGHBORHOOD PLAN
Project Objectives and Evaluation Criteria

 **Alternative meets evaluation criterion**

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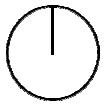 **Alternative does not meet evaluation criterion**

Project Objectives	Evaluation Criteria	Alternative 1	Alternative 2
TRANSIT ORIENTED DEVELOPMENT	**The design concept:**		
Develop safe, convenient and attractive routes to walk, bike and travel around Oak Grove, especially to and from the Park Avenue Station. **(B1, D1)**	• Has well-defined, multimodal linkages to area destinations (i.e. between homes, schools, Trolley Trail, station and commercial corridors) **(B1)**		
	• Has efficient and direct connections to the station		
Identify areas appropriate for transit oriented development.	• Has a variety of housing types to support a range of incomes and ages and area businesses		
Identify places for neighborhood businesses to reduce the need to travel outside the neighborhood. **(A1)**	• Proposes land uses take advantage of light rail and bus transit without relying on driving		
	• Improves pedestrian environment including increasing connections across and along McLoughlin Blvd.		
	• Meets Metro's station community targets (e.g. 45 persons per acre and areas suitable for 2-3 story buildings)		
ECOMONIC DEVELOPMPENT	**The design concept:**		
Create an environment that is attractive for area development and redevelopment	• Identifies potential public investments attractive to people and private development		
	• The design concept changes McLoughlin character to attract business investment		
	• Encourages businesses in commercial areas that have unique identity in which business can identify with and brand		

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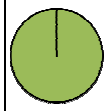 **Alternative meets evaluation criterion**

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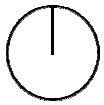
 **Alternative does not meet evaluation criterion**

Project Objectives	Evaluation Criteria	Alternative 1	Alternative 2
	• Provides land uses that can take advantage of light rail market opportunities		
	• Identifies catalyst development project(s) to help improve area character and attract area business investment		
PROCESS AND IMPLEMENTATION	**The design concept**		
Identify specific projects, estimated project costs and potential funding mechanisms to implement plan.	• Includes a short and long term implementation plan and estimates the potential leverage of public investment		
Develop code standards that promote compact development and a mix of uses in the station area. **(F4)**	• The Draft Comprehensive Plan/Zoning and Development Ordinance language is clear and includes requirements and design standards to achieve the project objectives		
Provide citizens both in and near the study area meaningful opportunities for citizen participation. **(F3)**	• Has community support (i.e. incorporates the" Urban Green" concepts and MAP project objectives)		

(*) Denotes MAP Phase I Vision, Values, and Guiding Principles relationship

Appendix C: Economic Development and Redevelopment Memorandum

PARK AVENUE NEIGHBORHOOD & STATION AREA PLAN

DATE:	January 24, 2011
TO:	Alex Dupey, DEA
FROM:	Chris Zahas, Leland Consulting Group Brian Vanneman, Leland Consulting Group
SUBJECT:	**3.1 Draft Economic Development and Redevelopment Memorandum**
PROJECT:	**Park Avenue Light Rail Station Plan**
COPIES:	1

Introduction

This memorandum describes existing and projected market and economic conditions in the Park Avenue Station Area (PASA). This information is used to define development opportunities in the PASA and to characterize development types that will respond to these opportunities and meet the vision for the area.

The memorandum draws on market and land use information gathered for part of the PASA Existing Conditions Report and was supplemented with additional market research conducted specifically for this task. The memorandum begins with an overview of the national and regional economic context and then follows with a discussion of the specific site area opportunities and challenges for the key land uses of housing, retail, and office. This is followed with a development forecast that specifies development and redevelopment targets over the short (1-5 years), medium (5-10 years), and long-term (10-20 years) timeframes. This information will help guide physical concepts and land use policy recommendations to be developed later in the PASA plan process. The key findings of the analysis and development forecast are:

- The majority of change and redevelopment in the PASA is likely to occur on the large, currently commercial-zoned properties that directly front onto McLoughlin Boulevard.
- Limited and incremental infill development is likely within the PASA's residential neighborhoods, since these neighborhoods are largely built out.
- Due to an aging population and ongoing increases in the number of one- and two-person households, housing will be in high demand over the next 20 years, especially infill and multifamily housing such as town houses, apartments, accessory dwelling units, condominiums, and senior housing. These types of uses can be built on many of the underutilized properties along McLoughlin, and at a smaller scale in the surrounding neighborhoods. Housing development in the PASA will benefit from demographic trends and its good transit and auto access to the region's employment concentration in central Portland.
- Demand for new large new retail spaces in the area will be very limited – the focus should be on rehabilitating and retenanting existing space, adding small niche retailers and services that will serve

the immediate neighborhood and transit patrons, and a small amount of larger-scale commercial redevelopment in the long term.

- While there will not be strong demand here for office uses, the PASA could be a good area for healthcare-related uses, a community college or other educational facilities, or a sports club or community center, all of which can provide job opportunities in addition to the retail jobs in the area today.

Project Goals

The conclusions in this memo respond to a combination of factors that include underlying market and demographic forces, the overall goals of this planning process, and the desires of the community. The intent is to balance a realistic assessment of the types of development that are likely to happen, with the development desired by the community. The goals of the Park Avenue Neighborhood and Station Area Plan are catalogued in the Project Objectives memorandum completed for Task 1.4 of this project. These objectives include goals established by the McLoughlin Area Plan, Metro's Title 6 (which sets goals for station communities and centers), and public input generated during this planning process. These goals are summarized below—please consult the Project Objectives memorandum for the complete list:

- Create a village center with community gathering places and services focused on the needs of surrounding neighborhoods;
- Integrate habitat and natural amenities in the area;
- Leverage public investment in light rail for transit oriented development;
- Create better connectivity and enhance the pedestrian environment;
- Target uses that generate transit ridership;
- Preserve the vitality of existing residential neighborhoods;
- Plan to reach a overall densities of 45 person per acre in the station area (combined residential and employment);

Project Location

The Park Avenue Station is located at the intersection of Park Avenue and McLoughlin Boulevard in unincorporated Clackamas County, just south of the City of Milwaukie. The station will be the end of the line of the new Milwaukie Light Rail line, slated to open in 2015. The study area for the station is the area within a one-half mile radius of the station. The land use projections and recommendations in this memorandum are focused on this station area boundary.

Figure 1. Park Avenue Station Location and Context

Source: Metro.

Source: Clackamas County.

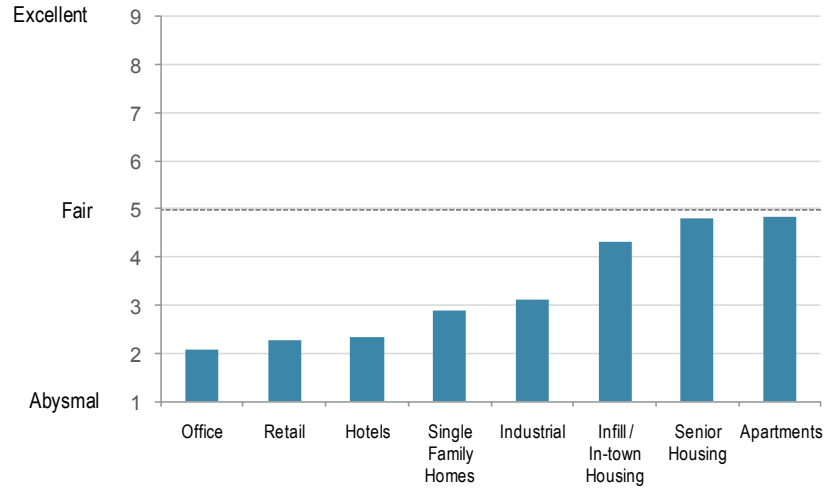
Market Overview

This section of the memorandum discusses the numerous national, regional, and local economic factors that affect what is appropriate and achievable in the station area. These factors range from broad demographic and economic shifts to the very local physical conditions of the site itself.

Development Outlook – Short Term

In the short term, development prospects are very limited due to the national economic recession. Figure 2 summarizes the Urban Land Institute's (ULI) national development outlook for 2011, where 875 real estate experts were surveyed and assigned each development type a number between one—an "abysmal" development prospect— and nine—"excellent." This is the industry group's shorthand way of indicating which development types are likely to generate reasonable investment returns during this year, and thus, which ones are likely to get built. The sobering takeaway is that none of the development prospects even reach the level of fair, much less excellent. To further underline the guidance in the figure, the ULI recommends that developers "stay on vacation" for 2011.

Figure 2. Development Prospects, 2011



Source: Emerging Trends in Real Estate 2011, Urban Land Institute.

This is consistent with most national real estate development forecasts, which indicate that—due to consistently high unemployment, slow job growth, and drastic overbuilding during the previous decade's real estate boom—there is little new demand and lots of excess product.

There are a number of qualifications and caveats that could be added to this outlook. It is for the short term—not the 20 years covered in this study—and looks at real estate at the national level—when in reality every market is different. However, the forecast does set the context for private market real estate decisions today, and most prospects will take years to improve significantly.

There are several land use types that are somewhat more promising than the others, namely:

- Apartments and infill housing. Many households are turning away from homeownership due to the recent slump in home values and towards renting. Meanwhile, a very large cohort of "generation y" or "echo boomers" is entering their prime rental years. Both trends suggest that these development types will fare well.
- Senior housing. The other demographic group that is booming is senior citizens—in the next two decades, the number of Americans over the age of 65 will more than double. This will support a major increase in the demand for a variety of senior housing ranging from standard apartments and condominiums to full-service senior retirement communities.

While it remains a very difficult time for real estate environment, it is not a bad time for planning. Well-crafted plans that are put in place now will be well positioned to catch the next waves of redevelopment, and many property prices are at historic lows.

Development Outlook – Long Term

Real estate development and place making of the kind anticipated at the station area depend on a strong economy—particularly strong job and wage growth, and in-migration. Therefore, the long-term economic uncertainty creates a major long-term question mark for development at this station area and around the state.

The Oregon Employment Department and federal agencies anticipate that the greatest amount of job growth during the next 10 years will come from jobs in education, health services and biosciences, and professional services (such as information technology). A number of long-term trends are positive for the PASA, including:

- **Population Growth.** For the past half-century, the Portland region has consistently attracted new residents to the area, and this is expected to continue in the future. Metro's 2010 *Urban Growth Report* forecasts that the region's population will increase from approximately 2.0 million today, to between 2.9 and 3.2 million in 2030; likewise, the number of jobs is expected to increase from approximately 850,000 today to between 1.3 million and 1.7 million in 2030.
- **Geographical limitations.** These new residents will need homes and workplaces, and most of this will be realized in the form of redevelopment and "infill development" in parts of the Portland metropolitan region that are already urbanized, such as the PASA and the McLoughlin corridor.
- **Demographics.** The vast majority of new households being formed during the next decade and beyond will be singles, couples, and seniors according to the Harvard University's Joint Center for Housing Studies. These are the types of households most likely to locate in urban, transit oriented development, and infill locations. There will continue to be many family households with children, but their over number will increase only very slightly.

Regional Economy

It is no secret that the economy—in the Portland region, the state, and nation—has experienced a very bumpy ride that began in 2008 and continues today. The symptoms of economic stagnation—among them lower wages, high unemployment, difficulty accessing financing, and low levels of job creation—are integrally related to the prospects for real estate redevelopment.

Dramatic fluctuations in the economy and real estate markets also make future projections very difficult. For example, given 2007 home sales prices that are often 20 percent or more higher than 2010 prices, which values should be used to project sales prices in 2012? We call this "forecasting in the fog." Other strategists are attempting to define the "new normal" for lifestyles and real estate, based on the premise that the next decade may be very different from 2010, 2007, or any other year in our rear-view mirror.

This takes forecasting back to fundamentals and long-term trends. Over a period of many decades, the Portland region's population growth has been strong. Job creation, while slower than some other comparable metropolitan areas, has followed a consistent long-term upward trend. These trends are expected to continue in the coming decades.

This consistent population and economic growth indicates that—although there will be significant fluctuations from year to year—there should be demand over the long term for housing, retail, office, and other uses both in Portland and in close-in areas such as the McLoughlin corridor.

Park Avenue Area Demographics, Economy, and Character

This section reviews the demographics, economics, and other defining characteristics of the subject area, based largely on the 4 November *Draft Existing Conditions Memorandum* prepared by Clackamas County for the PASA Plan. The emphasis here is on a summary of key points that are relevant to redevelopment in the project area; for a complete review of the area's demographics and economics, the earlier memorandum should be consulted.[1] Additional information that highlights local and regional real estate market conditions is included in other sections below.

- **Population size.** The station area contains 5,900 people and 2,900 households. However, this local population is not necessarily the "market area" for various types of real estate development or services. New residents or retail patrons can and will be drawn from a larger area. The boundaries of a market area will vary depending on the type of real estate or service.
- **Population growth.** The station area is growing slowly—at an estimated two percent annually—largely due to the fact that it is mostly built out. Meanwhile, Clackamas County continues to grow at a much faster rate—1.3 percent annually. Thus, the regional market for goods and services continues to grow at a fast pace.
- **Household incomes.** Median household incomes ($48,400) in the station area are somewhat less than the county ($52,000) though significantly higher than the state ($41,900). Just as notable is the variation in incomes that occurs within Census block groups near the small station area—median household incomes vary from $27,400 to $68,700. Other data sources indicate that higher income households tend to be located in the single family home areas set back from McLoughlin Boulevard, with the neighborhoods east of McLoughlin, outside of the immediate station area, among the highest income areas. Household incomes have an important impact on the types of real estate development likely to occur. Retailers pay close attention to household incomes, and professional office space tends to be developed near the homes of managers and executives.
- **Age.** There is a significant concentration of older residents in the station area, most of whom live in the retirement communities at the western edge of the project area along River Road. Proportionally, more than twice as many people are over the age of 65 in the PASA and more than three times as many people over the age of 85 than the state and county as a whole. Excluding the concentration of senior citizens, residents here are similar in age to those county and statewide.
- **Household size.** Largely due to the concentration of senior citizens near the planned station, average household sizes are also much smaller here. Forty-three percent of households here consist of one person, compared to 22 percent countywide. However, even excluding the retirement communities, there is a higher share of small households—34 percent. Household size has a significant impact on the types of housing that will be developed in a given area.

[1] Several considerations should be taken into account when reviewing the existing conditions data. First, most findings are based on 2000 Census data, so trends and changes that took shape or accelerated over the past decade will not be apparent. Detailed 2010 Census data is not expected to be released until summer 2011. Second, the existing conditions analysis used Census geographical areas that correspond closely, but not exactly, to the ½ mile project area (in some places, the Census areas extend beyond the ½ mile radius). Some figures have been rounded in this section.

- **Housing types.** The station area contains a wide range of housing types—including single family homes, attached housing ranging from duplexes to apartment buildings, two mobile home parks, and the retirement communities mentioned above. The retirement communities are clustered to the west along River Road, and include Willamette View (with 550 residents, or nearly 10 percent of the station area population) and Rose Villa, along with three smaller communities.
- **Education.** The educational attainment in the station area is similar to the county and state, though somewhat fewer local residents have a bachelor's degree (17 percent) compared to the county (19 percent). Education is often seen as an indicator of housing preference and has a bearing on the types of retail and employment likely to be developed in the area.
- **Race.** The racial makeup of residents in the station area is similar to the county and state; approximately 90 percent of residents in the area are white.
- **Transportation.** A higher percentage of local residents (5.7 percent) travel to work via transit compared to the county average (3.1 percent), which bodes well for future MAX ridership. Otherwise, the local work-trip mode shares are similar to the county average, with the majority (75 percent) of employees commuting alone by car. Another key feature of the transportation environment is the 37,600 vehicles per day that pass by the site on McLoughlin Boulevard.[2] This represents a large pass-through group, many of whom presumably patronize the retail along McLoughlin, and will be an asset to the viability of future retail near the station.
- **Location and Employment Access.** The PASA's location and MAX access will give residents easy access to central Portland—the largest employment center in the region, with more than 100,000 jobs. Easy access to jobs is one of the main criteria that people use when making a choice about where to live. Thus, as transit quality increases, the desirability of the PASA will increase.
- **Employment.** A small number of employees (336) work in the area, mostly at retail establishments along McLoughlin and the retirement communities. The average annual salary is $28,600.
- **Zoning.** Properties along McLouglin are zoned General Commercial, while those set back from the thoroughfare are residentially zoned, with Medium Density Residential areas closer to McLouglin and Low Density Residential further away. Complete details are included in the existing conditions report. Because this report is largely concerned with the types of redevelopment that could occur during the next two decades, the limitations imposed by current zoning do not have a major impact on the recommendations, and it is assumed that zoning could be changed if desired by the County and community.

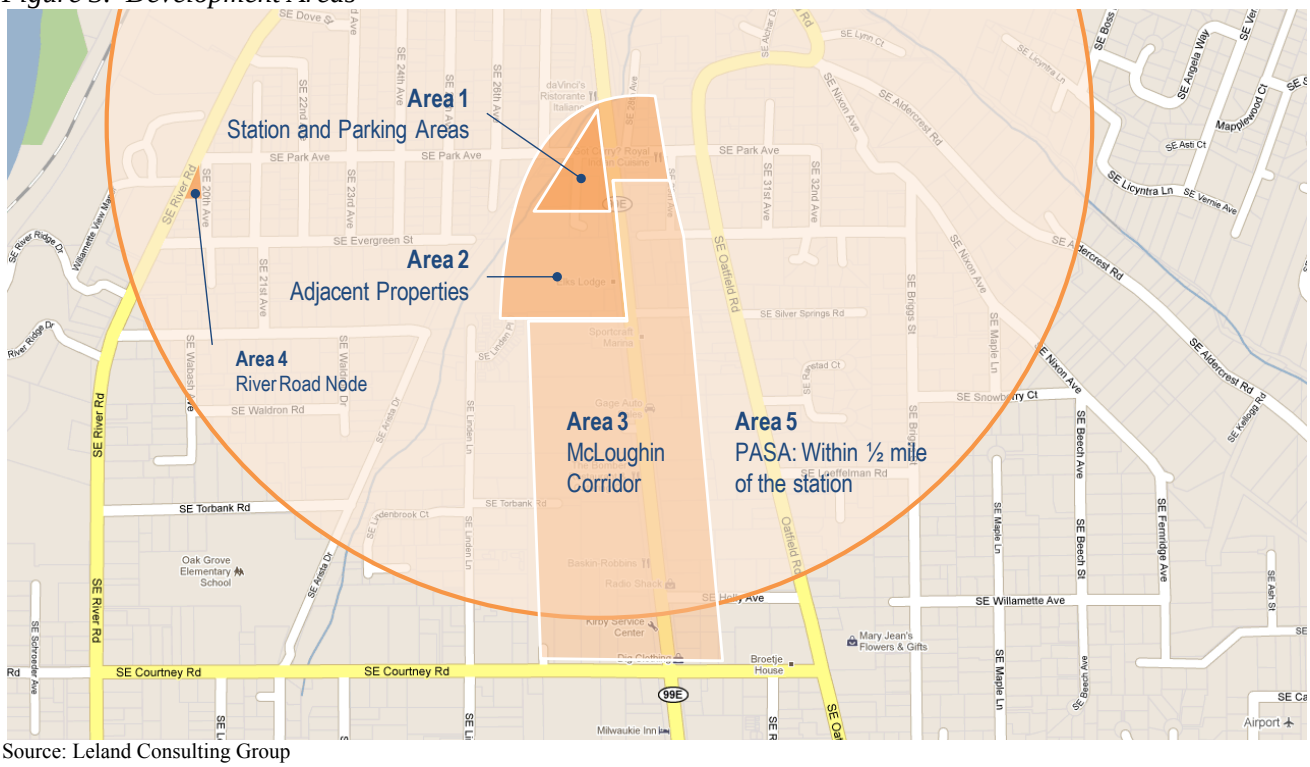
Development Areas

In order to more accurately describe the redevelopment conditions and potential of the PASA, the entire study area was further divided into several different ―development areas," which are shown and described below. These development areas reflect the how differences in variables will affect the type and quantity of new development that is possible. These variables include factors such as the pattern of current uses—ranging from residential neighborhoods to strip commercial; distance from the MAX station; proximity to McLoughlin—which is both a source of business and a nuisance; amount of underutilized and vacant

[2] Source: ODOT 2009 Traffic Volume Tables.

land; and other attributes. A detailed map showing individual potential redevelopment parcels is shown in the Appendix.

Figure 3. Development Areas



Source: Leland Consulting Group

Table 1. Development Area Descriptions

Area	***Description and development outlook***
• MAX Station and Parking Areas	• Includes the planned MAX station, plaza, parking garage, access roads and frontages, and a small amount of surplus land that could be redeveloped. • While the light rail's impact on development will be strongest here, there is relatively little land available for redevelopment. Development potential includes the possibility of a very small amount of retail at the station plaza and minimal development on surplus land.
• Adjacent Properties	• Includes several properties adjacent to the station to the south (totaling approximately 8.0 acres and including the Elks Lodge) and properties that face the station across McLoughlin (3.0 acres). • Housing and some retail redevelopment is possible on the properties just south of the station, while the properties on the eastern side of McLoughlin will remain commercial but could be redeveloped and upgraded. • The MAX can also be a very desirable amenity for these properties, since new residents or employees here would have excellent access to the station. • These properties are mostly built-out and will need to be rehabilitated or redeveloped. Redevelopment is often more difficult than new development

	since existing property owners are generating income off the land as-is and thus may have less incentive to sell. • The properties on the west side of McLoughlin have a very strong amenity in the form of Kellogg Creek and its trees. The creek also creates a sharp bluff that creates both an opportunity to create views and an engineering and cost challenge. • Most of the properties in this area front onto McLoughlin Boulevard and will be affected by the arterial in the ways discussed immediately below.
• McLoughlin Corridor	• Includes several dozen relatively large lots that extend from just south of Park to Courtney Avenue. Most of the properties are commercial, though there are several mobile home parks. • Natuarally, McLoughlin Boulevard is the defining feature in this area, and it both helps and hinders development. It brings great visibility to retail and other commercial businesses, but also appears chaotic with many deteriorated and vacant buildings and few pedestrian amenities. • Retail and commercial rehabilitation and redevelopment will take place on parcels fronting McLoughlin, while housing development can take place at the rear of these lots or other lots away from McLoughlin. • The large lot sizes here can be an advantage, since a developer or the public sector could acquire a large area via a small number of transactions. Major changes to an area's built environment are usually easier to achieve on a large, rather than small, area.
• ½ Mile Station Area	• Includes the entire study area and all land uses within ½ mile of the station, excluding the other redevelopment areas discussed above. • This area is made up of residential neighborhoods that contain a mix of single family homes and small and mid-size multifamily residences. As stated above, there are a number of retirement communities along the western edge of the study area. • Development opportunities here will be limited since the area is mostly built out. Some new housing will be developed through the addition of homes on vacant or subdivided lots and accessory dwelling units (cottages or ―granny flats"). In rare cases, existing homes will be demolished to make way for new housing. All told, the development will be incremental and will maintain the character of the neighborhoods.
• River Road Node	• A small vacant site on River Road south of Park Avenue presents an opportunity for a small neighborhood commercial development that can serve the immediate neighborhood and the retirement communities across the street. • The presence of a small market on the northeast corner helps to establish this

	intersection as a neighborhood commercial node. • There may be one or two other opportunities for small, neighborhood-serving retail nodes elsewhere in the PASA—however, operating isolated retail is difficult, and high traffic counts and compatible zoning are needed.

Housing

The station area is generally a good location for new housing development, though for the reasons listed above, development will be slow in the short term. An estimated 470 apartment units were built in the Portland region in 2010, considerably below the historical average of approximately 1,200 units. In addition, financing for apartment units is currently very difficult. Almost all new apartment projects that get the green light receive a federal HUD guarantee, for which there is one-year processing time. Almost all the housing built in the area will range in scale and density within the housing types shown below in Figure 4. To be successful, this type of housing usually requires the following criteria, which the station area generally meets.

- A critical mass of adjacent residential neighborhoods and nearby ~~"u~~rban residential amenities:" schools, parks, retail and services, transit and transportation infrastructure, and other features typically desirable in a neighborhood.
- Access to significant employment centers within a half-hour commute.
- Safety.
- A large share of one and two person households within the market area, or the potential to attract these households.

Housing Types

People look for different housing types in different places, and homebuilders respond to these preferences. Single family homes proliferate throughout much of the Portland metro region, while in certain locations, residents are attracted to denser housing types, ranging from townhouses to multi-story condos or apartments. Based on consumer preferences, economics, and past development trends, Leland Consulting Group anticipates that the housing types shown below are the most appropriate for the PASA.

Figure 4. Appropriate Housing Types for the Park Avenue Station Area

Accessory Dwelling Units or Clustered Cottages	*Townhouses*	*Low-Midrise Apartments*
• Can be built as accessory "granny flats" to existing homes, or on subdivided or vacant lots. • Flexible and suitable for family members or rentals. • Small footprint required—as small as 600 to 800 square feet.	• Suitable for any vacant infill sites of a quarter acre or larger, or as a component of redevelopment on larger McLoughlin Boulevard lots. • Range from about 15 to 25 dwelling units per acre. • Project size: Typically one-half to one acre.	• Suitable for station areas, larger development sites, and commercial sites along McLoughlin. • Range from 20 to 30 units per acre. • Project size: Can range from one-half to five acres.

While denser housing might be desirable in some cases in order to generate more ridership for the MAX line or to create a larger market for a local "village center," higher-density, mixed-use housing such as Milwaukie's North Main project (which features three or more floors of housing above one floor of retail) present a number of formidable economic and logistical challenges for the public sector and private developers. The urban amenities listed above must be very strong and demand must be high—in the range of $1.80 rents or more per square foot—or the public sector will need to invest significant funds to make the projects work, often with tax increment financing funds. As the data below show, local apartment rents average around $1.00 per square foot. Thus, significant public-sector incentives or investment would be needed to realize high-density, mixed-use projects.

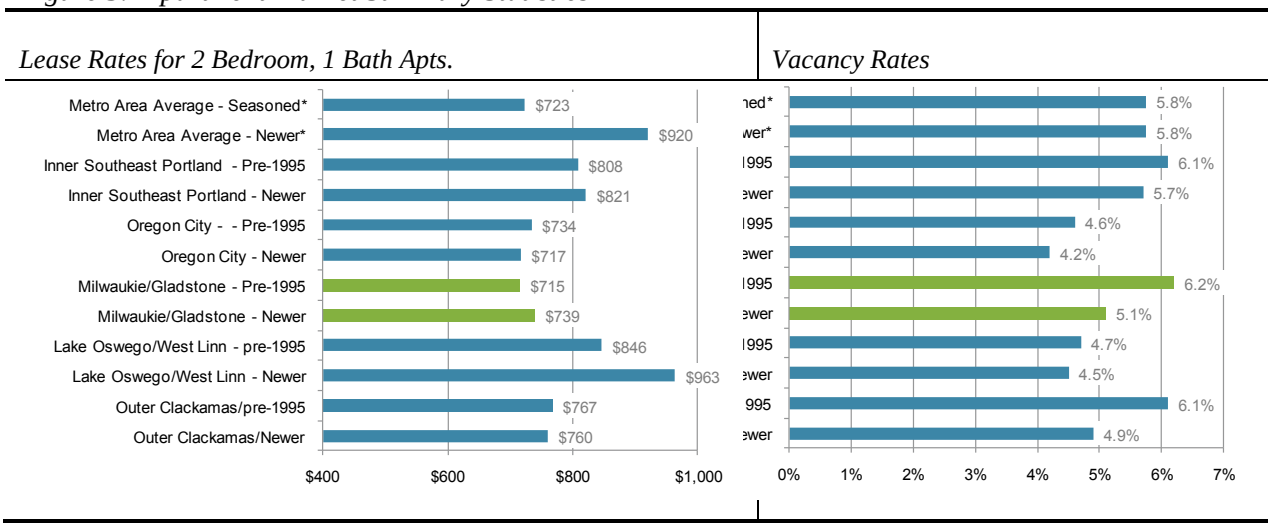
Rental Market

Figure 5 summarizes rental data for the local and regional rental housing markets. The station area is tracked with the "Milwaukie/Gladstone" rental submarket.

The data shows that rents are relatively low in the submarket for both newer and pre-1995 construction apartments. The contrast between rents being achieved by new projects in the local market ($739 for a two bedroom, one bath unit) versus the region ($920) is particularly notable. Occupancy levels, on the

other hand, are quite tight in the Milwaukie/Gladstone submarket and in the region as a whole, which suggests that additional stock is in demand. Vacancy levels of less than 5 percent signal a tight market and vacancy levels are generally expected to decrease in the region in coming years as some residents move out of the homeownership market and into rentals, as baby boomers enter retirement, and as Generation Y (or the echo boomers) leave college and enter the housing market.

Figure 5. Apartment Market Summary Statistics



*The vacancy rate for the Metro Area is reported as an average, not broken down by newer or older units.
Source: Norris & Stevens Apartment Investors Journal, Fall 2010 (most recent available).

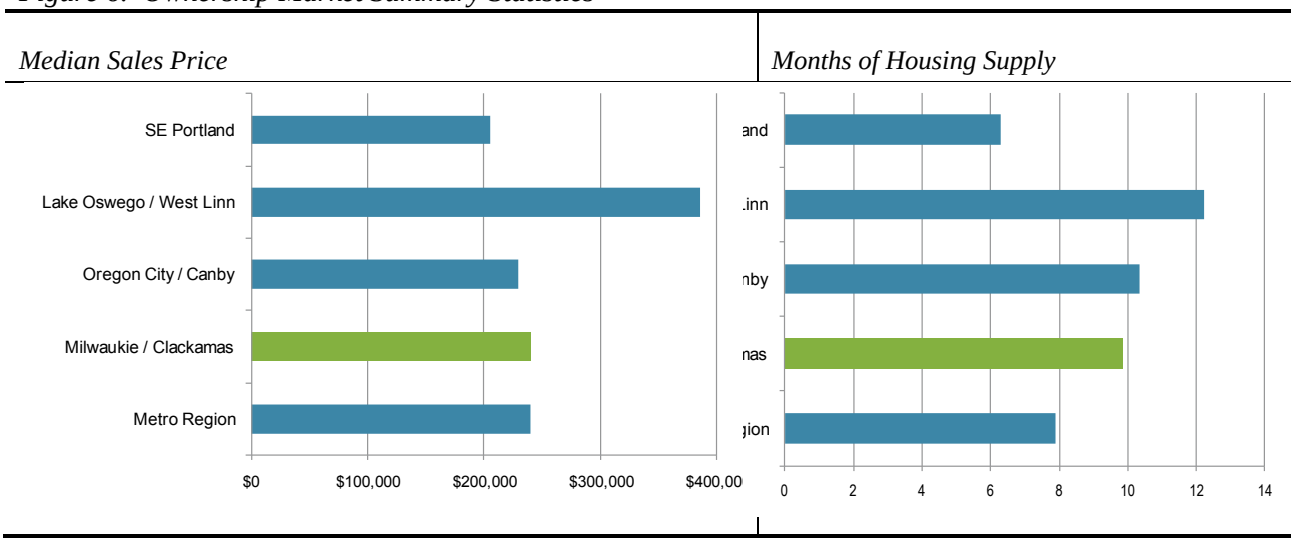
In summary, the data suggests that the rental market in the station area is for middle or lower income product, and that additional supply is in demand (and expected to grow in demand in the future). Furthermore, given the modest rents, some public assistance may be needed in order to get more challenging projects to work financially.

Ownership Housing Market

The ownership housing market will be severely constrained for the next several years as the housing crisis continues to impact the market through the increase in foreclosures, excess supply, and stagnating incomes. In either case, the development opportunity sites in the PASA, aside from small amounts of infill in the neighborhoods, will be limit housing development largely to attached housing types. Whether these housing types are apartments, townhomes, or small-lot cottages, whether they are rental or ownership is something that will be determined by market conditions and will not be affected by the type of zoning or other land use controls. That said, the demographic shifts discussed above indicate that the short to mid-term opportunities will be in rental housing. It will be several years, at a minimum, before attached ownership housing is economically feasible.

Home prices in the surrounding area vary widely, but the overall Clackamas/Milwaukie average closely mirrors the regional average as shown in Figure 6. However, the area has a slightly higher supply of homes for sale, also as shown in Figure 6.

Figure 6. Ownership Market Summary Statistics



Source: RMLS Portland Metro Area Report, December 2010.

Retail

Nationally, the retail marketplace has been impacted severely due to the recession. Many national retailers have gone out of business and many others are downsizing significantly. This trend is expected to continue well beyond the recovery, meaning that many areas such as McLoughlin Boulevard are ―over retailed." That is, they have excess retail capacity that may never find viable users to fill.

Generally, retail requires the following conditions to be successful:

- Visibility. While traditional strip retail requires daily traffic volumes of approximately 20,000, even smaller neighborhood-serving retail must be visible to automobile traffic.
- Accessibility. Must be very easy to get to; daily-shopping or convenience retail should be on the ―way home" (right) side of the street.
- Central location vis-a-vis target markets. For example, grocery anchored centers should be within approximately one mile of 10,000 residents.
- Manageable competitive environment. Most retailers will avoid an area if competitors are already located there.
- Anchor tenants. Retail developments are often "anchored" by one tenant (for example, a high-profile department store) who then attracts other tenants. Even for smaller neighborhood retail areas, there typically is a store or restaurant that functions as an anchor. This can sometimes be something as small as a coffee shop.
- Sense of place, safety, cleanliness. This is particularly important for neighborhood retail where many people will arrive on foot.
- Contiguity. Urban retail must be continuous. Standalone stores (unless they are regional destinations) are vulnerable due to their isolation. Likewise, in a ―Main Street" environment, gaps in retail

continuity (such as driveways, parking lots, or vacant properties) as small as 60 feet can be enough to turn shoppers around, depriving other retailers of foot traffic and visibility.

- Parking capacity. Convenient and adequate parking is essential even for small neighborhood retailers. On-street parking is important for neighborhood retailers, although parking can be accommodated off-street in a shopping center environment when on-street parking is not feasible (such as along McLoughlin Boulevard).

Retail Trends in the PASA

The retail environment in the PASA is dominated by the strip retail located on McLoughlin Boulevard. Interspersed with some non-retail uses such as light industrial, storage facilities, and mobile home parks, most of McLoughlin from Park Avenue south to Courtney is characterized by medium to large lots with auto-oriented retail. While much of the existing development is of older retail buildings, two new developments are notable and are described below along with several properties representative of the McLoughlin environment.

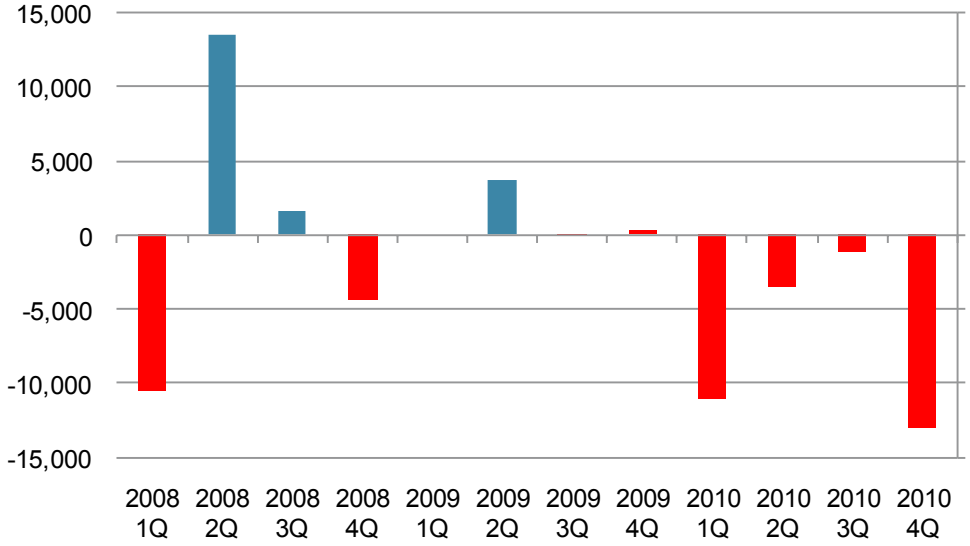
Figure 7. Representative Retail Properties and Recent Developments in the PASA

Project Name	*Description*
Courtney Plaza	This 48,000 square foot neighborhood retail center is located on the northwest corner of McLoughlin Boulevard and Courtney Avenue. Tenants include several small financial management firms, two thrift stores, and a pawn shop, but no regional or national retail tenants. While occupancy is at approximately 78 percent, about half of the center's total area is now available for lease (including some spaces that are currently occupied).
13710 SE McLoughlin Boulevard	This building, about a quarter-mile south of the Park Avenue station, is vacant and available for lease. The exterior shows signs of deferred maintenance.

Green Castle Development	Approximately 20,000 square foot commercial/retail shopping center, located approximately 0.2 miles south of the Park Avenue Station was completed in 2010. Currently, the property is almost entirely vacant and is for sale.
Fred Meyer Fueling Station	A full service retail gas station is currently under construction on the west side of McLoughlin, approximately 0.4 miles south of the Park Avenue Station.

Retail lease rates average between $11 and $12 per square foot per year within one mile of the Park Avenue station, based on a review of active listings available on CoStar, a commercial property database. This compares to an overall range of between $16 and $30 per square foot over the entire Southeast/East Clackamas subarea, as described in the Fourth Quarter 2010 Retail Market Report published by commercial property brokers Norris Beggs & Simpson. As a general rule lease rates must be approximately $24 per square foot to justify the cost of new construction. With average area rates at half that and with ample vacant space nearby (Green Castle development), it is likely that little new retail development will be feasible in the PASA for many years. Figure 8 summarizes the negative retail absorption that has characterized the station area (1-mile radius) since 2008.

Figure 8. Retail Absorption near the Park Avenue Station, 2008 - 2010

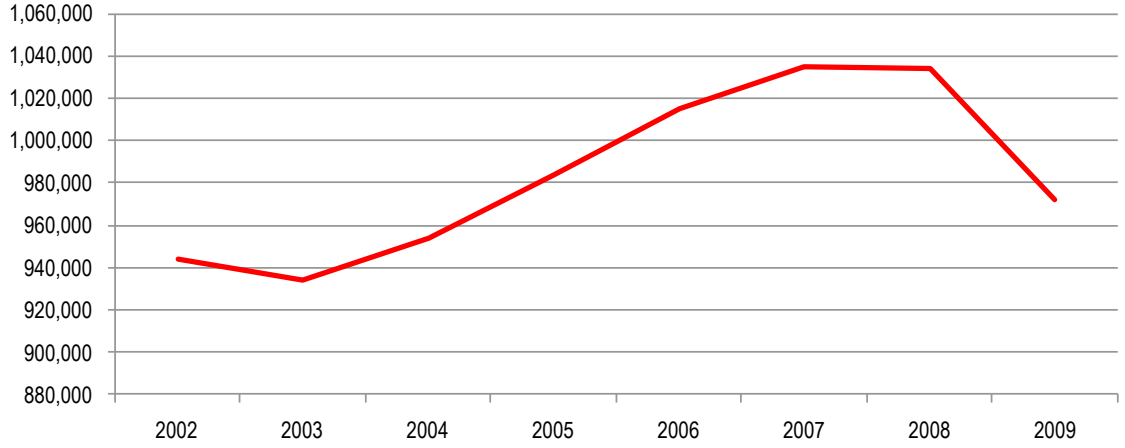


Source: CoStar.

Office and Employment

It is no secret that regional unemployment has risen significantly through the recession and remains high at the beginning of 2011. Figure 9 shows how the region's total employment has declined since the peak in 2007.

Figure 9. Total Nonfarm Employment, Portland Region (2002-2009).



Source: Worksource Oregon.

Like retail, office and commercial employment development follows broad rules of thumb for success. These are summarized below:

- Easy access to clients. The site should be easily accessible to clients. Transit accessibility is important, but the site should also be visible and accessible by car.
- Accessibility to workforce and executive residences. Offices tend to be sited near the center of a metro region (downtown Portland) or in proximity to executive housing (Kruse Way).
- Brand. The brand of a market area helps to identify it in a crowded marketplace and helps define its character. Places such as downtown Portland, Kruse Way, the Sunset Corridor, and the Clackamas/Sunnyside area all have immediate brand recognition.
- Proximity to suppliers and collaborator firms. Like retail, office uses like to cluster near other office uses.
- Parking capacity. Office uses outside of downtown Portland must have adequate parking capacity in order to successfully compete for tenants. Typical parking ratios range from three to four parking spaces per 1,000 square feet of office space.
- Proximity to support services. Office users need commercial amenities such as banking, food, hotels, and other services to meet the needs of their employees and customers.
- Access to intra- and inter-regional transportation connections such as freeways, high capacity transit, and airports.

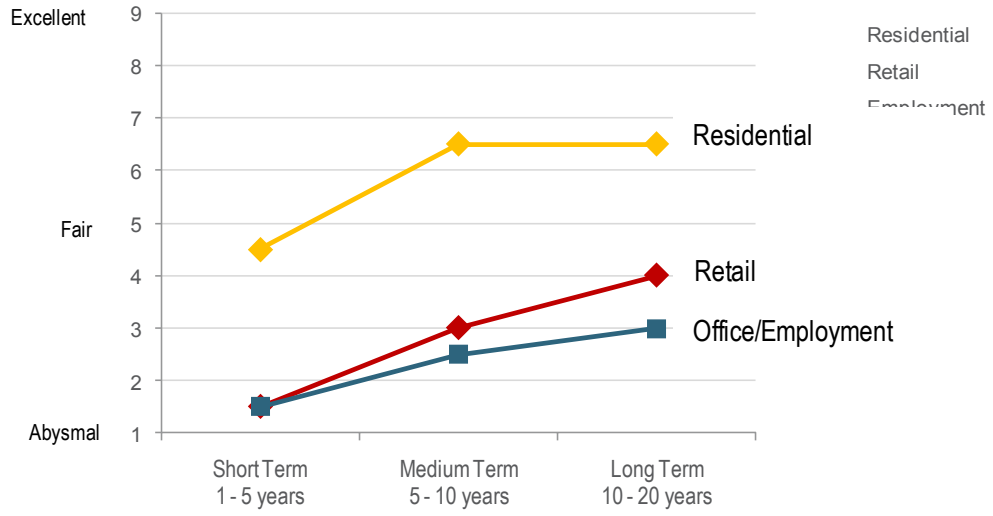
Office Market Assessment for PASA

Based on the conditions for success, the PASA area is relatively poorly positioned for office development. There currently are no other office users in the area other than small service users. Thus, it is somewhat a chicken-and-the-egg problem, where a critical mass of development needs to be in place before additional development is possible. In an environment where there are other nearby employment centers such as Clackamas/Sunnyside, downtown Portland, and the industrial areas of Milwaukie and the Highway 224 corridor, it is unlikely that significant employment uses will be attracted to the PASA. A significant exception to this assessment is medical uses such as clinics or even an urgent care facility. Given the easy access from McLoughlin and the sizeable senior citizen population nearby, some type of medical employment is possible in the PASA.

Park Avenue Development Outlook

National and local trends can be combined to create a broad ―development outlook" for the PASA, shown below, and modeled on the Urban Land Institute's framework shown in Figure 2 above. This outlook shows that while development conditions are not good in the short term, they will improve over time. Residential development is more likely to succeed in all time frames, while commercial development (retail and office) will face intense challenges in the near term, with fair prospects in the medium and long terms.

Figure 10. Park Avenue Development Outlook - Overview



Source: Leland Consulting Group

Table 2. Development Outlook

Land Use	*Short Term (Years 1-5)*	*Medium Term (Years 6-10)*	*Long Term (Years 11-20)*
Housing	• Challenging prospects, though some apartments, senior housing, or townhomes could be built. No condominiums are possible. • A small amount of rehabilitation and new housing development will take place within existing residential neighborhoods.	• Moderate development potential as economy recovers, and longer-term demographic and regional growth trends encourage infill.	• Significant development potential.
Retail	• No significant development. • Several food carts at the station are possible.	• Possible small amounts of development in niche areas such as at the Park Avenue Station and for specialty retail types not served by the current market.	• Modest growth commensurate with nearby development and overall population growth.
Office	• No development.	• No development.	• Limited development is possible in niche market types such as medical.
Other	• Community center or other civic uses could be built at any time depending on public sentiment and available funding.		

Source: Leland Consulting Group.

Opportunities and Constraints

Opportunities

Conditions and attributes that create opportunities within the PASA include:

- The new series of planned public investments—the MAX line, station, plaza, parking lot, supplemental public art installations, and Trolley Trail—coming to the PASA create a major opportunity, and the impetus for this planning process. Taken together, these investments will help to change both the way the community uses this area, and the way it is perceived locally and regionally. Because of the changes in topography and environment, Park Avenue already feels like a ―gateway" to and from the McLoughlin Boulevard corridor, and these physical changes will add to that sense, ideally conveying a more positive impression of the area to all passer-by. The Trolley Trail has the potential to introduce more people and customers to the PASA. The station parking lot should be managed as an asset on both weekdays (for MAX riders), and evenings and weekends, when it can be an asset for nearby retailers or other land uses that need parking on the evening and weekends.
- The MAP process and the local sense of community create an opportunity since they are generating a sense of momentum and shared vision. Developers prefer to build new housing, retail, office, and other projects where there is a strong sense of place and community—these are attractors and competitive advantages vis-a-vis other places. The community vision and guiding principles created by the MAP are very valuable since they begin to give all planning efforts, including the PASA Plan and others, a north star by which to steer. They will continue to help the PASA Plan and other efforts.
- The MAP area residential population. While the PASA contains approximately 5,900 residents, the entire MAP area—from which potential customers and residents for the PASA can also be drawn—has about five times as many residents, and in general incomes in the MAP area are higher than the PASA. Large portions of the residential neighborhoods to the east and west of McLoughlin Boulevard are attractive and well maintained. In addition, the retirement communities along the Willamette River are a potential source of commercial patronage. All told, this residential market provides a strong base for businesses in the area. In addition, there is clearly a mismatch between the quality of the residential neighborhoods and the quality of development on McLoughlin, suggesting that if conditions are right, the McLoughlin environment could improve.
- The area has attractive natural features that give the area character, will be attractive to potential new residents and developers, and should be capitalized on as much as possible. These include the Willamette River (which is very close but should be more accessible), Kellogg Creek, and numerous stands of old trees, particularly oak and fir trees.
- Some attributes of McLoughlin Boulevard. The many underutilized and vacant properties along McLoughlin provide dozens of acres that are at least potentially redevelopable, and many properties are for sale or lease now at low prices. Second, McLoughlin traffic volumes (at approximately 37,000 vehicles per day) are very strong. They are the reason that there is so much retail currently on McLoughlin, and they will continue to support commercial land uses in the future. Finally, the existing commercial zoning will continue to allow commercial development along the boulevard; it is the only location in the area where commercial uses can be developed.
- Long term trends suggest this is a relatively good location for residential infill development in the medium and long terms. These trends include ongoing migration to the Portland area and thus continued population growth; a growing number of one and two person households, and thus a

growing population that will be interested in infill housing such as townhouses and transit oriented apartment units; growing urban job bases in professional services, healthcare, technology, and other industry sectors; and constraints on the geographical extent of growth due to increasing congestion and policies such as the urban growth boundary.

Constraints

Conditions and attributes that create constraints within the PASA include:

- While McLoughlin Boulevard has some assets, which are described above, it also imposes a number of constraints: particularly its image or identity as perceived by local and regional residents; the low quality of much development along the boulevard; unpleasant pedestrian environment; and the very extensive amount of vacant and marginal retail development. In addition, there may be simply too much commercially zoned land. The high vacancies, low asking rents, and ubiquity of low quality development will deter most developers who might consider high quality or large scale development. The achievable rents are simply too low to justify new construction at this point, and the stigma associated with the corridor will deter some developers and major retail tenants.
- The short-term real estate and economic environment regionally and nationally. Real estate development is at a virtual standstill nationwide and within the Portland region due to high unemployment, limited job growth, stagnant wages, more conservative lending standards, and overbuilding that took place in most development types during the boom period.
- The very large amount of commercial development already in the corridor will deter commercial development over the medium and long terms as well.
- While the MAP community vision and guiding principles provide an excellent foundation for planning, the community should continue to add specificity to its vision. The clearer the end goal, the easier it will be to ensure that all plans, efforts, and investments are coordinated to achieve it. A clear vision will also help to secure funding from a variety of sources, and to assign staff to take specific actions.
- The PASA suffers from a lack of connectivity for pedestrian, auto, and bicycle traffic. More east-west connections to McLoughlin Boulevard from the nearby neighborhoods would be positive, as would an additional signalized crossing somewhere between Park and Courtney Avenues.
- Currently, there is no city department or redevelopment agency tasked with overseeing redevelopment in the PASA. While it is possible for other public departments or agencies to manage redevelopment (for example, Clackamas County's planning department, ODOT, TriMet, Metro, or other) it is most frequently accomplished by a city and/or redevelopment agency, because they are best integrated with community groups, have statutory and de facto authority, staff expertise, and the best-suited funding tools.

Development Forecast

This section quantifies the development outlook and analysis described above. The tables below show the development expected to take place within each of the PASA's development areas. All development forecasts are estimates based on the best information available to the project team. They should be seen as approximations about the most likely development outcomes in the PASA, not an exact prediction of what will happen.

In the long term, the entire PASA is expected to contain nearly 3,400 housing units and 240,000 square feet of retail and office space. This will mean the addition of approximately net new 426 housing units and 87,000 square feet of commercial space. Thus, while a considerable amount of housing and commercial space can be added over the long term, the area's development patterns will not change radically. In particular, because there is a significant amount of retail space in the area today, the total area will increase only by about 60 percent, mostly caused by a greater amount of retail space being fit onto existing retail sites. The largest amount of change will take place directly around the station and along the McLoughlin Corridor, while the rest of the ½ mile PASA will largely retain its current character.

Table 3. Current and Long Term Future Development - Summary

Area		Current		Long Term (2031)		Net New	
		Housing Units	Commercial Area (SF)	Housing Units	Commercial Area (SF)	Housing Units	Commercial Area (SF)
1	Station and Parking Lot	-	-	5	400	5	400
2	Adjacent Properties	1	21,000	133	46,600	132	25,600
3	McLoughlin Corridor	78	123,800	217	178,000	139	54,200
4	River Road Node	-	-	-	5,227	-	5,227
5	1/2 Mile Station Area	2,894	6,200	3,045	8,190	152	1,990
Total		**2,973**	**151,000**	**3,399**	**238,417**	**426**	**87,417**

Source: Leland Consulting Group. Some figures may not sum correctly due to rounding.

Given the dearth of room for new development, development at the station itself (development area one) is expected to be very minimal in scale: the plaza should be able to support one or two food carts or coffee kiosks. Despite their small size, these food vendors can create identity, a unique sense of place, and of course a valuable service for commuters and other patrons. The Adjacent Properties, particularly the Elks Lodge, have the potential to transition to a combined housing and retail/commercial format, with housing oriented toward the west and commercial space oriented towards McLoughlin. A total of 133 new housing units, of the types shown in Figure 4 and at a density of approximately 25 per acre, could be accommodated on the Elks property, all with good access to the Park Avenue station. This could be complemented in the long term with some additional commercial space. The amount of land and redevelopment potential within areas one and two could thus begin to create a "village center" or "community gathering place" near the station and Trolley Trail.

The McLoughlin Corridor (area three) is expected to change through a mix of some commercial and housing redevelopment, rehabilitation (described below), and new development. About half of the area's 37.4 acres are expected to redevelop over the next two decades. Some townhouses and apartments can be added to the rear of existing commercial lots as they are redeveloped. The River Road Node has the

potential to become a small, locally-oriented retail center, with potential services including groceries and convenience goods, restaurant or deli, a dry cleaner, hair salon, or similar tenants. Within the rest of the PASA, development will be limited. There are no potential sites for new commercial redevelopment located outside of the McLoughlin Corridor. Most of the new housing added in this area will come from development on currently vacant land, with a small amount of additional housing coming from the redevelopment of lower-value residential properties to higher intensity uses.

Table 4 shows another way to categorize redevelopment and revitalization: the amount of properties that will remain as-is, be rehabilitated, redevelop, or be developed from the ground up on vacant land. This table again shows that much of the area will remain as-is. However, it also shows that a significant portion of the properties can be rehabilitated or upgraded—even if most of their structures remain the same. Rehabilitation can bring significant changes in appearance, tenants, and services provided to the community, without the costs of complete redevelopment. Some facelifts or rehabs can be very dramatic, and given the difficult economics of wholesale redevelopment in this area, rehabilitation may make sense as a strategic focus. Significant change can take place, even without large amounts of new development. Enhancements within the retirement communities may make up a large portion of the residential rehabilitation. Table 4 also shows how little development on vacant land is expected to take place, simply because there is so little available.

Table 4. Future Development By Type - Summary

Area		Remaining		Rehabiliated		Redevelopment		New Development on Vacant Area		Total Future Development	
		Housing	Commercial	Housing	Commercial	Housing	Commercial	Housing	Commercial	Housing	Commercial
1	Station and Parking Lot	-	-	-	-	-	400	5	-	5	400
2	Adjacent Properties	-	-	1	21,000	132	25,600	-	-	133	46,600
3	McLoughlin Corridor	16	24,760	23	37,140	178	116,100	-	-	217	178,000
4	River Road Node	-	-	-	-	-	-	-	5,227	-	5,227
5	1/2 Mile Station Area	2,460	5,270	376	800	82	1,000	127	1,120	3,045	8,190
Total		**2,475**	**30,030**	**401**	**58,940**	**392**	**143,100**	**132**	**6,347**	**3,399**	**238,417**
Percent		73%	13%	12%	25%	12%	60%	4%	3%	100%	100%

Source: Leland Consulting Group.

Table 5. Long-Term Redevelopment and Rehabilitation Ratios

Area		Existing Development			
		Remains As Is	Rehab	Redevelops	Total
1	Station and Parking Lot	99.7%	0%	0.3%	100%
2	Adjacent Properties	0%	67%	33%	100%
3	McLoughlin Corridor	20%	30%	50%	100%
4	River Road Node	0%	0%	100%	100%
5	1/2 Mile Station Area	85%	13%	2%	100%

Source: Leland Consulting Group.
Note: The ―remaining" development for Area 1 reflects site conditions after completion of the MAX line. Thus most development here (including the plaza and parking lot) will ―remain as is."

Table 6 shows the net new development expected to take place during each of the time periods evaluated— short (1 to 5 years), medium (6 to 10 years), and long terms (11 to 20 years)—based on the development conditions and outlook explained above. Again, the guiding principle is that some residential development may be able to take place in the short term, while commercial development will have to wait until the medium and long terms. Further, the prospects for all development will improve in the medium and long terms.

Table 6. Net New Development by Time Period

Area		Short 2011 - 2016		Medium 2016 - 2021		Long 2021 - 2031		Total 2011 - 2031	
		Housing	Commercial	Housing	Commercial	Housing	Commercial	Housing	Commercial
1	Station and Parking Lot	5	400	-	-	-	-	5	400
2	Adjacent Properties	66	2,560	66	20,480	-	2,560	132	25,600
3	McLoughlin Corridor	35	-	69	18,970	35	35,230	139	54,200
4	River Road Node	-	-	-	5,227	-	-	-	5,227
5	1/2 Mile Station Area	50	-	50	696	50	1,293	151	1,990
Total		**156**	**2,960**	**186**	**45,374**	**85**	**39,083**	**426**	**87,417**

Source: Leland Consulting Group.

Implementation

The development forecast outlined above will take the PASA a long way towards the project's stated goals of creating a village center, leveraging the public investment in light rail, and strengthening the transit-oriented nature of the community.

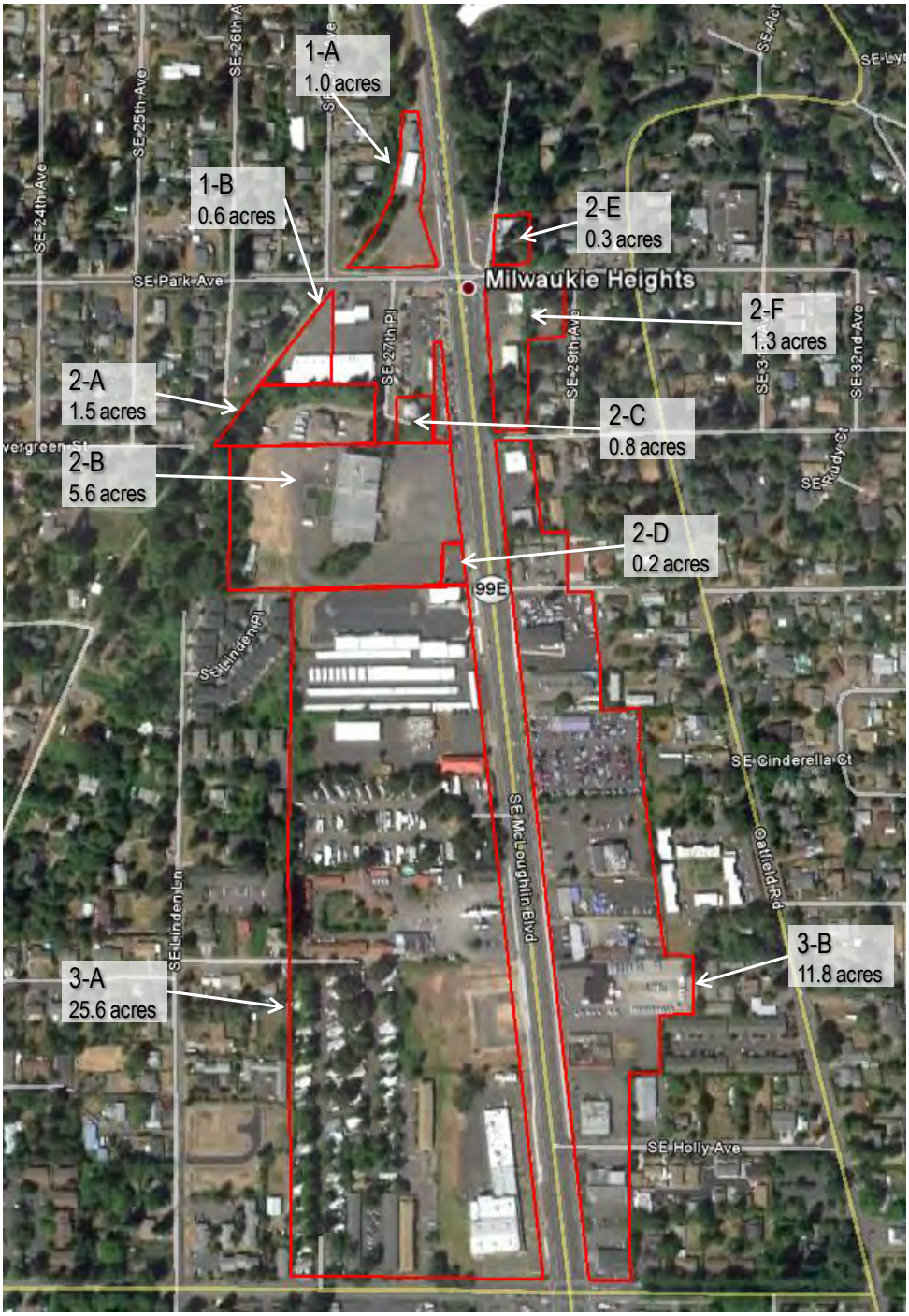
With that said, redevelopment does not just happen. People—including residents, local business owners, property owners, developers, lenders, brokers, public sector staff, architects, and others—will play a pivotal role in determining how development along the McLoughlin Corridor unfolds. Thus, well-orchestrated implementation—the actions taken by the people and groups—is critical to achieving desired outcomes. A number of implementation actions are listed below. This is just a beginning that will be added to as this project continues and the complete Station Area Plan comes into greater focus.

- **Continue to build the vision from the grass roots up.** Community-driven change must truly come from the community. And while that principle is true everywhere, it is even more important in Oak Grove and the ―McLoughlin Area," where residents have sent a clear message that they want to define their own vision, not have it imposed on them. In order for a plan to get implemented, the strategic vision must be clear and broadly shared. This process should continue to work closely with the McLoughlin Area Plan (MAP) to clarify the vision.
- **Focus efforts and "Establishing Pulse Nodes of Development"** are keys to redeveloping urban corridors according to the Urban Land Institute. With dozens of acres and scores of underperforming commercial properties along McLoughlin Boulevard alone, positive change cannot be effected everywhere at once. The community and public agencies involved should choose several key ―nodes" where they can focus efforts. A key part of the pulse node approach is to concentrate energy and redevelopment on the perpendicular cross streets such as Park Avenue rather than on McLoughlin itself.

- **Refreshing McLoughlin Boulevard's identity could go a long way towards encouraging development.** The MAX line, Park Avenue Station, Trolley Trail, and public art that reflects the character of the community should be a very good start. Streetscape improvements such as planter strips, landscaped areas, or revised street sections at certain nodes should continue to be considered. Greater connectivity within the PASA and a new east-west pedestrian and auto intersection across McLoughlin could also send the message that this is a ―place‟ and not a auto strip.
- **"Start with the petunias."** According to the Project for Public Spaces, simple actions like planting these affordable, colorful, and hardy flowers can send a message that an area is changing for the better, while enabling locals to see progress and get some easy "wins" early on. Not every change needs to cost thousands of dollars. Inexpensive food carts have given a splash of color and activity to numerous neighborhoods around the region in past years, and many farmers markets serve as centers of community without the benefit of a permanent structure.
- **Adequate financial and human resources should be available to implement the vision** once it has been established by the community. Funds may be needed for property acquisitions, road and other infrastructure improvements, site preparation, and other investments. These funds can come from local, county, regional, state, or federal sources, but establishing some source of locally-controlled funds (for example, through a capital improvement plan, urban renewal, or similar tool) is extremely important. Such local tools can also enable the community to incentivize the types of property upgrades and rehabilitation described in this memo; for example, many urban renewal districts provide grants for façade improvements or redevelopment feasibility analyses. Public agency staff or other professionals with a strong understanding of redevelopment should be assigned to work on implementation, with strategic guidance from community committees and others. Public-private partnerships would probably been necessary at key redevelopment sites. Zoning codes and other regulations may need to be revised. Because there are a number of overlapping jurisdictions in this area (Clackamas County, TriMet, ODOT) but no city, it will be important to define who is responsible for completing various actions. Some of these actions will be defined in greater detail during later phases of this plan.

Appendices

Figure 11. Development Areas and Properties



Source: Leland Consulting Group.

Appendix D: Existing and No Build Traffic Analysis

PARK AVENUE NEIGHBORHOOD & STATION AREA PLAN

DATE:	November 11, 2010
TO:	Shari Gilevich, Gail Curtis
FROM:	Shelly Alexander, PE Angela Rogge, EIT
SUBJECT:	**Final Existing Traffic Conditions Memorandum**
PROJECT:	**Park Avenue Neighborhood and Station Area Plan**
COPIES:	

This memo documents PM peak hour existing traffic conditions of the study area surrounding the proposed location of the Park Avenue light rail station and park-and-ride lot, including existing volumes, operations and 95th percentile queues. The study area includes seven intersections, with additional accesses for the park-and-ride. Access to the park and ride is not part of existing conditions because it has not been constructed, but will be included in the 2035 future conditions analyses (including "No-Build" and Build analyses).

Study Area

This memorandum describes the existing traffic conditions for the following intersections:

1) OR 99E at SE River Road (signalized)
2) SE River Road at Park Avenue
3) OR 99E at Park Avenue (signalized)
4) SE Oatfield Road at SE Park Avenue
5) SE River Road at SE Courtney Avenue
6) OR 99E at SE Courtney Avenue (signalized)
7) SE Oatfield Road at SE Courtney Avenue

Traffic Volumes and Signal Timing

All of the PM peak hour existing signal timing information was determined by referencing the Synchro Model (version 6) created by DKS Associates for their work on the *South-Corridor Portland-Milwaukie Light Rail Project FEIS Transportation Impacts Results Report.* The majority of the existing volume data was acquired from that same report, with the exception of the intersections of SE River Road at SE Courtney Avenue and SE Oatfield Road at SE Courtney Avenue, which are from turning movement counts provided by the County. See **Figure 1** for the volumes used in the analysis.

Traffic Analysis Methodology

For traffic signal analysis and coordination, the Synchro/SimTraffic analysis software package (version 7) was chosen to evaluate intersection operations for the closely spaced intersections within the study area.

Synchro is a deterministic tool similar to the Highway Capacity Software (HCS), and like the HCS, is based on the *2000 Highway Capacity Manual*. The Synchro model explicitly evaluates traffic operations under coordinated and uncoordinated systems of signalized and unsignalized intersections. Synchro calculates traffic arrival types, right-turn-on-red capacity, and determines queue lengths. It also calculates level of service (LOS) and volume–to-capacity (v/c) ratios based on the methodology in the *2000 Highway Capacity Manual*.

SimTraffic animates traffic flow based on input volumes and signal timing and allows viewing of traffic flow under saturated traffic conditions where traffic may spill over from one intersection to another. Different arrival patterns can be used to determine how sensitive the traffic operations are with subtle variations in traffic flows. SimTraffic is particularly effective at evaluating closely spaced intersections and was used to evaluate the 95th-percentile queue lengths.

The Synchro analysis includes existing volumes and signal timing as well as modifications to the standard Synchro/SimTraffic settings to comply with ODOT's Analysis Procedures Manual (APM).

Existing Conditions Analysis

The operational standard for Clackamas County is LOS D or better for signalized and unsignalized intersections[1]. The County intersections within the study area are unsignalized. All of the intersections along OR 99E within the study area are ODOT facilities and have an operational standard of a maximum v/c ratio of 0.99 during peak operating conditions[2]. These intersections also happen to be the only signalized intersections in the study area.

Intersection Operations

The operational results (v/c ratio and LOS) were determined from the Synchro analysis. **Figure 2** illustrates these results for each individual movement at all intersections and summarizes the overall results for the signalized intersections. The operational results for this project are generally in agreement with the results presented in the *South-Corridor Portland-Milwaukie Light Rail Project FEIS Transportation Impacts Results Report*[3], with only minor differences. The traffic volumes and signal timing are the same. The differences are likely due to the following:

- Using an updated model (Synchro 7 instead of Synchro 6),
- Incorporating the latest ODOT APM Synchro settings and Simtraffic parameters, and
- Using slightly different arrival patterns (each run includes random selection of the traffic arrival pattern).

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[1] Clackamas County Comprehensive Plan, Chapter 5, last updated April 28, 2005
[2] *1999 Oregon Highway Plan – Amendment,* The Oregon Department of Transportation, July 2005
[3] *DKS Associates*

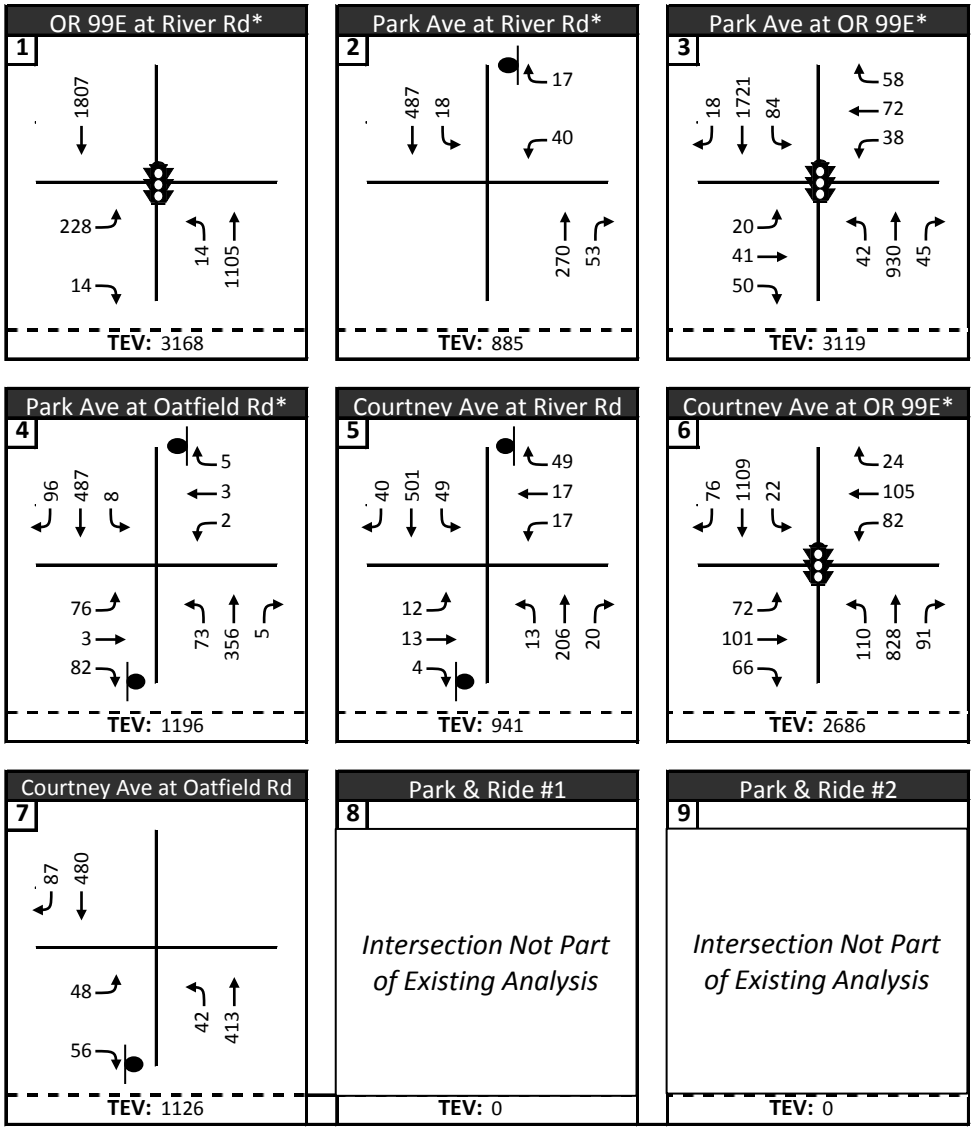
All three of the signalized intersections along OR 99E meet ODOT's standard v/c ratio of 0.99. The highest overall v/c ratio was 0.85 at OR 99E at River Road. This intersection operates at an overall LOS B; however, there are individual movements operating at LOS E or F. The eastbound left movement operates at LOS F, with a v/c ratio of 1.03, and the northbound left movement operates at LOS E, with a v/c ratio of 0.45. OR 99E at Park Avenue operates at LOS B overall, with a v/c ratio of 0.83 and only one individual movement below LOS D. The westbound left/through/right operates at LOS E and has a v/c ratio of 0.80. Finally, the intersection of OR 99E at Courtney Ave currently operates at LOS C with a v/c ratio of 0.68. Several of the individual movements operate at LOS E: the eastbound movements, westbound left and southbound left. The worst of those movements is the westbound left with a v/c ratio of 0.73.

All of the unsignalized intersections meet operational standards, with the exception of one movement at Park Avenue and Oatfield Road. The eastbound left/through/right movement is stop-controlled with a LOS E and v/c of 0.71. The remaining three unsignalized intersections all operate at LOS C or better.

Queuing

The 95th-percentile queues summarized in **Figure 3** were determined from the SimTraffic analysis. The operational results are indicative of where queuing may be an issue. The signalized intersections revealed several side streets and storage bays with queuing problems. The River Road approach to OR 99E backs up over 1,000 feet, almost reaching Lark Street. The intersection of OR 99E at Park Avenue shows the southbound left, northbound right, and eastbound approach queues just fitting into the available storage and the westbound queue blocking the closest local street. OR 99E at Courtney Avenue shows queues exceeding the length of the storage bays for the eastbound, westbound and northbound left turns with the southbound through movement backing up to the next local street access. Only one unsignalized intersection has potential queuing problems. The intersection of Park Avenue at Oatfield Road shows the stop-controlled eastbound queue just blocking the closest local road access.

Attachments:
Figure 1: 2010 Existing PM Peak Hour Volumes
Figure 2: 2010 Existing PM Peak Hour Operations
Figure 3: 2010 Existing PM Peak Hour Queues



DAVID EVANS AND ASSOCIATES INC.

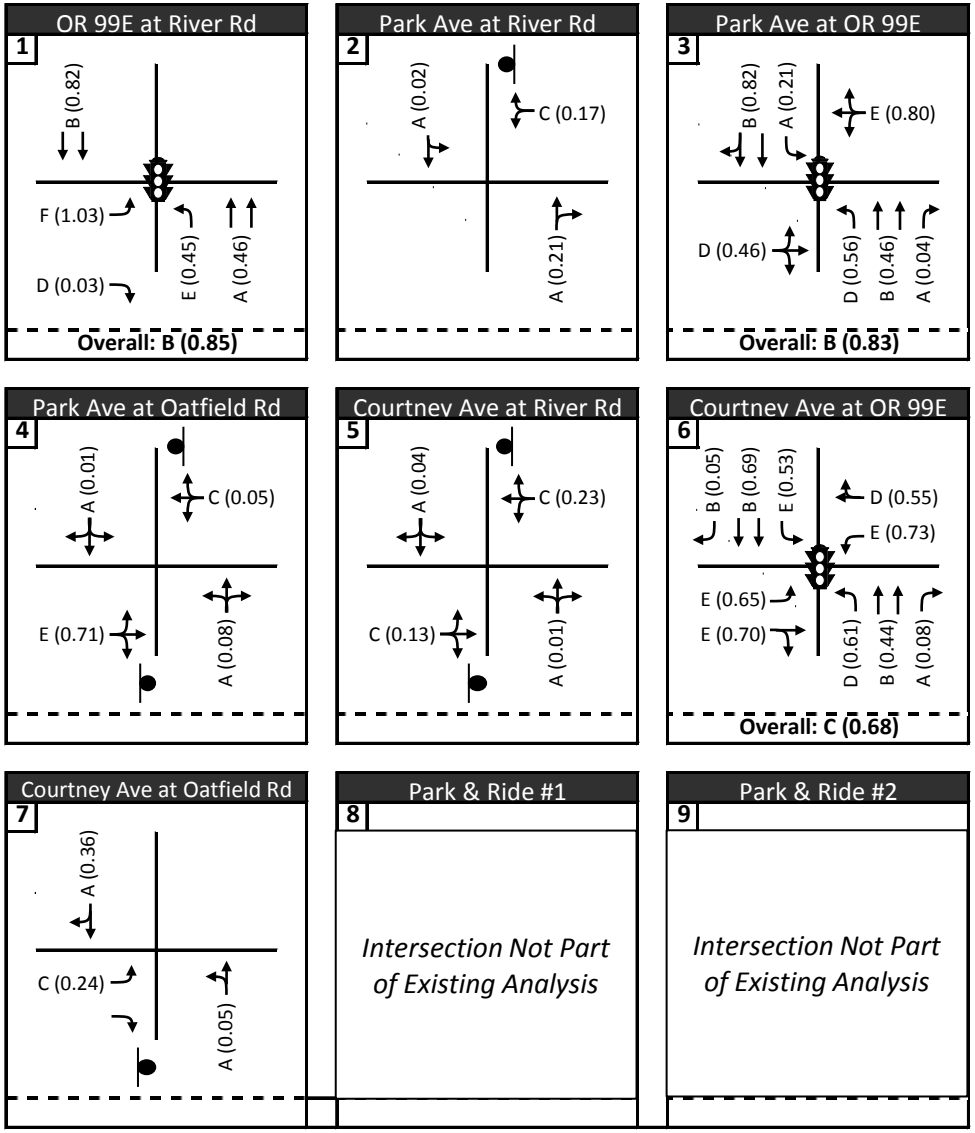
LEGEND

#	Study Intersection Number	TEV:	Total Entering Volume
	Traffic Signal	→	Allowable Movement
	Stop Sign	###	PM Peak Hour Volume

* Source: Volumes from DKS Associates
Portland-Milwaukie Light Rail Project Transportation Impacts Results Report

FIGURE 1

2010 Existing
PM Peak Hour Volumes



DAVID EVANS AND ASSOCIATES INC.

LEGEND

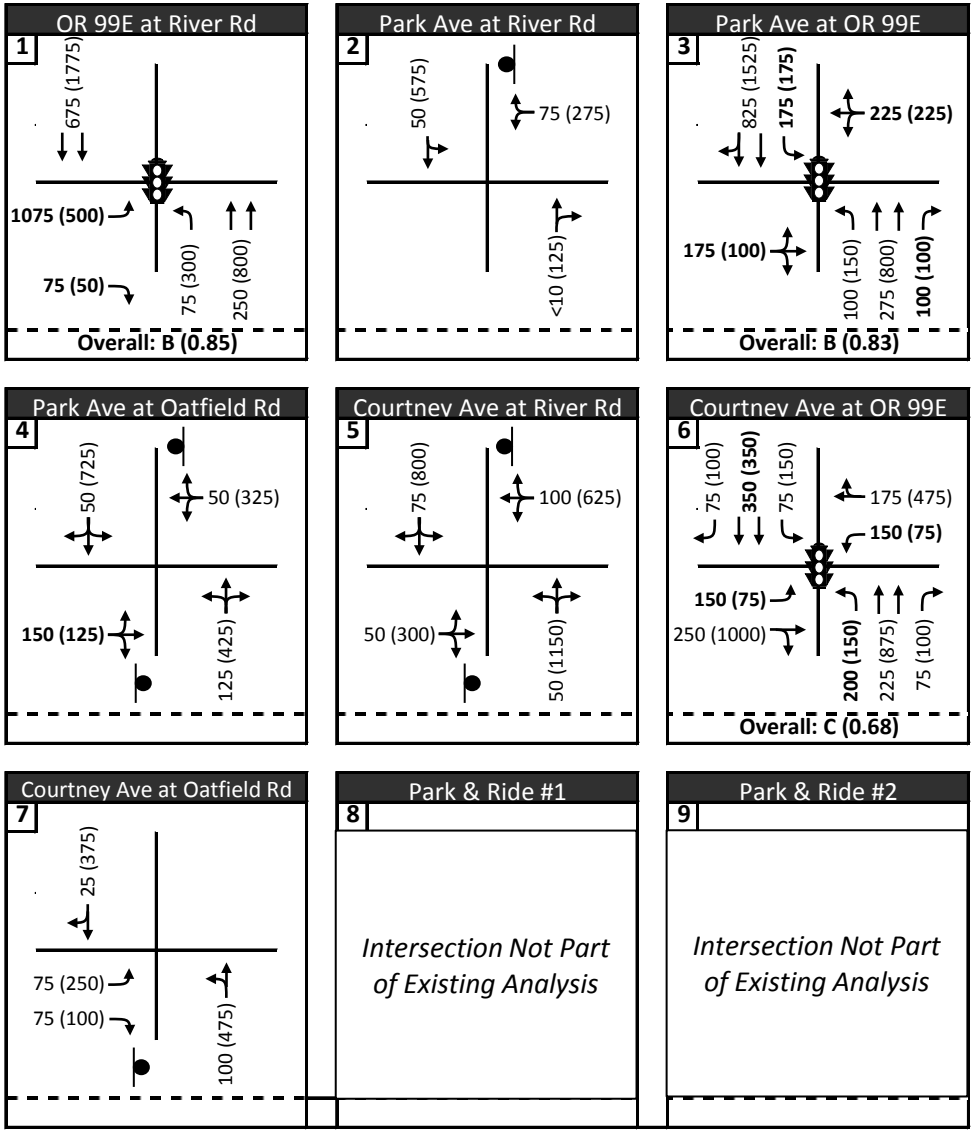
- # Study Intersection Number
- Traffic Signal
- Stop Sign
- Allowable Movement

A (0.00) LOS (v/c)

Standards
- Signalized: ODOT v/c, 0.99
- Unsignalized: Clackamas County, LOS D

FIGURE 2

2010 Existing
PM Peak Hour
Operations



DAVID EVANS AND ASSOCIATES INC.

LEGEND

- # Study Intersection Number
- Traffic Signal
- Stop Sign
- → Allowable Movement
- 25 (50) Queue (Storage)

FIGURE 3

2010 Existing PM Peak Hour Queues

DATE:	February 22, 2011
TO:	Shari Gilevich, Gail Curtis
FROM:	Shelly Alexander, PE Angela Rogge, EIT
SUBJECT:	**Final No Build Traffic Conditions Memorandum**
PROJECT:	**Park Avenue Neighborhood and Station Area Plan**
COPIES:	

This memo documents PM peak hour 2035 No Build traffic conditions of the study area surrounding the proposed Park Avenue light rail station and park and ride lot. It includes forecast volumes, operations and 95th percentile queues for the nine study area intersections: seven existing intersections and two new accesses for a 600-space park and ride structure.

Study Area

This memorandum describes the future No Build traffic conditions for the following intersections:

1) OR 99E at SE River Road (signalized)
2) SE River Road at Park Avenue
3) OR 99E at Park Avenue (signalized)
4) SE Oatfield Road at SE Park Avenue (signalized)
5) SE River Road at SE Courtney Avenue
6) OR 99E at SE Courtney Avenue (signalized)
7) SE Oatfield Road at SE Courtney Avenue
8) Park Avenue Park and Ride Access – Park and Ride Access #1 (signalized)
9) OR 99E Park and Ride access – Park and Ride Access #2 (right-in/right-out)

2035 No Build Traffic Volumes

The traffic volumes were calculated for the 2035 design year based on turning movement data from Metro's 2005 Existing and 2035 Financially Constrained (FC)[1] VISUM models.

[1] The 2035 FC VISUM model was adjusted to assess the 600-space park and ride capacity.

2035 Volume Development

Metro provided PM two-hour model output for two years: 2005 and 2035. The year 2035 model includes all of the mitigation measures outlined in the Portland-Milwaukie Light Rail (PMLR) Final Environmental Impact Statement (FEIS). These measures are summarized under the No Build Analysis Assumptions and Methodologies section of this memo. The output from the regional travel models was used to develop PM peak-hour intersection turning movement volumes[2] based on the turning movement patterns used for the Existing Conditions analysis.

The two travel demand models are used to determine forecast traffic growth for different streets, which is then applied to the existing volumes. This methodology minimizes the effects of model error by adding the increment of growth projected by the travel demand model while retaining the empirical data collected with the traffic counts. Therefore, intersection approach and departure volumes used in the level-of-service (LOS) calculations have been adjusted and may not match raw model volumes produced from the travel demand model.

Park and Ride Volume Adjustment

The No Build scenario includes the construction of a 600-space park and ride station to be located at the southwest corner of Park Avenue and OR 99E. Metro's 2035 model assumes that the Park Avenue Park and Ride station has 1000 spaces. In order to accurately forecast for the No Build scenario (600 spaces), the vehicular volume associated with the extra 400 spaces was removed from Metro's model. To determine where in the 2035 model the excess trips should be removed, a select zone analysis of the TAZ including the park and ride station was done in VISUM. The 280 trips were removed from the network based on the percentages found in the select zone analysis.

Table 1: Park and Ride Trip Generation

Park and Ride	Rate In	Trips In	Rate Out	Trips Out	Total Trips
PM Peak					
600 Space	0.20	120	0.50	300	420
800 Space	0.20	160	0.50	400	560
1,000 Space	0.20	200	0.50	500	700

Source: Draft Park Avenue Park and Ride Sensitivity memo dated January 7th, 2010 by DKS Associates for the PMLR FEIS.

No Build Forecast Volumes

Figure 1 shows the No Build forecast volumes developed through the process described above.

No Build Analysis Assumptions and Methodologies

Assumptions and methodologies used in the No Build analysis are described below.

[2] These turning movements were derived using post-processing methodologies outlined in Oregon Department of Transportation's Analysis Procedures Manual (ODOT APM). The post-processing method includes incorporating existing counts, base case travel demand model data (2005), and future travel demand model data (2035).

Mitigation

Mitigation measures for Park Avenue (and the surrounding area) were outlined in Appendix M of the *South-Corridor Portland-Milwaukie Light Rail Project FEIS Transportation Impacts Results Report* for the Locally Preferred Alternative (LPA). For this No Build analysis, these mitigation measures are assumed to be in place by year 2035. Specifically, measures are identified for the following locations:

- Park Avenue at Oatfield Road: The mitigation calls for a traffic signal at Oatfield Road and the addition of an eastbound right-turn lane, a northbound left-turn lane and a southbound left-turn lane.
- Park Avenue west of OR 99E: The mitigation calls for widening and restriping to allow for side-by-side left turn lanes to accommodate eastbound and westbound queuing Between the Park Avenue park and ride access and OR 99E.

Signal Timing

Two new signals are assumed for the No Build scenario, which makes five total signalized intersections. Of the three existing signalized intersections in the PM peak hour No Build model, all were modified to some extent due to the addition of the new signals on Park Avenue. The signal timing at OR 99E and Park Avenue was changed slightly to better coordinate with the new signalized intersections at the 27th Avenue park and ride access and at Oatfield Road and Park Avenue. Originally, the signal timing for the intersections along Park Avenue were determined by referencing the Synchro Model (version 6) created by DKS Associates for their work on the *South-Corridor Portland-Milwaukie Light Rail Project FEIS Transportation Impacts Results Report.* However, with the addition of the new signals along Park Avenue, the existing signals were modified to ensure the OR 99E corridor was operating appropriately. Specifically, the cycles lengths at the signalized intersections along OR 99E were set to be the same and the bandwidth was optimized.

Traffic Analysis Methodology

As mentioned in the Existing Conditions Memo[3], the Synchro/SimTraffic analysis software package (version 7) was chosen to evaluate intersection operations for the closely spaced intersections within the study area. The Synchro analysis includes modifications to the standard Synchro/SimTraffic settings to comply with ODOT's Analysis Procedures Manual (APM).

Operational Standards

The operational standard for Clackamas County is LOS D or better for signalized and unsignalized intersections[4]. There are two County intersections within the study area that are signalized: Park Avenue park and ride access and Oatfield Road at Park Avenue. All of the remaining intersections within the study area are along OR 99E and are ODOT facilities; they have an operational standard of a maximum v/c ratio of 0.99 during peak operating conditions[5].

No Build Analysis Results

The No Build analysis results are described below and illustrated in **Figure 2** and **Figure 3.**

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[3] For more details regarding the analysis tools see the *Draft Existing Conditions Memorandum* dated November 11, 2010 prepared by David Evans and Associates, Inc.
[4] Clackamas County Comprehensive Plan, Chapter 5, last updated April 28, 2005
[5] *1999 Oregon Highway Plan – Amendment,* The Oregon Department of Transportation, July 2005

Intersection Operations

The operational results (v/c ratio and LOS) were determined from the Synchro analysis. **Figure 2** illustrates these results for each individual movement at all intersections and summarizes the overall results for the signalized intersections.

The operational results for this project vary from the results presented in the *South-Corridor Portland-Milwaukie Light Rail Project FEIS Transportation Impacts Results Report*[6]. The variations are likely due to:

- Using a different future model (2035 instead of 2030)
- Assuming a 600 space park and ride instead of a 1,000 space park and ride
- Using an updated analysis model (Synchro 7 instead of Synchro 6)
- Incorporating the latest ODOT APM Synchro settings and SimTraffic parameters assuming the recommended mitigation from the FEIS

None of the three signalized intersections along OR 99E meet ODOT's standard v/c ratio of 0.99. The worst overall future operations would occur at the OR 99E and Courtney Avenue intersection with an intersection v/c ratio of 1.10 (LOS F). This high v/c ratio is a reflection of the southbound through movement, and the side street left-turn movements which are expected to have a v/c ratio of 1.28 and 1.34, respectively. All other movements would have v/c ratios below 0.99. The intersection of OR 99E at Park Avenue is expected to have an overall v/c ratio of 1.03 and operate at LOS E conditions. As with the OR 99E and Courtney Avenue intersection, the southbound through movement would have a v/c ratio above 0.99. Finally, the intersection of OR 99E at River Road is expected to operate at LOS D with a v/c ratio of 1.02. The worst individual movement would be the southbound through with a v/c ratio of 1.07.

Of the signalized County intersections, both operate within the County standard of LOS D. The Park Avenue park and ride access is expected to operate at LOS C and a v/c ratio 0.21 while the intersection of Oatfield Road at Park Avenue is expected to operate with LOS B and a v/c ratio 0.81.

Of the unsignalized intersections, the westbound movements at both Park Avenue at River Road and Courtney Avenue at River Road are expected to exceed the County's operational standards. These movements would operate at LOS E with a v/c ratio of 0.60 and 0.71, respectively.

Queuing

The 95th percentile queues summarized in **Figure 3** were determined from the SimTraffic analysis. Forecasts queue lengths were compared with the length of available storages bays or the distance to nearby intersections to identify where queuing may become an issue.

The analysis of the signalized intersections along OR 99E shows significant queuing may be expected in the southbound direction along the highway as well as several side streets and storage bays. The intersection of OR 99E at River Road has significant queuing of the southbound through movement along OR 99E. It is expected to back up into the closest upstream intersection, which is not a part of the study area. The intersection of OR 99E at Park Avenue would have queuing issues for the southbound left and right, northbound right, and westbound through/right queues as they are expected to exceed the available

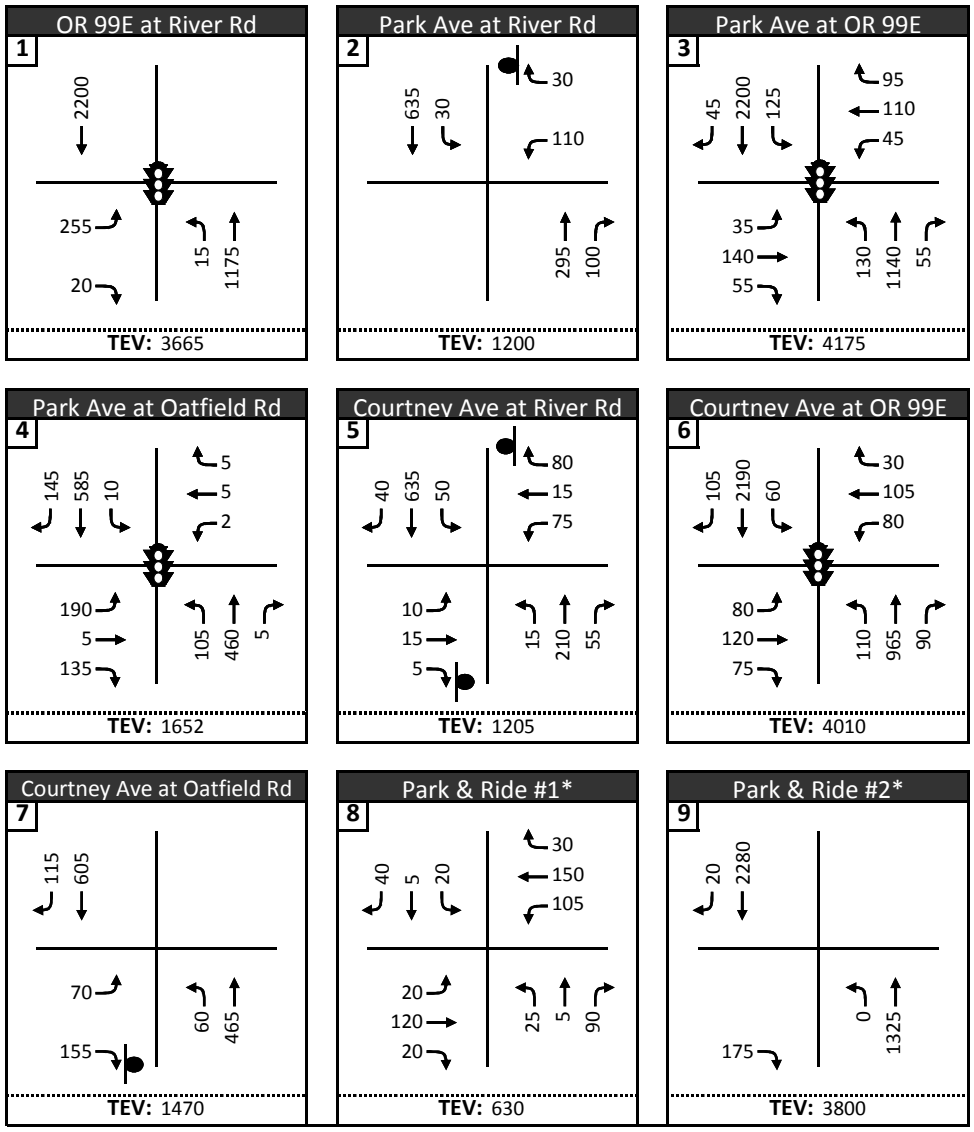
[6] *DKS Associates*

storage. The southbound through queue is expected to extend north to the intersection of OR 99E at River Road. The OR 99E at Courtney Avenue intersection also shows anticipated queuing problems. Here all left turn movements are expected to exceed the length of the storage bays, as well as the northbound and southbound rights. The southbound through queue is anticipated to extend north to Park Avenue, compounding the effect of the queuing problems there. Since the westbound through/right traffic is aligned with the left-turn movement and the left-turn movement is over capacity, the through/right traffic is blocked. This queue is then anticipated to extend east to Oatfield Road and impact the southbound right-turn movement at the intersection of Oatfield Road at Courtney Avenue.

At the County's signalized intersections, there is one movement with anticipated queue storage issues. At the intersection of Park Avenue and Oatfield Road, the southbound left queue is expected to reach the capacity of the turn bay.

Only two unsignalized intersections have potential queuing problems in the No Build scenario. The stop-controlled eastbound right turn on Courtney Avenue at Oatfield Road is expected to exceed available storage but is not anticipated to block the closest local road access. The southbound right queue at the OR 99E park and access would likely exceed the storage bay.

Attachments:
Figure 1: 2035 No Build PM Peak Hour Volumes
Figure 2: 2035 No Build PM Peak Hour Operations
Figure 3: 2035 No Build PM Peak Hour Queues



DAVID EVANS AND ASSOCIATES INC.

LEGEND

- # Study Intersection Number
- # Park and Ride Access
- Traffic Signal
- Stop Sign
- TEV: Total Entering Volume
- → Allowable Movement
- ### PM Peak Hour Volume

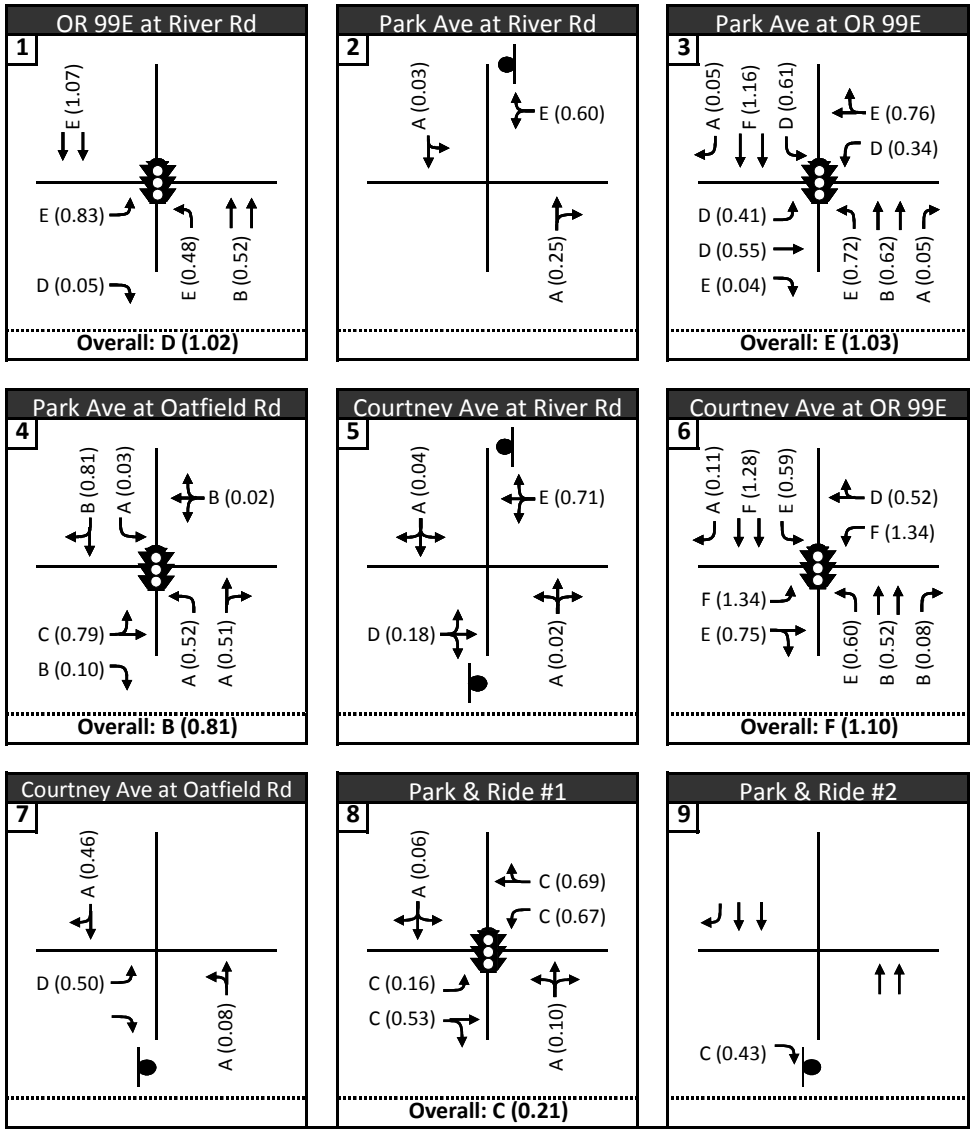
* Source: Volumes from DKS Associates

Portland-Milwaukie Light Rail Project Transportation Impact Results Reports

FIGURE 1

2035 No Build

PM Peak Hour Volumes



DAVID EVANS AND ASSOCIATES INC.

LEGEND

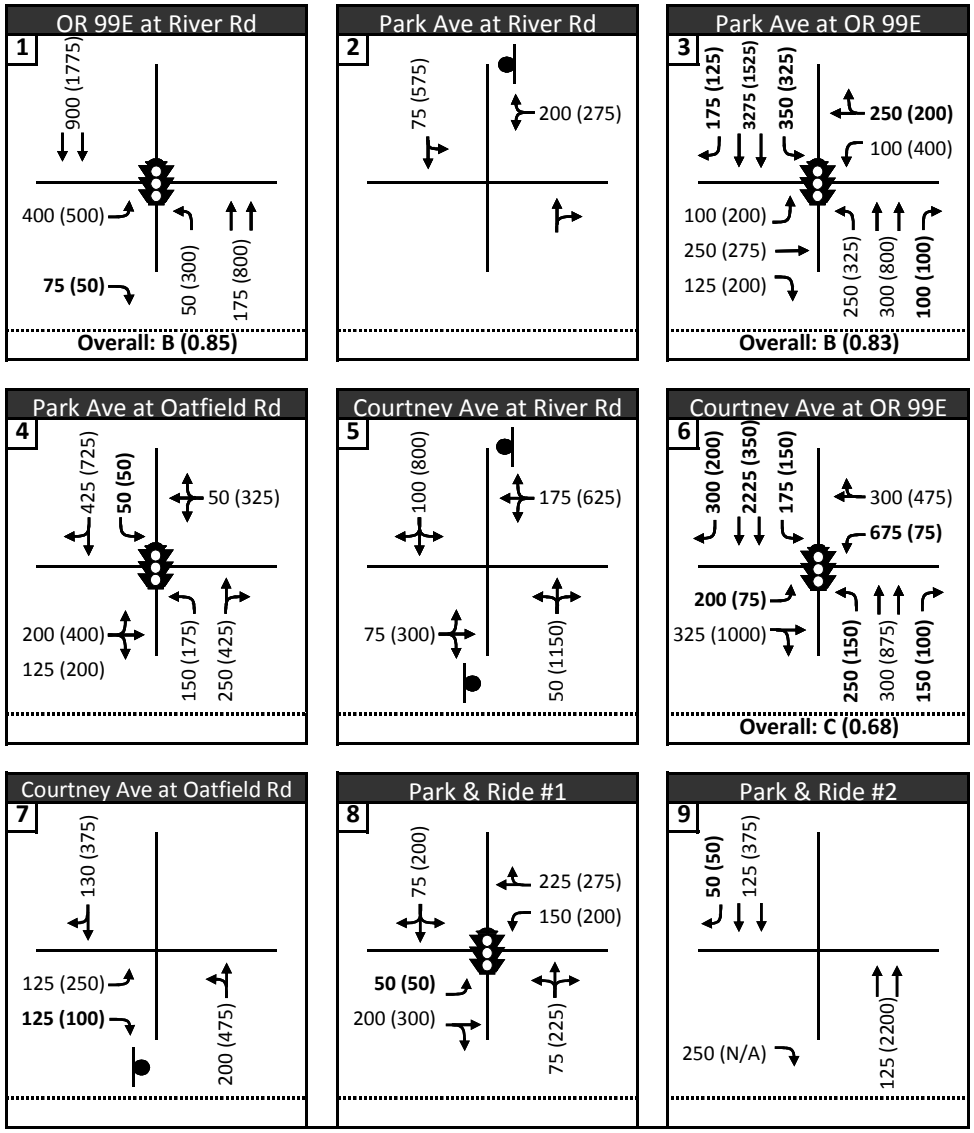
- # Study Intersection Number
- # Park and Ride Access
- Traffic Signal
- Stop Sign
- Allowable Movement

A (0.00) LOS (v/c)

Standards
- Signalized: ODOT v/c, 0.99
- Unsignalized: Clackamas County, LOS D

FIGURE 2

2035 No Build
PM Peak Hour
Operations



DAVID EVANS AND ASSOCIATES INC.

LEGEND

- # Study Intersection Number
- # Park and Ride Access
- Traffic Signal
- Stop Sign
- → Allowable Movement
- 25 (50) Queue (Storage)
- N/A Storage to be determined by Park and Ride design

FIGURE 3

2035 No Build

PM Peak Hour

Queues

Appendix E: Needs, Opportunities and Constraints Memorandum

PARK AVENUE NEIGHBORHOOD & STATION AREA PLAN

DATE:	March 31, 2011
TO:	Project Logistics Team
FROM:	Alex Dupey, Laurence Qamar
SUBJECT:	**Final Opportunities and Constraints Memorandum**
PROJECT:	**Park Avenue Light Rail Station Plan**
COPIES:	

Introduction

The Park Avenue station area is the last station on the future Portland to Milwaukie Light Rail Line (PMLR). The station will include a plaza and a 355-space park-and-ride located at the intersection of Park Avenue and McLoughlin Boulevard. Clackamas County is working with the residents in the area, local service providers, TriMet, ODOT, and Metro to develop a land use and transportation plan that takes advantage of this significant public investment in light rail and that encourages transit oriented development and uses that support area residents. Transit oriented development (TOD) focuses on developing walkable neighborhoods that provide a variety of housing, retail and employment options that is well served by transit.

This planning project is evaluating an area approximately one-half mile from the station and park-and-ride. Although this boundary extends into the City of Milwaukie, no changes will be proposed within the City of Milwaukie boundaries. However, it is important that planning around the Park Avenue station is coordinated with the City of Milwaukie to ensure that the concepts complement adjacent areas.

Developing a successful project outcome requires not only collaboration among jurisdictions, but also strong citizen involvement. The project team is coordinating with local citizens and neighborhood groups and concurrent planning efforts including:

- The Oak Lodge Community Council;
- City of Milwaukie neighborhood districts, including the Island Station Neighborhood and the Lake Road Neighborhood District;
- McLoughlin Area Plan Committee (MAP);
- Citizens Informed and Aware; and
- Urban Green.

The project team has met with representatives from each of these groups through the Stakeholder Advisory Group, public meetings, and stakeholder interviews. These discussions have provided a basis for identifying the opportunities and constraints within the project area. This information is supplemented

with the Project Objectives, traffic analysis (existing conditions and future 2035), regulatory framework assessment, market analysis, and the project team's land use, transportation, and urban design expertise.

Supporting Materials

Opportunities and constraints within the project area are summarized in Table 1. Attachment A, Map A-1 identifies the general location of the opportunity or constraint if it is specific to a particular location, while Map A-2 identifies potential opportunities for increasing circulation options in the project area. Map A-3 illustrates the existing disconnected large block and street pattern. Attachment B includes the McLoughlin Boulevard cross sections that ODOT and Clackamas County have adopted for the project areas. Attachment C provides some ideas about how McLoughlin Boulevard and future land uses in the corridor might integrate with one another. These concepts were developed to help visualized potential opportunities and how an older commercial strip might be retrofitted to improve pedestrian circulation and support more varied land uses.

Zoning in the Project Area

The following information is summarized from the *Park Avenue Neighborhood and Station Area Plan Existing Conditions Report* (Clackamas County, 2010). Existing zoning, particularly along the McLoughlin corridor and in the vicinity of the light rail station does not support TOD patterns, particularly mixed uses. Clackamas County and the City of Milwaukie have several zoning districts within the project area. The majority of land is residentially zoned at primarily low and medium densities, with general commercial zoning along the McLoughlin corridor.

Clackamas County Zone Designations

There are several residential zones in the project area. The Low Density Residential (R-7, R-8.5, and R-10) zones allow one detached single-family dwelling with the minimum lot size corresponding to the zoning. (e.g. R-7 allows one detached single-family dwelling per 7,000 square feet of site area and R-10 allows the same type of development based on 10,000 square feet). Medium Density (MR-1) allows multi-family developments, manufactured dwelling parks, nursing homes, public parks, and bed and breakfast residences and inns as primary uses, provided that adequate public facilities can serve the site and the density requirements are met. Areas zoned MR-1 are generally located north of Courtney Avenue along Linden Lane and along the length of the west side of Oatfield Road. High Density Residential (HDR) is located almost exclusively west of River Road, except for a small pocket of land northeast of McLoughlin Boulevard and Park Avenue. The HDR zone allows multi-family developments, nursing homes, and bed and breakfast residences as primary uses, provided that adequate public facilities can serve the site and the density requirements are met.

There are two commercial zones in the project area. General Commercial (C-3) includes land along McLoughlin Boulevard and allows retail, service, business park uses, housing facilities for senior citizens or handicapped persons, institutional uses, cultural/public uses, and office retail, provided that compliance with density standards and design review requirements is met. There is one parcel at the corner of River Road and Evergreen Street zoned Neighborhood Commercial (NC) that provides for a small retail shop on a corner lot in a residential district.

City of Milwaukie Zone Designations

No changes to Milwaukie zoning standards will be proposed through this project, but the city zone designations are described here because they are adjacent to parcels in unincorporated Clackamas County

where zoning could change to reflect the community's new vision for the area. All of the parcels that are in the project area and within Milwaukie City limits are zoned for residential development. Residential zones (R-1, R-2, R-3, R-5, R-7, and R-10) allow for single-family development, congregate housing, and agricultural or horticultural uses (with restrictions) provided that they meet minimum density standards. Density standards are reflected in the zoning designation (e.g. R-10 allows one dwelling unit per 10,000 feet of site area).

The City has identified land along Kellogg Creek as part of the Willamette River Greenway, which serves to protect, conserve, enhance, and maintain the natural, scenic, historic, economic, and recreational qualities of lands along the Willamette River and major courses flowing into the Willamette River. Additionally, the City has adopted a vegetated corridor overlay of the Willamette River Greenway to protect the water quality resources. Uses allowed outright include restoration and protection of stream, wetland, riparian, and upland enhancement projects.

Opportunities and Constraints Assessment

People

Opportunities

Areas residents have expressed that they have strong neighborhoods and the characteristics that make their neighborhoods strong should be protected as the project moves forward. This is particularly true for single-family homeowners who are concerned about the increases in density, traffic, and safety issues as a result of the future light rail station. Though single-family residences are the dominant housing type in the area, there are also medium and high density housing developments along River Road and interspersed throughout the project area that provide housing for various income levels. All of the residents will have increased access to transit when light rail is completed.

The Milwaukie Elks Lodge is a private institution, but has provided space for meetings, social gatherings, banquets, and recreational services (swimming, bowling, and racquetball) to generations of community residents for over 50 years. This parcel is currently for sale, but the Elks have expressed an interest in maintaining a community-centered focus by proposing future development or reuse of the existing facility to include a community center for the neighborhood. There are also two churches within the project area that provide gathering places for residents. One church is located on the west side of McLoughlin Boulevard on SE Lindenbrook Court, and the other on the east side of McLoughlin on SE Oatfield Road. School facilities also provide space for public gatherings, but there are limited facilities in the area.

Constraints

The area's historic development pattern has focused on McLoughlin Boulevard for commercial uses, with residential uses of mixed densities located outside of that corridor. Area residents perceive existing short-term residential uses along McLoughlin Boulevard negatively because they attract crime and are unappealing. That perception, combined with the lack of street lighting and sidewalks, makes pedestrians and bicyclists feel unsafe.

Neither the residential nor commercial areas integrate to support one another, which has led over time to a disconnected development pattern. Existing residential densities are also low within the immediate vicinity of the station, which limits potential commercial and retail development opportunities that requires higher residential densities. Overall, there is no defining focal point in the project area—neither

from a unique feature, such as a structure or building, nor a gathering place, such as a park or plaza. The residential areas are quiet, but the environment along McLoughlin Boulevard can be quite noisy and provides a poor street environment for bicyclists and pedestrians.

The existing commercial and retail areas do not support the surrounding residential areas with neighborhood uses—there are no grocery stores or pharmacies near the station (the nearest grocery is Fred Meyer, approximately 1 mile south of the future light rail transit station), few restaurants, and few small businesses that would attract area residents for their daily needs. The existing businesses likely provide very few employment opportunities, except for service-oriented jobs. Additionally, there are several vacant buildings in the area that contributes to the negative view of the commercial corridor.

There are no parks in the central portion of the project area, although Spring Park Natural Area is located on the edge of the project area near the Willamette River. Spring Park Natural Area provides a view of the Willamette River and includes a restroom facility, nature path to the waterfront, and a play structure. Although the Trolley Trail does provide recreational opportunities, it is limited to the narrow right-of-way and is disconnected from a larger recreational system, such as parks or other uses that provide some outdoor activity areas for existing and future residents.

There is one school (Oak Grove Elementary School) within one-half mile of the station. Students within the project area attend Oak Grove Elementary and Rowe Middle School, Alder Creek Middle School, Milwaukie High School or Rex Putnam High School, depending on where they live. There are few other public facilities in the area. Oak Grove Elementary provides the only public outdoor sports facilities in the area.

Strategies to Achieve Success

Strengthening community support for the *Park Avenue Neighborhood and Station Area Plan* will require strong, focused community investment that builds upon the opportunities and helps develop solutions to the constraints identified above. These strategies include:

- Engage the Stakeholder Advisory Group (SAG) to ensure that as many residents as possible attend the public design workshop and subsequent public meetings. Gathering public input will help the community create a plan for developing a strong sense of place and opportunities for various housing types and supporting uses, such as neighborhood-focused retail uses and recreational options.
- Evaluate the existing highway commercial and residential zoning patterns to allow a greater variety of land use types.
- Develop a realistic project list and implementation plan that includes public-supported projects.

Businesses

Opportunities

The commercial corridor along McLoughlin Boulevard is highly visible and is composed of several large lots with older structures that have not been maintained. As a result, land to improvement values within the project area are typically low, except for newly constructed buildings, including the Turret mini-mall and the boat sales store. Parcels are large enough, some larger than 5 acres, that they could be used for office or higher-density residential or divided to support multiple uses. The need to assemble properties can be a barrier to redevelopment, and the existing area large parcels reduce this barrier. If new

businesses provide services that are attractive to the community, then the residential areas can provide customers for these new businesses. Physical connections between business and residences would be important to reduce the need to travel by car and to activate the streets. There may also be an opportunity for identifying future mixed uses for the park and ride station.

The east side of McLoughlin provides unique development opportunities because it has access from both McLoughlin Boulevard and Oatfield Road. Parcel size is somewhat smaller than on the west side of McLoughlin, which could attract a greater variety of businesses that are looking for smaller store frontage.

The future light rail station and park-and-ride may provide some impetus for additional redevelopment as a result of the additional foot and car traffic. The Elks Lodge parcel is currently for sale and is immediately adjacent to the future park-and-ride. The site is more than five acres, has direct access to McLoughlin Boulevard, and also backs up to the Trolley Trail. Residential areas adjacent to the future plaza and station area could transition into live-work units or other mixed uses that take advantage of their proximity to the station.

Constraints

There is no consistent development pattern along the McLoughlin corridor that identifies the area as a "place" either for the residents or businesses. While the Bomber Restaurant provides some unique visual qualities typical of classic strip architecture, vehicles along McLoughlin Boulevard have no reason to stop unless they are looking for a specific business. For residents, there is little to walk to.

Parcel size may also be a constraint for some redevelopment efforts. The majority of parcels along the west side of McLoughlin are quite large, and there is no existing internal circulation system. Providing these circulation improvements would likely require some level of public investment and financing strategy. A master developer may be required to accomplish redevelopment at a larger scale.

Low developer interest is also a potential constraint. Given the depressed market, large-scale redevelopment may take some time.

Strategies to Achieve Success

Engaging public agencies, developers, landowners, and businesses interests will be critical for attracting new businesses and development that supports the community-focused design concept. Key strategies to achieve this include:

- Identify parcels potentially suitable for redevelopment. Initiate public outreach to key businesses and landowners to identify the level of landowner and business interest in redevelopment.
- Evaluate county zoning standards, including design guidelines for future development to determine if appropriate to support "nodal identity."
- Develop funding options to pay for basic infrastructure, such as sidewalks, street trees, and other infrastructure, to make the area more visually appealing.
- Consider a catalyst project, which could include a publicly funded project (such as a park or community center, or street and pedestrian improvements).

Transportation

Opportunities

Road Capacity

The "No Build" analysis identified potential capacity issues at the McLoughlin Boulevard intersections in 2035, which will have to be further evaluated as land use and transportation concepts are developed.

McLoughlin Boulevard provides good access to the region, and there are a large number of driveways and uncontrolled access points to adjacent development that could potentially be consolidated or redirected to an internal circulation system, if one were developed, to relieve some of the traffic impacts of existing and future development in the area. Local roads appear to function better than McLoughlin in 2035, but because they are located primarily in residential areas, the level of additional traffic placed on those roadways should be carefully considered. River Road and Oatfield Road provide alternative routes to McLoughlin, which residents said they frequently use when McLoughlin is busy.

Bicycle and Pedestrian Facilities

While the majority of the project area doesn't have sidewalks, several improvements are proposed in *The Clackamas County Pedestrian Network Plan*, including improvements to Park Avenue, Courtney Avenue, Oatfield Road, and River Road as priority projects. The Park Avenue project was completed, which included adding sidewalks on the north side of the street. Constructing the new light rail station will also include new sidewalks on the south side of Park Avenue between Oatfield Road and McLoughlin Boulevard.

Bicycle facilities are provided on the major roadways, including McLoughlin Boulevard, Oatfield Road, River Road, Park Avenue, and Courtney Avenue. Local roads provide the best environment for bicyclists in the area, while the high speed and density of traffic along McLoughlin Boulevard makes it challenging for bicyclists.

The Trolley Trail is an excellent opportunity area, because it will provide direct connections for pedestrians from the interior neighborhoods to the station area. As the trail is improved, it will provide benefits.

Transit

The project area is well served by transit with three bus routes, which provide an alternative mode to single-occupancy vehicles. TriMet has had to reduce service on some routes in the project area because of budget cuts but still provides frequent service (every 15 minutes or better during peak hours) along McLoughlin Boulevard (bus #33) with stops at key intersections and midpoint locations.

The #34 runs along River Road, connecting the transit center in Milwaukie to Oregon City. It provides service during standard commute hours, but service cuts have eliminated weekend service and service after about 7:00 p.m. on weekdays. Concerns have been raised about the lack of service to workers with non-standard hours, especially given the schedules of employees of the retirement communities, which operate on a 24/7 schedule. The #32 runs along Oatfield Road and has similar service hours as the #34. Its weekend service is only for a partial route in Oregon City. Bus stops are typically unimproved locations in the poorly lit right-of-way for individuals to wait for the bus.

The new light rail station will provide a significant improvement for transit users in the area when it is completed. The station could become a hub for pedestrians, bicyclists, and motorists using the park-and-ride and light rail station.

Access

Throughout the project area, access to the local road system appears to be unrestricted, with driveways located to access parking lots and residential areas. Along McLoughlin Boulevard, motorists have access to either side of the highway via the center left-turn lane. There are no medians, so left turns are possible at any point along the corridor. The McLoughlin Corridor Plan that extends from Park Avenue to the City of Gladstone includes anticipated highway cross-sections for McLoughlin. The plan was adopted by Clackamas County Plan in 1999 and remains valid according to the Oregon Department of Transportation (ODOT) and the County. It provides for eight to ten foot sidewalks separated from the highway by six-foot landscape planters and six-foot wide bike lanes on both sides of the highway. Cross sections are included as Attachment B.

Constraints

Road Capacity

The 2035 "No Build" traffic analysis showed that there will likely be capacity issues in some areas along McLoughlin Boulevard in that time frame, which could require additional mitigation or affect the types and densities of uses proposed in the plan to maintain the mobility standards of McLoughlin Boulevard and the local street system. There is the potential to accept lower mobility standards exists under certain circumstances if the station area can meet Metro's Title 6 development standards. Projected 2035 traffic on McLoughlin Boulevard is particularly high for southbound through movements and affects the overall function of the signalized intersections at River Road, Park Avenue, and Courtney Avenue. None of these three signalized intersections will meet ODOT's standards in 2035. Distributing the trips to Oatfield and River Road, the area minor arterial streets may help relieve McLoughlin but the street network work is limited and cut through traffic is a concern for area residents.

Land use and transportation concepts will need to address the capacity issues along McLoughlin Boulevard and provide mitigation solutions to meet local and state capacity requirements.

Bicycle and Pedestrian Facilities

Although there are bike facilities along McLoughlin Boulevard, they are challenging because of maneuvering the traffic and narrow shoulders. There are also limited locations for bicyclists to access the facilities. Residents have said that existing facilities along McLoughlin Boulevard and Oatfield Road are dangerous for both bicyclists and pedestrians because of narrow shoulders, number of driveways, and number of vehicles on the roads. The project area has few sidewalks, even along the major roadways. Where sidewalks are located, they are often disconnected, narrow, and have limited use. Based on field observation, it appears River Road; a direct north/south road with lesser-volumes is the preferred, bike route.

The Trolley Trail could provide a significant bicycle and pedestrian facility, but until it is developed as a paved multi-use path, it is limited to a walking path. It is also somewhat isolated from public view, is not lit, is narrow, and is isolated physically from adjacent properties.

Transit

The area does have three transit routes and a future light rail station; however, pedestrian access to the station is limited by the disconnected sidewalk system and the limited street connectivity. The pedestrian environment significantly detracts from transit use, either from a lack of sidewalks, from heavy traffic, or both. Low traffic-volume streets are common and provide pedestrian and bicycle connections without sidewalks or marked bike lanes.

Several bus stops are poorly lit, and riders may not feel safe waiting for the bus, which they often must do within the existing road right-of-way. In addition, TriMet's service reductions have limited use of the buses for riders who do not have standard schedules, particularly for employees at the retirement communities nearby.

The existing transit network service travels only in a north-south travel pattern; there is no circulator service in the area that could provide service between the existing bus lines or the future light rail station. The #33bus will stop across the street from the station area on McLoughlin Boulevard.

Access

Although there are numerous curb cuts and driveway accesses in the project area that benefit businesses, access for pedestrians is sparse and crosswalks are only provided at signalized intersections. Crosswalks are provided only at signalized intersections at Park and Courtney Avenues, which are more than one-half mile apart (approximately 2,800 feet). Existing barriers, coupled with a disconnected local street grid, prevent direct access to the station or commercial areas. The lack of crosswalks or pedestrian refuges and the distance between signals makes it uncomfortable for walking, particularly for the elderly or those with young children.

The Trolley Trail is a pedestrian amenity, but it is not currently paved, is not lit, is narrow, and is isolated physically and visually from adjacent properties.

Strategies to Achieve Success

Transportation issues are the key factors that will need to be addressed. The follow strategies are meant to improve the area's connectivity and support a walkable community:

- Implement the McLoughlin Corridor Plan to provide additional amenities (street trees, wider sidewalks). Determine if and where additional right-of-way is needed to implement the plan.
- Consider land uses that can rely on transit and support transit oriented development.
- Identify and prioritize improvements for corridors for cyclists and pedestrians, such as access to the Trolley Trail. Where improvement plans exist, develop concepts that build upon past efforts.
- Identify where sidewalks currently exist and where there are gaps in service. Identify areas of concern through the design workshop and interaction with SAG and the Technical Advisory Committee.
- Coordinate with TriMet to understand how buses will interact with the station and park-and-ride. Identify what improvements, if any, are proposed along the corridor for transit facilities.
- Identify circulation patterns, multimodal access to and from the residential areas, and street and multi-use path hierarchies to ensure that residential areas are protected from unwanted traffic, but are not isolated from future development or the light rail station.

Community Design and Character

Opportunities

The dominant land uses within the project area are the commercial strip along McLoughlin Boulevard, the single-family residential area between McLoughlin and River Road, the apartment and retirement communities west of River Road, and the residential areas east of Oatfield Road. The area's topography also contributes to the character of the neighborhoods, providing views in some locations of the Willamette River and Mt Hood where existing development does not block views. While outside of the project area there are some public open spaces (Elk Rock Island and the Spring Park Natural Area) that provide hiking opportunities.

These defined areas have little connection with one another and have few defining characteristics except for some residual "strip style" architecture, such as the bomber, and historic homes in the neighborhoods that provide some architectural diversity. While there are few vacant parcels in the area, commercial uses along McLoughlin generally have low improvement values and are often located on large lots with large parking areas, thus providing a potential redevelopment or infill opportunity. The Elks Lodge property is adjacent to the future park-and-ride, is for sale, and provides an immediate opportunity to help define the character of the area. Additionally, the future park-and-ride will be constructed to accommodate additional floors. There may be an opportunity to develop that with parking and mixed uses.

Some new construction has occurred recently, including the Turret mini-mall and the soon-to-be-completed Fred Meyer refueling station on the west side of McLoughlin Boulevard. Large parcels (several larger than three acres), low improvement values, and high traffic counts on McLoughlin could provide incentives to redevelop the area, but future development would not likely change the character of the development to pedestrian- and neighborhood-oriented uses unless there are better connections to the residential areas, new residential units are added to support new retail and commercial, and McLoughlin is more pedestrian-friendly.

Several residents have stated that the area lacks any unifying theme, and they support the concept of developing nodes that will give it some focus. Some residents envision future redevelopment to emulate a small town or main street area that has neighborhood-oriented rather than auto-oriented stores, is walkable, and has a unified theme. Sustainability through green design was a concept that MAP participants stated was also important, and this could be an opportunity given the current work that Urban Green has done for the Trolley Trail and the light rail station. Sustainable design could be a component of the unifying theme that area residents are looking for.

The new light rail station will change the area around the station by making it a more active place, at least when transit riders get on and off the train. There is potential around the station to develop amenities that that these riders can take advantage of, but existing zoning would need to be evaluated to ensure that commercial and retail uses are permitted. Adjacent residential areas could be affected by these changes, which will require extensive public outreach. Existing commercial zoning along McLoughlin is not restrictive, but does not include design guidelines that would encourage a main street concept or mixed uses. This would be particularly important for sites like the Elks that are large and for sale. This site could provide a catalyst project if the design characteristics are established that supports the resident's vision.

The project area supports a diverse mix of housing types that provide housing options for a variety of age and income levels. The established residential areas in the central portion of the project area are typically single-family homes on larger lots that, even under existing zoning, could accommodate some additional housing units. The majority of housing was built before 1980, although there are a handful of homes built in the early 1900s. The housing stock on the west side of McLoughlin Boulevard is generally older than the housing on the east side. Residents have been clear that preservation of the existing neighborhoods is very important and that changes in the area should occur around the station and along the McLoughlin corridor. Although there are few pedestrian amenities in the existing neighborhoods, the areas are very quiet, with little traffic, and have an established tree canopy that provides a serene, older suburban setting. Clackamas County has also identified Habitat Conservation Areas along the Trolley Trail to protect significant vegetated areas that support wildlife. Protecting existing residential areas, while providing opportunities for high-quality mixed uses in key areas, will provide possibilities for meeting the community-supported project objectives for the project.

Constraints

There are two dominant constraints in the project area: McLoughlin Boulevard, with its lack pedestrian environment, and the existing local street system, which provides little connectivity for residents to access the commercial area, existing transit, and the future light rail station. These design constraints could make redeveloping the area with a main street or small town node—as some area residents envision—a long-term rather than a short-term plan. Additionally, there are no existing land uses in the vicinity of the station to immediately transition into a nodal community.

McLoughlin Boulevard is a barrier both because of its high speed and often heavy traffic and its lack crosswalks. The only two crosswalks in the project area are at Courtney Avenue and Park Avenue, which are approximately one-half mile (2,800 feet) apart. The commercial corridor is also focused toward the road, not to the neighborhood, both in design and in services.

As stated elsewhere, the pedestrian environment in the commercial corridor and along Park and Courtney Avenues and Oatfield Road is degraded, and many residents have stated that it is dangerous because of inadequate sidewalks, narrow shoulders, and lack of lighting. Those factors, coupled with steep topography on the east side of McLoughlin Boulevard, make connections difficult. Even if residential and commercial areas were connected, there are few services for pedestrians to walk to, and the environment along McLoughlin is loud and unpleasant.

Existing employment opportunities are limited primarily to service sector jobs that do not offer high wages. Aside from some limited recent development, the area has seen little redevelopment. What has developed recently is consistent with the existing auto-focused corridor development pattern. Additionally, while parcels between McLoughlin and Oatfield Road are smaller than parcels on the west side of McLoughlin Boulevard, the large parcel size may restrict the number of developers interested in the area. Future development would also have to contend with constrained road capacity and would likely need to find creative ways to meet capacity and level of service standards.

There are only a few public spaces in the project area, such as parks or community facilities, and this lack of public spaces is an issue that the MAP committee also identified. The Trolley Trail will provide a linear park through the project area, but it will not provide any larger areas for family and sporting events or other recreational activities. The Trolley Trail is also somewhat of a barrier to connecting the commercial area to the residential areas. Bridges or other infrastructure would need to be provided to make these connections.

There some environmental limitations in the project area. A portion of Courtney Springs Creek along the Trolley Trail has a high water table. This area, located between McLoughlin Boulevard and Arista Road, has a high water table that rises within 1.5 feet of the ground surface. Development in this area would need to adhere to specific building code standards to avoid damage. There are also two wetlands identified on the National Wetland Inventory (NWI) maps. One is next to Arista Road between Evergreen and Silver Springs Road; a second one is located just north of Courtney Road next to Arista Road.

Strategies to Achieve Success

The area has a strong residential core, but it is disconnected from the McLoughlin corridor. There are also few mixed uses or defining features in the area that could constitute a "node." Through existing community groups (MAP Committee, TAC, SAG, and Oak Lodge Community Council) and the public design workshop, the project should:

- Identify key nodal areas that could support a "main street" or "small town" node;
- Use the market analysis to identify realistic development mixes and densities around the light rail station and in the corridor;
- Build upon Urban Green's work in improving the corridor;
- Take advantage of the Trolley Trail as a multi-use trail spine;
- Identify uses near the station that will make it an active place and assess whether existing zoning encourages or hinders nodal development around the station;
- Incorporate existing natural resources along the Trolley Trail and Kellogg Creek to improve livability and protect important resources;
- Consider green streets and other on-site stormwater management plans that take advantage of the topography of the area; and
- Integrate green building incentives into the zoning and development code.

Public and Private Investment

The Draft Economic Development and Redevelopment Memorandum completed for the Park Avenue Neighborhood and Station Area Plan identified several opportunities and constraints in the area.

Opportunities

There will be significant public investments in the area including the new LRT line, station, plaza, parking lot, supplemental public art installations, and Trolley Trail. Taken together, these investments will help to change both the way the community uses this area, and the way it is perceived locally and regionally. Because of the changes in topography and environment, Park Avenue already feels like a "gateway" to and from the McLoughlin Boulevard corridor, and these physical changes will add to that sense, ideally conveying a more positive impression of the area to all passer-by. The Trolley Trail has the potential to introduce more people and customers to the area. The station parking lot should be managed as an asset on both weekdays (for MAX riders), and evenings and weekends, when it can be an asset for nearby retailers or other land uses that need parking on the evening and weekends.

Developers prefer to build new housing, retail, office, and other projects where there is a strong sense of place and community. The community vision and guiding principles created by the MAP committee are very valuable since they begin to give all planning efforts, including this plan. Additionally, large portions of the residential neighborhoods to the east and west of McLoughlin Boulevard are attractive and

well maintained. The retirement communities along the Willamette River are a potential source of commercial patronage. All told, this residential market provides a strong base for businesses in the area. In addition, there is clearly a mismatch between the quality of the residential neighborhoods and the quality of development on McLoughlin, suggesting that if conditions are right, the McLoughlin environment could improve. There are many underutilized and vacant properties along McLoughlin that provide dozens of acres that are at least potentially redevelopable, and many properties are for sale or lease now at low prices. Second, McLoughlin traffic volumes (at approximately 37,000 vehicles per day) are very strong. They are the reason that there is so much retail currently on McLoughlin, and they will continue to support commercial land uses in the future.

Medium and long term trends also suggest that this area is a relatively good location for residential infill development. These trends include ongoing migration to the Portland area, a growing number of one and two person households that would be interested in infill housing such as townhouses and transit oriented apartment units; growing urban job bases in professional services, healthcare, technology, and other industry sectors; and constraints on the geographical extent of growth due to increasing congestion and policies such as the urban growth boundary.

Constraints

While there several potential opportunities in the area, the McLoughlin Boulevard area also has many constraints, particularly its image or identity as perceived by local and regional residents, the low quality of development along the boulevard, unpleasant pedestrian environment, and the amount of vacant and marginal retail development. In addition, there may be simply too much commercially zoned land. The high vacancies, low asking rents, and ubiquity of low quality development will deter most developers who might consider high quality or large scale development. The achievable rents are simply too low to justify new construction at this point, and the stigma associated with the corridor will deter some developers and major retail tenants. Real estate development is at a virtual standstill nationwide and within the Portland region due to high unemployment, limited job growth, stagnant wages, more conservative lending standards, and overbuilding that took place during the boom period.

The project area suffers from a lack of connectivity for pedestrian, auto, and bicycle traffic. More east-west connections to McLoughlin Boulevard from the nearby neighborhoods would be positive, as would an additional signalized crossing somewhere between Park and Courtney Avenues. Coupled with limited multimodal amenities, there is no county department or redevelopment agency tasked with overseeing redevelopment. While it is possible for other public departments or agencies to manage redevelopment (for example, Clackamas County's planning department, ODOT, TriMet, Metro, or other) it is most frequently accomplished by a city and/or redevelopment agency, because they are integrated with community groups, have statutory and de facto authority, staff expertise, and the funding tools.

Strategies to Achieve Success

The development forecast provides a sound basis for potential development opportunities, leveraging the public investment in light rail, and strengthening the transit-oriented nature of the community. A well-orchestrated implementation plans is critical to achieving desired outcomes. The project should:

- Focus efforts to establishing pulse nodes of development. With dozens of acres and scores of underperforming commercial properties along McLoughlin Boulevard alone, positive change cannot be effected everywhere at once.

- The community and public agencies involved should choose several key “nodes” where they can focus efforts and concentrate energy and redevelopment on the perpendicular cross streets such as Park Avenue rather than on McLoughlin itself.
- Refresh McLoughlin Boulevard’s identity by building on future transit investment and provide additional streetscape improvements such as planter strips, landscaped areas, or revised street sections at certain nodes. Greater connectivity and a new east-west pedestrian and auto intersection across McLoughlin could also send the message that this is a “place” and not an auto strip.
- Identify early, inexpensive actions to improve the area that shows progress and “wins” early on.
- Provide adequate financial and human resources to implement the vision through a variety of funding sources

Table 1: Opportunities and Constraints Summary

	Opportunities (*constraints indentified in **blue** on Map A-1, if location specific)*	**Constraints** (*constraints in **red,** on Map A-1, if location specific))*	**Location on Map A-1** (*if location specific*)		**Strategy to Address These Factors**
People					
	Stable neighborhoods that retain some historic character	Lack of defining focus (where go residents gather?)	1		• Engage the Stakeholder Advisory Group (SAG) to ensure that as many residents as possible attend the public design workshop and subsequent public meetings. Gathering public input will help the community create a plan for developing a strong sense of place and opportunities for various housing types and supporting uses, such as neighborhood-focused retail uses and recreational options. • Evaluate the existing highway commercial and residential zoning patterns to allow a greater variety of land use types. • Develop a realistic project list and implementation plan that includes public-supported projects.
	Mixed housing types and periods throughout corridor	"Unsavory individuals" frequent McLoughlin. Existing housing along McLoughlin is unappealing		1	
	Strong apartment and senior communities along River Road that would use the light rail station	Concerned with safety walking to the station	2	2	
	Future light rail station will improve transit access and provides potential for future TOD node	Few public institutions for gathering places (churches, schools, parks, community gardens etc.)	3		
	Elks Club has been in the area for over 50 years and would like to see a community center on it's for sale property	Noisy environment near McLoughlin	4	3	
		Few local services, such as a grocery store or pharmacy		4	
Businesses					
	High Visibility from McLoughlin Boulevard	No consistent development pattern that identifies "location" or node.		5	• Identify parcels potentially suitable for redevelopment. Initiate public outreach to key businesses and landowners to identify the level of landowner and business interest in
	Low building to land values could encourage redevelopment	No internal connections to residential areas. All circulation occurs on McLoughlin	5	6	

	Opportunities (*constraints indentified in **blue** on Map A-1, if location specific)*	**Constraints** (*constraints in **red,** on Map A-1, if location specific))*	**Location on Map A-1** (*if location specific*)		**Strategy to Address These Factors**
	Large lots along McLoughlin Corridor. Several larger than on acre. The Elks is 5.6 acres. The east side of McLoughlin has smaller lots	Redevelopment is contingent upon the desire of commercial property owners to redevelop. There is currently little demand for commercial space.	6		redevelopment. • Evaluate county zoning standards, including design guidelines for future development to determine if appropriate to support "nodal identity." • Develop funding options to pay for basic infrastructure, such as sidewalks, street trees, and other infrastructure, to make the area more visually appealing. • Consider a catalyst project, which could include a publicly funded project (such as a park or community center, or street and pedestrian improvements).
	New park and ride and station will increase foot traffic in the area. There is also potential to use space above park and ride for mixed-use	Large parcels may require a master developer or breaking parcels into smaller sizes with an internal street system.	7	7	
	Residential areas adjacent to the station may have potential as live/work or mixed use	Lack of focus in commercial areas. The current development pattern is focused towards drivers, not the surrounding community.	8		
	Potential for shared parking areas	There is little to walk to now.		8	
		Existing development pattern around the plaza not supportive of transit station		9	
Transportation					
Road Capacity					• Implement the McLoughlin Corridor Plan to provide additional amenities (street trees, wider sidewalks). Determine if and where additional right-of-way is needed to implement the plan. • Consider land uses that can rely on transit and support transit oriented development. • Identify and prioritize improvements for corridors for cyclists and pedestrians, such as access to the Trolley Trail. Where improvement plans exist, develop concepts that build upon
	The area has good access to the regional system	High volumes of traffic on McLoughlin and it is expected to get worse.		10	
	Alternate connections (River Road, Oatfield Road) are potential opportunities for encouraging small retail and service oriented businesses.	Cut through traffic in neighborhoods may be an issue as traffic worsens on McLoughlin	9		
	River Road and Oatfield provides bicycle facilities with less traffic than McLoughlin Boulevard	Residents avoid McLoughlin Boulevard and use other routes	10	11	
	McLoughlin Boulevard provides direct connection for autos and bikes through the area	Very few east/west connections, except for Courtney and Park Avenues		12	

	Opportunities (*constraints indentified in **blue** on Map A-1, if location specific)*	**Constraints** (*constraints in **red,** on Map A-1, if location specific))*	**Location on Map A-1** (*if location specific*)		**Strategy to Address These Factors**
	Oatfield and River Road are strong north/south alternatives to McLoughlin.				past efforts. • Identify where sidewalks currently exist and where there are gaps in service. Identify areas of concern through the design workshop and interaction with SAG and the Technical Advisory Committee. • Coordinate with TriMet to understand how buses will interact with the station and park-and-ride. Identify what improvements, if any, are proposed along the corridor for transit facilities. • Identify circulation patterns, multimodal access to and from the residential areas, and street and multi-use path hierarchies to ensure that residential areas are protected from unwanted traffic, but are not isolated from future development or the light rail station.
Bicycle and Pedestrian Facilities					
	Bicycle facilities on McLoughlin, Oatfield and River Road.	Heavy traffic on McLoughlin and Oatfield is not conducive to recreational riders. Narrow shoulders	**11**	**13**	
	The new light rail line will provide new sidewalks on Park between McLoughlin and Oatfield	Few opportunities to cross McLoughlin at traffic signal. Park Avenue/McLoughlin and Courtney Avenue/McLoughlin are the only two signalized intersections	**12**	**14**	
	The Trolley Trail provides direct north/south connections for pedestrians	Few sidewalks and the ones that exist are often inadequate and disconnected	**13**	**15**	
		Trolley trail is isolated from public view and not well lit		**16**	
Transit					
	Transit service provided on McLoughlin (#33), River Road (#34) and Oatfield Road (#32).	Existing bus stops are difficult for pedestrians to access because of McLoughlin		**17**	
	New Light Rail station will provide improved transit service	Incomplete and inconsistent pedestrian environment accessing the station. Noisy and unpleasant environment.	**14**		
		Limited schedules for some routes			
Access					
	Park Avenue and McLoughlin will become the primary transit hub for the area	Difficult pedestrian environment, particularly for crossing McLoughlin	**15**	**18**	

	Opportunities (*constraints indentified in **blue** on Map A-1, if location specific)*	**Constraints** (*constraints in **red,** on Map A-1, if location specific))*	**Location on Map A-1** (*if location specific*)		**Strategy to Address These Factors**
	Auto access almost unrestricted for parcels in both direction on McLoughlin (no medians limiting turning movements across traffic).	No consistent pattern for driveways along McLoughlin, making the pedestrian and bicycle environment difficult to manage			
	Potential opportunity to consolidate driveway access	Difficult for pedestrians to cross McLoughlin. No pedestrian refuges		19	
		Local street grid is very disconnected and does not provide direct access to the station or commercial areas			
		Trolley Trail is not paved or lit, is narrow and is isolated physically and visually from adjacent properties		20	
Community Design and Character					
	The park and ride will be constructed to add future levels onto the structure. There may be opportunity to mix uses on those levels. Consider park and ride for weekend parking to support new development.	McLoughlin is a barrier to pedestrians and the local road system is disconnected. Few crosswalks on McLoughlin	16		• Identify key nodal areas that could support a "main street" or "small town" node; • Use the market analysis to identify realistic development mixes and densities around the light rail station and in the corridor; • Build upon Urban Green's work in improving the corridor; • Take advantage of the Trolley Trail as a multi-use trail spine; • Identify uses near the station that will make it an active place and assess whether existing zoning encourages or hinders nodal development around the station; • Incorporate existing natural resources along the Trolley Trail and Kellogg Creek to improve
	Public support for developing small town or main street nodal areas. Focus would be on small, local stores.	Little existing commercial development to build upon	17	21	
	Urban Green has developed a plan to incorporate sustainability and greenery to improve the Trolley Trail, park and ride, and plaza that has strong public support.	There are no existing land uses in the station's vicinity that would immediately support nodal development.	18	22	
	Elks Lodge is for sale: Opportunity as a catalyst site and as a community center. Could begin to build node on site adjacent to station	Lack of destinations and street character along roads limits walker interest	19	23	

	Opportunities (*constraints indentified in **blue** on Map A-1, if location specific)*	**Constraints** (*constraints in **red,** on Map A-1, if location specific))*	**Location on Map A-1** (*if location specific*)		**Strategy to Address These Factors**
	The light rail station and park and ride will define the area as a new node	No public parks except for the Trolley Trail with 1/2 mile of the station	20		livability and protect important resources; • Consider green streets and other on-site stormwater management plans that take advantage of the topography of the area; and • Integrate green building incentives into the zoning and development code.
	Large residential population near station and commercial area. Supports diverse housing types and income levels	No specific identity related to the area. Retirement communities limit views of the Willamette River.	21	24	
	Evergreen/River Road currently has community commercial uses. Could be expanded to more neighborhood focused development.	Lack of employment and residential opportunities along corridor. Area has little new development	22	25	
	Strong local connections to historic homes and Trolley Trail	Commercial corridor is focused towards McLoughlin, not the neighborhood.		26	
	Established, quiet neighborhoods with large trees and vegetated areas that provide habitat.	Challenging pedestrian setting with narrow sidewalks, where available, make the area difficult for non-motorists	23		
		Topography, particularly east of McLoughlin, can be steep. Pedestrian and bicycle connections on east side may be difficult		27	
		Large lots in residential areas may or may not redevelop at higher densities, Residents do not support increased density in existing neighborhoods			
		The existing trail facility lacks connection to the commercial area. It is limited to pedestrians because it isn't paved and some areas would require bridges to access residential areas.		28	
		High water table in some areas		29	

	Opportunities (*constraints indentified in **blue** on Map A-1, if location specific)*	**Constraints** (*constraints in **red,** on Map A-1, if location specific))*	**Location on Map A-1** (*if location specific*)		**Strategy to Address These Factors**
		The corridor has seen little significant private investment recently		**30**	
Public and Private Investment					
	Significant future public infrastructure investment in LRT and Trolley Trail	Potentially too much commercial land available. High vacancies and low rents may deter developers			
	Attractive residential areas could attract developers	Little interest in development until economy improves			
	Retirement communities are potential source of commercial patronage	Lack of connectivity will require new infrastructure			
	Medium and long term trends suggest that housing may have potential	No development agency coordinating planning/projects			

Attachment A: Opportunities and Constraints Maps

Map A-1:Opportunities and Constraints

10 **Opportunity** *(see Table 1 of the Opportunities and Constraints Report for description of opportunity)*

15 **Constraint** *(see Table 1 of the Opportunities and Constraints Report for description of constraint)*

Mixed Use 99E Corridor

Residential Neighborhoods

Mixed-use Village Nodes

Hwy 99E Arterial

Secondary Collectors

Map A-2:Circulation Routes

Pedestrian Friendly Environment

Limited Pedestrian Environment

Pedestrian Barrier

Semi-Permeable Barrier

Light Rail Station

Potential Network Connection

Legend

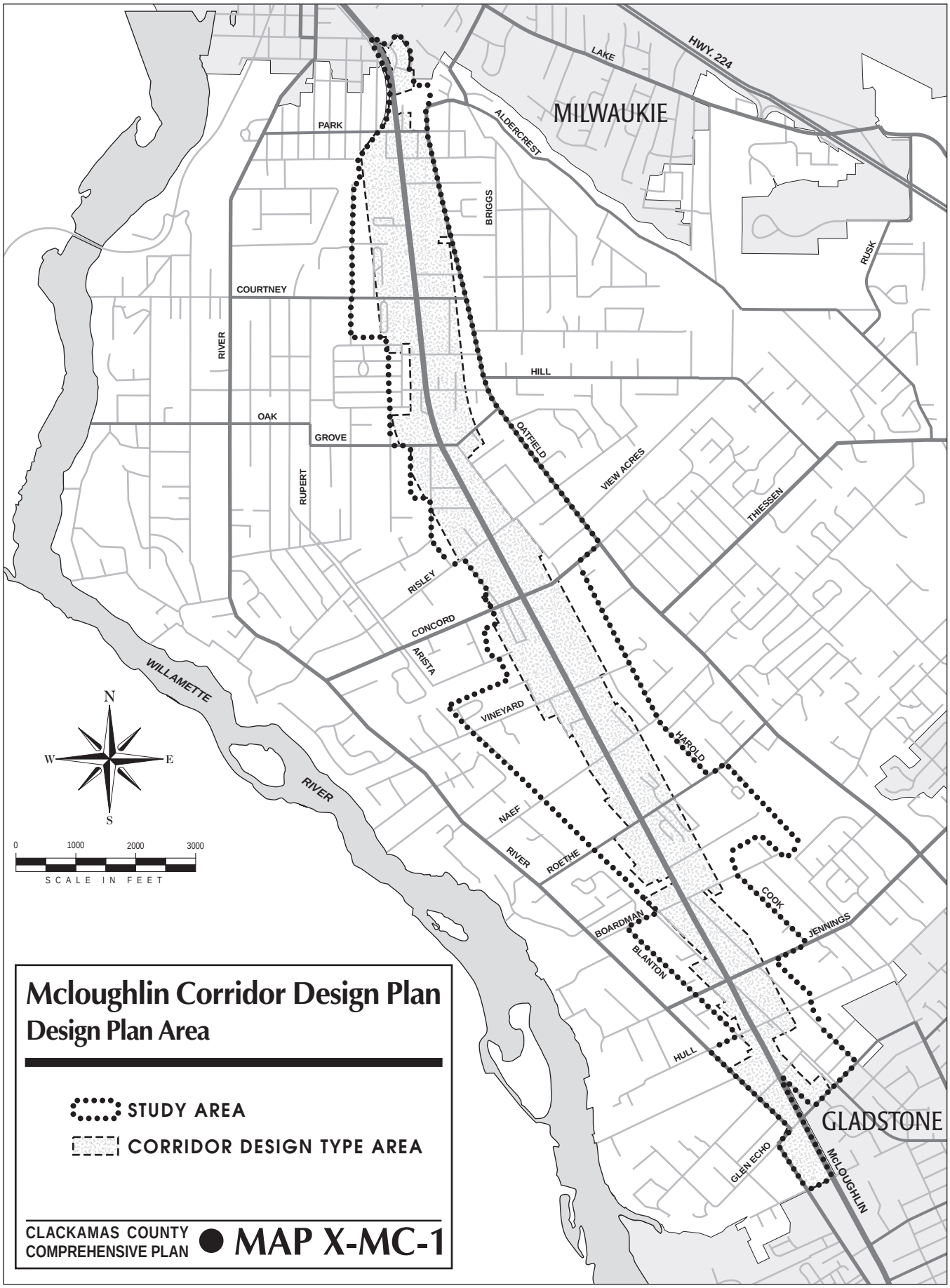
- Light Rail Station
- Park Avenue Station Area (1/2 mile buffer)
- Milwaukie City Limits

Map A-3: Street and Block Pattern

0 500 1,000 2,000 Feet

N

Attachment B: McLoughlin Corridor Plan Cross Sections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GLADSTONE
HWY. 224
LAKE
ALDERCREST
PARK
BRIGGS
RUSK
COURTNEY
RIVER
HILL
OAK
GROVE
RUPERT
OATFIELD
VIEW ACRES
THIESSEN
RISLEY
CONCORD
ARISTA
WILLAMETTE
RIVER
VINEYARD
HAROLD
NAEF
RIVER
ROETHE
COOK
BOARDMAN
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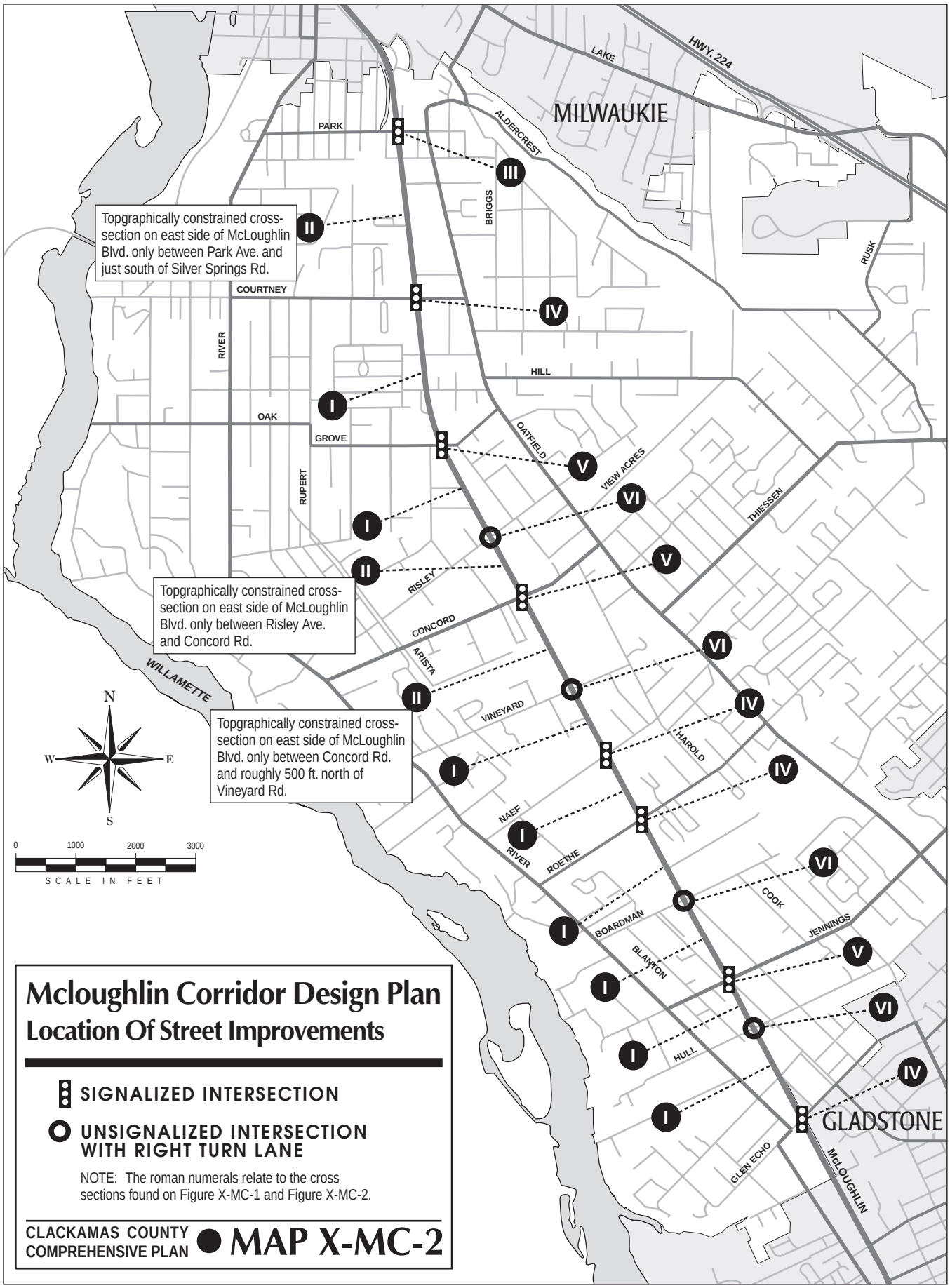
SCALE IN FEET
Mcloughlin Corridor Design Plan
Design Plan Area
STUDY AREA
CORRIDOR DESIGN TYPE AREA
CLACKAMAS COUNTY
COMPREHENSIVE PLAN
MAP X-MC-1


MILWAUKIE
GLADSTONE
HWY. 224
LAKE
ALDERCREST
PARK
BRIGGS
RUSK
COURTNEY
RIVER
HILL
OAK
GROVE
OATFIELD
VIEW ACRES
THIESSEN
RUPERT
RISLEY
CONCORD
ARISTA
WILLAMETTE
VINEYARD
HAROLD
NAEF
RIVER
ROETHE
COOK
BOARDMAN
JENNINGS
BLANTON
HULL
GLEN ECHO
McLOUGHLIN
Topgraphically constrained cross-section on east side of McLoughlin Blvd. only between Park Ave. and just south of Silver Springs Rd.
Topgraphically constrained cross-section on east side of McLoughlin Blvd. only between Risley Ave. and Concord Rd.
Topgraphically constrained cross-section on east side of McLoughlin Blvd. only between Concord Rd. and roughly 500 ft. north of Vineyard Rd.
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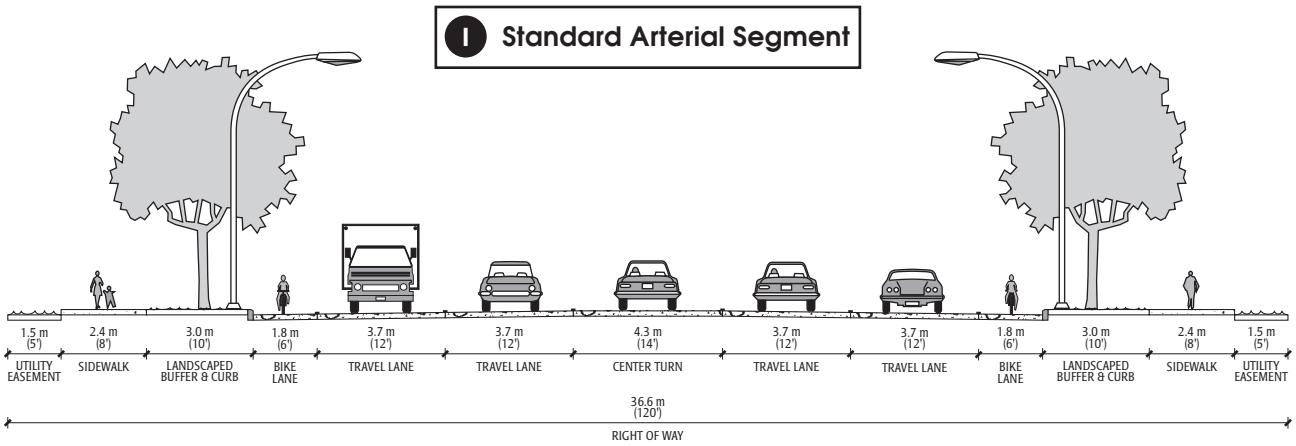
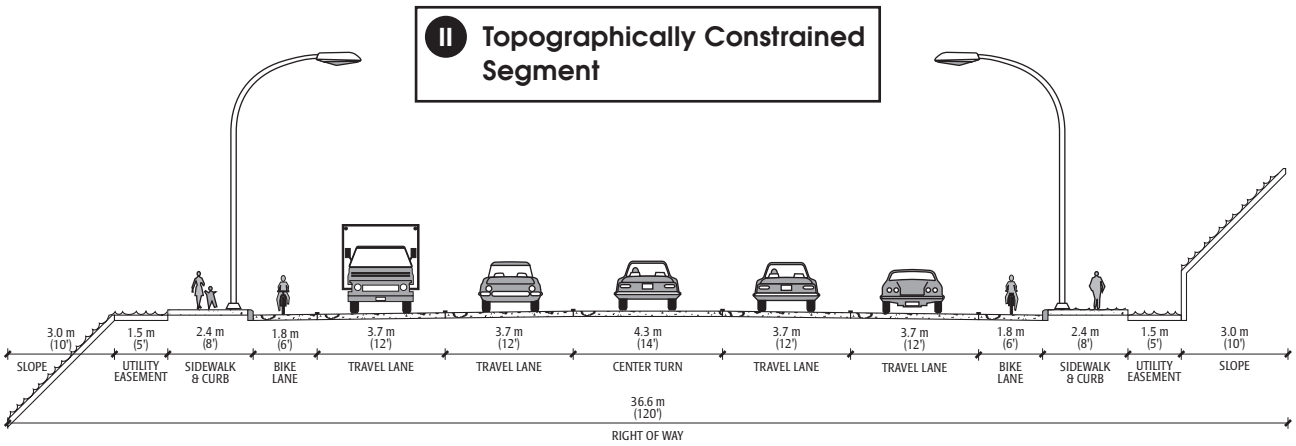
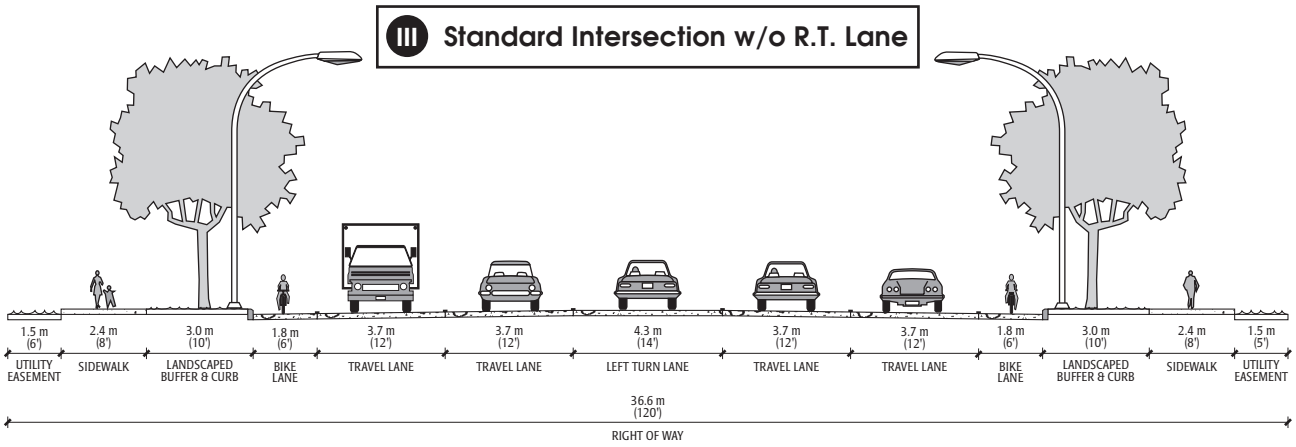
SCALE IN FEET
Mcloughlin Corridor Design Plan
Location Of Street Improvements
SIGNALIZED INTERSECTION
UNSIGNALIZED INTERSECTION WITH RIGHT TURN LANE
NOTE: The roman numerals relate to the cross sections found on Figure X-MC-1 and Figure X-MC-2.
CLACKAMAS COUNTY COMPREHENSIVE PLAN
MAP X-MC-2





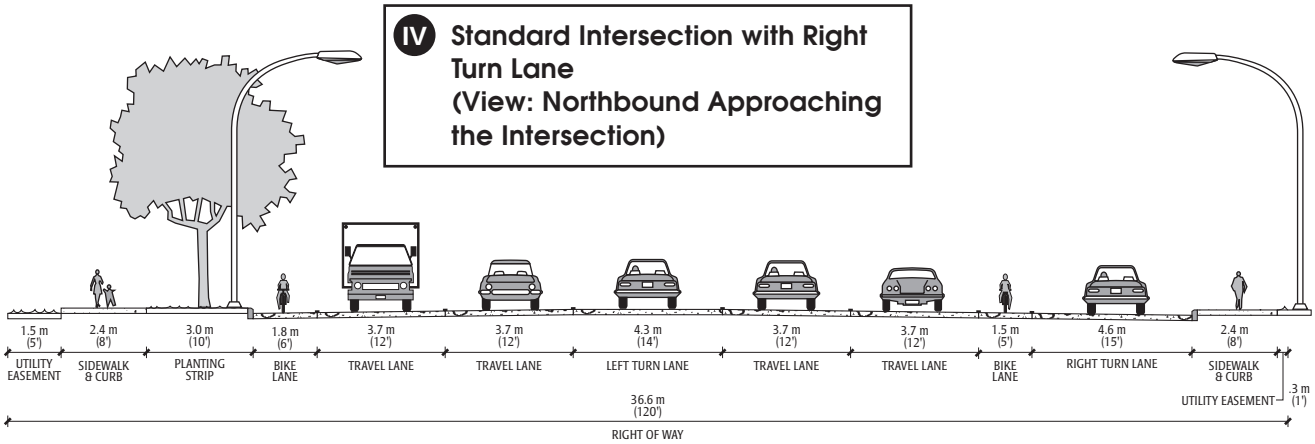


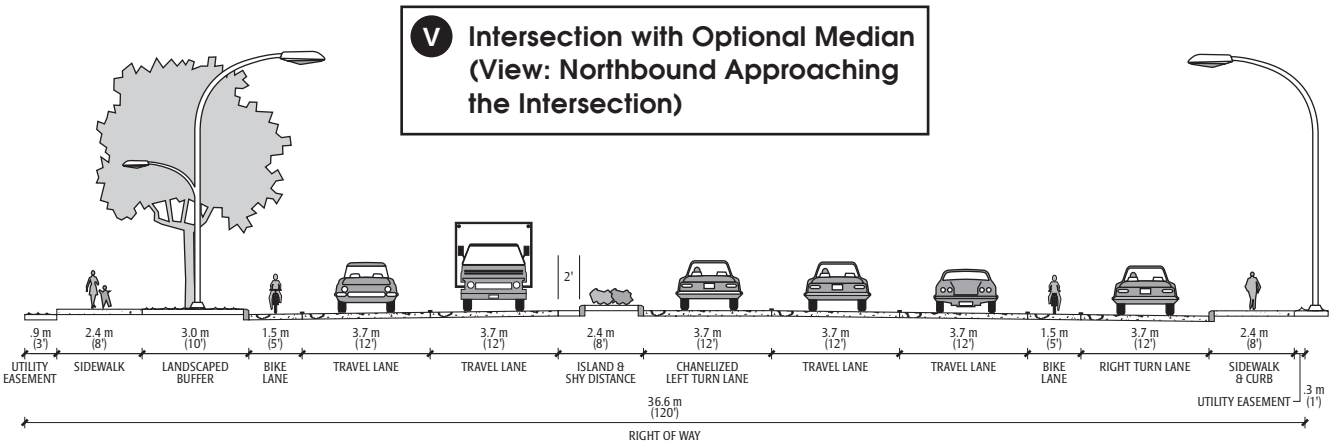
McLoughlin Corridor Design Plan
Street Cross Sections

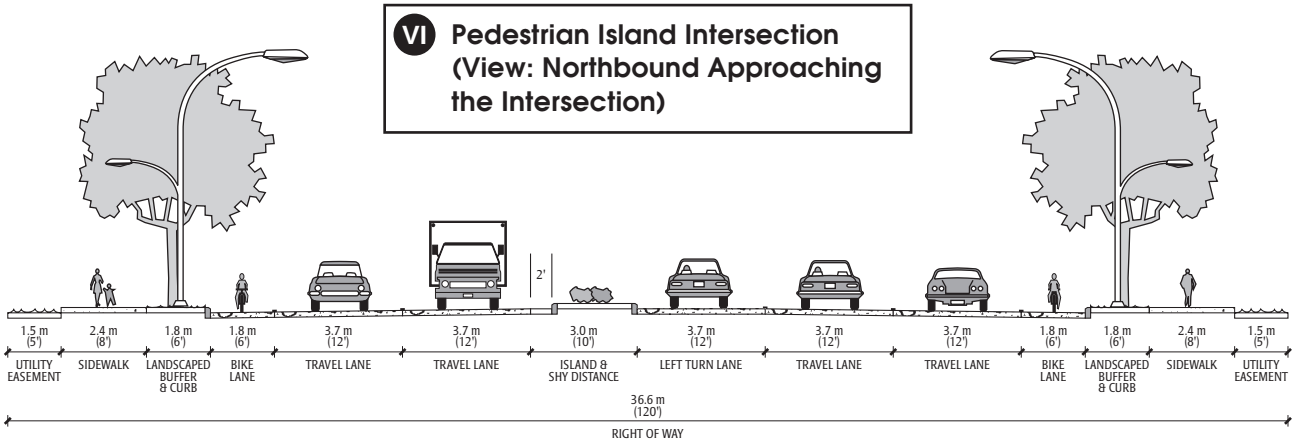
I CROSS SECTION LOCATION (See Map X-MC-2)

CLACKAMAS COUNTY COMPREHENSIVE PLAN

FIGURE X-MC-1







McLoughlin Corridor Design Plan
Street Cross Sections

I CROSS SECTION LOCATION (See Map X-MC-2)

CLACKAMAS COUNTY COMPREHENSIVE PLAN

FIGURE X-MC-2

Attachment C: Corridor Retrofit Concepts

Note: These concepts are for illustrative purposes only to show various ways to consider the highway corridor and potential redevelopment options. They are not specific proposals for the McLoughlin Boulevard corridor.

Commercial Strip Retrofit: Perpendicular Main Street

Laurence Qamar Architecture & Town Planning

January 19, 2011

Commercial Strip Retrofit: Parkway & Housing Infill

Laurence Qamar Architecture & Town Planning

January 19, 2011

Commercial Strip Retrofit: Boulevard Frontage Lanes

Laurence Qamar Architecture & Town Planning

January 19, 2011

Appendix F: Design Concepts Report

DATE: April 19, 2011

TO: Project Logistics Team

FROM: Alex Dupey, AICP; Laurence Qamar, AIA, CNU-A

SUBJECT: Design Concepts Report

PROJECT: **Park Avenue Neighborhood and Station Area Plan**

COPIES: File

Introduction

The Draft Design Concepts Report is the first step in synthesizing the background information developed for the Park Avenue Neighborhood and Station Area Plan (Project) and public input gathered through the Stakeholder Advisory Group, Technical Advisory Committee, individual stakeholder meetings, and public design workshop. This memorandum describes and illustrates land use and transportation concepts for the Project that incorporates the ideas and vision heard from area residents and businesses.

This next phase of the project will refine these concepts described in this report. The project team will use the Stakeholder Advisory Group input to help identify which characteristics of these concepts will be carried forward as alternatives that will be evaluated using the Project's Evaluation Criteria developed earlier in the process. From that, the public, advisory groups, and the project team will identify a preferred alternative.

Public Design Process

The concepts incorporate information gathered at the public workshop held in March 2011. At the workshop, the project team presented background information gathered earlier in the Project, including input received from the advisory groups and the public. Representatives from TriMet and the McLoughlin Area Plan (MAP) project were also available at the public workshop to answer questions and ensure that the Park Avenue process is coordinated with the MAP project and the Portland to Milwaukie Light Rail project.

The project team presented a "visual catalogue" of images that showed various types of land uses and transportation options as examples for the workshop participants to consider. Images were organized around the following questions:

- How do you envision the McLoughlin corridor changing? Is it a boulevard or a parkway? Does it stay the same?
- What does a village/node look and feel like, and what does it offer the community? What is the right scale of its streets and buildings?
- How do you envision new housing types and where will those be located?

- How do you address the existing physical barriers (dead ends, streams, McLoughlin Boulevard)? What kinds of neighborhood connections enhance and connect your neighborhood?

The visual catalogue included examples of other boulevards, parkways, and local streets in which living, working, shopping, biking, and walking are integrated activities. A variety of housing types and live/work building types were also offered as examples of potential additions that could be compatible with the existing the neighborhoods.

After the project team's presentation, workshop participants (approximately 40 people) broke into small groups of approximately eight people. Each table had a designated facilitator who was either a member of the Stakeholder Advisory Group or a member of the project team. For those workshop participants who did not want to take part in a small group discussion, individual maps were made available so that they could provide their comments and recommendations. Project team members floated among the tables and were available to answer questions and help the small groups or individuals as needed.

Two design sessions, each lasting approximately two hours, were held on the same day to maintain a small working group atmosphere and accommodate the participants' schedules.

Images of the small group maps and written results are included in **Appendix A.**

Small Group Sessions

Workshop participants were asked a series of questions to help them develop their land use and transportation concepts. Participants were first asked to think about their overall vision for the area within the following context:

> *If you moved away to another city or state and then returned to the area in 25 years, what would you want the station community to look like? Describe what you would like to see changed, preserved, and the new places that have developed.*

This was the umbrella vision each small group was asked to consider when responding to the questions below. Table facilitators and note takers captured any comments related to the group's vision, and this vision was used to keep each group focused on its core issues throughout the session.

Question #1: Describe the character of the central places where those activities come together. Why does that build a strong station community?

Related to their overall vision, meeting participants were asked to describe where they see the central places, what the character of those places is, and how those places build a strong station community. Each group identified areas on a map and described them on a chart pack. Examples of responses to this question included identification of types of uses and how they relate to other development (new and existing), and ideas about access to and around the future light rail station. Some groups also identified images from the visual catalogue as examples of the type of development they want to see.

Question #2: What areas do you preserve?

Area residents have been very clear throughout the project process that stability of existing neighborhoods is important to them. This question asked what areas or land uses should remain the same as today. The small groups identified these areas on their maps and stated why they should be preserved. Generally, the groups wanted to preserve the historic properties and the single-family development pattern of the area, but some groups did recommend increased density in areas along Park and Evergreen and to the north of Park Avenue in the vicinity of the station.

Question #3: What might new connections look like, and where are they located?

The Opportunities and Constraints Report identifies connectivity within the project area as a key constraint for both access to the commercial area from existing residences and the challenging pedestrian environment along McLoughlin Boulevard. The small groups identified potential connections for a variety of modes to access the light rail station and future development along the main corridors in the area. The small groups further defined what types of connections those would be (pedestrian, roads, trails, etc.).

Examples of new connections include north/south pedestrian-focused connections that allow vehicle traffic but at slow speeds, east/west connections that connect the neighborhoods to the commercial areas, and a pedestrian bridge across McLoughlin Boulevard.

Report Out: Identify the key factors that define your plan.

After the design session was completed, each group presented its concepts to the other attendees. Each group identified four to five key factors that defined its results. In general, the results reported by the groups stated that they want to:

- Retain neighborhood character
- Support alternative transportation modes (jitneys, golf carts)
- Increase residential density around the station but keep existing density in other areas
- Redevelop McLoughlin Boulevard with mixed-use/commercial/residential uses
- Create a main street feel with trees and traffic calming
- Provide a safe way for kids to walk to school
- Provide public spaces, green space, community gardens, and street trees
- Identify safer crossings at McLoughlin and Park, Oak Grove, and Courtney, possibly including a pedestrian overpass across McLoughlin Boulevard
- Add multimodal streets and connections to neighborhoods in key areas

Plan Components

This report identifies a proposed Station Community Area boundary that identifies the targeted location for future infrastructure investment and potential modifications to existing zoning to promote transit oriented development and increase walkability. It also includes a conceptual circulation plan that incorporates a variety of travel modes, including vehicles, bicycles, and pedestrians.

Two development concepts were developed using the input gathered at the public workshop and information gathered from stakeholder meetings, as well as information from the opportunities and constraints and market analysis completed for the project area. The two development plans consider the following land uses and how they might develop in the area:

- **Concept #1** provides for primarily housing with limited mixed-use development combined with a parkway along McLoughlin Boulevard
- **Concept #2** provides for a more traditional mixed-use development pattern along the McLoughlin Corridor combined with a multi-way boulevard along McLoughlin.

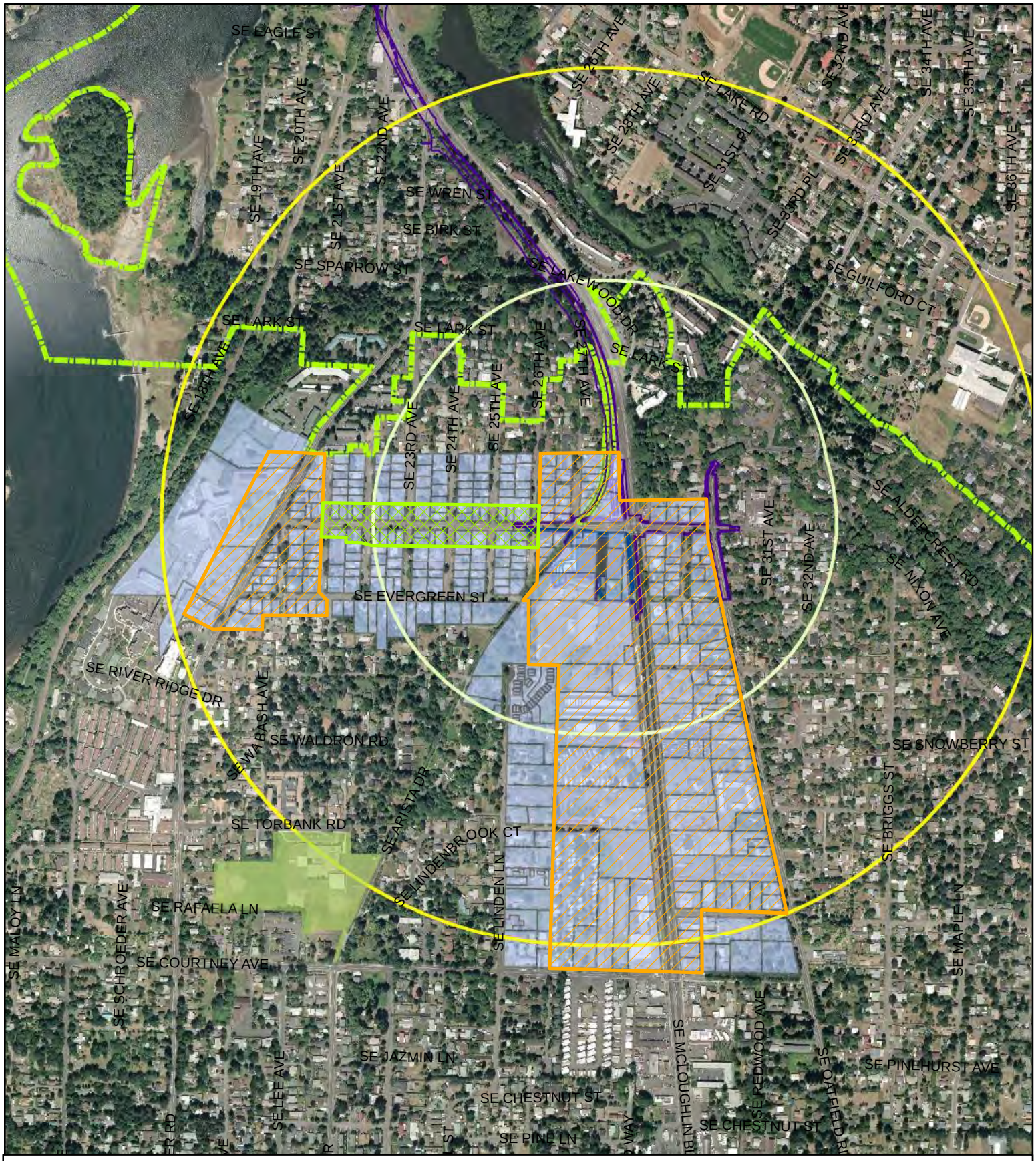
These concepts are for illustrative purposes only and do not identify any changes in zoning that would permit these types of development to occur. Changes to zoning will be identified when draft alternatives are developed after the Stakeholder Advisory Group provides input on which characteristics they would like to see carried forward.

Proposed Station Community Area Boundary

A Station Community is a formal designation described in Title 6 of Metro's Urban Growth Management Functional Plan. Station Communities are areas that are designated to provide a mix of uses that support non-automobile–dependent development styles and transit investment (in Park Avenue's case, the future Park Avenue light rail station), and to provide a mix of housing types that supports multiple demographics. Identifying and implementing a Station Community designation also provides opportunities for securing regional grants and directing public investment into these areas. The proposed Station Community boundary for Park Avenue is illustrated on **Map 1** and is the same for both concepts.

Metro's goal for Station Communities is 45 residents and workers per acre, which would be met through a variety of densities and land uses within the Station Community boundary. Metro's 2040 Concept also designates the McLoughlin Corridor where target densities are 45 residents and workers per acre. Within the context of the Project, increased residential and commercial densities would be focused in key areas to preserve existing residential areas. The proposed Station Community boundary for Park Avenue includes the McLoughlin Boulevard corridor, which is where the primary land use changes and increased density would likely occur. The River Road/Park Avenue area could also see changes in density to support a development node. Some workshop participants also identified the Park Avenue corridor as a location for live work/mixed-use increase that increases residential density, albeit at lower densities than along River Road or McLoughlin Boulevard.

The Station Community boundary extends from River Road to Oatfield Road. The Station Community boundary includes Park Avenue and Evergreen Roads as east/west connections. Some groups at the public workshop indicated that these roads could be improved to increase connectivity between residential areas and support some increased residential density provided that the development is in scale and in character with the surrounding neighborhood. Increased residential and commercial density within the Station Community boundary would still be primarily focused along McLoughlin Boulevard and along portions of River Road.



Map 1: Proposed Station Community Boundary

- Proposed Station Community
- Taxlots
- Development Focus Area
- School
- Trolley_Trail
- Milwaukie City Limits
- Live-Work/Duplex or Triplex Housing

0 400 800 Feet

N

Date: 4/19/2011

Circulation

The small groups at the workshop identified several potential new connections within the project area to support their land use and transportation vision. These ideas were incorporated into a circulation plan for the project area and consist of a variety of potential connection types as illustrated in the attached circulation maps and cross sections. The goal of this circulation plan is to provide guidance for future development while providing some flexibility in location for developers to maximize the development potential of a particular area. As development occurs, these connections will need to be located in a manner that supports the development while meeting the goals and objectives for this project to provide better circulation and a pedestrian oriented circulation pattern.

Map 2 shows the conceptual circulation pattern for the area. New connections are located to build upon the existing roadways and improve connections through the proposed station community. The proposed circulation system identifies a more pedestrian friendly grid pattern with intersections spaced approximately 450 feet apart. There are steep grades and natural resources in some parts of the project area that may pose some challenges for constructing portions of the circulation plan. These connections are feasible, but may require additional design considerations (retaining walls, bridges, wetland mitigation etc.).

The conceptual circulation plan provides options for alternative modes of transportation, as well as greater variety of choices of convenient routes to a variety of destinations. The Opportunities and Constraints report noted that there are currently no local east/west street connections to McLoughlin through the properties on its west from the residential streets.

Public workshop participants identified jitney or small electric vehicles that residents could use as an alternative to typical automobiles. The proposed road system supports this mode, but their use would be limited to local roads with low speed limits. The expanded circulation system also provides increased access to existing facilities, such as local roads and the Trolley Trail system.

McLoughlin Boulevard

One new full intersection with a traffic signal is proposed at a new Torbank/McLoughlin intersection to improve pedestrian crossings along the corridor. Other intersections may be right-in/right-out turning movements. These intersections would also provide some type of pedestrian refuge and/or pedestrian crossing signals on McLoughlin.

Any new signal on McLoughlin Boulevard requires the State Traffic Engineer's approval. Signals closer than one-half mile apart are discouraged and require a progression analysis and justification for approval to be considered. Any new street (or driveway) on McLoughlin Boulevard also requires an ODOT Approach Permit. In order for ODOT to grant an Approach Permit for additional streets on McLoughlin, existing driveways (or streets) would need to be closed to help justify the permit approval. In cases where spacing standards are not met (e.g. where the number of driveway exceeds the standard), Approach Permit requests may be processed through a "Deviation" where a benefit to the highway can be demonstrated.

Two conceptual cross sections are also included for McLoughlin Boulevard. These include a parkway that is illustrated in Concept #1, and multi-way boulevard/slip lane that is illustrated in Concept #2. Both

concepts for McLoughlin Boulevard maintain the current regional transportation function of 99E and reduce the number of driveways. Each alternative also maintains the same number of through lanes.

The proposed concepts alter the relationship of the properties adjacent to the highway. Currently, McLoughlin Boulevard has a continuous center left turn lane in order to accommodate frequent curb cut access to each adjoining property, which makes it dangerous for pedestrian crossing the road because there is no raised median or other type of refuge. Walking along the sidewalks is also perceived as dangerous and unpleasant due to the frequency of curb cuts, of which there are approximately18 on the east side, and 12 on the west side of McLoughlin Boulevard between Courtney and Park avenues.

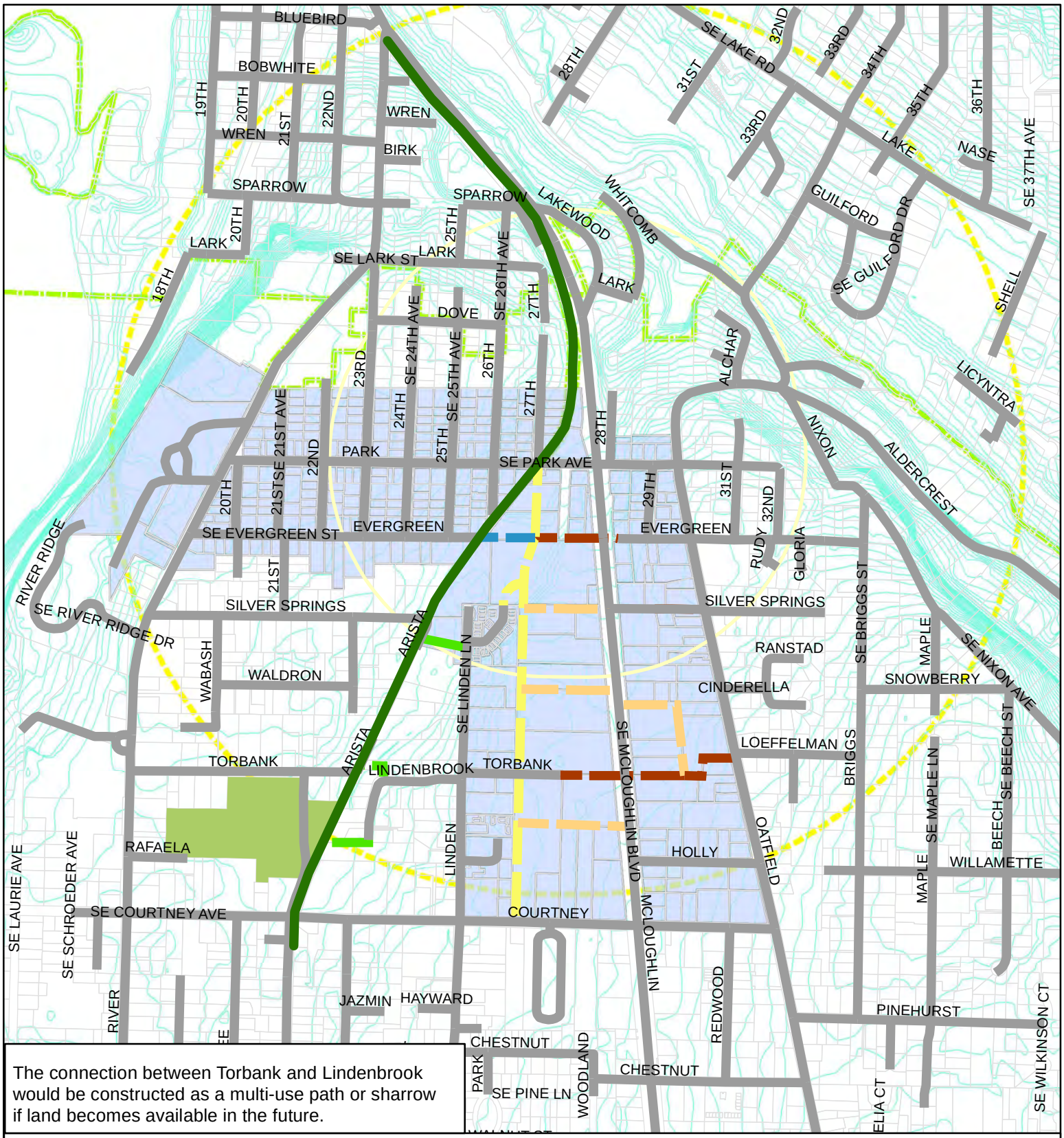
Both concepts propose organizing and assembling the curb cuts into more clearly defined local street intersections that then feed directly into the slip lanes that connect along the frontages of the adjacent properties.

These frontage lanes provide parking in front of the stores to support a main street/village concept. Retailers desire on-street parking because it increases walk-by traffic and can attract customers. Providing on-street parking also minimizes the need for larger parking areas to the side of or behind the building, which has the potential to change the primary retail access away from the street and towards the parking lot.

Potential Implementation Issues

To achieve this circulation plan, there are several factors that may need to be addressed as the circulation plan is further developed:

- Changes to the McLoughlin Boulevard corridor will require ODOT approval and detailed traffic analysis. The analysis will need to address additional connecting streets, pedestrian crossings, traffic signals, and street trees.
- Linden Lane is a private drive. Connecting a public road to it will need additional evaluation.
- Several workshop participants voiced interest in providing a pedestrian bridge across McLoughlin Boulevard. This project will need to be evaluated in greater detail.
- At some point, a parking management plan will likely be required to reduce the need for parking and to have more reliance on walking, biking and using transit while minimizing parking impacts on the neighborhoods. Achieving the right regulatory mix will likely occur overtime based on area needs.
- Identify traffic calming through design standards that minimizes impacts to neighborhoods
- Identifying the right balance for neighborhood connectivity, safety and the future Trolley Trail crossings.
- There are sensitive natural areas along the Trolley Trail that will need to be considered. Environmental impacts would need to be minimized or mitigated if impacts are unavoidable.



Trolley Trail

Taxlots

School

Proposed Station Community

5-Foot Contour

Map 2: Conceptual Circulation Plan for Concepts 1 and 2

Proposed Connections

Multi-Use Path

Lane

Two-Way Sharrow

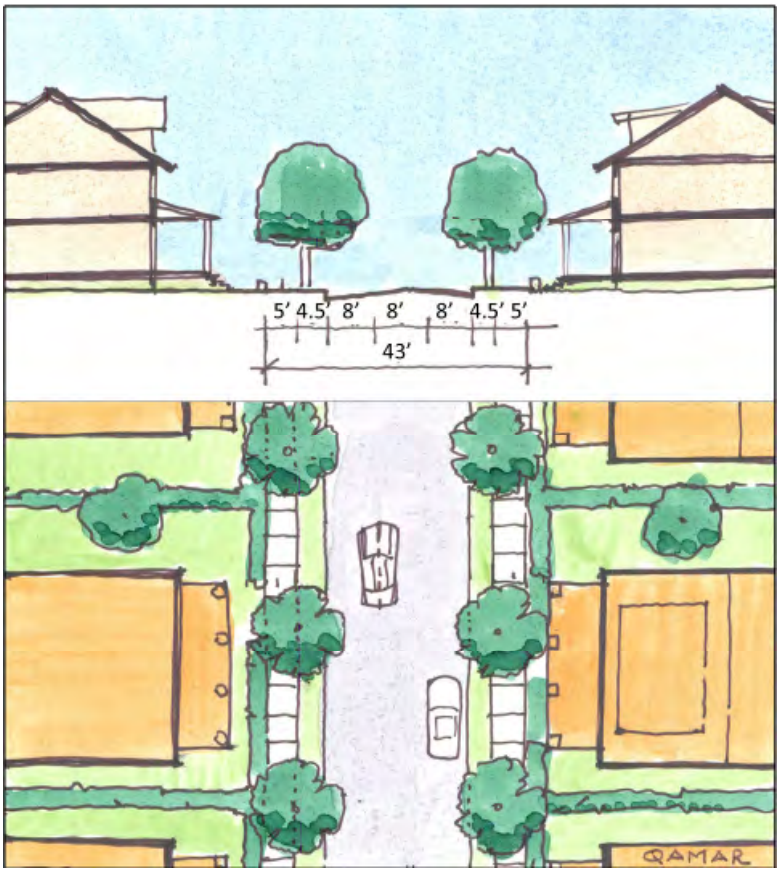
Skinny Street

Two-Lane Street

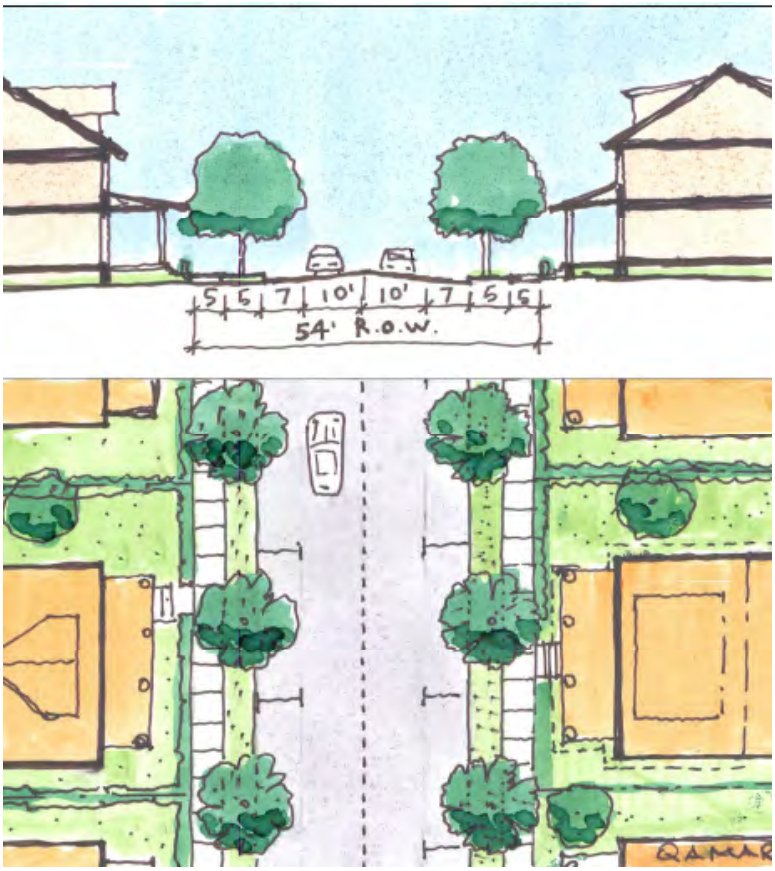
0 400 800 Feet

N

Date: 4/21/2011

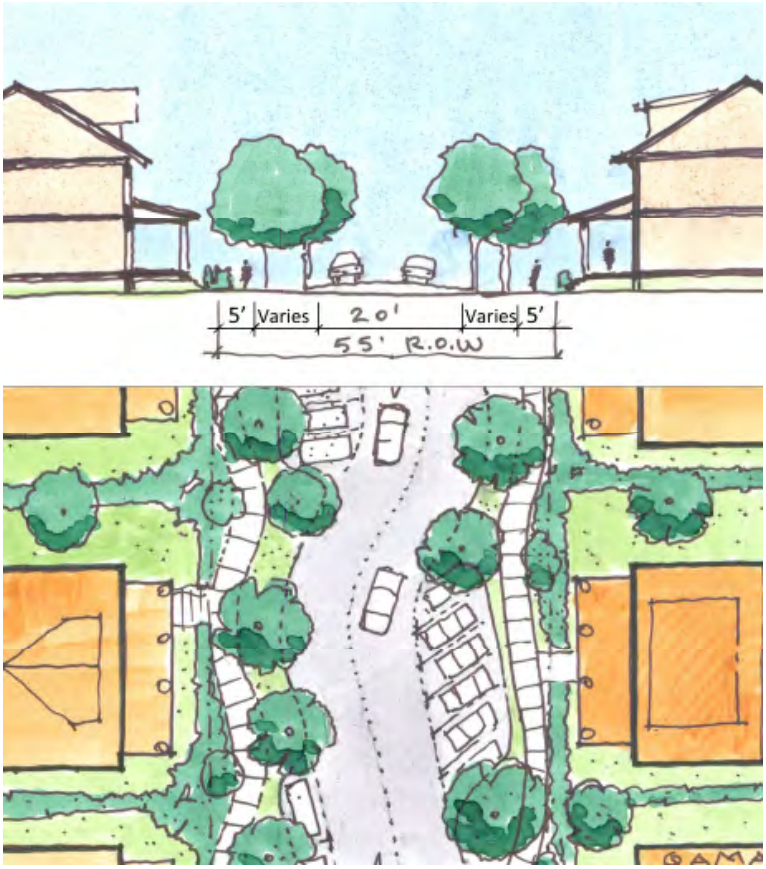


Skinny Streets are safer than wider alternatives by slowing drivers, and making them more aware of their surroundings. This road allows two-way traffic where oncoming cars slowly pass by one another y moving into the parking lane allowed on one side of the road to allow others to pass. Clackamas County has adopted this cross section as part of its Sunnyside Village Plan (Figure X-SV-5).

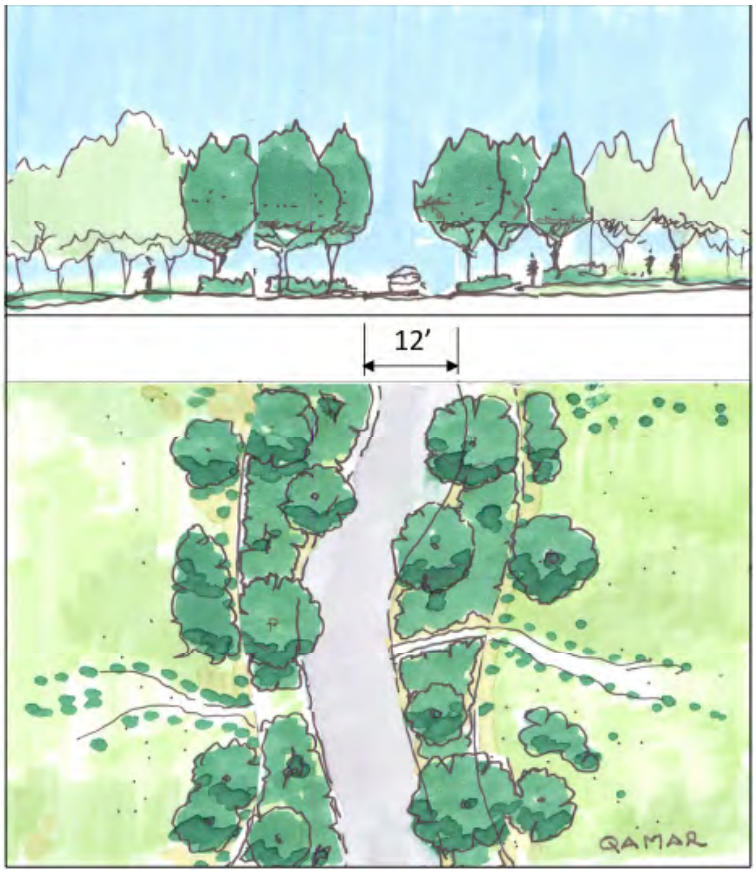


Two lane streets are appropriate where there are expected higher volumes of traffic such as directly connected to a larger avenue or boulevard. This road allows two-way traffic and is wider than would be necessary for local residential-only streets. Clackamas County has adopted this cross section as part of its Sunnyside Village Plan (Figure X-SV-2).

The park lane is a two-way street intended for passing through a local park or natural area where a more meandering alignment will slow drivers, and allow them to mix with pedestrians and cyclists. This cross section is designed to minimize road infrastructure, maintain low speeds, and limit the amount of through traffic.



The **two-way sharrow** is intended to be a street in which pedestrians are the norm and cars are 'guests'. Their organic, angled, casual alignments and mix of landscaping and limited paved areas signals the driver to be extra cautious of pedestrians. Parking can be provided in key areas and can be used as a traffic calming devise.



The **multi-use path** is intended to provide pedestrian and bicycle connections from the McLoughlin Corridor to the Trolley Trail and nearby neighborhoods. It would be constructed to complement the current Trolley Trail improvement project.

Concept Plans

Concept #1: Parkway and Residential Focus

This concept focuses on rethinking the large amount of commercial land along McLoughlin Boulevard by replacing a portion of it with green space to create a buffer between the highway and future development on either side of McLoughlin Boulevard. The proposed circulation system would provide internal circulation for residential areas and on-street parking for focused mixed-use retail and commercial development that supports existing and future residential needs. Local 'frontage lanes' would parallel McLoughlin and connect back to a network of perpendicular local lanes. No on-street parking would be provided on McLoughlin Boulevard. Concept #1 is illustrated on **Maps 3** and **3a**.

The parkway section is defined by a wide strip of vegetation or open space as a buffer from noise and

Parkway
(with townhouses and apartments)

traffic along McLoughlin Boulevard. While proposed right-of-way appears to be 180' wide (depending on the width of the corridor) the public right-of-way would remain 120 feet, the same as in the existing *McLoughlin Corridor Plan*.

This concept assumes that no additional land would be purchased to provide the open/park space. Given the depth of the lots, particularly on the west side of McLoughlin Boulevard, implementing ordinances could require setbacks to provide space for this amenity and in exchange the zoning would allow much higher density as a density bonus for implementing the plan immediately adjacent to park and open space. One goal of this concept is that individual properties could use their own park space for recreation,

potentially including club houses with pools, tennis courts, or gardens. By keeping it in private ownership with public easements across it, residents can still utilize that open space for private functions while developers can obtain density bonuses for providing the upfront open space on their own land.

In addition to the green space along McLoughlin Boulevard green space is also enhanced along the Trolley Trail to improve that amenity and build upon the work that will be completed as part of the Trolley Trail project and the Nature in Neighborhoods grant for the Park Avenue Light Rail Station. Small pocket parks near River Road provide open space for residents.

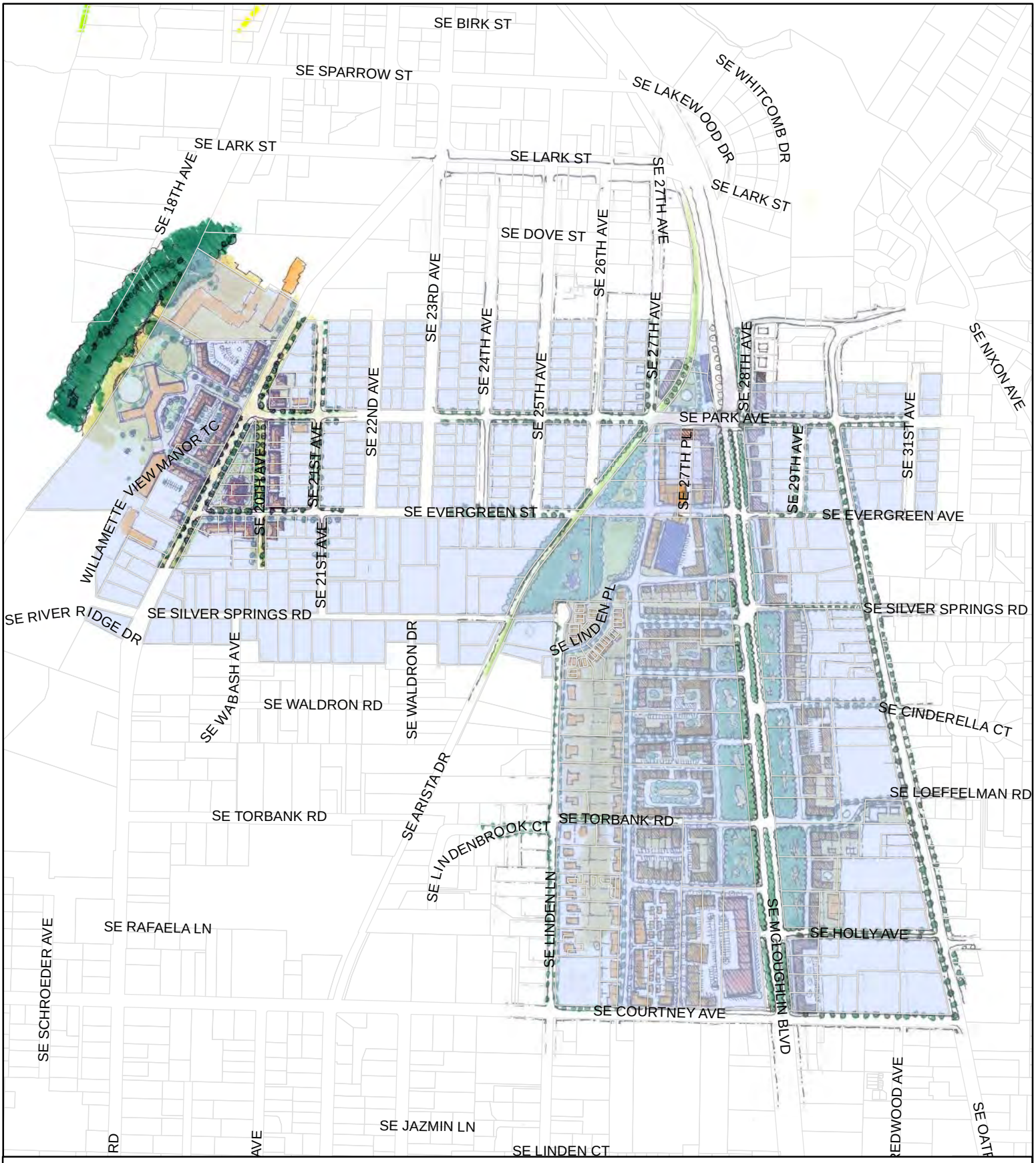
Concept #1 is based on a village/main street concept, with housing as the primary focus and Torbank Road as a potential new main street perpendicular to McLoughlin Boulevard. Retail and commercial uses are located in targeted areas to support residential areas. Residential density varies by location. The highest residential densities are located near the station and along McLoughlin Boulevard, and are potentially in two- to four-story mixed-use apartments and townhomes that support Station Community densities. Residential densities would decrease moving away from McLoughlin Boulevard and closer to existing neighborhoods. Neighborhood corridors, such as Park Avenue and Evergreen Road, would increase in density, potentially allowing duplex, triplex and live/work units, as well as accessory dwelling units (which are already permitted under the existing zoning), but they still retain neighborhood character. Residential areas outside of the Station Community boundary would retain the current zoning.

In the River Road area, residential areas include apartments and limited mixed use. A cottage style home development pattern, where there are several small homes targeted for empty nesters, small families, or retirees surrounding a central common area, are also to be located in this area. Cottage style development would preserve a single-family residential environment, would provide increased housing options for various demographics, and would support slightly higher residential densities than exist today. This concept is illustrated on **Map 5.**

Potential Implementation Issues

To achieve this concept, there are several factors that would need to be addressed including:

- An incentive structure will need to be defined to encourage developers to dedicate land for open space that supports their project. One option may be to consider PUD development or master planning requirements that require open space in exchange for flexibility in density and location of development. Another option may be density bonuses or density transfers.
- New or revised development and design standards with setback, incentive, and density bonus requirements would need to be created and adopted by the County. Some County standards could be modified to accommodate this development pattern
- Potential impacts to existing mobile home parks would need to be addressed when development affects that property.
- The strong focus on residential uses may require additional institutional uses such as community centers, libraries, parks, churches, schools, and fire stations to support residents.
- Protect view sheds by limiting building heights in key areas and/or screening heating and cooling.
- Preserve the existing tress and other native species. This can be accomplished through design standards and landscaping requirements.



Legend

Proposed Station Community

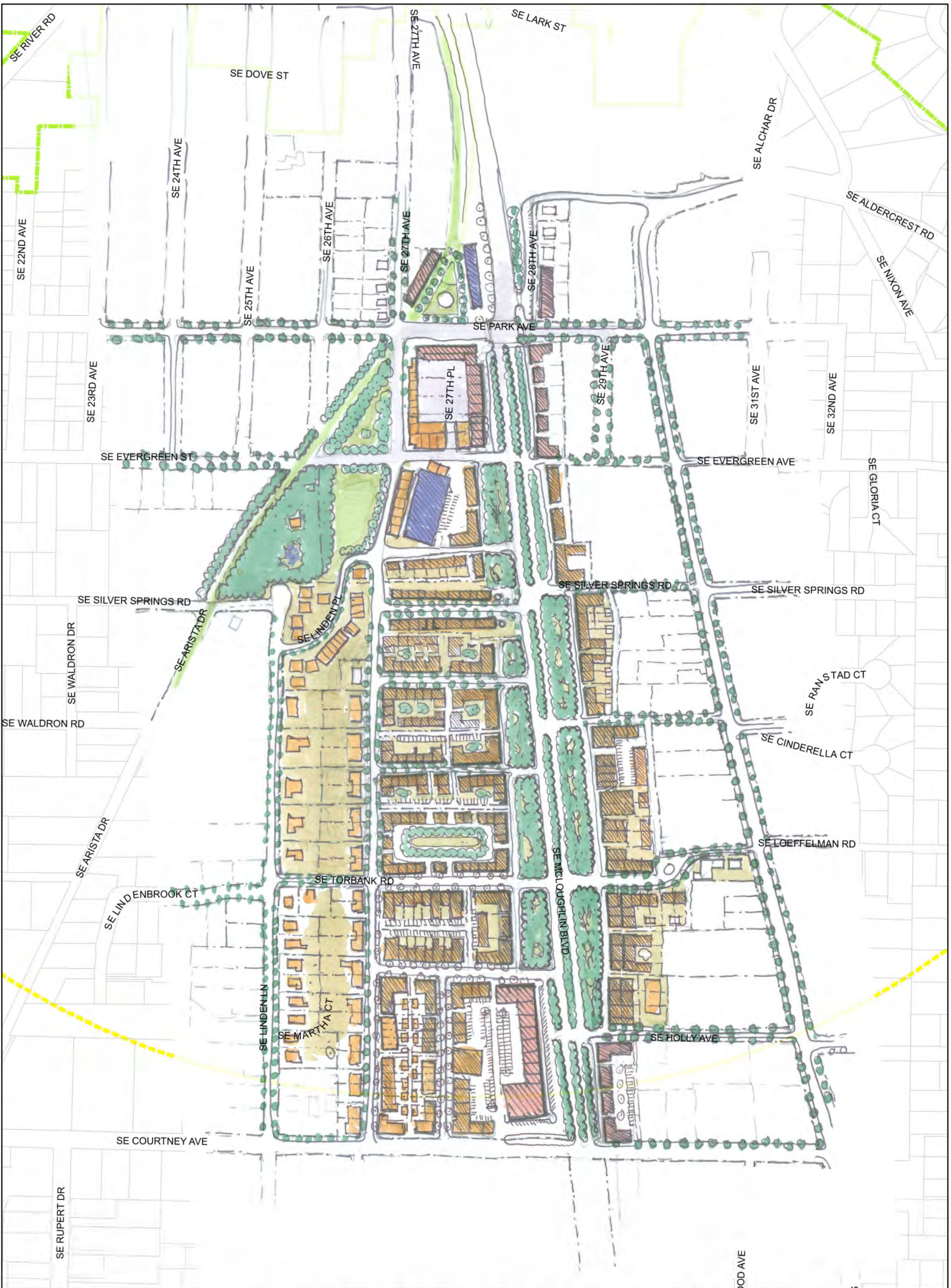
Taxlots

Map 3: Parkway with Residential/Mixed-Use

N

0 300 600 Feet

Date: 4/11/2011



Map 3a: (Detail) Parkway with Residential/Mixed-Use

0 150 300 Feet

N

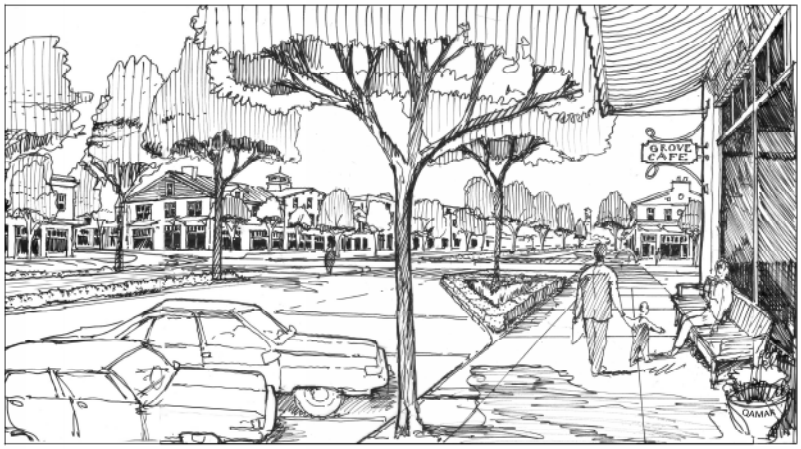
Date: 4/19/2011

Concept #2: Multi-Way Boulevard and Mixed Use Focus

This concept uses the same circulation plan as proposed in Concept #1, although McLoughlin Boulevard is modified to include a slip lane that provides bicycle and pedestrian circulation and on-street parking that is separated from the through lanes on McLoughlin Boulevard. Concept #2 is illustrated on **Maps 4** and **4a**. This concept assumes a more traditional transit oriented development pattern than Concept #1, with retail and mixed use located in a narrow band fronting McLoughlin Boulevard, Torbank Road, and Evergreen Road. Some housing is located above retail, but most housing is behind the retail area, where it is screened from traffic noise. Housing densities may be slightly lower than in Concept #1, focusing on two- to three-story apartments and townhomes except in the immediate vicinity of the station, where densities would be higher. As with Concept #1, this concept is based on a village/main street concept, but its primary focus is mixed-use development, and retail and commercial uses, rather than primarily housing, are located immediately adjacent to the slip lane along the McLoughlin corridor.

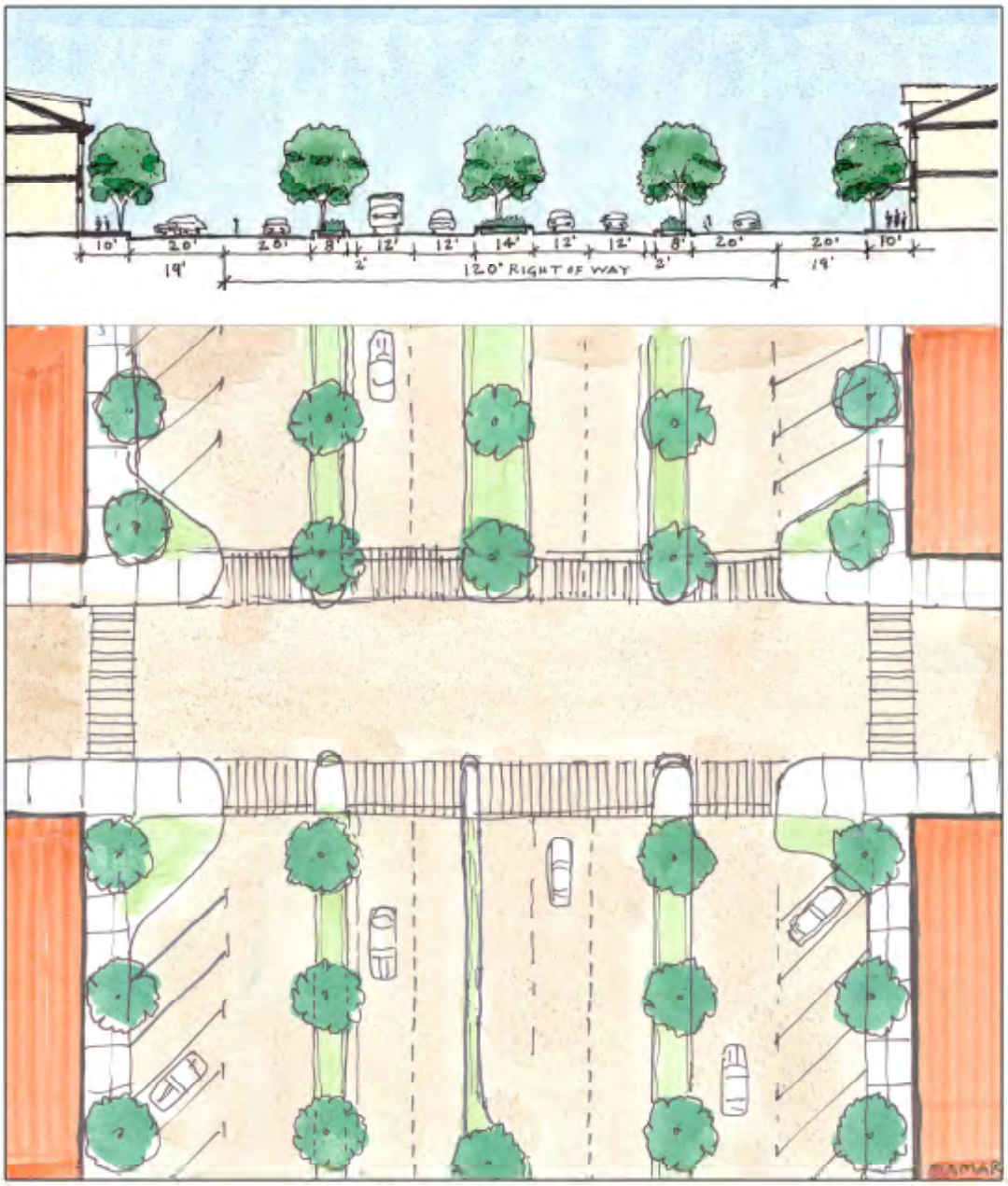
The market analysis stated that retail and commercial construction could be a long-term rather than a near-term possibility. For this reason, even if future zoning permits mixed-use development, residential uses could continue to be the predominant new uses in the area for the foreseeable future.

Residential densities vary depending on location, and residential uses are focused away from McLoughlin Boulevard and closer to existing neighborhoods. As with Concept #1, the highest residential densities are located near the station and along McLoughlin Boulevard. Buildings near the station could be two- to four-story structures. Residential densities decrease closer to existing neighborhoods.



Multi-Way Boulevard

Residential densities between the new mixed use corridor along McLoughlin and the existing neighborhoods include some apartments, but also include townhome units. As with Concept #1, neighborhood corridors such as Park Avenue and Evergreen Road increase in density, allowing duplex, triplex, live/work units, and accessory dwelling units (which are already permitted under the existing zoning), but they still retain neighborhood character. Development in the River Road area is the same as under Concept #1 (**Map 5**). Housing types provide increased housing options for various demographics and support slightly higher residential densities than exist today.



Multiway Boulevard -

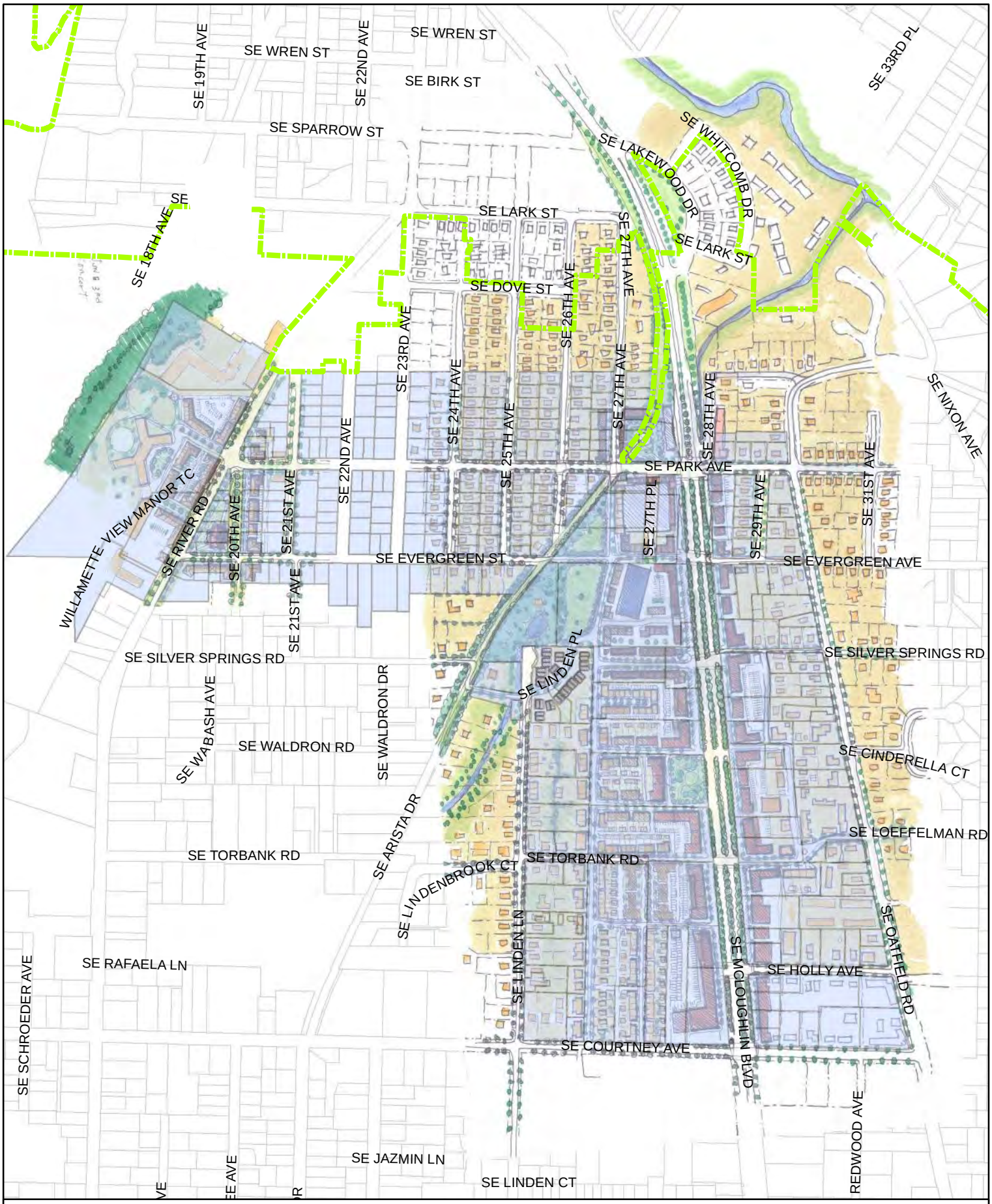
Green space is focused in key areas near residential uses as opposed to primarily along McLoughlin Boulevard as proposed under Concept #1. Green space is enhanced and expanded along the Trolley Trail to improve that amenity and build upon the work that will be completed as part of the Trolley Trail

project and the Nature in Neighborhoods grant for the Park Avenue Light Rail Station. Other pocket parks are provided in key locations.

Potential Implementation Issues

To achieve this concept, there are several factors that would need to be addressed including:

- Given the low market demand for retail and commercial space, residential units will likely be constructed first. Specific zoning standard could identify the mix of residential and retail/commercial to ensure that one use does not dominate the other.
- Retail and commercial often have higher trip generation rates, which will need to be addressed with an adequate circulation plan.
- New or revised development and design standards with setback, incentive, and density bonus requirements would need to be created and adopted by the County. Some County standards could be modified to accommodate this development pattern. This is particularly important to preserve space along McLoughlin for on-street and parking and the slip lane.
- Potential impacts to existing mobile home parks would need to be addressed when development affects that property.
- Protecting view sheds by limiting building heights in key areas and/or screening heating and cooling needs to be considered when determining maximum building heights.
- Preserve the existing tress and other native species. This can be accomplished through design standards and landscaping requirements.

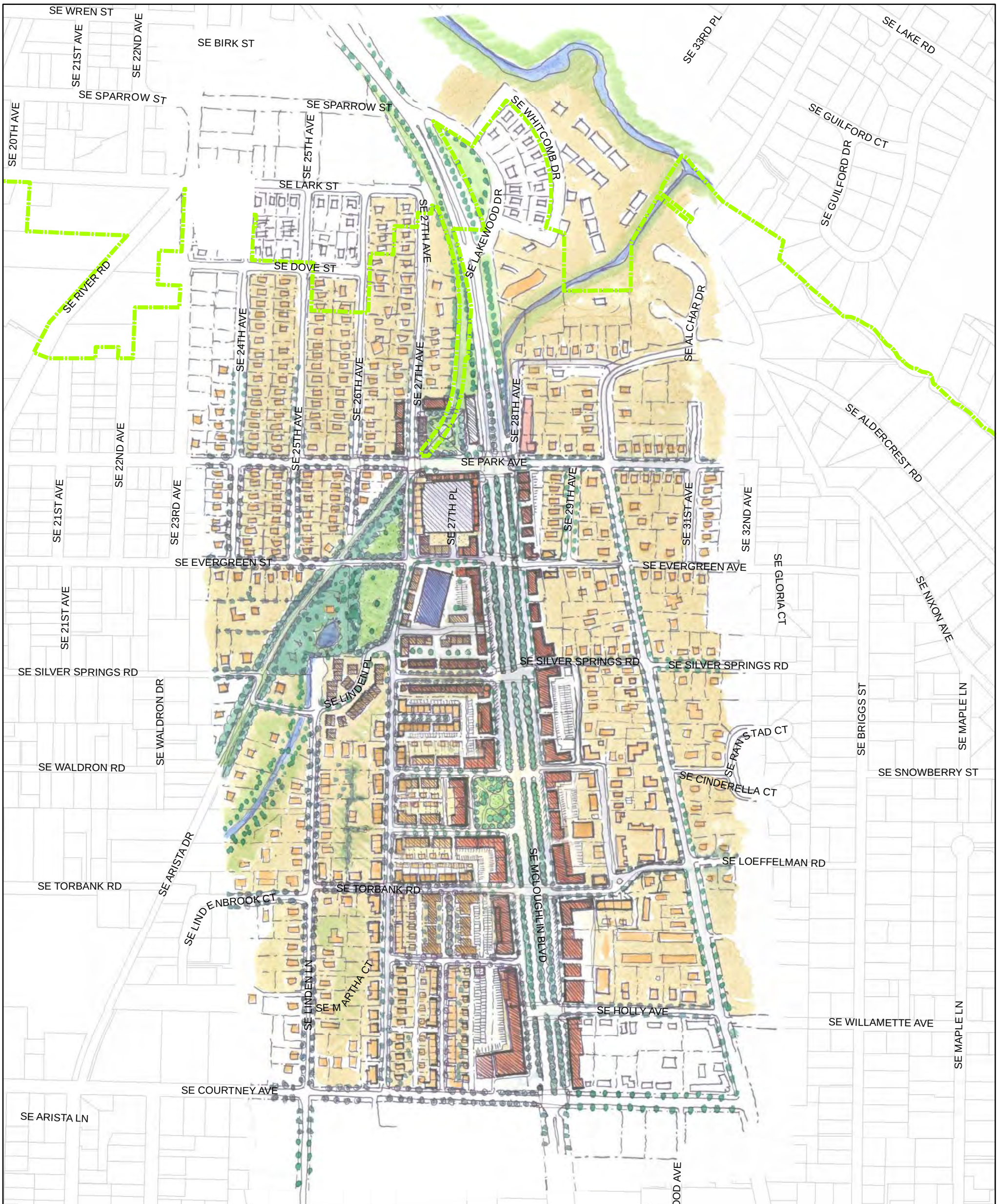


Map 4: Multi-Way Boulevard with Mixed Use

0 300 600 Feet

N

Date: 4/20/2011



Map 4: Multi-Way Boulevard with Mixed Use

0 200 400 Feet

N

Date: 4/20/2011

Map 5: Vision Detail - River Road Neighborhood

0 150 300 Feet

N

Date: 4/12/2011

Appendix A: Public Workshop Meeting Results

Workshop Priorities on Chartpacks

Group #1

- Increase residential density in some areas around the station, while maintaining existing R-10 in other areas
- Tie in with MAP Values, Vision, Goals, and Principles
- Mixed use shops/services around station
- Redevelop McLoughlin between Park and Courtney as mixed-use/commercial with sharrow lane between McLoughlin and Linden.

Group #2

- New zoning should integrate habitat
- Kellogg Creek restoration with high density housing (identified #19 and #22 from table book) for professional commuters
- Construct overpass between station and east side of McLoughlin (7-11 area)
- Parkway concept for McLoughlin with housing behind it
- Provide east/west connection on Torbank from River Road to Oatfield
- Pedestrian connection to Willamette River
- Provide safe way for kids to walk for Island Station Neighborhood to Oak Grove Elementary
- Provide Pedestrian Connection for apartment residents north of Park and east of McLoughlin to walk to Park Avenue

Group #3

- Retention of neighborhood feel. Create design guidelines to keep historic character
- Better pedestrian linkages. Sidewalks along main thoroughfare
- Creation of "village" destinations
- Provide greenspace, community gardens, and street trees
- Creation of live/work-main street feel. Provide mixed use, trees, and traffic calming

Group #4

- Safer crossings at McLoughlin and Park, Oak Grove, and Courtney
- Keep greenery along McLoughlin
    - Trolley Trail-Build it!
    - Concerned about impact on Oatfield and Park. More traffic?
- Need more jobs along McLoughlin. Focus Density along McLoughlin and reduce concrete
    - Lighting, shops, bike shop, restaurants
- Bike and walking connections/loop at Park, River Road, Courtney, Oak Grove
    - Shuttles, bike rentals

- Multimodal streets
    - Senior streetcar tourist trams .
    - Keep cars on streets with walking, bikes, and transit

"BRIDGE AT PARK AVE"

~~ADDRESS~~ ADDRESS SEVERE GRADES

Legend

- Light Rail Station
- Park Avenue Station Area (1/2 mile buffer)
- Milwaukie
- 5-foot Contour

- LAND USES TO SERVE OLDER RESIDENTS
- EX. BLD. STOCK LACKS ENERGY EFFICIENCY AND MUST GO AWAY
- NEED GROCERY STORE SCALED TO NEIGHBORHOOD
- LOCAL FOCUS FOR RESOURCE PURPOSES
- PARK = NATURAL AREAS TO MINIMIZE MAINTENANCE

N

1 inch = 200 feet

· CHARLIE'S SCENARIO

ELEANORE GRP
To Milwaukie
GREENWAY
KIDS from Here go Elementary School
Ped connection to Park Ave
Parkway
Ped bridge
Parking on parking lots
Parkway 9'30
Rotary for traffic calming
"14" zone
SE EAGLE ST
SE BLUEBIRD ST
SE BOBWHITE ST
SE WREN ST
SE BIRK ST
SE SPARROW ST
SE LARK ST
SE DOVE ST
SE EVERGREEN ST
SE SILVER SPRINGS RD
SE WALDRON RD
SE TORBANK RD
SE COURTNEY AVE
SE HOLLY AVE
SE CHESTNUT ST
SE PINELANE ST
SE HAYWARD WAY
SE JASMIN LN
SE ARISTA LN
SE RAFAELA LN
SE 17TH AVE
SE 18TH AVE
SE 20TH AVE
SE 21ST AVE
SE 22ND AVE
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SE 143RD AVE
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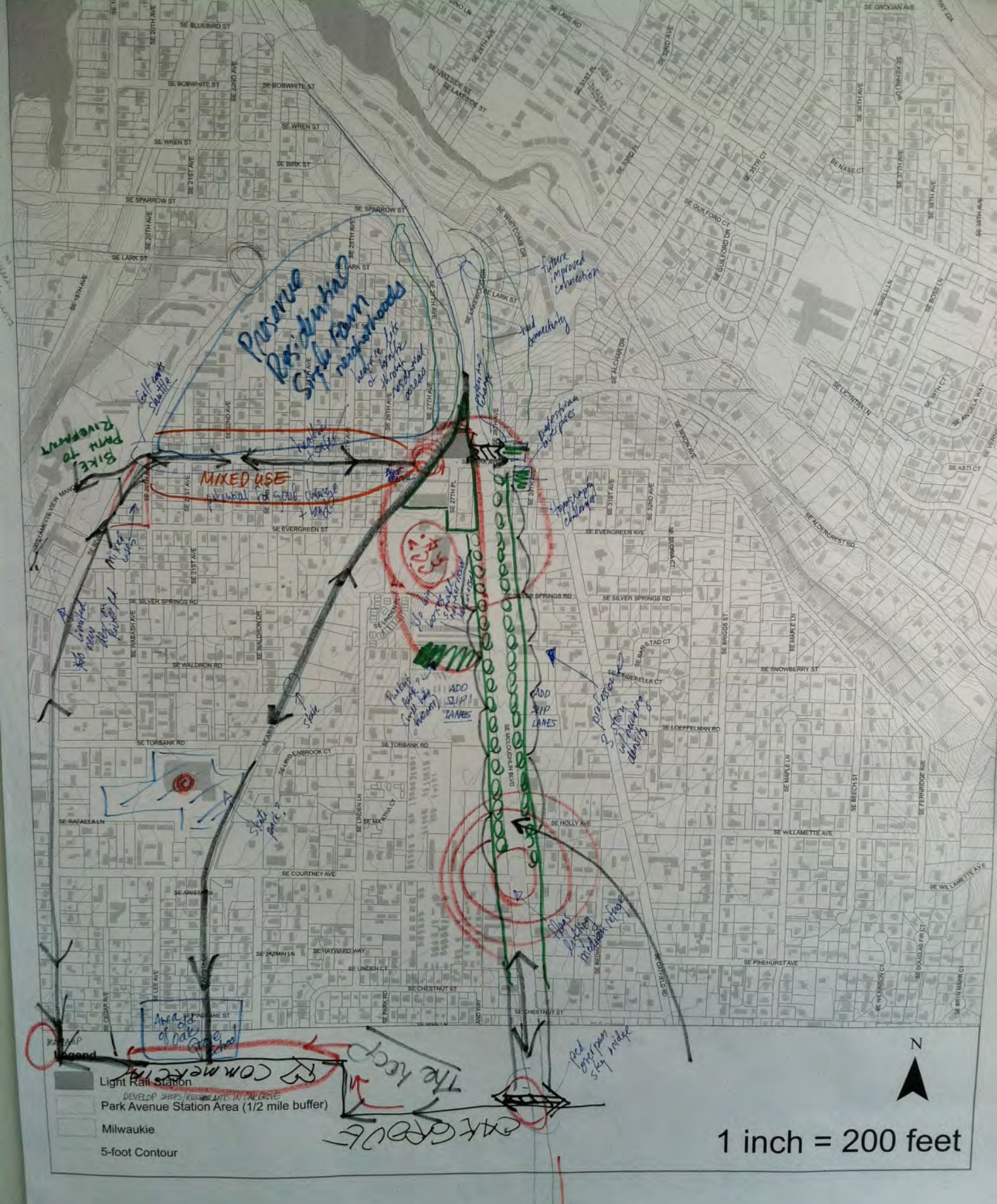
Legend

- Light Rail Station
- Park Avenue Station Area (1/2 mile buffer)
- Milwaukie

N



Notes continue at NEFE - Jennings

Have a Greenway: Peds + Bike Path all along river, accessible to all
INCREASE DENSITY 3-10 STORY BUILDING
PED. BIKE BRIDGE
Bridge
INCREASE DENSITY LOW RISE
Community Center
BIZ
PARK
PARK
PARK
PARK IFY
SE PARK AVE
SE COURTNEY AVE
SE WILLAMETTE AVE
SE SILVER SPRINGS RD
SE EVERGREEN AVE
SE LARK ST
SE INTERNATIONAL WAY
N
1 inch = 200 feet
Center Nodes
Sidewalks
5 story stores: retail on ground floor business offs on 2-3 residential on 4-5
Green Park
D-9: hallways + exhaust, let center see from Park to Courtney
Curvy streets trees + parks
Tim Keep Story Stick
Jerry Fry
Sa Fields
Bill
Richard Mattson
Ed Yorke
Mary Schmidt
Residential density - where?
3-4 story not too dense - upzoning
3-6 " - better density
* Mixed Use - place on top / housing
new name - new ground fl.
No NIH - condos - townhouses
- better housing - provide better
* Tie site MAP provides
Green McLaughlin
* Commercial Bail & Off NSL
* Sharon streets bikes commuting
Don't change zoning behind
Sharon's along SLR
Courtney
Transit station nodes -
coffee shops, bike repair, dry cleaning
Elks Lodge also into Community Center
Major Zoning Issues
Action of Park Ad Sites - should be "zoning" & smaller park
Community of stop lines + parking strip
of multi-use along of pedes + bicycle
Sharon bikeway
Residential commercial / mixed use / apartments
Park + Courtney into Library / Mixed Use
Tie in NIH facing OLD layouts + return
block to building around stop -
Hotels, short-use with NIH, keep
curved streets, parks, walkways, Sharon
bike / ped friendly,
NO SIGNS

Appendix G: Land Use and Transportation Alternatives Memorandum

PARK AVENUE NEIGHBORHOOD & STATION AREA PLAN

DATE: September 28, 2011

TO: Stakeholder Advisory Group, Policy Advisory and Technical Advisory Committees

FROM: Project Team

SUBJECT: **Land Use and Transportation Memorandum**

PROJECT: Park Avenue Neighborhood and Station Area Plan

COPIES: File

Introduction

This memo summarizes the two land use alternatives and the circulation plan for the Park Avenue Neighborhood and Station Area Plan project that were developed using input from the Stakeholder Advisory Group, Technical Advisory Committee, Policy Advisory Committee, individual stakeholders, and a public design workshop in Spring/Summer 2011. The purpose of this memo is to help the various project committees to identify the preferred components of the alternatives. The preferences will then be used to develop the Recommended Draft Park Avenue Neighborhood and Station Area Plan, which will consist of one proposal. The recommended draft plan will be presented to the public in late fall 2011 for public comment.

The two alternatives were presented to the Stakeholder Advisory Group in May 2011 and to the Technical Advisory Committee and at a public workshop held at the Elks Lodge in June 2011.

This memorandum also includes three attachments. Attachment A identifies the existing zoning in the area; Attachment B includes a detailed list of comments gathered throughout the concept and alternatives development process; and Attachment C identifies how the evaluation criteria and related McLoughlin Area Plan Guiding Principles relate to the two alternatives. Attachment D identifies members of the Stakeholders Advisory Group and Technical Advisory Committee.

Project Basis

Both of the proposed alternatives incorporate transit oriented design (TOD) concepts that integrate urban design, land use planning, transportation planning, and traffic engineering to create an area around the future light rail station and McLoughlin corridor to create a more lively neighborhood and streets than exist today. The goal of this project is to create an attractive neighborhood containing a mix of uses for residents, and to increase jobs within walking distance of the station in an environment that encourages walking and bicycling.

The Park Avenue station area has few direct connections to the station, particularly for neighborhoods at the southern end near Courtney Avenue, and the auto-oriented commercial development pattern along McLoughlin Boulevard has intermittent sidewalks and limited pedestrian access. Additionally, the relatively high number of small residential lots west of the station presents a challenge for redevelopment, and there is a desire to maintain a more small-scale development pattern to reflect the established

neighborhood. In contrast, to the south of the station area there are relatively large parcels with land values often exceeding the building values. If TOD concepts are to function, basic infrastructure, such as a road system that provides a walkable street grid, is needed. New development will need to be appropriate to local market demographics and include housing at several price points.

The Circulation System

The proposed circulation system was developed in part through the public workshop and stakeholder engagement process for the project. The goal of this circulation plan is to provide guidance for future development while providing some flexibility in location, so that developers can maximize the development potential of a particular area. As development occurs, these connections will need to be located in a manner that supports the development while meeting the goals and objectives for this project to provide better circulation and a pedestrian-oriented circulation pattern. The proposed street cross sections are included below following Map 1. Existing, approved County road standards are used in the circulation plan, where feasible.

Map 1 shows the existing and proposed circulation system for the area. New connections are located where they can build upon the existing roadways and improve connections through the proposed station community. The proposed circulation system provides a more pedestrian-friendly grid pattern, with intersections spaced approximately 450 feet apart. All of these connections are feasible, but they may require additional design features (retaining walls, bridges, wetland mitigation, etc.) to address steep grades and natural resources in some parts of the project area, requiring some flexibility in road location.

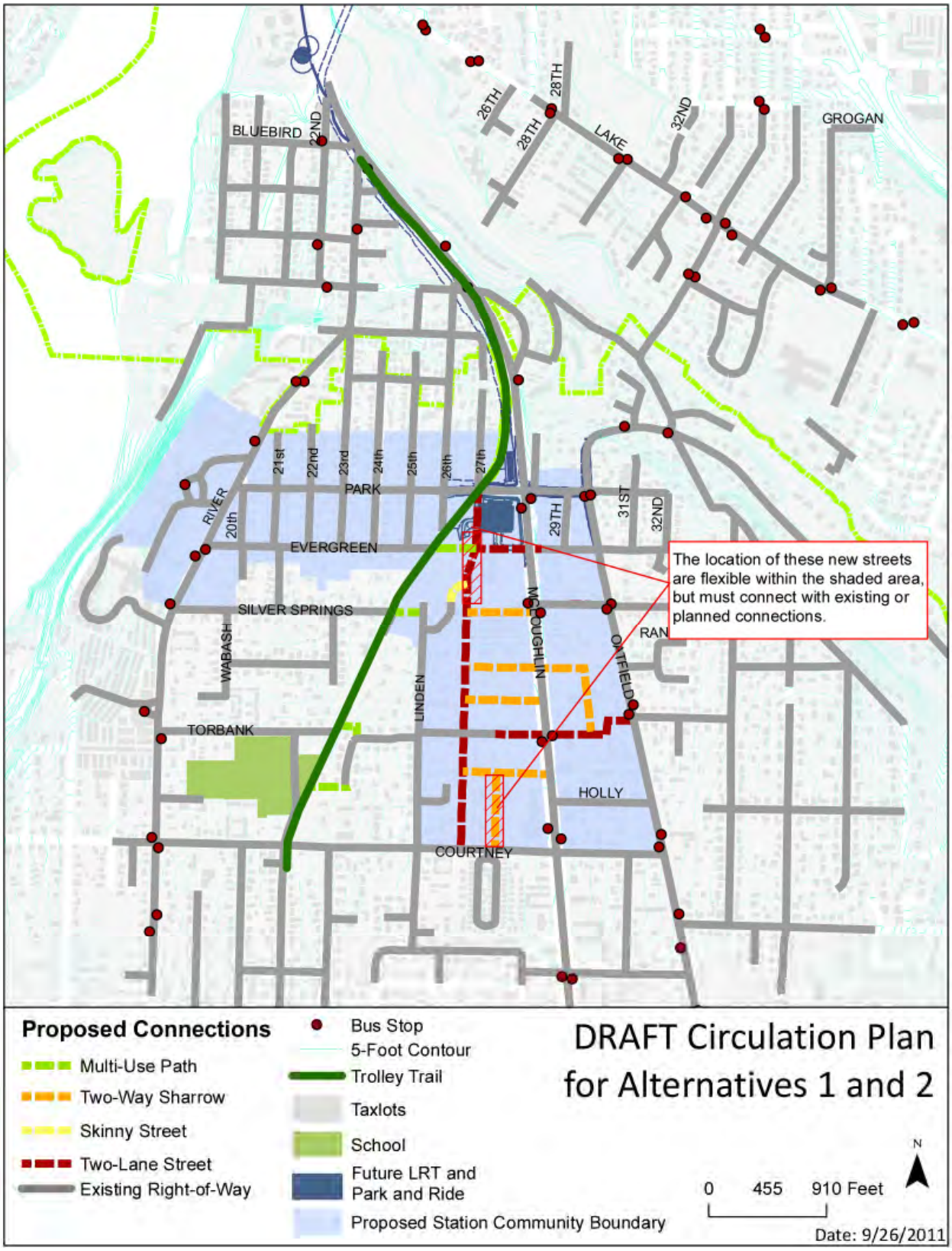
McLoughlin Boulevard

Two corridor alternatives were developed for McLoughlin Boulevard: a parkway design that provides varying widths of greenspace to buffer high-density housing adjacent to McLoughlin Boulevard and a multi-way boulevard/slip lane that permits off-street parking on a frontage lane on McLoughlin Boulevard to support mixed-use development. These road treatments are described in greater detail under each alternative (parkway under Alternative 1, multi-way boulevard under Alternative 2). Both alternatives maintain the current regional transportation function of 99E/McLoughlin Boulevard and reduce the number of driveways. Each alternative also maintains the same number of through lanes as currently exists.

Both road treatments alter the relationship of the properties adjacent to the highway. Currently, McLoughlin Boulevard has a continuous center left-turn lane to accommodate frequent curb cut access to each adjoining property, which makes it dangerous for pedestrians crossing the road, because there is no raised median or other type of pedestrian refuge. Walking along the sidewalks is also perceived as dangerous and unpleasant due to the frequency of curb cuts, of which there are approximately 18 on the east side and 12 on the west side of McLoughlin Boulevard between Courtney and Park avenues.

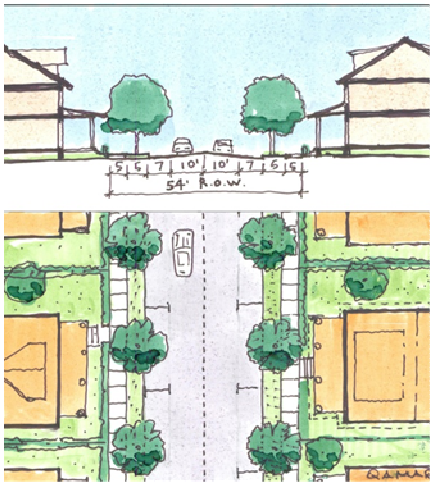
Both alternatives propose organizing and assembling the curb cuts into more clearly defined local street intersections. Frontage lanes provide parking in front of the stores to support a main street/village concept. Providing on-street parking also minimizes the need for larger parking areas to the side of or behind the buildings, which has the potential to change the primary retail access away from the street and towards the parking lot.

Map 1: Proposed Circulation Plan



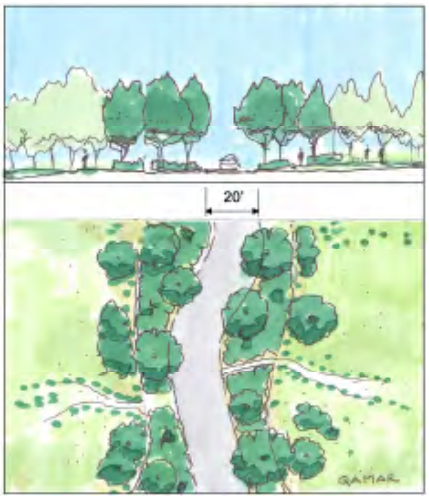
Proposed Street Cross Sections

Skinny streets are safer than wider streets because skinny streets slow drivers and make them more aware of their surroundings. This road allows two-way traffic, where oncoming cars slowly pass by one another by moving into the parking lane allowed on one side of the road to allow others to pass. Clackamas County has adopted this cross section as part of its Sunnyside Village Plan (Figure X-SV-5).



Two-lane streets are appropriate where higher volumes of traffic are expected, such as for streets that are directly connected to a larger avenue or boulevard. This road allows two-way traffic and is wider than would be necessary for local residential-only streets. Clackamas County has adopted this cross section as part of its Sunnyside Village Plan (Figure X-SV-2).

The **two-way sharrow** is intended to be a street in which pedestrians are the norm and cars are "guests." Their organic, angled, casual alignments and mix of landscaping and limited paved areas all signal the driver to be extra cautious of pedestrians. Parking can be provided in key areas and can be used as a traffic-calming device.



The **multi-use path** is intended to provide pedestrian and bicycle connections from the McLoughlin corridor to the Trolley Trail and nearby neighborhoods. It would be constructed to complement the current Trolley Trail improvement project.

Signalized and Unsignalized Intersections

Both alternatives for McLoughlin Boulevard assume two new, fully signalized intersections at Silver Springs/McLoughlin and Torbank/McLoughlin to support better vehicular access and provide additional pedestrian crossings. These new signalized intersections would reduce the distance between signals from approximately 2,800 feet to approximately 900 feet, considerably reducing the distance a pedestrian will need to walk to cross McLoughlin at a signalized intersection. Signalized intersections will include crosswalks and pedestrian refuges within the center median. Other intersections will be unsignalized and may be right-in/right-out turning movements and/or have left-turn pockets on McLoughlin Boulevard. All intersections will incorporate a raised center median that also serves as a pedestrian refuge.[1]

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[1] Oregon Department of Transportation approval will be required for this design, which will also accommodate left-turn lanes at signalized intersections and where possible, other left-turn lanes at other designated locations.

Traffic associated with the local circulation plan and proposed land use alternatives was evaluated to determine whether or not one or two signals might function at an acceptable level of service for an ODOT facility (McLoughlin Boulevard is a state highway). The traffic analysis (summarized at the end of this memorandum) showed that one or two signals could be feasible at some point in the future when development densities warrant an additional signal. However, any new signal on McLoughlin Boulevard will require the State Traffic Engineer's approval. Signals that are less than one-half mile apart are discouraged. Any new street (or driveway) on McLoughlin Boulevard also requires an ODOT Approach Permit. For ODOT to grant an Approach Permit for additional streets on McLoughlin, existing driveways (or streets) would need to be closed to help justify the permit approval. In cases where spacing standards are not met (e.g., where the number of driveways exceeds the standard), requests for an Approach Permit may be processed through a "Deviation" when a benefit to the highway can be demonstrated.

Feedback on the Proposed Circulation Plan

The Stakeholder Advisory Group and Technical Advisory Committee have reviewed the proposed circulation plan and the proposed street cross sections. The same material was presented at the public workshop in June 2011. Highlights of the input received include (see Attachment B for a complete summary):

- Most groups support changing the character of McLoughlin Boulevard to either a multi-way boulevard or parkway. There has been some discussion about whether the greenspace provided for a parkway treatment will be used and whether the additional right-of-way requirements will be feasible.
- The Clackamas County Fire Department and Clackamas County traffic engineer have concerns about the ability of the narrow streets to accommodate fire trucks (note: the proposed skinny and two-lane street standards are adopted county standards). Conflicts appear to occur because of cars parking illegally. Some Stakeholder Advisory Group members do not support skinny streets and prefer a more suburban street width.
- On-street parking is critical for minimizing the amount of on-site parking needed and encourages street activity. If more street parking is provided, additional development could occur that would otherwise typically be dedicated for parking areas.
- There are concerns that the circulation plan will increase traffic in neighborhoods, especially if the area develops as proposed.
- The circulation plan should consider providing alternative routes for the walking/bike network to move it off of McLoughlin Boulevard.
- Walkability in the area should be a key consideration on both new and existing streets.
- Consideration should be given to alternative modes of travel, such as golf carts, as a way for residents to access the area without driving an automobile. There has been considerable discussion about the Trolley Trail and how proposed connections across the trail function, either limited to bicycles and pedestrians or to also allow vehicles.

Transit Service, Bicycle, and Pedestrian Amenities

Transit

As of September 2011, TriMet does not propose any changes to the existing bus stop locations when light rail becomes operational. Existing bus stops along these routes are shown on Map 1. Three bus routes will still serve the project area:

- Bus #33 provides frequent service (every 15 minutes or better during peak hours) along McLoughlin Boulevard;
- Bus #34 runs along River Road, connecting the transit center in Milwaukie to Oregon City; and
- Bus #32 runs along Oatfield Road and has similar service hours as the #34, but its weekend service is only for a partial route in Oregon City.

Existing bus service has been reduced along many of these routes, and area stakeholders have said that the service cuts have made it more challenging to use transit, particularly when work schedules do not correspond with transit schedules.

Bicycle and Pedestrian Improvements

The new light rail station will be a significant improvement for transit users in the area. The station could become a hub for pedestrians, bicyclists, and motorists using the park-and-ride and light rail station. Additionally, light rail construction will also include completion of portions of the Trolley Trail north of Park Avenue and pedestrian improvements on Park Avenue between Oatfield Road and the station.

All new roads proposed in this plan include sidewalks. Traffic along the new roadways is expected to be slow, and bicyclists will share the road with vehicles. Dedicated bicycle lanes will be provided on McLoughlin Boulevard (both on the designated bike lane and on the slip lanes) under either boulevard treatment and on River and Oatfield Roads. The Trolley Trail will also be upgraded to a paved multi-use path (as a separate, ongoing project). Connections to the Trolley Trail and the proposed street system will be provided at Lindenbrook Court (two potential locations), Silver Springs Road, and Evergreen Street. Overall, access for pedestrians and bicyclists will improve significantly with the improvements that are already approved under separate projects along with the proposed circulation plan under either of the Park Avenue land use alternatives described in this memo.

Feedback on Transit, Bicycle, and Pedestrian Amenities

The advisory groups and the public voiced similar concerns and support for the transit, bicycle, and pedestrian amenities proposed in this project, which included (see Attachment B for a complete summary of comments):

- Transit service has been cut in the area and does not complement the shift changes that occur at major employers (Willamette View, Rose Villa), forcing employees to drive if they have vehicles.
- Several advisory group members and public meeting participants said that the plan should consider a future without cars.
- Walkability and bicycling should not be threatened by making the plan about cars (including allowing vehicle crossings on the Trolley Trail).
- There are many existing bicycle and pedestrian deficiencies in the area. The plan should focus on both new and existing streets.

Land Use Alternatives

Alternative 1: Urban Housing

Alternative 1 (see page 13 for an illustration of the McLoughlin corridor under this alternative) is a housing-focused alternative that incorporates significant greenspace as a buffer between the highway and future development on either side of McLoughlin Boulevard. The proposed circulation system would provide access for residential areas and on-street parking for focused mixed-use retail and commercial development that supports existing and future residential needs. Local frontage lanes would parallel McLoughlin Boulevard and connect to the local road system.

Parkway
(with townhouses and apartments)

Open space is an integral part of this alternative, and recommended zoning ordinances will have design and development standards for plazas, open space, and other recreation areas, as well as incentives, such as a density bonus, for park dedications. The parkway section is defined by a wide strip of vegetation or open space as a buffer from noise and traffic along McLoughlin Boulevard. As opposed to requiring the purchase of additional land to construct the side lanes and park buffer, plan implementation would require that Clackamas County establish setbacks along the corridor to preserve areas for the park/open space and lanes located on private property. In exchange for this dedication, zoning would allow the landowner to develop at higher densities immediately adjacent to park and open space. The privately owned park space within public easements would allow residents to use the park land, while developers could obtain density bonuses for providing the upfront open space on their own land. Conversely, and more ideally, the resulting open space could be publicly owned, programmed, and maintained if a county or city agency were willing and able to have this responsibility.

The North Clackamas Parks and Recreation District (NCPRD) develops and manages parks and open space for the area, including the Trolley Trail. In September 2011, the NCPRD Board was presented the draft station area plan. In response, the board expressed support for the open space concepts and an understanding of the need to have parks to support the now park-deficient community and to attract new development. This alternative incorporates the greenspace along McLoughlin Boulevard, the enhanced Trolley Trail environment, and the Nature in Neighborhoods improvements resulting from the Metro Grant for the Park Avenue Light Rail Station. The alternative also assumes that the Mixed-Use Neighborhood community along River Road includes a small pocket park to provide open space for residents.

Alternative 1 includes a village/main street along Torbank Road surrounded with housing. Retail and commercial uses are located in targeted areas to support residential areas. Residential density varies by location. The highest residential densities are located near the station and along McLoughlin Boulevard, and residential buildings are mixed-use apartments that are up to four stories and townhomes. Residential densities would decrease moving away from McLoughlin Boulevard and closer to existing neighborhoods. Neighborhood corridors, such as Park Avenue and Evergreen Street, would increase in density, providing for duplex, triplex, and live/work units, as well as accessory dwelling units (which are already permitted under the existing zoning).

In the River Road area, residential areas include apartments and limited mixed use. A cottage style home development pattern could also be located in this area. Cottage style development would preserve a single-family residential environment, provide increased housing options for various demographics, and support slightly higher residential densities than exist today because lots can generally be smaller.

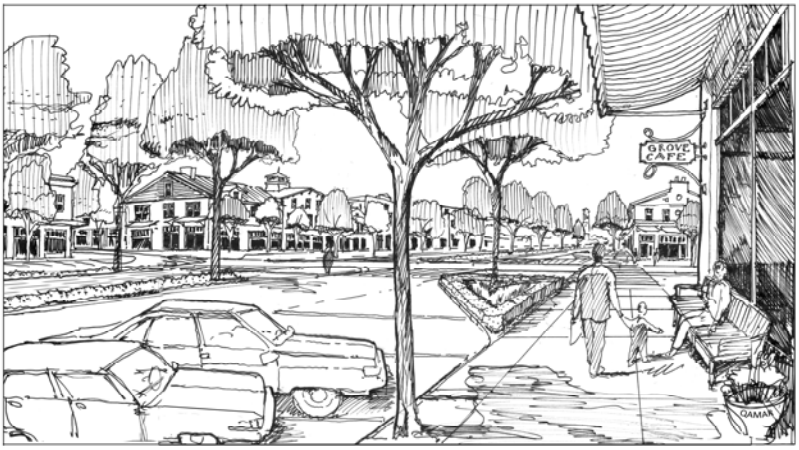
Alternative 2: Main Street Retail

Alternative 2 (see page 15 for an illustration of the McLoughlin corridor under this alternative) proposes developing a multi-way boulevard along McLoughlin Boulevard to provide on-street parking and better pedestrian circulation that is separated from the McLoughlin Boulevard through lanes. Alternative 2 is a mixed-use development concept with less focus on high density housing than under Alternative 1. Under this alternative, one- to two-story mixed-use buildings are located along McLoughlin Boulevard, and along the sections of Torbank Road and Silver Spring Road directly west from McLoughlin. Some housing is located above retail, but most housing is behind the retail area, where it is screened from traffic noise. Housing densities are slightly lower than under Alternative 1, with more townhomes and two- to three-story apartments, except in the immediate vicinity of the station, where densities would be similar to Alternative 1.

Multiway Boulevard - Proposed Retrofit of a 5-lane Commerical Strip

The market analysis completed for the project stated that retail and commercial construction could be a long-term rather than a near-term possibility. For this reason, even if future zoning allows mixed-use development, residential uses will likely continue to be the predominant new uses in the area for the foreseeable future. The majority of retail parking is assumed to be on-street, with some on-site designated parking areas for residential areas.

Residential densities vary depending on location; residential uses are focused away from McLoughlin Boulevard and closer to existing neighborhoods. The highest residential densities are located near the station and along McLoughlin Boulevard. Buildings near the station would be structures up to four stories. Residential densities decrease closer to existing neighborhoods. Residential buildings between the new mixed-use corridor along McLoughlin and the existing neighborhoods include some apartments, but also include townhome units. As with Alternative 1, neighborhood corridors such as Park Avenue and Evergreen Road increase in density, providing for duplex, triplex, live/work units, and accessory dwelling units (which are already permitted under the existing zoning), but still retain neighborhood character. The Mixed-Use Neighborhood along River Road is the same as under Alternative 1. Housing types provide increased housing options for various demographics and support slightly higher residential densities than exist today.



Multi-Way Boulevard

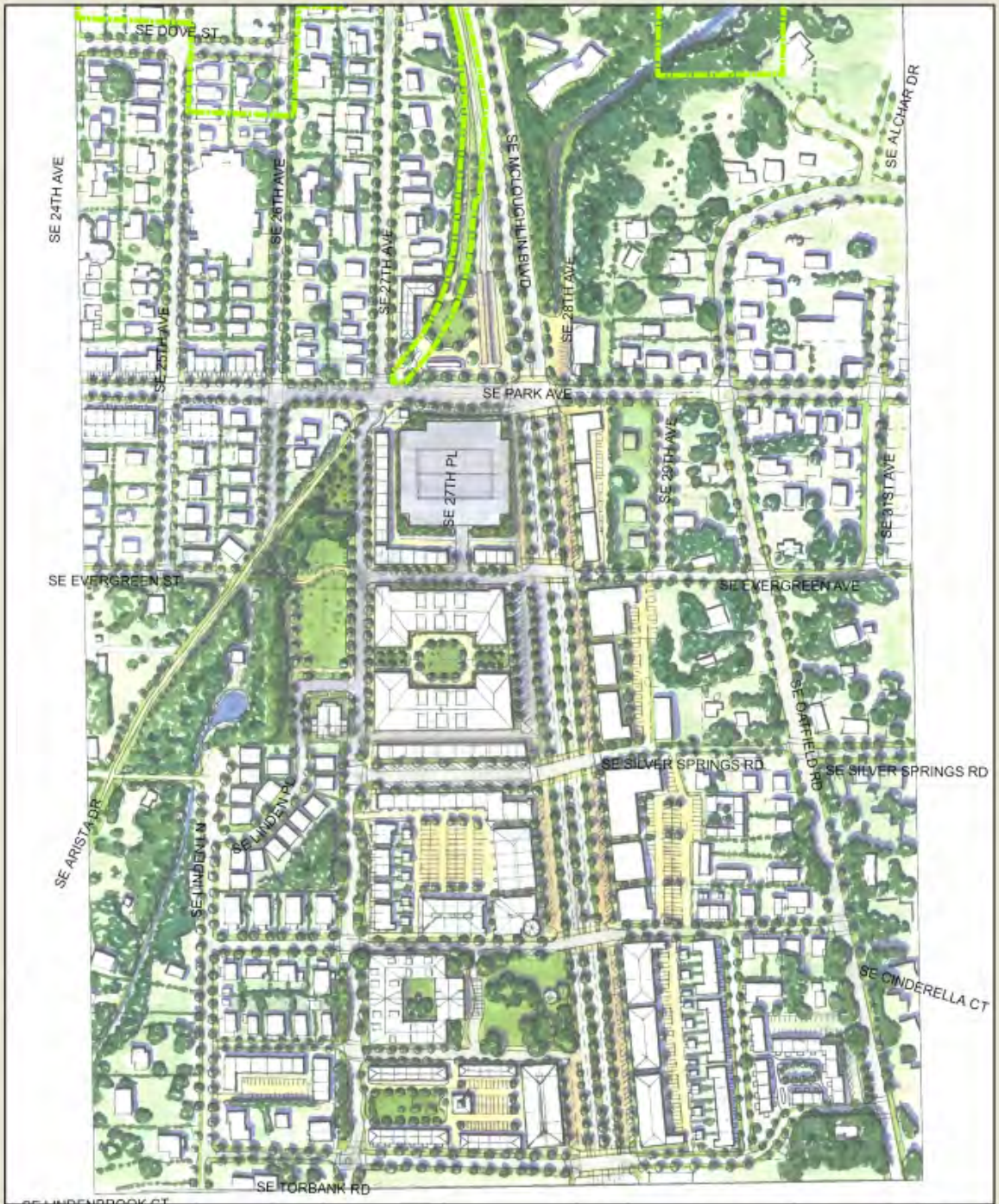
As with Alternative 1, open space is an integral part of this alternative, and zoning ordinances would have design and development standards for plazas, open space, and other recreation areas, as well as incentives, such as a density bonus, for park dedications.

Map 2: Alternative 1-Urban Housing Scenario with Parkway

0 150 300 Feet

N

Date: 6/8/2011



Map 3: Alternative 2-Main Street Retail Scenario with Multi-Way Boulevard

0 150 300 Feet

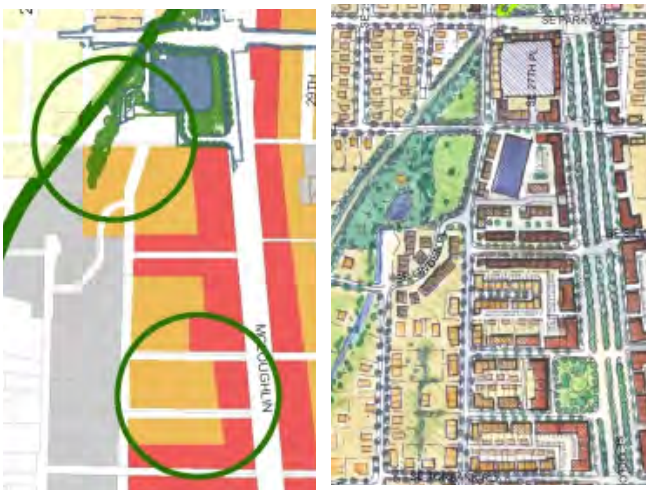
N

Date: 6/8/2011

Parks and Open Space

A primary goal of this project is to provide recreational opportunities and natural areas to support and revitalize natural resources in the area. Both alternatives identify opportunity areas where parks and open space could be provided. These areas could be dedicated or acquired for parks and open space, plazas, and activity areas that support the surrounding development. These areas also will integrate with current plans to improve the Trolley Trail and restore habitat as part of Urban Green's Nature in Neighborhoods grant and other grant money that may be available. In addition to the identified opportunity areas where new parks might be located, each alternative assumes that 20 percent of land would be provided for parks, open space, and plazas. Existing provisions in the Clackamas County Development Ordinance will also encourage developers to dedicate additional land for recreation areas in exchange for a density bonus, potentially increasing the amount of land dedicated to greenspace. Land for parks can also be consolidated with other dedications to provide larger areas, which is particularly important given the increased densities and the need to provide open space and recreation areas.

NCPRD's master plan states that there are few park facilities in the project area and identifies a need for a three-acre neighborhood park north of Park Avenue just to meet existing demand and meet NCPRD's target of nine acres of parks for every 1,000 people. The master plan also notes that the document does not identify potential locations or service areas for smaller parks such as pocket parks, open space, or land-banked areas for future park space.



The left image shows the proposed land use categories, with green circles indicating potential park opportunity areas. The right image shows how the land use designation informs development and what might occur for the same area when a percentage of land is set aside for parks.

Based on the anticipated population growth and additional new households that are proposed under the two land use alternatives, additional park space needed to meet the target of nine acres per 1,000 people is:

- Alternative 1 (Urban Housing) Scenario: 9.3 acres of parks needed, assuming 2.5 persons per household.
- Alternative 2 (Main Street Retail) Scenario: 6.6 acres of parks needed, assuming 2.5 persons per household.

These calculations are only for new households in the Station Community Boundary and do not include the existing identified deficiency, which would require additional parks within existing neighborhoods to meet the demand.

Each alternative assumes that it will meet the parks and recreation demand from new development by including larger parks (the alternatives identify approximately 6.3 acres of potential park space) in combination with smaller parks where land is available. The proposed park locations identified for both alternatives would use the existing resources as a base for the recreation facility, such as a strong connection to the Trolley Trail and Nature in Neighborhoods restoration area and the oak trees along McLoughlin Boulevard. Given that much of the project area is already developed, future dedications from developers will also play a key role in meeting the need for park space. Providing additional park space can boost property values and attract additional development. Clackamas County will need to consider policies to identify how development will interface with the Trolley Trail and what the expectations for park dedications will be.

Park space can also include community gardens, which are a desire of many of the area's residents. Given the large amount of unused pavement in the project area and the presence of active community organizations, there may be opportunities for community groups to work with landowners and de-pave some of those large paved areas for garden space or natural areas. This process has already occurred in several parts of the Portland Metro area. There may also be opportunities for reconsidering how future right-of-way is used. Providing slightly wider rights-of-way in key locations (such as the 27th north/south connector) could also accommodate narrow community gardens adjacent to the roadway.

Feedback on the Land Use Alternatives and Parks Assumptions

The land use alternatives are based on the early concepts developed from the public design workshop, and are guided by the project's goals, evaluation criteria, and related McLoughlin Area Plan guiding principles. Both alternatives have support, although specific issues have been raised for both, including:

- The market analysis supports the housing densities as proposed in both alternatives, but does not support the amount of retail/commercial space identified in Alternative 2 (Main Street Retail).

- Both the parkway and multi-way boulevard options for McLoughlin are good options, but right-of-way costs and the impact to property owners should be considered. The Parkway treatment will require more right-of-way than the multi-way boulevard, and the amount of this additional right-of-way is dependent on the amount of parkway provided.

- Impacts to natural areas along the Trolley Trail should be minimized, including any vehicular crossings or impacts from nearby development. Policies and zoning language will need to be included in the final plan to meet this goal.

- The alternatives need to provide adequate park space under either alternative. This space should include larger parks with amenities and smaller pocket parks in the neighborhoods. Future development should be integrated into a park network, with incentives for developers to dedicate additional open space. Also, provide community gardens.

- Housing should be owner-occupied and well-designed. The area needs to be community-oriented and family friendly.

- Businesses need to be small scale and focused on the neighborhood (small grocers, coffee shops, cafes, etc.). There are limited jobs in the area right now, and there are existing needs that businesses could fill, such as healthcare and services for area residents.

- To encourage entrepreneurship and local opportunities, light industrial/flex space uses should be considered.

Comparing the Alternatives

Table 1 compares the estimated acreage by land use category for each alternative. Each alternative is a scenario that assigns a particular land use to an area to determine how it might affect the existing and proposed transportation system and to help the project team and advisory groups identify which components are the most important to include in a preferred alternative to be developed later in the project. The land use categories below are not proposals for new zones; rather, they are density and development assumptions for how an area might develop. Maps 4 and 5 identify the land use categories within the Station Community. When the recommended alternative (which may be a combination of both alternatives) is selected, appropriate zoning will be identified that implements the selected vision. All of these areas would include a combination of parks, open space, and plazas.

Table 1. Estimated Acres, Retail/Commercial Square Footage, and Dwelling Unit by Alternative

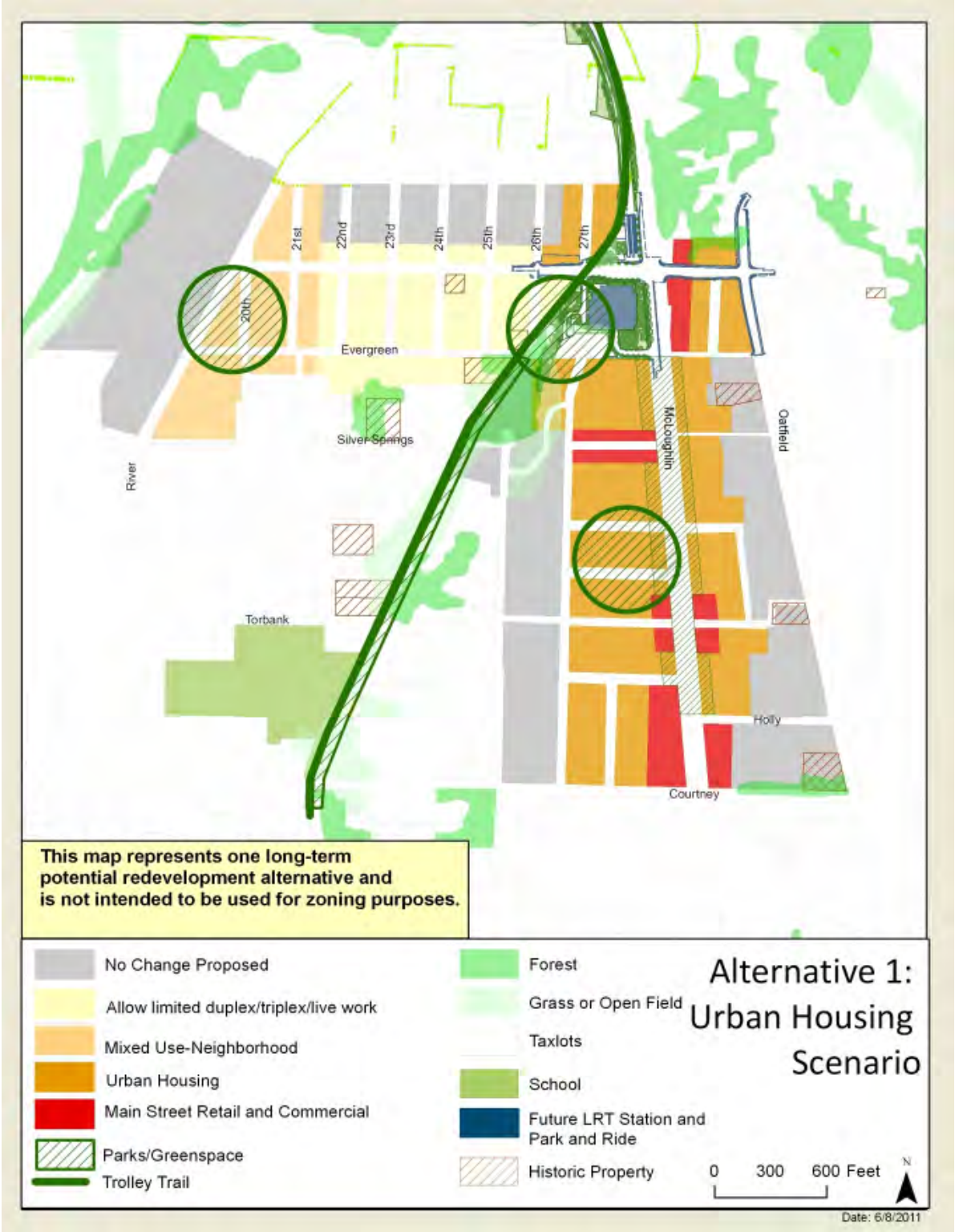
	Total Acres		**Percent of Station Area**	
Land Use Category	Alt. 1	Alt. 2	Alt. 1	Alt. 2
Station Community Boundary	128.7	128.7		
No Change Proposed within Boundary	59.5	59.5	46%	46%
Duplex/Triplex/Live Work	14.9	14.9	12%	12%
Mixed-Use Neighborhood	10.5	12.6	8%	10%
Urban Housing	34.4	23.1	27%	18%
Main Street Retail	9.5	18.6	7%	14%
			100%	100%

Note: The Station Community Boundary acreage shown above does not include acreage where future rights-of-way would be located. The total gross acreage within the Station Community Boundary is approximately 141 acres.

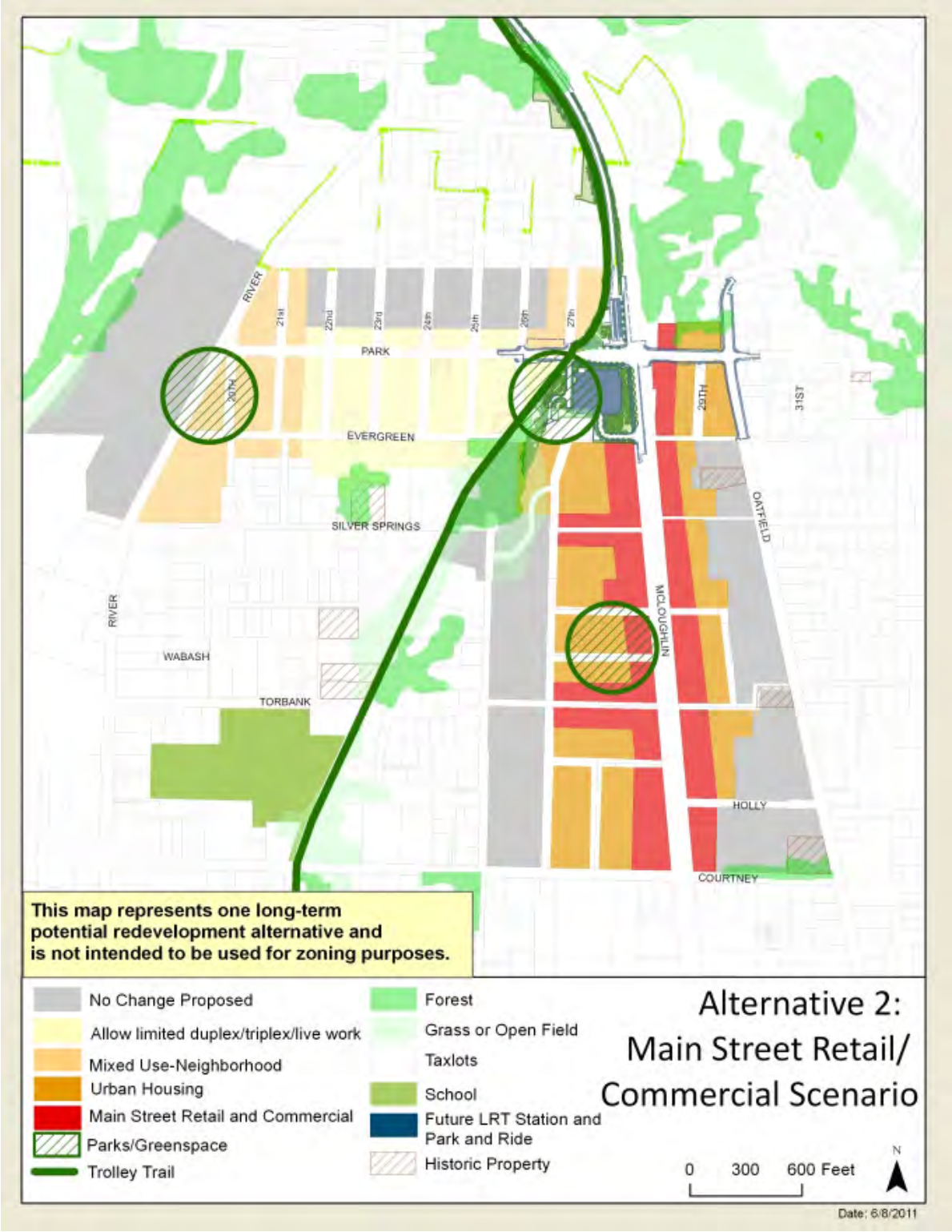
The total area within the proposed Station Community Boundary is approximately 129 acres, not including land that would be dedicated as existing or new public rights-of-way to support the anticipated development pattern. Almost half of the proposed Station Community Boundary would retain its current residential zoning (see Attachment A for existing zoning). Much of the multifamily areas are constructed with apartments, manufactured home parks, and duplexes, though some areas within the MR-1 zone retain single-family detached homes. No changes are proposed to those single-family home uses, but a landowner could convert those properties to higher density uses under the existing MR-1designation.

Alternative 2 places greater emphasis on Mixed-Use Retail and Commercial, with approximately 19 percent of the Station Community acreage for that use compared to less than 10 percent in Alternative 1.

Map 4. Alternative 1 (Urban Housing Land Use Scenario)



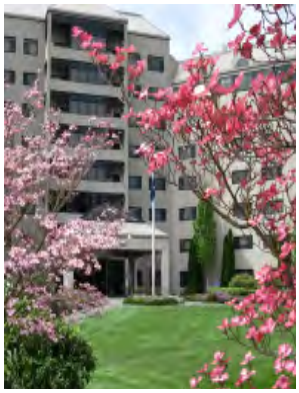
Map 5. Alternative 2 (Main Street Retail Land Use Scenario)



Land Use Categories

Areas Where No Land Use Changes Are Proposed

These areas serve as buffers between existing residential uses and higher density land uses placed along the primary transportation corridors under both alternatives. Generally, these areas are already developed with apartments and attached homes, or cottage style homes in a medium density zone along McLoughlin Boulevard, Oatfield Road, and Linden Lane (with zoning densities between 12 and 15 units).



The left image shows construction of compact residential development on Linden Lane that is allowed under the current MR-1 zoning. The right image shows the existing high density development pattern on River Road.

Large lots with single-family homes could develop with higher density uses, but are not required to do so. High density residential areas located along River Road would also remain the same as today. Existing zoning permits residential development up to 25 units per acre. The majority of these areas are already developed, but there may be some opportunity for infill in these areas within the context of the existing zoning (see Attachment A).

Duplex/Triplex and Live/Work Units

There are stable, primarily single-family neighborhoods located between River Road and McLoughlin Boulevard. Preserving these neighborhoods is an important part of both alternatives, but there may be some opportunity to provide additional housing in this area.

Top: Townhouses and homes converted to live/work units. Bottom: Compact homes with porches and a strong neighborhood-focused design.

Both alternatives would allow duplex, triplex, and live/work units on lots fronting Park Avenue and Evergreen Street. On-street parking or alley access would be provided. Overall, housing densities would not be increased significantly because of the limited infill potential within this area, but where feasible, both alternatives provide landowners the opportunity to take advantage of the light rail station.

Mixed-Use Neighborhood

A mixed-use neighborhood is located along River Road between Park Avenue and Silver Springs Road, adjacent to the high density residential development that already exists along the River Road corridor. While this development pattern is not assumed to be at the densities proposed along the McLoughlin corridor, it does take advantage of the high density residential developments in the area and the existing transportation corridors that provide good circulation.

The Mixed-Use Neighborhood includes apartments and limited retail mixed use, such as a coffee shop or small retail uses to support existing and future residents. Cottage style homes would be permitted in this area. This development style provides for several small homes surrounding a central common area and is often targeted for empty nesters, small families, or retirees. Cottage style development would preserve a single-family residential environment, would provide more housing options for various demographics, and would support slightly higher residential densities than exist today. Assumed residential densities would be between 12 and 15 units per acre.

Above: A cottage style home. Below: A cottage style home community under construction in SE Portland. All parking is on-street, with covered bicycle and community facilities located in a central area.

Urban Housing

Mixed-use high density housing is focused along the McLoughlin corridor, with residential densities varying depending on the proximity to existing development and mixed-use retail that will support the existing neighborhoods and new residential areas. The highest residential densities are located near the station and along McLoughlin Boulevard, and buildings are potentially up to four-story mixed-use apartments and attached townhomes that support Station Community densities. Assumed densities within this area are 20 to 40 units per acre.

High density housing can be provided in a variety of forms, including townhouses and apartments and mixed-use structures.

Main Street Retail and Commercial

Each alternative proposes neighborhood scale mixed-use commercial and retail areas (such small offices, coffee shops, and a medical clinic) that support the surrounding development. Both alternatives have a mixed-use retail and commercial area, incorporating housing that is either adjacent to or incorporated into a multi-story structure. This area is a central component of both alternatives. Retail spaces would be geared towards smaller businesses rather than being a typical strip commercial development. Design requirements and building footprint limitations would also restrict "big box" development and auto-oriented uses (car lots, gas stations, and drive-throughs) that are not compatible with the pedestrian-oriented development pattern.

Mixed-use retail and commercial development would be one-to two-story structures. The key factors are walkability, pedestrian interest, and on-street parking to support retail.

Development Program

Both alternatives were evaluated to determine how the area might develop, based on the proposed land use categories for each alternative. Several factors were taken into account when determining how much development might occur, which included:

- Assumptions were made about which parcels might redevelop completely, as opposed to having the existing structures rehabilitated. Where existing structures are assumed to be rehabilitated (such as the shopping center at the corner of McLoughlin and Courtney), no additional density or change in use was assumed.
- Recently built structures such as the Fred Meyer gas station and the "Castle" mini mall are assumed to remain as they are today.
- Assumptions were made for the level of redevelopment that might actually occur. For example, 70 to 100 percent of the area along McLoughlin is assumed to redevelop, while only 15 percent of areas with neighborhoods might redevelop.
- Of the remaining land identified as a potential redevelopment area, 20 percent was removed for new parks and open space and gathering areas, while 15 percent was dedicated to parking and interior circulation. This assumes that on-street parking will be available to provide additional parking near retail areas.
- All proposed road rights-of-way were removed from the potential development program before calculating development potential. No additional land was removed for roads.
- Average residential densities per acre were used to calculate the number of residential units rather than assuming high or low units per acre numbers. Residential densities vary by location.

Development potential is a long-term as opposed to a short-term assumption (20 year time frame). Little new development is expected to occur in the near term, although some existing structures could be rehabilitated. This methodology resulted in the total square footage for various uses and the number of

residential units that might be generated under the proposed land use alternatives. Potential development assumed under Alternative 1 is based on the findings of the *Economic and Redevelopment Memorandum* (Leland, 2011) that assessed potential redevelopment along the McLoughlin corridor and within one-half mile of the Park Avenue light rail station.

Alternative 2 is *not* based on a market study, and focuses on retail and office development that may take much longer to develop than Alternative 1 given the existing excess amount of commercial land in the corridor. Alternative 2 also provides a "bracket" for understanding how a potential development pattern might affect traffic in the area. Development assumptions under this alternative also assume some two-story structures that provide ground floor retail with commercial/office above. Two-story structures could also be exclusively commercial or office depending on the market needs for the area.

The total estimated retail and commercial square footage and dwelling units for each alternative are shown in Table 2.

Table 2. Net New Development Potential by Alternative

Alternative	Acres (Gross) with Land Use Changes	Area (Square Feet)	Net Buildable Land (Acres)	Retail Square Footage	Commercial/Office Square Footage	Dwelling Units
Alternative 1	69.2	3,016,079	44.2	109,965	18,343	410
Alternative 2	69.2	3,015,514	44	267,681	69,808	302

Both alternatives provide the same amount of gross acreage and net buildable land because the proposed circulation system and Station community boundary is the same for both alternatives. Overall, Alternative 1 provides about 30 percent more housing units than Alternative 2. Alternative 2 would provide more than twice the retail and commercial/office space than Alternative 1. These uses are focused along the McLoughlin corridor and the new internal east-west connections.

The primary difference between Alternative 1 and Alternative 2 is the amount of housing, retail, and commercial each alternative includes. Alternative 1 focuses on higher density housing with some retail and commercial uses to support existing and new residents. Approximately 34 percent of the Station Community is designated for mixed-use high density housing under Alternative 1 compared to approximately 23 percent under Alternative 2. Alternative 2 places greater emphasis on main street retail and commercial, with approximately 19 percent of the Station Community acreage compared to less than 10 percent in Alternative 1.

Traffic Analysis

Note: The traffic information described below is preliminary and may be refined as the modeling is completed for the Park Avenue project area.

Six alternatives were evaluated as part of the Park Avenue Station Area Plan traffic analysis. All assumed the multi-way boulevard and additional street network. The six alternatives are composed of three land

use options (No Build, Land Use 1, and Land Use 2, described below) paired with two traffic control options (two new signals, one new signal) and compared to baseline conditions. Baseline conditions include 2035 No Build volumes applied to the existing geometric lane configuration. This summary provides the preliminary results of the traffic analysis and how the six alternatives function related to jurisdictional standards.[2]

Network

A multi-way boulevard concept for McLoughlin Boulevard was investigated for traffic operations and circulation along the McLoughlin Boulevard corridor between the intersections of River Road and Courtney Avenue. The analysis considers the existing cross section and lane configurations, and additional side street connections to provide a better network for bicycle, pedestrian and vehicular circulation, and combines access to and from side lanes between cross streets.

In addition to the multi-way boulevard, the project proposes creating a local circulation system that creates a more interconnected network. Most notable are the three new east-west connections across McLoughlin Boulevard: Silver Springs Road, Cinderella Road, and Torbank Road. The network is an important base to facilitate pedestrian connections and to provide access to the future transit station as well as vehicular access to adjacent businesses. To facilitate additional crossing opportunities on McLoughlin Boulevard, which is currently a barrier for pedestrians and bicyclists to cross, two traffic control options were evaluated between Park Avenue and Courtney Avenue:

Traffic Control Option 1: The first traffic control option builds on the No Build geometry[3] and would add two new traffic signals at the intersections of the newly constructed east-west connections at Silver Springs Road and Torbank Road. These two new signals would effectively reduce the existing signal spacing from 2,800 feet (Park Avenue to Courtney Avenue) to approximately 900 feet, or approximately four city blocks. This change would provide better crossing opportunities of McLoughlin Boulevard for pedestrian and bicycle traffic, which is crucial to supporting the new Park Avenue transit station.

Traffic Control Option 2: The second traffic control option builds on the No Build option and would add one new traffic signal at the new east-west connection of Cinderella Road. A traffic signal at this location will reduce the current signal spacing between Park Avenue and Courtney Avenue from 2,800 feet to 1,400 feet. Although it is an improvement over the existing crossing opportunities, from a neighborhood and pedestrian access perspective this option is less appealing than traffic control option 1.

While traffic control option 1 is preferable from a neighborhood-feel perspective, it comes with trade-offs, specifically what it might mean to through-vehicular traffic that uses the McLoughlin Boulevard corridor as a link between the City of Portland and nearby cities. On similar facilities, traffic signal spacing is generally recommended to be no shorter than one-half mile, though shorter spacing can be considered. Installation of traffic signals requires significant consideration for all modes as well as approval by the state traffic engineer. This evaluation does not guarantee any signal placement along the McLoughlin Boulevard corridor.

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[2] Jurisdictional standards: The volume-to-capacity (v/c) ratio for existing intersections is 1.1 for the first hour (Oregon Highway Plan), while the v/c ratio for new intersections is 0.75 (Highway Design Manual Table 10-1).
[3] The No Build geometry assumes all planned projects in the 2035 Metro Regional Transportation Plan.

Trip Generation

Three land use options were considered in this analysis: No Build, Land Use Scenario 1, and Land Use Scenario 2. The No Build option assumes the retention of the existing commercial zoning. The two land use options consider different land use patterns than the current zoning. Land Use Scenario 1 is focused on providing primarily housing in the corridor, while Land Use Scenario 2 also assumes a more traditional mixed-use development pattern and includes more retail and office space. The resulting changes in area for the two major land use types are shown in Table 3.

Table 3. 2035 Trip Generation for Land Use Scenarios 1 and 2

	PM Peak Hour					
	No Build		Alternative 1 (Urban Housing)		Alternative 2 (Main Street Retail)	
	Area	Trips	Area	Trips	Area	Trips
Land use type						
Single Family	290 units	274	1,285 units	1,046	805 units	687
Shopping Center	1,191,932 square feet	3,347	289,064 square feet	1,296	864,448 square feet	2,699
Trip Reduction: Pass-by (19-29%) **		-636		-376		-567
TOD Reductions (0-30%)		0		-590		-846
Total		**2,985**		**1,376**		**1,973**

Source: David Evans and Associates, Inc. Trip estimates from the ITE Trip Generation Manual.

Internal trips were calculated with the methodology used in Chapter 7 of the ITE Trip Generation Handbook, 8th edition.

**Pass-by trips were calculated with the methodology used in Chapter 5 of the ITE Trip Generation Handbook, 8th edition. The associated pass-by percentage is calculated from the fitted curve equation in figure 5.5.

The future trip generation estimates for Alternative 1 and 2 were compared to the No Build condition to determine whether more or fewer trips will result. In this case, fewer trips are estimated to occur with the proposed land use options compared to the No Build condition. Land Use Scenario 1 estimates would result in the fewest total trips for the project area (approximately 1,609 fewer than No Build); while Land Use Scenario 2 estimates would result in approximately 1,973 trips (1,012 fewer than No Build).

Traffic Evaluation and Preliminary Results

The traffic evaluation looked at a variety of measures including: volume-to-capacity (v/c) ratios, delay, queuing, signal progression, and corridor travel time and speeds. For operations (v/c ratio, level of service (LOS), and queuing), the (No Build, Land Use Scenario 1, Land Use Scenario 2, one signal, and two signal) alternatives were compared to each other in order to evaluate the transportation impacts. A comparison with the baseline scenario was made for signal progression, corridor travel times, and speeds. The following is a summary of the analysis:

Two New Signals

- With the future 2035 No Build land use option, four of the project area intersections would operate at or over capacity. Of the four intersections, two are existing (Park Avenue [v/c ratio=1.05] and Courtney Avenue [v/c ratio=1.09]) and two are new (Silver Springs Road [v/c ratio=1.27] and Torbank Road [v/c ratio=1.19]).
- The future 2035 Land Use Scenario 1 estimates a reduction in vehicle trips generated for the project area compared to the No Build option. The reduction in vehicle trips would result in zero intersections operating at capacity. The Park Avenue and Courtney Avenue intersections would be near capacity with v/c ratios at 0.98, closely followed by the near intersections of Silver Springs and Torbank with v/c ratios of 0.96 and 0.92, respectively.
- The future 2035 Land Use Scenario 2 estimates a project area trip generation midway between that calculated for the No Build option and the Land Use Scenario 1 option. The resulting operations would be similar to but slightly better than the operations under the No Build option. Specifically, four total intersections would operate at (or over) capacity; of the four intersections, two are existing intersections (Park Avenue [v/c ratio=1.03] and Courtney Avenue [v/c ratio=1.08]) and two are new intersections (Silver Springs Road [v/c ratio=1.18] and Torbank Road [v/c ratio=1.16]).
- No mitigation was identified for either the Land Use Scenario 1 or Land Use Scenario 2 options, because they would operate better than operations reported for the No Build option.
- Signal progression along McLoughlin Boulevard was evaluated for all three future land use options. All three future land use options would have decreased through-traffic bandwidth when compared to baseline conditions.
- The majority of the southbound congestion would be experienced north of Park Avenue for all options.

One New Signal

- With the future 2035 No Build option, three of the project area intersections would operate at (or over) capacity; of the three intersections, two are existing (Park Avenue [v/c ratio=1.05] and Courtney Avenue [v/c ratio=1.09]) and one is new (Cinderella Road [v/c ratio=1.48]).
- The future 2035 Land Use Scenario 1 option estimates a reduction in project area vehicle trips generated compared to the No Build option. Cinderella Road, a new intersection in the project area, would operate above capacity (v/c ratio=1.14).
- The future 2035 Land Use Scenario 2 option estimates project area trip generation midway between that calculated for the No Build option and the Land Use Scenario 1 option. The operational results would be similar to but slightly better than the operations under the No Build option. Three intersections would operate at (or above) capacity; of the three intersections, two

are existing (Park Avenue [v/c ratio=1.03] and Courtney Avenue [v/c ratio=1.08]) and one is new (Cinderella Road [v/c ratio 1.46]).

- No mitigation was identified for either the Land Use Scenario 1 or Land Use Scenario 2 options, because they would operate better than operations reported for the No Build option.
- Signal progression along McLoughlin Boulevard would result in decreased through-traffic bandwidth for all three 2035 land use options over baseline conditions.
- The majority of the southbound congestion would be experienced north of Park Avenue for all options.

Overall, the system operations would see the biggest improvement if Land Use Scenario 1 were combined with the two new signals option. For all six alternatives, congestion along McLoughlin Boulevard in the southbound direction is primarily experienced north of the Park Avenue intersection. Once through the Park Avenue intersection, signal progression is moderately good and traffic flows fairly smoothly regardless of the number of additional signals within the project area.

Operations and 95th percentile queuing were evaluated for all project area intersections. Additionally, corridor travel time and speed were evaluated for McLoughlin Boulevard (River Road to Courtney Avenue), River Road (McLoughlin Boulevard to Courtney Avenue), and Oatfield Road (Park Avenue to Courtney Avenue). Along McLoughlin Boulevard, preliminary signal warrants and signal progression were also evaluated.

For each of the alternatives, the new east-west connections along OR 99E at Silver Springs, Cinderella, and Torbank are assumed as local streets with a single travel lane in each direction. The new connections draw trips that would normally use the existing OR 99E connections at Park and Courtney Avenues, resulting in a need to further assess, and possibly refine, the roadway classifications and cross sections assumed for this analysis.

Cost of Improvements

Both of the land use alternatives propose the same local circulation plan to provide improved connectivity within the project area, and this circulation plan is an essential element for creating a successful development environment. While financing for these improvements could be from public or private development alone, some initial investments will almost certainly need to be publicly financed, while some improvements could be constructed through public/private partnerships. The proposed street improvements and their associated costs are described in Table 4 and illustrated on Map 6. Estimated project costs include purchase of additional right-of-way.

These connections will improve access to the light rail station, commercial areas, and neighborhoods and will begin to create a block pattern that is more conducive for pedestrians. The improvements to McLoughlin Boulevard are phased in order to break up construction costs, but early commitments to complete these improvements will improve the pedestrian environment and begin to change the character of the corridor.

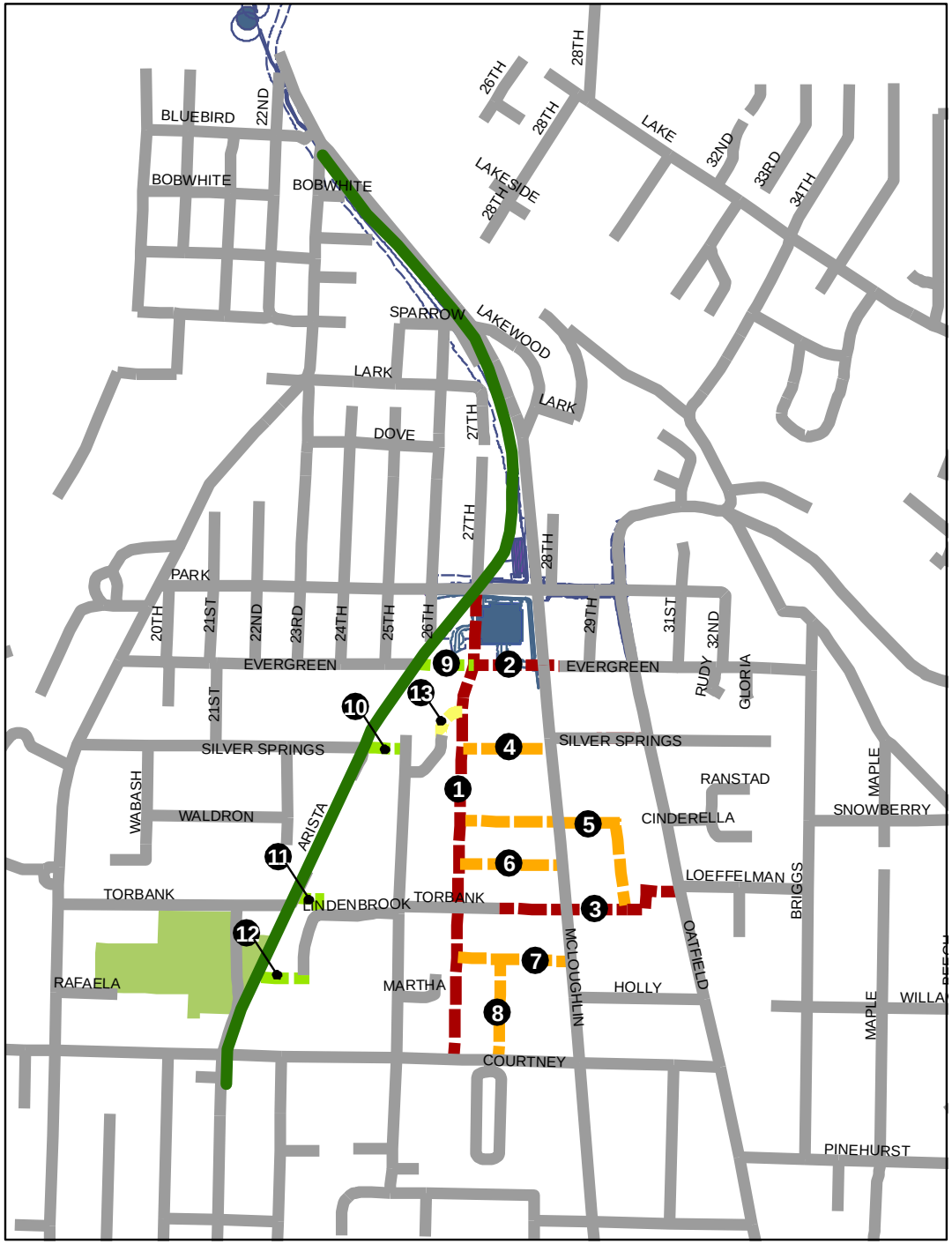
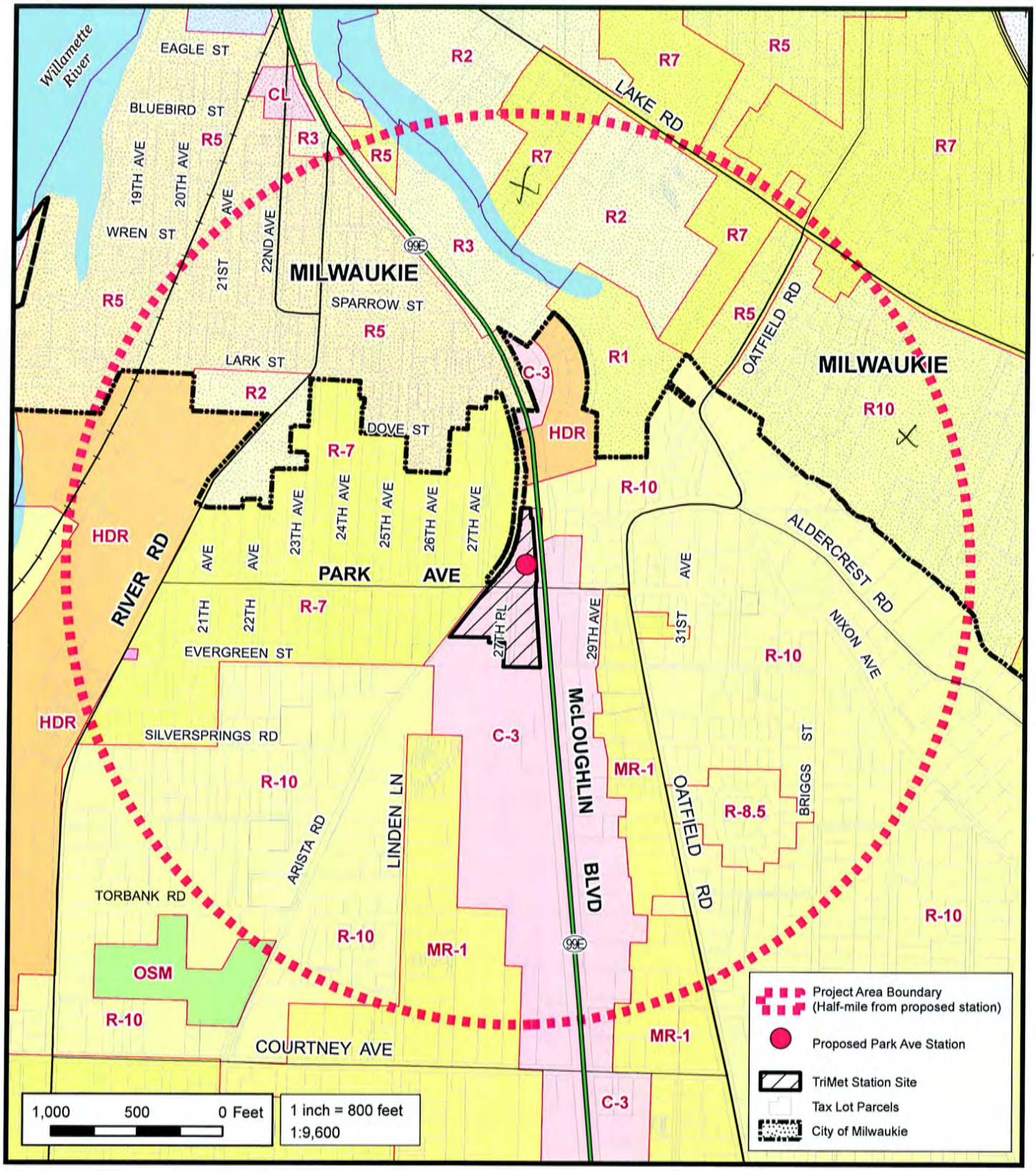


Table 4. Estimated Cost for Proposed Road and Path Construction

Segment Number (See Map 6)	*Priority*	*Description*	*Road Type*	*Estimated Cost with New R/W*
1	Short	27th Avenue Extension	Two-Lane Street	$7,858,000
2	Medium	Evergreen Extension	Two-Lane Street	$1,172,000
3	Short	Torbank Extension	Two-Lane Street	$1,458,000
4	Short	Silver Springs Extension	Two-Way Sharrow	$1,715,000
5	Medium	New East/West Road (Cinderella)	Two-Way Sharrow	$4,067,000
6	Long	New East/West Road (south of Cinderella)	Two-Way Sharrow	$1,543,000
7	Long	New East/West Road (south of Torbank)	Two-Way Sharrow	$1,731,000
8	Long	North/South Local Access Road	Two-Way Sharrow	$1,572,000
9	Medium	Evergreen Multi-Use Path	Multi-Use Path	$318,000
10	Medium	Silver Springs Multi-Use Path	Multi-Use Path	$194,000
11	Medium	Torbank Multi-Use Path	Multi-Use Path	$173,000
12	Medium	Multi-Use Path (south of Torbank)	Multi-Use Path	$240,000
13	Medium	Linden Lane Connection	Skinny Street	$679,000
	Short	McLoughlin Boulevard Phase 1	Median Island	$626,000
	Medium	McLoughlin Boulevard Phase 2	Shoulder Islands & Resurface Existing	$3,824,000
	Medium/as development occurs	McLoughlin Boulevard Phase 3	Side Streets & Parking	$4,736,000
			Total Cost	*$31,906,000*

Attachment A: Existing Zoning Map



CLACKAMAS COUNTY

CLACKAMAS COUNTY DESIGNATIONS:
Single-Family Residential, 7,000 sq ft min (R-7)
Single-Family Residential, 8,500 sq ft min (R-8.5)
Single-Family Residential, 10,000 sq ft min (R-10)
Medium-Density Residential District (MR-1)
High-Density Residential (HDR)
Open Space Management (OSM)
General Commercial (G-3)

CITY OF MILWAUKIE DESIGNATIONS:
Single-Family Residential (R-1, R-2, R-3, R-5, R-7, R-10)
Limited Commercial (CL)

Park Ave Study Area

EXISTING ZONING

FIGURE 5

February, 2011

Attachment B: Advisory Groups and Public Comments Matrix

A	Character of Place; Land Use & Preservation			
	Comments	**Response & Recommended Action**	**Meeting / Notes**	**Evaluation Criteria & (Guiding Principles) (1)**
1.	Highlight historic structures in area.	Structures that are on the county and/or state inventories are identified on the land use map.	Walking Tour	
2.	Maintain nice, stable older neighborhoods	Plan is to retain older neighborhoods. *(Add acreage estimate of area considered for new zoning.)*	Walking Tour	
3.	Consider Park Avenue as a node.	Plan focuses on Park/McLoughlin to activate the light rail station area and integrate w/ Trolley Trail. LRT & parking structure will dominate west side of intersection, so "node" for this plan continues south on McLoughlin (area for redevelopment) and west to node River Road.	SAG 1	
4.	Plan how to attract a Trader Joe's, New Season's or other more upscale store in station area.	Improve business environment with design standards and allowed uses. Provide for higher density residential.	SAG 1	
5.	Avoid gentrification. Descriptive language needs to reflect regular lives.		SAG 2	
6.	Make an area of interest, show where people want to go, and create pride in the neighborhood.		SAG 2	
7.	Need better understanding of different types of density.	Provide pictures of developments at varied densities (local examples where possible)	SAG 3	Ia1 (C1) Id1,2,3 (D2) Id2 (E1) Id3 (D5) IIa1 (D1) IIIa1,2,5 (C4)
8.	Plan lacks needed community services.	Draft policy in implementation plan to seek public/private partnerships to identify specific needs, and to plan for and build facilities to serve the area.	SAG 3	IIa1 (C5) IIIa1 (C3) IIIa1,2,5 (C4)
9.	Concepts lack parks, open space, green, urban farms.	Draft policy in implementation plan will be to engage North Clackamas Parks & Rec District in planning for parks and open space in area. Coordinate with available grant opportunities (such as, Nature in Neighborhoods)	SAG 3	Ia1 (C1) Id1,2,3 (E3) IIa1 (C5) IIIa1 (C3) IVa1 (F1)
10.	Station area also is a gateway to the community and this is a chance to go beyond the market study and create crazy ideas.		SAG 3A	
11.	Zoning code may target prohibited uses, but it would still be critical to let the market work.		SAG 3A	

(1) See Attachment A, **Park Avenue Station Area Project Evaluation Criteria and Attachment B, McLoughlin Area Plan Guiding Principles**
*SAG: Project Stakeholder Advisory Committee

A	Character of Place; Land Use & Preservation			
	Comments	**Response & Recommended Action**	**Meeting / Notes**	**Evaluation Criteria & (Guiding Principles) (1)**
12.	Instead of restricting uses, more uses should be allowed.		SAG 3A	
13.	Light manufacturing may be something to allow.		SAG 3A	
14.	If there's a market for taller buildings, then those could be developed. Higher buildings would have advantage of views to river and downtown.		SAG 3A	
15.	♦ Incorporate "localism" to take advantage of what is here . ♦ A local economy is best.		SAG 3A	
16.	There needs to be a large enough area in the zone to accommodate the desired uses.	*Add info on acreages in mixed-use area along McLoughlin. Note topographic challenges.*	SAG 3A	
17.	The area needs a community center	See Comment A9.	SAG 3A	
18.	♦ Plan for nodes down McLoughlin. ♦ Plan should focus on nodes. ♦ It's the type of node directed toward the station ♦ Not against high density, but wants active, well-serviced nodes. ♦ Maximize development at a smaller scale (focus on nodes).		SAG 3A	
19.	♦ There's no activity here. ♦ There needs to be a draw to the area, but nothing in the alternatives provides that.		SAG 3A	
20.	♦ Plan seems to lack a place for people to make a living in the area. ♦ There still would not be a place for people to make a living in the area. ♦ People may be provided vouchers to live in housing, so people have a place to live, but no jobs.	The types of uses proposed to be allowed in the area include commercial, services (medical clinics), office, light (or limited) manufacturing, and residential. The proposal for a mixed-use zone would support numerous types of jobs.	SAG 3A	
21.	Do not plan to build what's not needed.		SAG 3A	

(1) See Attachment A, **Park Avenue Station Area Project Evaluation Criteria and Attachment B, McLoughlin Area Plan Guiding Principles**
*SAG: Project Stakeholder Advisory Committee

B	Circulation and Transportation			
	Comments	**Response & Recommended Action**	**Notes**	**Evaluation Criteria & (Guiding Principles)**
1.	♦ East and west connectors play a strong role in the area. ♦ Lack of ped/bike connectivity – support building stronger connections ♦ Lack of neighborhood connection to commercial area.		Walking Tour	
2.	Prefer to keep traffic connectors as they are today.		Walking Tour	
3.	McLoughlin: Explore possibility to reduce speed. This could necessitate speed reductions on River and Oatfield Roads.	ODOT is just starting to discuss "pedestrian level of service" & appropriate posted speeds on highways in station areas.	Walking Tour	
4.	McLoughlin: Pedestrian crossing is death-defying.		Walking Tour	
5.	Avoid impacts on historic landmarks by new streets.	Street plan revised to protect historic structure adjacent Trolley Trail. No land uses changes proposed for sites with historic structures.	SAG 3	IIa1 (D1)
6.	Consider what is needed for car-free neighborhood.	Provide well-connected streets for emergency access, golf-carts; walking & biking.	SAG 3	Id2, IIa1-2, IIc2 (B1-B5)
7.	McLoughlin: Assume excellent future transit along highway.	According to the Regional Transportation Plan (RTP), the highway is candidate for High Capacity Transit.	SAG 3	IVa1 (F1)
8.	Could the Castle property be used as a main street?		SAG 3A	
9.	Park Ave: Is on-street parking possible?	Power lines on south side of Park Ave. may limit improving more right-of-way to add on-street parking. Park Ave has bike lanes, per adopted Bicycle Master Plan, and those would likely need to be relocated to get on-street parking.	SAG 3A	
10.	McLoughlin: If there's more traffic congestion in future, then removing driveways could negatively affected private properties	If the number of individual driveways is reduced and traffic collects onto the new side streets, then the street design change may <u>not</u> worsen congestion on McLoughlin.	SAG 3A	
11.	Evergreen: Issue with the concept of extending Evergreen across the Trolley Trail. ♦ The Trolley Trail goes by historic homes, and adding a street to the side of the home would be a problem. ♦ The Evergreen neighbors do not want a street extension. Park Avenue is just a block away to connect to McLoughlin Boulevard	*Impact to Nature in Neighborhood project.* *Opinions from NCPRD and OLSD about trail and creek crossings.*	SAG 3A	

(1) See Attachment A, **Park Avenue Station Area Project Evaluation Criteria and Attachment B, McLoughlin Area Plan Guiding Principles**
*SAG: Project Stakeholder Advisory Committee

C	Natural Areas, Habitat and Open Space			
	Comments	**Response & Recommended Action**	**Notes**	**Evaluation Criteria & (Guiding Principles)**
1	Support re-vegetation project to reclaim the natural vegetation along Trolley Trail		Walking Tour	
2	Topography is a constraint in the area. Make sure topographic features are considered.		Walking Tour	
3	The "start" (new development) should not be characterized as small, but rather as eco-restoration, like that being accomplished with the nature in neighborhoods project.		SAG 2	
4	Protect and enhance habitat in plan area.	Comply with mitigation requirements, development transfer and other standards for Habitat Conservation Areas, Riparian Areas, wetlands, and other natural areas.	SAG 3	Id2 (E1-E3)
5	Provide public access to Willamette River.	To be investigated in MAP process.	SAG 3	Id2 (E2)
6	None of the green areas/habitat that previously had been envisioned, and that the purpose appeared to be just to maximize development. Lack of green areas on maps	Comments referred to draft alternative maps used as base for calculating acreage of each type of "land use." Subsequent concept maps included green and natural areas foreseen through new park locations, landscaping, and buffers.	SAG 3A	
7	Concern that extending Evergreen across the Trolley Trail would take out 100-year old trees. The area recently got the Nature in Neighborhoods project to add natural areas, but then this plan would come in and take out trees.	Propose ped/bike path crossing of trail at Evergreen.	SAG 3A	
8	Do not take out old trees.		SAG 3A	
9	♦ Proposed idea for "set asides" for natural areas; concentrate development in certain places and leave the rest. ♦ Critical from the beginning with the NIN grant approval that ecosystems be restored in the area ♦ Need to save existing natural areas. Be aligned with MAP1 ♦ Need to plan for areas of green to connect through the area. ♦ Set aside special places in area. ♦ Show where there would <u>not</u> be development to provide space for woods.	Work with North Clackamas Parks & Rec District about planning for parks (need, process to locate site, funding). Added graphic illustrating green connections along streets and paths. Identifying park areas may come at a cost to purchase parcels with existing houses, but the benefit could be an improved values to houses in the area	SAG 3A	

(1) See Attachment A, **Park Avenue Station Area Project Evaluation Criteria and Attachment B, McLoughlin Area Plan Guiding Principles**
*SAG: Project Stakeholder Advisory Committee

C	Natural Areas, Habitat and Open Space			
	Comments	**Response & Recommended Action**	**Notes**	**Evaluation Criteria & (Guiding Principles)**
10	With more people in the area, more green space will be needed	Could require very low density or clustering buildings. Involve NCPRD & forward park ideas into District's parks master plan (work to begin in 2012).	SAG 3A	

D	Economic Development / Implementation			
	Comments	**Response & Recommended Action**	**Notes**	**Evaluation Criteria & (Guiding Principles)**
1.	Address the location of the Elks Lodge. It provides many public amenities and draws a local & national population that should be considered during the process.	Elks property currently is for sale and Clackamas County has been in negotiations to purchase the property.	SAG 1	
2.	Don't overlook the community at Willamette View Manor or senior citizens in the area.	Plan supports improving pedestrian access and connections for al residents. Proposed "node" on River Road near Park Avenue would support local services and other housing opportunities.	SAG 1	
3.	♦ Acknowledge that urban renewal exists and take advantage of this opportunity. ♦ Possibility for urban renewal in area to meet obligation for funding of the light rail projects. ♦ There needs to be a partnership with Metro and for urban renewal.	The process to form an urban renewal district (that would include the Park Ave area) is outside scope of this project. However, forming an urban renewal district would be one strategy to establish a funding source to pay for projects. Partnerships with Metro and other service agencies such as TriMet are important as these entities may have access to and allocate grants for a variety of projects that would be important to the Park Avenue community.	SAG 2	
4.	Plans should be for reality. MAP is looking at a variety of funding sources, so don't limit creative thinking.	Plan ideas are based on both community discussions and results of market study	SAG 2	
5.	Implementation of plans should refresh the area, start small to gain success, and get adequate financial and human resources.	The plan will include an implementation plan and priority list of projects.	SAG 2	
6.	Make businesses on highway visible and viable from multi-lane.	Draft development standards that complement the type of use in a development. For example, locate buildings up to street to ensure visibility and to help define pedestrian realm.	SAG 3	Ib2, IIc1,3 (A1) Ib2, IIc1 (A2) IIa1-5 (A4)

(1) See Attachment A, **Park Avenue Station Area Project Evaluation Criteria and Attachment B, McLoughlin Area Plan Guiding Principles**
*SAG: Project Stakeholder Advisory Committee

D	Economic Development / Implementation			
	Comments	**Response & Recommended Action**	**Notes**	**Evaluation Criteria & (Guiding Principles)**
7.	Include light manufacturing to allow jobs within walking distance if feasible.	Current C3 zone allows some manufacturing uses as allowed in the Business Park zone. Proposal is for a mixed-use zone that would support light manufacturing.	SAG 3 4/28/2011 Area jobs will contribute to 45 person per acre goal.	IIIa1-5 (A4)
8.	Services (professional & community, such as community center, library) are needed for existing and future populations.	Current C3 zone allows "cultural/public uses" (e.g., libraries, museums) and indoor recreational facilities (as allowed in Business Park zone). As noted, add policy in implementation plan to seek public/private partnerships to identify needs, plan for and build facilities to serve the area.	SAG 3	IIb2, IIb1, IIc1,3 (A1, A2, A3)
9.	Areas could be purchased with urban renewal money.	Process to form an urban renewal district (that would include the Park Avenue area) is independent of the scope of this project. However, forming an urban renewal district would be one strategy to establish a funding source needed to support public projects.	SAG 3A	
10.	Urban renewal bonds affect development in such a way that it's not a market decision		SAG 3A	
11.	Alternatives look like development would be wall-to-wall, 3-story buildings along McLoughlin just so the County would get more money from an urban renewal district.		SAG 3A	
12.	Development that is not needed is built because it's supported by urban renewal money, and the public has paid for it. Plan would provide for developers making a profit, even if amount of development is not needed.		SAG 3A	
13.	Lack sufficient resources to maintain development.	Identify responsible district and agencies, and identify potential funding sources. Strategies for funding. Partnerships	SAG 3A	
14.	There is not the economy for this development		SAG 3A	
15.	Development has been curtailed in the current economy, but it's not dead; developers will build when there is a market.	Market study	SAG 3A	
16.	Recognize that people own the land; show how owners can		SAG 3A	

(1) See Attachment A, **Park Avenue Station Area Project Evaluation Criteria and Attachment B, McLoughlin Area Plan Guiding Principles**
*SAG: Project Stakeholder Advisory Committee

D	Economic Development / Implementation			
	Comments	**Response & Recommended Action**	**Notes**	**Evaluation Criteria & (Guiding Principles)**
	transition to new uses.			
17.	Need to see intermediate steps that can be achieved in our lifetime.	Implementation plan and priority recommendations	SAG 3A	

E	Process			
	SAG Comments	**Response & Recommended Action**	**Notes**	**Evaluation Criteria & (Guiding Principles)**
1.	♦ Narrow the definition for "code standards" – it is too broad as it is currently addressed. ♦ Open the bullet to "develop code standards" to clarify what types of codes will be reviewed. ♦ Add "define community identify" to objectives. ♦ Add that the plan is to create an area of pride.		SAG 1	
2.	Projects that come out of the Park Avenue study need to be incorporated into the MAP program.		SAG 2	
3.	Need to engage more people in the planning process.	Attend monthly Pre-Oak Lodge Community Council meeting to discuss Park Avenue project. Notice of June public meeting mailed to all property owners & site addresses in study area. Notice to email list. Continue coordination with MAP and other community organizations.	■ SAG 3 4/28/2011 Continue various efforts including one-on-one's between neighbors. SAG 3A	IVb1 (F4) IVc1 (F3)
4.	Plan needs qualitative features to reflect the vision, values and principles of MAP.		SAG 3A	
5.	The community needs visuals of what we're working towards.	Additional graphics prepared in response to comments	SAG 3A	

(1) See Attachment A, **Park Avenue Station Area Project Evaluation Criteria and Attachment B, McLoughlin Area Plan Guiding Principles**
*SAG: Project Stakeholder Advisory Committee

F	Zoning			
	SAG Comments	**Response & Recommended Action**	**Notes**	**Evaluation Criteria & (Guiding Principles)**
1.	Existing zone could be improved by enabling other housing	General Commercial allows high density residential. Existing residential zones allow "accessory dwelling units" on a parcel with a house. Residential zones also have standards for duplex or triplex, providing a slightly higher density (dwelling units/acres) than the base zone standard.	SAG 2	
2.	Issue: what about properties that might be "down-zoned" in order to change to less commercial?	A "mixed-use" zone would allow a range of commercial, office and residential uses as currently supported in the General Commercial zone. However, some currently allowed uses, such as auto sales lot, may be prohibited in the new zone; such uses would become "non-conforming" uses in the new zone. *See Response in F7 re non-conforming uses.*	SAG 2	
3.	Existing commercial zoning doesn't seem to bring businesses to the area.	The market study indicates that there is an over-supply of commercially zoned properties.	**SAG 2**	
4.	If there's a market for taller buildings, then those could be developed. Higher buildings would have advantage of views to river and downtown.		**SAG 3A**	
5.	Code may target prohibited uses, but it would still be critical to let the market work.	The proposed type of "mixed-use" zoning supports a range of development types, including retail, office, residential and possibly light manufacturing.	**SAG 3A**	
6.	There needs to be enough area in the zone to accommodate the desired uses.	*Determine acreage within proposed mixed-use area.* West side of McLoughlin: parcel depth is 215 ft. to 635 ft. feet (check), but much narrower (116 ft. to 372 ft.) on the east side of McLoughlin	**SAG 3A**	
7.	Concern about impact to existing development when zoning is changed, and that development becomes a nonconforming use	County code (per state regulation): a non-conforming use may be continued under the new zone; a change in ownership or in the operator of the nonconforming use is permitted. If a nonconforming use is discontinued for more than 12 consecutive months, then a new use must conform to the current ordinance. The County has an application for "expansion of a nonconforming use."	**SAG 3A**	

(1) See Attachment A, **Park Avenue Station Area Project Evaluation Criteria and Attachment B, McLoughlin Area Plan Guiding Principles**
*SAG: Project Stakeholder Advisory Committee

G	Questions & Answer			
	Comments	**Response & Recommended Action**	**Notes**	**Evaluation Criteria & (Guiding Principles)**
1.	Why is extending Evergreen St. east to highway being proposed? It is a big change and will remove trees.	Proposal is to improve access, primarily for bicyclists and pedestrians, for the neighborhood. Street design will minimize impact on natural area and allow cars as "guests."	SAG 3 4/28/2011 Impacts on natural environment creates vehicular circulation that may disrupt character of neighborhood. (?)	Id1-3 (D2) Id2, IIa1-2 (B2)
2.	Do skinny streets accommodate fire trucks?	Yes, if there is not on-street parking. (Fire District standards require 20 feet of unobstructed area.)	SAG 3	
3.	Is additional main street on west side of plan area feasible?	"Main street" at Castle development or Torbank. We are looking to MAP Committee work and evaluation in the market study. Mixed use is a long term vision, but with increase residential density can support a village center	SAG 3	
4.	Is coordination with Milwaukie occurring?	Yes. City staff is on Technical Advisory Committee (TAC) and City Councilor is on Policy Advisory Committee (PAC).	SAG 3 4/28/2011 Plan proposal for station area will not include Milwaukie.	
5.	How will plan be implemented; what comes first?	An implementation plan will be developed to identify priority projects.	SAG 3	IVb1 (F4)
6	Can images about different type of densities be provided as part of plan?	Yes, images are provided on the alternatives maps.	SAG 3	
7.	What are key methods to achieve high-quality development?	Several elements are at play. See Attachment C for list.	SAG 3	IVb1 (F4)
8.	What will attract density to plan area?	Proximity to employment; travel options; affordable, high-quality urban design; supportive community and development code; and favorable market conditions.	SAG 3	Ia1 (C1) IIIa1-5 (A4) IIIa1, 2 & 5 (C4)
9.	Why density here vs. in Milwaukie?	Based on current property conditions (values, lot sizes, uses) there are more opportunities for redevelopment in plan area than the station area in Milwaukie.	SAG 3	
10.	Can highway be reclassified to discourage freight use between OR224 & I-205?	To be determined through discussions between ODOT and the County.	SAG 3	IIa1 (B3)
11.	Can a pedestrian bridge to station be included?	None is proposed in the revised TriMet plan. Ped bridge over Park Ave was considered between parking structure & station as part of the light rail project, but removed when size of the park and ride was reduced	SAG 3	IIa1 (B3)
12.	Can "sharrow" roads provide connections between neighborhood and highway?	Yes	SAG 3	Id2, IIa1-2 (B2) IIa1 (B1, B3, B4)

(1) See Attachment A, **Park Avenue Station Area Project Evaluation Criteria and Attachment B, McLoughlin Area Plan Guiding Principles**
*SAG: Project Stakeholder Advisory Committee

H	Q & A about multi-way highway			
	Comments	**Response & Recommended Action**	**Notes**	**Evaluation Criteria & (Guiding Principles)**
1.	Would speeds be changed on McLoughlin?	TBD	SAG 3	IIa1 (B3)
2.	How will bus traffic be affected?	Request information from TriMet about bus service.	SAG 3	
3.	How much additional right of way is needed?	Boulevard concepts for McLoughlin use a 120-ft. right-of-way. Obtain highway cross sections from ODOT to identify if additional right-of-way is needed.	SAG 3	
4.	Does plan support future light rail to south? Would proposed tree buffer be removed to accommodate light rail?	The plan does not account for any extension of light rail. It is not feasible to analyze without a specific proposal.	SAG 3	

(1) See Attachment A, **Park Avenue Station Area Project Evaluation Criteria and Attachment B, McLoughlin Area Plan Guiding Principles**
*SAG: Project Stakeholder Advisory Committee

I	Advice & other comments			
	Comments	**Response & Recommended Action**	**Notes**	**Evaluation Criteria & (Guiding Principles)**
1.	Provide higher density by highway with transition to lower densities.	The alternatives provide higher residential densities near the highway with transition areas (existing multifamily zones) to lower densities.	SAG 3	Ib2 (D4)
2.	Higher densities are going to increase demand for crossings along McLoughlin.	MAP is investigating how to improve pedestrian crossings along McLoughlin.	SAG 3	
3.	Can more mixed-use be provided between River Road and Station? Can this concept be extended to 23rd to provide local services?	The alternatives would provide a node on River Road (higher density; cottage clusters) and local services.	SAG 3	Ib2 (A2) IIIa1-5 (A4) IIIa1,2,5 (C4)
4.	Change is likely to occur slowly; build on strengths.	As noted, an implementation plan will be developed to identify priority projects.	SAG 3	
5.	Land use & transportation options impact public health.	The County Health Division has been invited to review the plan and be on the Expert Review Panel.	SAG 3	IIIa1 (C3) IIIa1,2,5 (C4)
6.	Avoid top-down decision-making; help citizens understand how decision to bring light rail to McLoughlin was made.	Ensure that citizens know of opportunities for input during process. Goal is to develop plan that meets citizens' vision, has responded to issues, and can be supported by the community.	SAG 3	IVc1 (F3)
7.	Support plan recommendations with quantitative data.	Data about the alternatives are currently being developed.	SAG 3	
8.	Residential is driven by businesses just as business is driven by residential.	Both alternatives provide a mix of uses.	SAG 3	
9.	Density drives business.	Residential densities would increase and support additional small retail.	SAG	
10	The Nature in Neighborhoods work at the Park Avenue light rail station is the only station in the US where integrating nature into station the approach.	Both alternatives support the work done to date at the station area.	SAG 3	
11	Support designation of multifamily, such as along Oatfield.	The alternatives maintain the multi-family zoning along Oatfield Road, Courtney and Linden Lane.	SAG 3	
12	Don't over-emphasize commercial on McLoughlin Boulevard.	Alternatives provide for residential uses in the areas that currently zoned for commercial development.	SAG 3	

(1) See Attachment A, **Park Avenue Station Area Project Evaluation Criteria and Attachment B, McLoughlin Area Plan Guiding Principles**
*SAG: Project Stakeholder Advisory Committee

ATTACHMENT A – Park Avenue Station Area Project Evaluation Criteria

OBJECTIVES	EVALUATION CRITERIA
I Station Area Community	
Ia. Reinforce/develop a unique neighborhood identity	**Ia1.** Builds upon characteristics that make the Oak Grove area unique and desirable (e.g., Trolley Trail, streams, wetlands, trees and views to the West Hills and area mountains)
Ib. Provide for a variety of housing types to support a range of incomes and ages.	**Ib1.** Provides transit oriented development that is designed to encourage walking and biking
	Ib2. Defines development node(s) to reinforce a neighborhood-scale character and to provide nearby neighborhood services
	Ib3. Introduces features to break up McLoughlin Blvd.'s strip commercial character
Ic. Determine station boundary to increase eligibility for infrastructure funding.	**Ic1.** Identifies a Station Area Boundary (as defined by Metro Title 6) to reinforce the area identity and increase eligibility for infrastructure funding
	Ic2. Identifies opportunities for sustainable infrastructure (e.g. green streets)
Id. Identify & reinforce natural and distinctive elements, such as streams & wetlands, trees. & historic places, which make the Oak Grove area unique and desirable.	**Id1.** Incorporates the Urban Green design concepts for the Trolley Trail and light rail station.
	Id2. Natural resources are enhanced and incorporated into the neighborhoods
	Id3. Preserves the historic components of the area
II Transit Oriented Development	
IIa. Develop safe, convenient and attractive routes to walk, bike and travel around Oak Grove, especially to and from the Park Avenue Station.	**IIa1.** Has well-defined, multimodal linkages to area destinations (e.g., between homes, schools, Trolley Trail, station and commercial corridors)
	IIa2. Has efficient and direct connections to the station
IIb. Identify areas appropriate for transit oriented development.	**IIb1.** Has a variety of housing types to support a range of incomes and ages and area businesses
IIc. Identify places for neighborhood businesses to reduce the need to travel outside the neighborhood.	**IIc1.** Proposes land uses that take advantage of light rail and bus transit without relying on driving.
	IIc2. Improves pedestrian environment including increasing connections across and along McLoughlin Blvd.
	IIc3. Meets Metro's station community targets (e.g., goal of 45 persons per acre and includes areas suitable for 2-3 story buildings)

ATTACHMENT A – Park Avenue Station Area Project Evaluation Criteria -- Continued

(1) See Attachment A, **Park Avenue Station Area Project Evaluation Criteria and Attachment B, McLoughlin Area Plan Guiding Principles**
*SAG: Project Stakeholder Advisory Committee

III Economic Development	
IIIa. Create an environment that is attractive for area development and redevelopment	**IIIa1.** Identifies potential public investments attractive to people and private development
	IIIa2. The design concept changes McLoughlin character to attract business investment.
	IIIa3. Encourages businesses in commercial areas that have unique identity in which business can identify with and brand
	IIIa4. Provides land uses that can take advantage of light rail market opportunities
	IIIa5. Identifies catalyst development project(s) to help improve area character and attract area business investment
IV Process and Implementation	
IVa. Identify specific projects, estimated project costs and potential funding mechanisms to implement plan.	**IVa1.** Includes a short and long term implementation plan and estimates the potential leverage of public investment
IVb. Develop code standards that promote compact development and a mix of uses in the station area.	**IVb1.** The Draft Comprehensive Plan/Zoning and Development Ordinance language is clear and includes requirements and design standards to achieve the project objectives
IVc. Provide citizens both in and near the study area meaningful opportunities for citizen participation.	**IVc1.** Has community support (e.g., incorporates the" Urban Green" concepts and MAP project objectives)

(1) See Attachment A, **Park Avenue Station Area Project Evaluation Criteria and Attachment B, McLoughlin Area Plan Guiding Principles**
*SAG: Project Stakeholder Advisory Committee

ATTACHMENT B

McLoughlin Area Plan
Guiding Principles
(***Vision Framework May 20, 2010)***

A. ECONOMIC VITALITY

A1. Ensure that any improvements, development or zoning changes shall promote an environment that fosters small business development and retention of existing businesses.

A2. Ensure that any improvements, development or zoning changes preserve or enhance shopping and retail opportunities that serve the McLoughlin are community.

A3. Ensure that any improvements, development or zoning changes continue to support and maintain a reasonable cost of living.

A4. Ensure that any improvements, development or zoning changes provide for the long-term stability and viability of local businesses, as well as stimulate job creation and retention.

B. TRANSPORTATION

B1. Encourage access and connections to local amenities and the region for bicyclists and pedestrians.

B2. Provide sidewalks, streets and trails within neighborhoods to enhance accessibility. Any improvements shall have a minimal impact on the natural environment such as trees and streams.

B3. Greatly improve pedestrian access and safety throughout the McLoughlin area with an emphasis on routes to schools and crossings on McLoughlin Boulevard.

B4. Where possible, integrate off-street trails and other facilities that benefit bicyclists and pedestrians.

B5. Improve east-west multi-modal connections across the McLoughlin area.

C. SOCIAL

C1. Develop an atmosphere that is human-scale, family friendly, inviting and attractive.

C2. Create or maintain transition zones (buffers) between residential neighborhoods and the more intense nature of McLoughlin Boulevard

C3. Create gathering places for citizens such as community centers, parks and plazas that foster social environments and opportunities.

C4. Ensure that any improvements, development or zone changes shall promote a healthy, safe and high quality environment for neighborhoods and schools.

C5. Support neighborhood schools by encouraging youth programs and community involvement, and by providing safe access.

(1) See Attachment A, **Park Avenue Station Area Project Evaluation Criteria and Attachment B, McLoughlin Area Plan Guiding Principles**
*SAG: Project Stakeholder Advisory Committee

ATTACHMENT B, Guiding Principles Continued

D. DESIGN

D1. Support a network of distinctive neighborhoods that have good connectivity for autos, transit, bicyclists and pedestrians.

D2. Utilize and integrate existing natural features, geography and topography of the area and minimize negative impacts of improvements on such areas. This applies to new development, re-development, access and transportation improvements.

D3. Ensure design functionality, beautification, lighting treatments and landscaping along McLoughlin Boulevard.

D4. Provide a series of clustered and concentrated thriving centers that provide a focal point for the neighborhoods of the McLoughlin area.

D5. Preserve, protect and enhance the current residential neighborhoods while maintaining current densities.

E. ENVIRONMENTAL

E1. Ensure that the long-term health and viability of the natural environment, river, streams, trees and habitat are fostered or enhanced when property is developed or re-developed.

E2. Enhance, preserve and establish access to the rivers, streams and other natural habitat.

E3. Retain, preserve, expand and add natural areas and parks.

F. ADMINISTRATIVE

F1. Ensure that, prior to any public improvements being approved, a mechanism is in place that provides for ongoing maintenance and operation of the facility.

F2. Ensure that sufficient funding remains in place for existing facilities, programs and emergency services.

F3. Incorporate strong and active community involvement and decision-making into any planning efforts that affect the McLoughlin area. These efforts will include economically, socially and ethnically diverse members of the community.

F4. Provide improved and updated building codes, zoning codes and zoning overlays based on local aspirations, community involvement and decision-making.

F5. Provide adequate enforcement at all levels of county and other applicable code.

F6. Continue to explore governance options as a means of supporting independence and local control.

(1) See Attachment A, **Park Avenue Station Area Project Evaluation Criteria and Attachment B, McLoughlin Area Plan Guiding Principles**
*SAG: Project Stakeholder Advisory Committee

ATTACHMENT C

PEDESTRIAN-AND TRANSIT-FRIENDLY DESIGN[1]

Essential Features	**Highly Desirable Features**
• Medium to high density development • Mix of land uses • Short to medium length blocks • Transit routes every one-half mile • Two- or four-lane streets (with some exceptions) • Continuous sidewalks wide enough for couples • Safe crossings • Appropriate buffering from traffic • Street-oriented buildings • Comfortable and safe places to wait • On-street parking on all streets, except interstate highways **Nice Additional Features** • Streetwalls • Functional street furniture • Coherent, small-scale signage • Specific pavement • Loveable objects, especially public art	• Supportive commercial uses • Grid like street networks • Traffic calming along access routes • Closed space shared trees along access routes • Nearby parks and other public open space • Small-scale buildings (or articulated large ones) • Classy looking transit facilities

[1] Source: PEDESTRIAN-AND TRANSIT-FRIENDLY DESIGN: A primer for Smart Growth By Reid Ewing Smart Growth Network Based on a manual prepare for the Florida Department of Transportation and published by the American Planning Association

(1) See Attachment A, **Park Avenue Station Area Project Evaluation Criteria and Attachment B, McLoughlin Area Plan Guiding Principles**

*SAG: Project Stakeholder Advisory Committee

Attachment C: Evaluation Criteria

PARK AVENUE NEIGHBORHOOD AND STATION AREA PLAN
PROJECT OBJECTIVES AND EVALUATION CRITERIA

Alternative meets evaluation criterion

Alternative mostly meets evaluation criterion

Alternative somewhat meets evaluation criterion

Alternative barely meets evaluation criterion

Alternative does not meet evaluation criterion

Park Avenue Project Objectives	Park Avenue Evaluation Criteria		Relating MAP Phase 1 Guiding Principle	Alternative 1 Urban Housing	Alternative 2 Main Street Retail
STATION AREA CHARACTER	**The design concept:**		-		
a. Reinforce/develop a unique neighborhood identity	a1 Builds upon characteristics that make the Oak Grove area unique and desirable (i.e. Trolley Trail, streams, wetlands, trees and views to the West Hills and area mountains)		C1. Develop an atmosphere that is human-scale, family friendly, inviting and attractive.		
b. Provide for a variety of housing types to support a range of incomes and ages.	b1 Provides transit oriented development that is designed to encourage walking and biking				
	b2 Defines development node(s) to reinforce a neighborhood-scale character and to provide nearby neighborhood services		A1. Ensure that any improvements, developments or zoning changes shall promote an environment that fosters small business development and retention of existing businesses. A2. Ensure that any improvements, development or zoning changes preserve or enhance shopping and retail opportunities that serve the McLoughlin area community. A3. Ensure that any improvements, development or zoning changes continue to support and maintain a reasonable cost of living. D4. Provide a series of clustered and concentrated thriving centers that provide a focal point for the neighborhoods of the McLoughlin area.		
	b3. Introduces features to break up McLoughlin Blvd.'s strip commercial character		D3. Ensure functionality, beautification, lighting treatments and landscaping along McLoughlin Blvd.		
c. Determine station boundary to increase eligibility for infrastructure funding.	c1 Identifies a Station Area Boundary (as defined by Metro Title 6) to reinforce the area identity and increase eligibility for infrastructure funding		F2. Ensure that sufficient funding remains in place for existing facilities, program and emergency services.		
	c2 Identifies opportunities for sustainable infrastructure (e.g. green streets)				
d. Identify and reinforce natural and distinctive elements, such as streams and wetlands, trees and historic places, which make the Oak Grove area unique and desirable.	d1 Incorporates the Urban Green design concepts for the Trolley Trail and light rail station		D2. Utilize and integrate existing natural features, geography and topography of the area and minimize negative impacts of improvements on such areas. This applies to new development, re-development, access and transportation improvements.		
	d2 Natural resources are enhanced and incorporated into the neighborhoods		B2. Provide sidewalks, streets and trails within neighborhoods to enhance accessibility. Any improvements shall have a minimal impact on the natural environment, such as trees and streams.		

PARK AVENUE NEIGHBORHOOD AND STATION AREA PLAN
PROJECT OBJECTIVES AND EVALUATION CRITERIA

Alternative meets evaluation criterion

Alternative mostly meets evaluation criterion

Alternative somewhat meets evaluation criterion

Alternative barely meets evaluation criterion

Alternative does not meet evaluation criterion

Park Avenue Project Objectives	Park Avenue Evaluation Criteria		Relating MAP Phase 1 Guiding Principle	Alternative 1 Urban Housing	Alternative 2 Main Street Retail
			D2. Utilize and integrate existing natural features, geography and topography of the area and minimize negative impacts of improvements on such areas. This applies to new development, re-development, access and transportation improvements.		
			E1. Ensure that the long-term health and viability of the natural environment, river, streams, trees and habitat are fostered or enhanced when property is developed or re-developed.		
			E2. Enhance, preserve and establish access to the rivers, streams and other natural habitat.		
			E3. Retain, preserve, expand and add natural areas and parks.		
	d3 Preserves the historic components of the area		D2. Utilize and integrate existing natural features, geography and topography of the area and minimize negative impacts of improvements on such areas. This applies to new development, re-development, access and transportation improvements.		
			D5. Preserve, protect and enhance the current residential neighborhoods while maintaining current densities.		
TRANSIT ORIENTED DEVELOPMENT	**The design concept:**				
a. Develop **safe**, convenient and attractive routes to walk, bike and travel around Oak Grove, especially to and from the Park Avenue Station.	a1 Has well-defined, multimodal linkages to area destinations (e.g., between homes, schools, Trolley Trail, station and commercial corridors)		B1. Encourage access and connections to local amenities and the region for bicyclists and pedestrians.		
			B2. Provide sidewalks, streets and trails within neighborhoods to enhance accessibility. Any improvements shall have a minimal impact on the natural environment, such as trees and streams.		
			B3. Greatly improve pedestrian access and safety throughout the McLoughlin area with an emphasis on routes to schools and crossings on McLoughlin Boulevard.		
			B4. Where possible, integrate off-streets trails and other facilities that benefit bicyclists and pedestrians.		
			B5. Improve east-west multi-modal connections across the McLoughlin area.		
			C5. Support neighborhood schools by encouraging youth program and community involvement, and by providing safe access.		
			D1. Support a network of distinctive neighborhoods that have good connectivity for autos, transit, bicyclist and pedestrians.		

PARK AVENUE NEIGHBORHOOD AND STATION AREA PLAN
PROJECT OBJECTIVES AND EVALUATION CRITERIA

Alternative meets evaluation criterion

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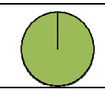
Alternative does not meet evaluation criterion

Park Avenue Project Objectives	Park Avenue Evaluation Criteria		Relating MAP Phase 1 Guiding Principle	Alternative 1 Urban Housing	Alternative 2 Main Street Retail
	2a Has efficient and direct connections to the station		B2. Provide sidewalks, streets and trails within neighborhoods to enhance accessibility. Any improvements shall have a minimal impact on the natural environment, such as trees and streams.		
b. Identify areas appropriate for transit oriented development.	b1 Has a variety of housing types to support a range of incomes and ages and area businesses		A3. Ensure that any improvements, development or zoning changes continue to support and maintain a reasonable cost of living.		
c. Identify places for neighborhood businesses to reduce the need to travel outside the neighborhood.	c1 Proposes land uses that take advantage of light rail and bus transit without relying on driving.		A1. Ensure that any improvements, developments or zoning changes shall promote an environment that fosters small business development and retention of existing businesses. A2. Ensure that any improvements, development or zoning changes preserve or enhance shopping and retail opportunities that serve the McLoughlin area community.		
	c2 Improves pedestrian environment including increasing connections across and along McLoughlin Blvd.		B5. Improve east-west multi-modal connections across the McLoughlin area.		
	c3 Meets Metro's station community targets (e.g., 45 persons per acre and includes areas suitable for 2-3 story buildings)		A1. Ensure that any improvements, developments or zoning changes shall promote an environment that fosters small business development and retention of existing businesses.		
ECONOMIC DEVELOPMENT	**The design concept:**				
d. Create an environment that is attractive for area development and redevelopment	a1 Identifies potential public investments attractive to people and private development		A4. Ensure that any improvements, development or zoning changes provide for the long-term stability and viability of local businesses, as well as stimulate job creation and retention. THIS GUIDING PRINCIPLE APPLIES TO ALL THE EVALUATION CRITERIA C3. Create gathering places for citizens such as community centers, parks and plazas that foster social environments and opportunities. C4. Ensure that any improvements, development or zone changes shall promote a healthy, safe and high quality environment for neighborhoods and schools.		
	a2 The design concept changes McLoughlin character to attract business investment.		C4. Ensure that any improvements, development or zone changes shall promote a healthy, safe and high quality environment for neighborhoods and schools.		
	a3 Encourages businesses in commercial areas that have unique identity in which business can identify with and brand				
	a4 Provides land uses that can take advantage of light rail market opportunities				

PARK AVENUE NEIGHBORHOOD AND STATION AREA PLAN
PROJECT OBJECTIVES AND EVALUATION CRITERIA

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Park Avenue Project Objectives	Park Avenue Evaluation Criteria		Relating MAP Phase 1 Guiding Principle	Alternative 1 Urban Housing	Alternative 2 Main Street Retail
	a5 Identifies catalyst development project(s) to help improve area character and attract area business investment		C4. Ensure that any improvements, development or zone changes shall promote a healthy, safe and high quality environment for neighborhoods and schools.		
PROCESS AND IMPLEMENTATION	The design concept				
a. Identify specific projects, estimated project costs and potential funding mechanisms to implement plan.	a1 Includes a short and long term implementation plan and estimates the potential leverage of public investment		F1. Ensure that, prior to any public improvements being approved, a mechanism is in place that provides for ongoing maintenance and operation of the facility. F2. Ensure that sufficient funding remains in place for existing facilities, program and emergency services.	To Come	To come
b. Develop code standards that promote compact development and a mix of uses in the station area.	b1 The Draft Comprehensive Plan/Zoning and Development Ordinance language is clear and includes requirements and design standards to achieve the project objectives		C2. Create or maintain transition zones (buffers) between residential neighborhoods and the more intense nature of McLoughlin Boulevard. F4. Provide improved and updated building codes, zoning codes and zoning overlays based on local aspirations, community involvement and decision-making.	To Come	To come
c. Provide citizens both in and near the study area meaningful opportunities for citizen participation.	c1 Has community support (i.e. incorporates the" Urban Green" concepts and MAP project objectives)		F3. Incorporate strong and active community involvement and decision-making into any planning efforts that affect the McLoughlin area. These efforts will include economically, socially and ethnically diverse members of the community.		

Attachment D: Stakeholder Advisory Group and Technical Advisory Committee Members

Park Avenue Station Area Plan --- Committee and Team Rosters, March 2011

Technical Advisory Committee (TAC)

FIRST	LAST	AGENCY / ORGANIZATION / INTEREST GROUP
Basil	Christopher	ODOT Region 1
Bill	Holmstrom	Dept of Land Conservation & Development (DLCD)
Brett	Arvidson	Oak Lodge Sanitary District (www.oaklodgesanitary.com)
Crista	Gardner	Metro
Dan	Bradley	Oak Lodge Water District
Dan	Gauger	PGE
Hal	Busch	City of Gladstone
Jamie	Stencil	Comcast
Jamie	Snook	Metro (Corridor & Station Area Planning)
Jeb	Doran	TriMet
Jeff	Davis	County Sheriff's Office
Jennifer	Donnelly	Dept of Land Conservation & Development (DLCD)
Jodi	Wright	Northwest Natural (East Metro)
Joe	Sandfort	County Library District Advisory Committee
Joseph	Auth	ODOT Region 1
Katie	Mangle	City of Milwaukie
Kenneth	Sciulli	Qwest
Mary-Rain	O'Meara	County Housing Authority
Michelle	Healy	County North Clack. Parks & Rec District (NCPRD)
Nicole	West	North Clackamas Urban Watershed Council
Rick	Nys	County Engineering
Susan	Shanks	City of Milwaukie
Tammy	Bannick	City of Gladstone
Tim	Mills	North Clackamas School District #12
Todd	Knapp	Oak Lodge Water District
Trish	Nixon	County Design Review Committee
		County Fire District #1 (www.clackamasfire.com)

Stakeholders' Advisory Group (SAG)		
FIRST	LAST	AGENCY / ORGANIZATION / INTEREST GROUP
Bobbi	Lyman	Senior organization - Rose Villa (Rep to be appointed)
Brian	Mosley	1/4 mile NBD
Chips	Janger	Urban Green
Cindy	Miguel	1/4 mile NBD
Corie	Harlan	Metro, Nature in Neighborhoods
David	Ruelas	1/4 mile NBD
Dion	Shepard	Friends of North Clackamas Parks
Ed	Riddle	Urban Green
Eleanore	Hunter	Oak Lodge Community Council Member (OLCC)
Eric	Perkins	Island Station Nbrhood District Asso. (Milwaukie)
Everett	Wild	McLoughlin Area Planning (MAP) Committee
Fred	Nelligan	TriMet CAC member for PMLR project
Gail	Barker	1/4 mile NBD
George	Schneider	1/4 mile NBD
Greg	Smith	Jennings Lodge CPO
Henry	Schmidt	McLoughlin Area Planning (MAP) Committee
Janet	Putnam	1/4 mile NBD
Jason	Lehne	Economic Development Commission
JoAnn	Herrigel	City of Milwaukie
Kim	Buchholz	Senior organization - Willamette View
Michael	Sears	1/4 mile NBD
Nathan	Burton	1/4 mile NBD
Pat	Kennedy	History
Ted	Hartzell	County Ped/Bike Advisory Committee Member
Thelma	Haggenmiller	CIA and Friends of the Trolley Trail
Tina	Buettell	1/4 mile NBD
Valerie	Chapman	Oak Lodge Community Council Member (OLCC)
Wanda	Berry	
Wilda	Parks	North Clackamas Chamber of Commerce
William	Wild	Friends of Local Control

Appendix H: Future Traffic Alternatives Analysis

PARK AVENUE NEIGHBORHOOD & STATION AREA PLAN

DATE:	September 29, 2011
TO:	Shari Gilevich, Gail Curtis
FROM:	Shelly Alexander, PE Angela Rogge, EIT
SUBJECT:	**Future Traffic Conditions Memorandum**
PROJECT:	Park Avenue Neighborhood and Station Area Plan
COPIES:	

This summary memorandum identifies the 2035 traffic impacts of the land use and transportation options generated from the Park Avenue Neighborhood and Station Area planning process. The study area surrounds the proposed Park Avenue light rail station and Park and Ride lot and contains twelve intersections: seven existing, two new accesses for the 600-space Park and Ride structure, and three new circulation connections.

Key Results of the analysis:

- As the project moves forward, it is important to understand the competing objectives at play, the most obvious being the need to provide access to area properties while maintaining travel speed throughout the McLoughlin Boulevard corridor. In terms of maintaining travel speed and time, no new signal(s) on McLoughlin Boulevard is the best outcome for highway operation. The addition of one or 2 new signals to the highways has a minimum impact of 10 seconds to the southbound progression, and 10 seconds to the northbound progression. This results in increased congestion, albeit within acceptable ranges compared to the outcome of building out the land use under existing zoning.
- No decisions about the future traffic signals on McLoughlin Boulevard (or elsewhere) have been made as a result of the analyses. No mitigation has been identified with the exception of the proposed street network necessary to distribute trips and reduce reliance on McLoughlin Boulevard. Mitigation may include pedestrian-activated crossings in the form of beacon traffic lights, depending upon the ultimate project proposal.
- The primary highway congestion in the corridor for existing conditions and projected future conditions exists to the north of Park Avenue in downtown Milwaukie where there are closely spaced traffic signals.

The purpose of this traffic analysis is intended to help inform the discussions about future transportation improvements for three different land use scenarios and two signal configurations. The traffic analysis also addresses the Transportation Planning Rule (TPR) subsection 0600 requirements. This analysis provides information necessary to discuss the potential for whether or not additional signals may be warranted on McLoughlin Boulevard and how those changes could affect traffic on the local road network. Pedestrian activated crossings may also be warranted instead of traffic signals depending upon ultimate project proposal.

For the purpose of this study the following terminology will be used:

- Baseline Condition retains the current land use zoning land use with the roadway network recommended in the *South-Corridor Portland-Milwaukie Light Rail Project FEIS Transportation Impacts Results Report*[1]. The Baseline Condition results were presented in the 2035 No Build Traffic Analysis Memorandum prepared in February 22, 2011 by David Evans and Associated, Inc.
- No Build Land Use Option refers to the land use option that retains the current land use zoning but is paired with one of the two traffic control options.
- Land Use Option 1 refers to the land use option which is housing focused and paired with one of the two traffic control options.
- Land Use Option 2 refers to the land use option which is retail focused and paired with one of the two traffic control options.
- Traffic Control Option 1 refers to a roadway network that includes the multi-way boulevard concept and circulation system with two new traffic signals on McLoughlin Boulevard.
- Traffic Control Option 2 refers to a roadway network that includes the multi-way boulevard concept and circulation system with one new traffic signal on McLoughlin Boulevard.

Six alternatives were evaluated as part of the Park Avenue Station Area Plan traffic analysis. All assumed the multi-way boulevard and additional circulation system street network. The six alternatives are comprised of the three land use options (No Build, Land Use 1, and Land Use 2) paired with the two traffic control options (two new signals, one new signal). Each alternative was compared to baseline conditions. This summary provides the results of the traffic analysis, including forecast volumes, operations, and 95th percentile queuing, and how the six alternatives function related to jurisdictional standards.

Study Area

The study area includes the following intersections:

1. OR 99E at SE River Road (signalized)
2. SE River Road at Park Avenue

[1] DKS Associates

3. OR 99E at Park Avenue (signalized)
4. SE Oatfield Road at SE Park Avenue (signalized)
5. SE River Road at SE Courtney Avenue
6. OR 99E at SE Courtney Avenue (signalized)
7. SE Oatfield Road at SE Courtney Avenue
8. Park Avenue Park and Ride Access – Park and Ride Access #1 (signalized)
9. OR 99E Park and Ride Access – Park and Ride Access #2 (right-in/right-out)
10. Silver Springs Road at OR 99E
11. Cinderella Road at OR 99E
12. Torbank Road at OR 99E

Multi-way Boulevard Concept

A multi-way boulevard concept for McLoughlin Boulevard was investigated for traffic operations and circulation along the McLoughlin Boulevard corridor between the intersections of River Road and Courtney Avenue. The analysis considers the existing cross-section and lane configurations, additional side street connections to provide a better network for bicycle, pedestrian and vehicular circulation, and combines access to and from frontage lanes between cross streets.

The frontage lanes are the distinguishing feature of the multi-way boulevard concept where the through-travel lanes would be bordered by a planting strip that provides separation from a parallel frontage lane. The frontage lane would provide one lane of parallel parking, one through lane for slow moving local traffic, and wide sidewalks separating the parking aisle from business frontages.

This layout effectively consolidates direct adjacent business access to McLoughlin Boulevard via a lower-speed frontage lane with intermittent access to McLoughlin Boulevard. The frontage lane direction of travel could be in the same direction as the mainline traffic or against; however, the direction would need to be consistent for all frontage lanes within the study area.

2035 Lane Configurations and Traffic Control Options

In addition to the multi-way boulevard concept applied to each alternative, the project proposes creating a local circulation system that creates a more interconnected network. Most notable are the three new east-west connections across McLoughlin Boulevard: Silver Springs Road, Cinderella Road, and Torbank Road. These connections facilitate pedestrian access to the future transit station as well as providing vehicular access to adjacent businesses. The full circulation system can be seen in the Land Use and Transportation Memorandum dated September 24, 2011. The new connections are assumed as local roadways and have been analyzed with single lane approaches (no flares) to McLoughlin Boulevard.

McLoughlin Boulevard is currently a barrier for pedestrians and bicyclists trying to travel between land uses on either side of the highway. To facilitate additional crossing opportunities, two traffic control options were evaluated between Park Avenue and Courtney Avenue.

- Traffic Control Option 1: The first traffic control option assumes the multi-way boulevard and the proposed local circulation system and would add two new traffic signals at the intersections of the newly constructed east-west connections at Silver Springs Road and Torbank Road. These two new signals would effectively reduce the existing signal spacing from 2,800 feet (Park Avenue to Courtney Avenue) to approximately 900 feet. This change would provide better crossing opportunities of McLoughlin Boulevard for pedestrian and bicycle traffic, crucial to supporting the new Park Avenue transit station.
- Traffic Control Option 2: The second traffic control option assumes the multi-way boulevard and the proposed local circulation system but would add only one new traffic signal at the new east-west connection of Cinderella Road. This location would reduce the current signal spacing between Park Avenue and Courtney Avenue from 2,800 feet to 1,400 feet. While an improvement over the existing crossing opportunities, from a neighborhood and pedestrian access perspective this option is less appealing than Traffic Control Option 1.

While Traffic Control Option 1 is preferable from a neighborhood-feel perspective, it comes with trade-offs, specifically some slowing for through-vehicular traffic that uses the corridor as a link between the City of Portland and nearby cities. On similar facilities, traffic signal spacing is generally recommended no closer than one-half mile, though shorter spacing can be considered and examples of closer spacing can be found at many locations. Installation of traffic signals requires significant consideration for all modes as well as approval by the state traffic engineer. This evaluation does not guarantee any signal placement within the study area corridor.

Assumed lane configurations and traffic control are shown in the operations figures: Figure 1b, Figure 2b, Figure 3b, Figure 4b, Figure 5b, and Figure 6b.

2035 Land Use Options

Three land use options were considered as part of the analysis and would result in a change in the current land use zoning. The focus of Land Use Option 1 is increased urban housing, while Land Use Option 2 has a stronger retail focus.

- No Build Land Use Option: This option retains the current land use zoning.
- Land Use Option 1: This option is a housing-focused alternative that incorporates significant green space as a buffer between the highway and future development on either side of McLoughlin Boulevard. The proposed circulation system would provide access for residential areas and on-street parking for focused, mixed-use retail and commercial development that supports existing and future residential needs. Local frontage lanes (via the multi-way boulevard concept) would parallel McLoughlin Boulevard and connect to the local road system.
- Land Use Option 2: This option is a mixed-use development concept with less focus on high density housing than under Land Use Option 1. Under this alternative, one- to two-story mixed-use buildings are located along McLoughlin Boulevard, and along the sections of Torbank Road and Silver Spring Road directly west from McLoughlin. Some housing is located above retail, but most housing is behind the retail area, where it is screened from traffic noise. Housing densities

are slightly lower than under Alternative 1, with more townhomes and two- to three-story apartments except in the immediate vicinity of the station, where densities would be similar to Alternative 1.

For more details see the Land Use Alternatives section of the "Land Use and Transportation Memorandum" prepared by David Evans and Associates, Inc. on September 24, 2011.

2035 Alternatives Traffic Forecasts

As discussed in the 2035 Lane Configurations and Traffic Control Options section, two traffic control options were considered. These two traffic control options were paired with each of the three land use options for a total of six alternatives. Six alternatives, each with a different volume set, were evaluated for this project. A description of the volume development follows.

2035 Volume Development

Each of the traffic volume sets were calculated for the 2035 design year based on turning movement data from Metro's 2005 Existing and 2035 Financially-Constrained (FC)[2] VISUM models. The 2035 alternatives traffic forecasts were developed in a three stage process:

1. No Build (Baseline Condition)
2. Application of land use changes
3. Application of lane configuration and traffic control

No Build (Baseline Condition)

The first stage uses the volumes derived during the No Build scenario (referred to as the Baseline Condition for the remainder of this memorandum) which is based on the two-hour Metro models of two analysis years: 2005 and 2035. The year 2035 model includes all of the mitigation measures outlined in the Portland-Milwaukie Light Rail (PMLR) Final Environmental Impact Statement (FEIS). The baseline forecast volume set also included Park and Ride adjustments. The No Build Analysis memorandum dated February 22, 2011 includes more detail regarding the No Build methodology and assumptions.

Application of Land Use Changes (Trip Generation)

The second stage of 2035 alternatives forecast traffic volume development accounts for land use change assumptions that are part of the focus of the Park Avenue Area Station Area plan. A summary of the land use change assumptions is shown below. See Appendix A for more details.

Three land use options are considered in this analysis: No Build Land Use Option, Land Use Option 1, and Land Use Option 2. The No Build Land Use Option assumes the retention of the existing commercial zoning. The two land use options consider different land use patterns than the current zoning. Land Use Option 1 is focused on providing primarily housing in the corridor, while Land Use Option 2 also

[2] The 2035 FC VISUM model was adjusted to assess the 600-space Park and Ride capacity during the assessment of baseline (No Build) conditions.

assumes a more traditional mixed-use development pattern and includes more retail and office space. The resulting changes in area for the two major land use types are shown in Table 1.

Table 1. 2035 Trip Generation for Land Use Options 1 and 2

	PM Peak Hour					
	No Build Land Use Option		Land Use Option 1		Land Use Option 2	
Land Use Type	**Area**	**Trips**	**Area**	**Trips**	**Area**	**Trips**
Single Family	290 units	274	1,285 units	1,046	805 units	687
Shopping Center	1,191,932 s.f.	3,347	289,064 s.f.	1,296	864,448 s.f.	2,699
Trip Reduction: Pass-by (19-29%) **		-636		-376		-567
TOD Reductions (0-30%)		0***		-590		-846
Total		**2,985**		**1,376**		**1,973**

Source: David Evans and Associates, Inc. Trip estimates from the ITE Trip Generation Manual, 8th edition.
*Internal trips were calculated with the methodology used in Chapter 7 of the ITE Trip Generation Handbook, 2nd edition.
**Pass-By trips were calculated with the methodology used in Chapter 5 of the ITE Trip Generation Handbook, 2nd edition. The Associated Pass-By percentage, calculated from the fitted curve equation in figure 5.5.
***No transit reduction was assumed for the No Build Land Use Option.

The future trip generation estimates for Land Use Options 1 and 2 were compared to the No Build Land Use Option to determine if more or fewer trips will result. In this case fewer trips are estimated to occur with the proposed land use modifications compared to the No Build Land Use Option. Land Use Option 1 estimates would result in the fewest total trips (1,376) for the study area (1,609 fewer than the No Build Land Use Option); while Land Use Option 2 estimates would result in 1,973 trips (1,012 fewer trips compared to the No Build Land Use Option).

Application of Lane Configuration and Traffic Control

To account for roadway and intersection improvements, as well as develop PM volumes, an eleven-step process was used to estimate year 2035 PM peak hour traffic volumes. For this analysis, the network was not modified to explicitly show each new roadway shown in the circulation plan. Instead centroid connectors were used to assign traffic to the study area network. This decision was based on a phone conversation[3] which confirmed the following understanding of the METRO regional travel demand model:

> *The forecasting model does not include all of the existing roadway system as the Transportation Analysis Zone (TAZ) structure within the forecasting model is not broken down to a level where local roadway trips could be accounted for accurately. Primary (major collectors and above) roadways are coded in the model, and minor streets are not. Since local roadway directional link capacities are set to 600 vph (as a minimum) within the travel demand model and volumes on the project area local roadways would likely be less than 400 vph, this level of modeling detail (inclusion of local*

[3] Phone conversation with Peter Bosa (of METRO) on July 12th, 2011.

roadways) was deemed as unnecessary. Alternatively, the more simplistic approach of hand assignment would likely be just as effective.

Instead, links called centroid connectors are used to represent the volume carried by multiple neighborhood and local roadways within a TAZ to the major roadways. METRO modeling staff suggests that traffic engineers use engineering judgment to hand assign trips to the local roadways that are not present in the model. Project engineers should have a deep understanding of the local traffic patterns within a given project study area, and are therefore in the best position to distribute the traffic carried by the centriod connectors onto the local roadway network.

If development patterns were to occur in a manner that supports the usage, but differed from those assumed in these analysis, it would be possible for more or less trips to utilize any one of the study area intersections along OR 99.

The ten-step process is shown below:

1. Convert the two-hour VISUM forecasts into one-hour forecasts by using a factor of 0.52 for the existing year (2005) and future year (2035) models.
2. Calculate the difference between the existing and future year one-hour VISUM forecasts.
3. Normalize growth for the analysis year 2011 (not 2005), 24 years of growth.
4. Add the difference of the 24 year forecast growth to the existing 2011 traffic volumes to calculate 2035 PM peak hour no-build turning movement volumes.
5. Distribute turn movement volumes from the centroid connectors to the two proposed internal roadway networks (Traffic Control Options 1 and 2) for the No Build Land Use Option using the METRO VISUM model as a basis for trip distribution.
6. Calculate the total number of trips generated for full build out of existing zoning (i.e., No Build Land Use Option) using the ITE Trip Generation Manual (8th edition).
7. Calculate the total number of trips generated for full build out of two proposed land uses (Land Use Option1 and Land Use Option 2) using the ITE Trip Generation Manual (8th edition).
8. Use the ITE Trip Generation Handbook (2nd edition) to calculate total trip ends associated with reasonably worst case build out of existing and proposed zoning after pass-by and internal trip reductions.

   NOTE: Because proposed zoning would result in fewer trips than existing zoning, trips will be removed from the network for all proposed land use options.

9. Calculate total trips to be removed from the network by using a ratio of total trips associated with proposed zoning (Land Use Options 1 and 2) versus existing zoning (No Build Land Use Option).
10. Remove trips from individual intersections for each local network (Traffic Control Options 1 and 2) based on trip distribution from the METRO VISUM model.

The study area roadway improvements identified previously as well as other improvement projects noted in the Regional Transportation Plan were included as background improvements to the transportation system. The combination of the three land use options and two traffic control options resulted in six 2035 PM peak hour turning movement forecasts. The resulting output data from the VISUM forecasting model and the detailed forecasting calculations are contained in Appendix B. For more information on the circumstances that need to exist in order to gain approval for a traffic signal, see the Preliminary Signal Warrant section.

The resulting 2035 traffic forecasts for the six alternatives are shown in Figure 1a, Figure 2a, Figure 3a, Figure 4a, Figure 5a, and Figure 6a.

Alternatives Analysis Assumptions and Methodologies

Assumptions and methodologies used in the alternatives analyses are described below.

Travel Speeds

Posted travel speeds along all existing area roadways are assumed to remain the same as existing and baseline conditions. The frontage lanes (associated with the multi-way boulevard) assume a posted speed of 30 mph.

Signal Phasing and Timing

Signal phasing (and the associated timing plan) as well as signal progression were revisited for the 2035 alternatives analysis. Specifically, some of the APM preferences are not observed at current signalized intersections. This led to reconsideration of how the new, potentially signalized, intersections should be evaluated. The following summarizes the ODOT Region 1 and/or APM preferences and the assumptions used for this analysis.

Phasing for Mainline Left Turns: Lead/Lead[4] *Versus Lead/Lag*[5]

- Preference: Current ODOT Region 1 practice is to use Lead/Lead left-turn phasing. However, they recognize that Lead/Lag phasing provides greater opportunities to optimize corridor bandwidth and progression as opposed to Lead/Lead left-turn phasing.
- Analysis Assumption: For this analysis, consultation with ODOT Region 1 staff resulted in consideration of Lead/Lag phasing to maximize the traffic flow opportunities within the corridor. If Region 1 continues its current practices and preferences, a modification to the signal timing to facilitate Lead/Lead operation may result in impacts to the progression along the corridor.

[4] When describing an intersection where opposing mainline left turns both occur at the same time, prior to the mainline through movements, the term Lead/Lead is used.

[5] The term Lead/Lag is used when referencing an intersection where the mainline left turn and through movement of the same approach are served, followed by the opposing through movements, and finally the opposite left turn and through movement.

Signal Timing Minimums

- Preference: APM manual and ODOT Region 1 preference indicates the following signal timing minimums should be used for mainline left turns and side street approaches:
    - Mainline left-turn phase: use a maximum split value of at least 13 seconds
    - Side street phase: a minimum of 30 seconds[6] (accounting for vehicular movement and pedestrian crossing times)
- Analysis Assumption: Signal timing was retained for existing intersections, regardless of whether it met APM/Region preference. However, the signal timing at the intersections of Silver Springs, Cinderella, and Torbank Roads were assumed to be consistent with the ODOT Analysis and Procedure Manual (APM) settings[7].

Signal Cycle Length

- Preference: Cycle lengths along OR 99E/McLoughlin Boulevard are set to the same value.
- Analysis Assumption: All traffic signals along OR 99E/McLoughlin Boulevard are set to signal cycle length of 120 seconds. The same length as existing conditions.

Signal Progression

Signal progression was optimized along OR 99E/McLoughlin Boulevard within the study area (between River Road and Courtney Avenue) to provide a similar progression pattern to existing conditions. The intersections of the potential new traffic signals were adjusted to fit within the existing offsets for the Park Avenue and Courtney Avenue intersections. It is acknowledged that this segment of OR 99E/McLoughlin Boulevard is a subset of the larger progression corridor which extends from River Road to Arlington Street. At such time that a preferred alternative is chosen, and this project moves forward, a full signal progression analysis should be considered that spans the full length of the progression corridor (River Road to Arlington Street).

Traffic Analysis Methodology

As mentioned in the Existing Conditions Memo[8], the Synchro/SimTraffic analysis software package (version 7) was chosen to evaluate intersection operations for the closely spaced intersections within the study area. The Synchro analysis includes modifications to the standard Synchro/SimTraffic settings to comply with ODOT's Analysis Procedures Manual (APM).

[6] This value could be as low as 13 seconds if no pedestrian crossing is present, which is not the case for our study.
[7] Source: Exhibit 7-23, page 7-37 of online version (09/21/11)
[8] For more details regarding the analysis tools see the Draft Existing Conditions Memorandum dated November 11, 2010 prepared by David Evans and Associates, Inc.

Operational Standards

The operational standard for Clackamas County is LOS D or better for signalized and unsignalized intersections[9]. There are five total County intersections within the study area, two signalized and three unsignalized. The two signalized intersections are Park Avenue at the Park and Ride access and Oatfield Road at Park Avenue. The two unsignalized County intersections are Courtney Avenue at Oatfield Road, Park Avenue at River Road, and Courtney Avenue at River Road. All of the remaining intersections within the study area are along OR 99E and are ODOT facilities; they have an operational standard of a maximum v/c ratio of 0.99 during peak operating conditions[10]. The operational standard for design projects, per the Highway Design Manual, is a v/c ratio of 0.75.

Alternatives Analyses Results

The traffic evaluation looked at a variety of operational measures including: volume-to-capacity (v/c ratio), delay, 95th percentile queuing, signal progression, and corridor travel time and speeds. The following is a summary of the analysis:

<u>Traffic Control Option 1: Two New Signals</u>

- With the future 2035 No Build Land Use Option, four of the study area intersections along McLoughlin Boulevard (OR 99E) would operate at or over capacity. Of the four intersections, two are existing, Park Avenue (v/c ratio=1.05) and Courtney Avenue (v/c ratio=1.09), and two are new, Silver Springs Road (v/c ratio=1.27) and Torbank Road (v/c ratio=1.19).
- The future 2035 Land Use Option 1 estimates a reduction in vehicle trips generated for the study area compared to the No Build Land Use Option. The reduction would result in better operations for the intersections along McLoughlin Boulevard (OR 99E). The Silver Springs Road intersection would operate at capacity (v/c ratio=1.0), while the Park Avenue and Courtney Avenue intersections would be near capacity (v/c ratios=0.98). The Torbank Road intersection would have a v/c ratio of 0.92.
- The future 2035 Land Use Option 2 estimates a study area trip generation mid-way between that calculated for the No Build Land Use Option and Land Use Option 1. The resulting operations would be similar but slightly better than with the No Build Land Use Option. Specifically, four intersections along McLoughlin Boulevard (OR 99E) would operate at (or over) capacity. Of the four intersections two are existing, Park Avenue (v/c ratio=1.03) and Courtney Avenue (v/c ratio=1.08), and two are new intersections, Silver Springs Road (v/c ratio=1.22) and Torbank Road (v/c ratio=1.16).
- No mitigation was identified for either the Land Use Options 1 or 2 as they would operate better than operations reported for the No Build Land Use Option.
- Signal progression along McLoughlin Boulevard (OR 99E) was evaluated for all three future land use options. All three future land use options would have decreased through-traffic bandwidth

[9] Clackamas County Comprehensive Plan, Chapter 5, last updated April 28, 2005
[10] 1999 Oregon Highway Plan – Amendment, The Oregon Department of Transportation, July 2005

when compared to Baseline Conditions. However, Land Use Options 1 and 2 would provide more bandwidth in the southbound direction (increased by approximately 1-2 seconds) when compared to the No Build Land Use Option, while the northbound bandwidth would remain the same.

- McLoughlin Boulevard (OR 99E) could benefit from a future change in land use. Although the through-traffic bandwidth would decrease compared to Baseline Conditions, fewer vehicle trips as a result of Land Use Option 1 would result in an approximate travel time savings of 4.5 minutes in the southbound direction. Because the overall vehicle trip reduction is less significant with Land Use Option 2, the travel time would be similar to Baseline conditions but would increase by approximately 30 seconds). The northbound direction would see minimal changes for travel time.
- The River Road and Oatfield Road corridors would see minimal or no change in travel time in either direction for any of the land use options.
- The majority of the southbound congestion would be experienced north of Park Avenue for all land uses.

Traffic Control Option 2: One New Signal

- With the future 2035 No Build Land Use Option, three of the study area intersections along McLoughlin Boulevard (OR 99E) would operate at (or over) capacity; of the three intersections two are existing, Park Avenue (v/c ratio=1.05) and Courtney Avenue (v/c ratio=1.09), and one is new, Cinderella Road (v/c ratio=1.48).
- The future 2035 Land Use Option 1 estimates a reduction in study area vehicle trips generated compared to the No Build Land Use Option. Cinderella Road and McLoughlin Boulevard (OR 99E), a new intersection in the study area, would operate above capacity (v/c ratio=1.14).
- The future 2035 Land Use Option 2 estimates study area trip generation mid-way between that calculated for the No Build Land Use Option and Land Use Option 1. The operational results would be similar but slightly better than to the No Build Option. Three intersections along McLoughlin Boulevard (OR 99E) would operate at (or above) capacity; of the three intersections two are existing, Park Avenue (v/c ratio=1.03) and Courtney Avenue (v/c ratio=1.08), and one is new, Cinderella Road (v/c ratio 1.46).
- No mitigation was identified for either the Land Use Options 1 or 2 as they would operate better than operations reported for the No Build Land Use Option.
- Signal progression along McLoughlin Boulevard (OR 99E) was evaluated for all three future land use options. All three future land use options would have decreased through-traffic bandwidth when compared to Baseline Conditions. However, Land Use Options 1 and 2 would provide more bandwidth in the southbound direction (increased by approximately 3-5 seconds) when compared to the No Build Land Use Option. The northbound bandwidth would not be matched or improved for either option (Land Use 1 or 2).
- McLoughlin Boulevard could benefit from a future change in land use. Although the through-traffic bandwidth would decrease compared to Baseline Conditions, fewer vehicle trips as a result of Land Use Option 1 and would result in an approximate travel time savings of 5.5 minutes and

1.5 minutes, respectively in the southbound direction. The northbound direction would see minimal changes for travel time.

- The River Road and Oatfield Road corridors would see minimal or no change in travel time in either direction for any of the land use options.
- The majority of the southbound congestion would be experienced north of Park Avenue for all land uses.

Overall, the system operations would see the biggest improvement if Land Use Option 1 is combined with the Traffic Control Option 1: two traffic signals. For all six alternatives, the majority of the southbound congestion along McLoughlin Boulevard is experienced north of the Park Avenue intersection. Once through the Park Avenue intersection, signal progression is relatively good and traffic flows smoothly regardless of the number of additional signals within the study area.

The Alternatives analyses results are described in further detail below**.**

Operations

The operations will be presented in two sections based on the traffic control options. Traffic Control Option 1 (two signals) will be presented first, followed by Traffic Control Option 2 (one signal). The operational results (v/c ratio and LOS) were determined from the Synchro analysis. Additionally traffic signal progression (through-traffic bandwidths) was evaluated with the Synchro software.

The Simtraffic software was used to determine 95th percentile queue lengths, travel time and speed along OR 99E/McLoughlin Boulevard and adjacent north-south corridors of River Road and Oatfield Road. Forecasted queue lengths were compared with the length of available storage bays or the distance to nearby intersections to identify where queuing may become an issue.

Traffic Control Option 1: Two Signals

This detailed analysis presents intersection operations followed by movements that would experience 95th percentile queuing in excess of available storage. Finally, a comparison of signal progression, main north-south corridor travel times and speeds are presented.

Although two new traffic signals were evaluated in this analysis, they were done so prior to conducting preliminary signal warrants. Preliminary signal warrants were later prepared and can be found in the Preliminary Signal Warrants section.

Intersection Operations

Study area intersections were evaluated with the Traffic Control Option 1 (two traffic signals) paired with each of the land use options. The assumed lane configurations and resulting operations, v/c ratio and LOS, are presented in Figure 1b, Figure 2b, and Figure 3b. A detailed table of operations is available in Appendix E.

In general, the majority of the southbound congestion along McLoughlin Boulevard (OR 99E) would be experienced at the Park Avenue and River Road intersections. The high overall v/c ratios along OR

99E/McLoughlin Boulevard within the study area are a reflection of the high southbound through movement volumes which are at or over capacity combined with high volume side street left-turn movements.

The No Build Land Use Option would result in four of the study area intersections along McLoughlin Boulevard (OR 99E) operating at or over capacity. Of the four intersections, two are existing, Park Avenue (v/c ratio=1.05) and Courtney Avenue (v/c ratio=1.09), and two are new, Silver Springs Road (v/c ratio=1.27) and Torbank Road (v/c ratio=1.19).

Land Use Option 1 would result in the best operations of the three alternatives considered with Traffic Control Option 1. One intersection would operate at capacity, Silver Springs Road at McLoughlin Boulevard (v/c ratio=1.0). The intersections of McLoughlin Boulevard at Park Avenue and Courtney Avenues would be near capacity with v/c ratios of 0.98. The new intersection of Torbank Road would operate at a v/c ratio of 0.92. While two new signals were added to the McLoughlin Boulevard system for this alternative, it is likely the reduction in vehicle trips associated with the change in land use that would result in intersections being at or under capacity.

Similar to the No Build Land Use Option, though slightly better, Land Use Option 2 would result in four intersections operating at or above capacity. The reduction in vehicle trips associated with Land Use Option 2 would result in trip generation mid-way between that calculated for the No Build Land Use Option and Land Use Option 1. Of the four intersections, two are existing Park Avenue (v/c ratio=1.03) and Courtney Avenue (v/c ratio=1.08), and two are new intersections, Silver Springs Road (v/c ratio=1.22) and Torbank Road (v/c ratio=1.16).

Of the signalized County intersections, both operate within the County standard of LOS D for all land use options. The Park Avenue Park and Ride access would operate at LOS C or better and v/c ratio of 0.17 or better for all three land use options. The intersection of Oatfield Road at Park Avenue would operate with LOS B or better and a v/c ratio of 0.78 or better.

Of the unsignalized intersections, the westbound movement at the Park Avenue at River Road intersection would meet the County's operational standard for all land use options. However, Courtney Avenue at River Road would continue to exceed the County's operational standards for the No Build Land Use Option and Land Use Option 2. For these two land use options, the westbound movement would operate at LOS E with a v/c ratio of 0.65 (No Build Option) and 0.62 (Land Use Option 2). The intersection of Courtney Avenue at Oatfield Road would meet County standards for all three land uses.

When comparing the two alternative land use options to the no build land use option, the trip generation is reduced and consequently the overall operations improve. As a result, these proposed land use options would not trigger Transportation Planning Rule (TPR) mitigation.

95th Percentile Queuing

The queuing results for movements exceeding available storage for this alternative are shown in Table 2.

The analysis of the intersections along the McLoughlin Boulevard (OR 99E) corridor for the Traffic Control Option 1 (two signals) shows significant queuing would occur in the southbound direction between River Road and Torbank Road, as well as several side streets and storage bays. In the No Build Land Use Option, there would be significant queues along Torbank Road which were not present with the other two land use options. South of Torbank Road, the mainline queuing would begin to improve.

Along McLoughlin Boulevard (OR 99), there are a few storage bays that would be at capacity or just exceeding it, which compound the through queues in the southbound direction. The side streets of Park Avenue and Courtney Avenue would have some minor queuing issues, exceeding storage by a few vehicles.

Table 2. 2035 95th Percentile Queues Exceeding Available Storage-Two Signal Option

Intersection		Direction & Movement	95th % Queue (ft) No Build Land Use	Land Use 1	Land Use 2	Available Storage (ft)
1	OR 99E at River Rd	EB L	**525**	425	**575**	500 [1]
		EB R	**100**	75	75	90 [2]
3	Park Ave at OR 99E	WB T/R	**250**	**275**	**275**	200 [2]
		SB L	**350**	**350**	**400**	325 [2]
		SB T	**3325**	**2950**	**3325**	1525 [1]
		SB R	**175**	**175**	**150**	125 [2]
6	Courtney Ave at OR 99E	EB L	**125**	**125**	**150**	75 [2]
		WB L	475	**525**	375	475 [1]
		WB T/R	**250**	**275**	**250**	75 [2]
		NB R	**125**	100	75	100 [2]
		SB R	200	**225**	**225**	200 [2]
7	Courtney Ave at Oatfield Rd	EB R	**150**	**125**	**125**	100 [2]
8	Park & Ride #1	EB L	**75**	**75**	50	50 [2]
		WB L	**175**	125	**175**	130 [2]
9	Park & Ride #2	NB T	**325**		25	425 [1]
		SB R	50	50	**350**	50 [2]
10	Silver Springs at OR 99E	NB T/R	**475**	**450**	**450**	450 [1]
		SB L	**175**	**200**	**175**	150 [2]
		SBT/R	425	**500**	425	425 [1]
11	Cinderella at OR 99E	SBT/R	**550**	**550**	**500**	450 [1]
12	Torbank at OR 99E	EB L/T/R	**1075**	225	625	900 [1]
		WB L/T/R	**650**	300	600	600 [1]
		SB L	**150**	**150**	125	150 [2]
		SBT/R	**550**	**575**	**550**	500 [1]

Notes
1. Storage distance reflects spacing to the next public access point.
2. Storage distance reflects length of travel lane or turn bay.
3. Two-way, left-turn lane (TWLTL) without a designated turn bay
4. Storage distance reflects length of turn bay but TWLTL allows additional storage space.

SHADING indicates 95th percentile queues that would exceed available storage.

Signal Progression Comparison

A signal progression analysis was also considered as part of the evaluation process. None of the land use options can meet or improve upon the progression time used in the Baseline Conditions analysis. Land Use Option 1 would result in the best progression of the three land use options, followed by Land Use Option 2. The No Build Land Use Option would perform the worst for signal progression. Table 3 shows a comparison of the signal progression between the three land use options and the Baseline Condition.

Table 3. 2035 Signal Progression Comparison - Traffic Control Option 1 (Two Signals)

Direction of Travel	Baseline Condition	Multi-Way Boulevard with Two New Traffic Signals		
		No Build Option	Land Use Option 1	Land Use Option 2
Northbound Bandwidth	50 sec.	**40 sec.**	**40 sec.**	**40 sec.**
Southbound Bandwidth	62 sec.	50 sec.	**52 sec.**	51 sec.

BOLD- Bandwidth approximately 10 seconds (or less) difference compared to Baseline

Travel Time and Speed Comparison

Travel time and speed were two additional parameters evaluated as part of this analysis. Table 4 provides a summary of the travel time results for all three land uses. In general, no significant changes in travel time were observed in the northbound direction for any of the land use options when compared to the Baseline Condition. In the southbound direction, the greatest benefit would be seen along the OR 99E/McLoughlin Boulevard corridor for Land Use Option 1, with an approximate reduction in travel time of over 4.5 minutes compared to the Baseline Condition. The southbound travel time along OR 99E/McLoughlin Boulevard for Land Use Option 2 would be roughly equivalent to the Baseline Conditions while the No Build Land Use Option would result in a slightly longer travel time, an increase of approximately 2.5 minutes.

Table 4. 2035 Travel Time Comparison – Traffic Control Option 1 (Two Signals)

Roadway Segment	Baseline Condition		Travel Time (min.)											
			No Build Option				Land Use Option 1				Land Use Option 2			
	NB	SB	NB	Δ	SB	Δ	NB	Δ	SB	Δ	NB	Δ	SB	Δ
River Road (OR 99E to Courtney)	3.5	2.0	3.6	**+0.1**	2.0	0.0	3.4	**-0.1**	2.0	0.0	3.8	**+0.3**	2.0	0.0
McLoughlin Boulevard (River Road to Courtney)	2.4	13.5	2.7	**+0.3**	15.9	**+2.4**	2.6	+0.2	8.7	**-4.8**	2.7	**+0.3**	14.2	**+0.7**
Oatfield Road (Park Avenue to Courtney)	1.3	1.5	1.3	0.0	1.5	0.0	1.2	**-0.1**	1.4	**+0.1**	1.3	0.0	1.5	0.0

Δ-Change in travel time between Baseline and Land Use option
BOLD indicates segments where the alternative travel time decreased compared with Baseline Conditions.
WHITE indicates segments where the alternative travel time increased compared with Baseline Conditions.

The River Road and Oatfield Road corridors would result in minimal changes in the corridor travel time in the southbound direction.

The changes in speed throughout the corridors, which correspond with the travel time data, are shown in Table 5.

Table 5. 2035 Speed Comparison – Traffic Control Option 1 (Two Signals)

Roadway Segment	Baseline Condition		Speed (mph)											
			No Build Land Use				Land Use 1				Land Use 2			
	NB	SB	NB	Δ	SB	Δ	NB	Δ	SB	Δ	NB	Δ	SB	Δ
River Road (OR 99E to Courtney)	19	31	19	0	31	0	20	**+1**	31	0	18	**-1**	31	0
McLoughlin Boulevard (River Road to Courtney)	30	9	25	**-5**	8	**-1**	26	**-4**	11	**+2**	25	**-5**	9	0
Oatfield Road (Park Avenue to Courtney)	28	26	29	**+1**	27	**+1**	31	**+3**	28	**+2**	29	**+1**	27	**+1**

Δ-Change in travel speed between Baseline and Land Use option
BOLD indicates segments where the alternative travel speed increased compared with Baseline Conditions.
WHITE indicates segments where the alternative travel speed decreased compared with Baseline Conditions.

For the No Build Land Use Option, two of the three corridors would result in little change in speed in either direction. The OR 99E/McLoughlin Boulevard corridor would result in a reduction in speed of approximately 5 miles per hour (mph) in the northbound direction and be approximately equal in the southbound direction.

Land Use Option 1 would result in slight changes in speed for the River Road and Oatfield Road corridors in either direction, ranging from no change to an improvement of 3 mph. The OR 99E/McLoughlin Boulevard corridor would result in a reduction of 4 mph in the northbound direction and a slight improvement in the southbound direction of approximately 2 mph.

For Land Use Option 2, the speeds would be approximately equivalent to the baseline conditions along the Oatfield Road and River Road segments in both directions, as well as the southbound direction of OR 99E/McLoughlin Boulevard. The northbound direction of travel along OR 99E/McLoughlin Boulevard would result in a speed reduction of approximately 5 mph.

The travel time and speed data help to qualitatively assess changes between options as well as provide metrics which are easy to relate to. The comparison summaries provided in Table 4 and Table 5 are based on the Synchro/Simtraffic software package which is not a dynamic model nor can actively reassign traffic based on levels of congestion within the model. The travel time and speed results are based on the forecast volume set identified in the 2035 Alternatives Traffic Forecasts section. A dynamic model may provide a more thorough assessment of interaction between the three north-south corridors and should be considered if further analysis is conducted.

Traffic Control Option 2: One New Signal

This detailed analysis presents intersection operations followed by movements that would experience 95th percentile queuing in excess of available storage. Finally, a comparison of signal progression, main north-south corridor travel times and speeds are presented.

Although a new traffic signal was evaluated in this analysis, it was done so prior to conducting preliminary signal warrants. Preliminary signal warrants were later prepared and can be found in the Preliminary Signal Warrants section.

Intersection Operations

Study area intersections were evaluated with Traffic Control Option 2 (one traffic signal) paired with each of the land use options. The assumed lane configurations and resulting operations, v/c ratio and LOS, are presented in Figure 4b, Figure 5b, and Figure 6b**.** A detailed table of operations is available in Appendix E.

In general, the majority of the southbound congestion would be experienced at the Park Avenue and River Road intersections. The high overall v/c ratios along OR 99E/McLoughlin Boulevard within the study area are a reflection of the high southbound through movement volumes which are at or over capacity combined with high volume side street left-turn movements.

The No Build Land Use Option would result in three of the study area intersections along the McLoughlin Boulevard (OR 99E) operating at or over capacity. Of the three intersections for the No Build Land Use option, two are existing, Park Avenue (v/c ratio=1.05) and Courtney Avenue (v/c ratio=1.09), and one is new, Cinderella Road (v/c ratio=1.48).

The Land Use Option 1 alternative would result in the best operations with only one intersection over capacity, McLoughlin Boulevard at Cinderella (v/c ratio=1.14). The intersections of Park Avenue and Courtney Avenue would be near capacity with v/c ratios of 0.98. While one new signal was added to the McLoughlin Boulevard system for this alternative, it is likely the reduction in vehicle trips associated with the change in land use that would result in fewer intersections being at or over capacity compared to No Build Land Use option.

The reduction in vehicle trips associated with Land Use Option 2 would result in trip generation mid-way between that calculated for the No Build Land Use Options and Land Use Option 1. Similar to the No Build Lane Use Option, though slightly better, Land Use Option 2 would result in three intersections along McLoughlin Boulevard (OR 99E) operating at or above capacity. Of the three intersections, two are existing, Park Avenue (v/c ratio=1.03) and Courtney Avenue (v/c ratio=1.08), and one is the new intersection, Cinderella (v/c ratio=1.46).

Of the signalized County intersections, both operate within the County standard of LOS D for all land use options. The Park Avenue Park and Ride access would operate at LOS C or better and v/c ratio of 0.17 or better for all three land use options. The intersection of Oatfield Road at Park Avenue would operate with LOS B or better and a v/c ratio of 0.78 or better.

Of the unsignalized intersections, the westbound movement at the Park Avenue at River Road intersection would meet the County's operational standard for all land use options. However, Courtney Avenue at River Road would continue to exceed the County's operational standards for the No Build Land Use Option and Land Use Option 2. For these two land use options, the westbound movement would operate at LOS E with a v/c ratio of 0.65 (No Build Option) and 0.62 (Land Use Option 2). The intersection of Courtney Avenue at Oatfield Road would meet County standards for all three land uses.

When comparing the two land use options to the no build land use option, the trip generation is reduced and consequently the overall operations improve. As a result, these proposed land use options would not trigger Transportation Planning Rule (TPR) mitigation.

95th Percentile Queuing

The queuing results for movements exceeding available storage for this alternative are shown in Table 6.

The analysis of the intersections along the McLoughlin Boulevard (OR 99E) corridor for Traffic Control Option 2 (one signal) shows significant queuing in the southbound direction between River Road and Cinderella Road, as well as several side streets and storage bays. South of Cinderella Road, the mainline queuing would begin to improve but there would be significant westbound queues along Courtney Avenue at McLoughlin Boulevard (OR 99E). The westbound queue would back up to the intersection of Courtney Avenue at Oatfield Road, impacting operations and queuing at that intersection.

Along McLoughlin Boulevard (OR 99E), there are a few storage bays that would be at capacity or just exceeding it, which would compound the through queues in the southbound direction. The side streets of Park Avenue, Cinderella Road and Courtney Avenue, would have some minor queuing issues, exceeding storage by one or two vehicles.

Table 6. 2035 95th Percentile Queues Exceeding Available Storage-One Signal Option

Intersection		Direction & Movement	95th Percentile Queue (ft)			Available Storage (ft)
			No Build Land Use	Land Use 1	Land Use 2	
1	OR 99E at River Rd	EB L	500	450	**575**	500 [1]
3	Park Ave at OR 99E	WB T/R	**275**	**325**	**350**	200 [2]
		NB R	75	**125**	100	100 [2]
		SB L	**350**	**350**	**375**	325 [2]
		SB T	**3225**	**2575**	**3325**	1525 [1]
		SB R	125	**175**	**150**	125 [2]
6	Courtney Ave at OR 99E	EB L	**150**	**125**	**125**	75 [2]
		WB L	**850**	**900**	**725**	475 [1]
		WB T/R	**300**	**300**	**300**	75 [2]
		NB R	100	75	**125**	100 [2]
		SB R	200	**275**	**225**	200 [2]
7	Courtney Ave at Oatfield Rd	EB R	**150**	**125**	**150**	100 [2]
		NB L/T	450	**550**	300	475 [1]
		SB T/R	**575**	**525**	250	375 [1]
8	Park & Ride #1	WB L	**150**	125	**150**	130 [2]
9	Park & Ride #2	SB T	**400**	**400**	**450**	375 [1]
		SB R	50	50	**75**	50 [2]
10	Silver Springs at OR 99E	SB T/R	**475**	**600**	**525**	425 [1]
11	Cinderella at OR 99E	EB L/T/R	**675**	300	400	500 [1]
		SB L	**200**	**175**	**200**	150 [2]
		SBT/R	450	**475**	425	450 [1]

Notes
1. Storage distance reflects spacing to the next public access point.
2. Storage distance reflects length of travel lane or turn bay.
3. Two-way, left-turn lane (TWLTL) without a designated turn bay
4. Storage distance reflects length of turn bay but TWLTL allows additional storage space.

SHADING indicates 95th percentile queues that would exceed available storage.

Signal Progression Comparison

A signal progression analysis was also considered as part of the evaluation process. Table 7 shows a comparison of the signal progression between the three land use options and the baseline condition. None of the land use options can meet or improve upon the progression time used in the Baseline Conditions. Land Use Option 1 would result in the best southbound progression of the three land use options, followed by Land Use Option 2. The No Build Land Use Option would perform the worst for southbound signal progression. Conversely, in the northbound direction the No Build Land Use Option would result in the best progression, followed by Land Use Options 1 and 2.

Table 7. 2035 Signal Progression Comparison- Traffic Control Option 2 (One Signal)

Direction of Travel	Baseline Condition	Multi-Way Boulevard with One New Traffic Signal		
		No Build Option	Land Use Option 1	Land Use Option 2
Northbound Bandwidth	50 sec.	39	36	33
Southbound Bandwidth	62 sec.	45	50	48

Travel Time and Speed Comparison

Travel time and speed were two additional parameters evaluated as part of this analysis. Table 8 provides a summary of the results for all three land use options. In general, no significant changes in travel time were observed in the northbound direction along McLoughlin Boulevard (OR 99E) for any of the land uses. In the southbound direction, the greatest benefit would be seen along the OR 99E/McLoughlin Boulevard corridor for Land Use Option 1, an approximate reduction in travel time of over 5.5 minutes compared to the Baseline Condition. The southbound travel time along OR 99E/McLoughlin Boulevard for Land Use Option 2 would be slightly reduced (1.3 minutes) compared to the Baseline Conditions while the No Build Land Use Option would result in no significant change.

The River Road corridor would result in minimal changes in the corridor travel time for both directions. The Oatfield Road corridor would result in minimal changes in the travel time in the southbound direction. However, the northbound travel time may increase by as much as 1.8 minutes (Land Use Option 2).

Table 8. 2035 Travel Time Comparison – Traffic Control Option 2 (One Signal)

Roadway Segment	Baseline Condition		Travel Time (min.)											
			No Build Option				Land Use Option 1				Land Use Option 2			
	NB	SB	NB	Δ	SB	Δ	NB	Δ	SB	Δ	NB	Δ	SB	Δ
River Road (OR 99E to Courtney)	3.5	2.0	3.5	0	2.0	0.0	3.5	0.0	2.0	0.0	3.8	**+0.3**	2.0	0.0
McLoughlin Boulevard (River Road to Courtney)	2.4	13.5	2.6	**+0.2**	13.3	**-0.2**	2.6	**+0.2**	7.8	**-5.7**	2.7	**+0.3**	12.2	**-1.3**
Oatfield Road (Park Avenue to Courtney)	1.3	1.5	2.4	**+1.1**	1.6	+0.1	3.1	**+1.8**	1.6	**+0.1**	1.5	**+0.2**	1.5	0.0

Δ-Change in travel time between Baseline and Land Use option
BOLD indicates segments where the alternative travel time decreased compared with Baseline Conditions.
WHITE indicates segments where the alternative travel time increased compared with Baseline Conditions.

The changes in speed throughout the north-south corridors are shown in Table 9 and correspond with the travel time data presented in Table 8.

Table 9. 2035 Speed Comparison- One Signal Option

Roadway Segment	Baseline Condition		Speed (mph)											
			No Build Land Use				Land Use 1				Land Use 2			
	NB	SB	NB	Δ	SB	Δ	NB	Δ	SB	Δ	NB	Δ	SB	Δ
River Road (OR 99E to Courtney)	19	31	20	**+1**	31	0	20	**+1**	32	**+1**	19	0	31	0
McLoughlin Boulevard (River Road to Courtney)	30	9	27	**-3**	9	0	27	**-3**	12	**+3**	26	**-4**	9	0
Oatfield Road (Park Avenue to Courtney)	28	26	24	**-4**	25	**-1**	22	**-6**	25	**-1**	27	**-1**	26	0

Δ-Change in travel speed between Baseline and Land Use option
BOLD indicates segments where the alternative travel speed increased compared with Baseline Conditions.
WHITE indicates segments where the alternative travel speed decreased compared with Baseline Conditions.

For the No Build Land Use Option, two of the three corridors (McLoughlin Boulevard and Oatfield Road) would see some decrease in speed in the northbound direction. In the southbound direction all three corridors would essentially maintain the same speed. The OR 99E/McLoughlin Boulevard and Oatfield Road corridors would result in a slight reduction in speed of approximately 3 mph and 4 mph, respectively, in the northbound direction.

Land Use Option 1 would result in little change in speed in either direction for the River Road corridor. The Oatfield Road corridor would experience a decrease in speed for the northbound direction of approximately 6 mph, while the southbound direction would result in equivalent speeds to the Baseline Condition. The OR 99E/McLoughlin Boulevard corridor would result in a reduction of 3 mph in the northbound direction and a slightly improvement in the southbound direction of approximately 3 mph.

For Land Use Option 2, the speeds would be approximately equivalent to the baseline conditions along Oatfield Road and River Road corridors in the northbound and southbound directions as well as the southbound direction of OR 99E/McLoughlin Boulevard. The northbound direction of travel along OR 99E/McLoughlin Boulevard would result in a speed reduction of approximately 4 mph.

The travel time and speed data help to qualitatively assess changes between options as well as provide metrics which are easy to relate to. The comparison summaries provided in Table 8 and Table 9 are based on the Synchro/Simtraffic software package which is not a dynamic model nor can actively reassign traffic based on levels of congestion within the model. The travel time and speed results are based on the forecast volume set identified in the 2035 Alternatives Traffic Forecasts section. A dynamic model may provide a more thorough assessment of interaction between the three north-south corridors and should be considered if further analysis is conducted.

Preliminary Signal Warrants

Once 2035 peak hour traffic volumes were estimated for the six alternatives under consideration, ODOT's set of preliminary traffic signal warrants were used to determine if signals might be warranted at three different locations as part of the traffic control options. Though based on the MUTCD warrants, ODOT's preliminary warrants focuses on only two of the warrants, and is generally not accepted as a basis for approving the installation of a traffic signal but is helpful at evaluating future conditions.

ODOT's preliminary traffic signal warrants were evaluated using the 2035 volumes developed for the No Build Land Use Option, Land Use Option 1 and Land Use Option 2 for the proposed signalized intersections of McLoughlin Boulevard at Silver Springs and Torbank Roads for Traffic Control Option 1 and at Cinderella for Traffic Control Option 2. The results of the evaluation are summarized in Table 10.

Table 10. Summary of Preliminary Signal Warrant Evaluation

	Meets Preliminary Traffic Signal Warrants		
Traffic Control	**No Build Option**	**Land Use Option 1**	**Land Use Option 2**
Option 1: Two New Signals			
Silver Springs Road	Yes	Yes	Yes
Torbanks Road	Yes	No	Yes
Option 2: One New Signal			
Cinderella Road	Yes	Yes	Yes

WHITE indicates an intersection which does not meet preliminary signal warrants with current analysis assumptions.

The preliminary signal warrant analysis for Traffic Control Option 1 (two signals) yielded different results, depending on the land use option. For the intersection of OR 99E at Silver Springs Road, Case B is met for each of the three land use options. For the intersection of McLoughlin Boulevard at Torbank Road, the results differ for each land use option. For the No Build Land Use Option and Land Use Option 2, Case B is met, while neither of the warrants (Case A or B) are met for Land Use Option 1.

The analysis for the one signal traffic control option indicates that both of the preliminary warrants would be met under all three future land use options for the intersection of OR 99 at Cinderella.

The signal warrants were based on an assumed development pattern; however, actual development may differ and result in more or fewer trips at these three intersections. Any change to McLoughlin Boulevard, whether it is a pedestrian actuated crossing or traffic signal will require signal warrants to be met. If no warrants can be met, then the intersection would remain unsignalized.

METRO council of government modeling staff recommended that engineering judgment be applied when analyzing how drivers gain access to and from the study area in the future years. An alternative approach was discussed, which would have entailed adding local roadway network detail to the travel demand model. However, since the directional link capacities for the local roadways are set to 600 vph (as a minimum) within the travel demand model and volumes on these local roadways would likely be less

than 400 vph, this approach was deemed as unnecessary. The more simplistic approach of hand assignment was assumed to be an effective approach.

If development patterns were to occur in a manner that supports the usage, but differed from those assumed in these analysis, it would be possible for more or less trips to utilize any one of the study area intersections along OR 99.

Additionally, these signal warrant findings do not mean that a commitment has been made to install a traffic signal on McLoughlin Boulevard within the study area. ODOT's preliminary signal warrants may be used as a starting point, but all MUTCD traffic signal warrants must be considered and the State Traffic Engineer's approval obtained before a traffic signal can be installed on a state highway. Additional factors should be evaluated as well, such as safety concerns, alternatives to signalization, consistency with local plans, delay, queuing and others.

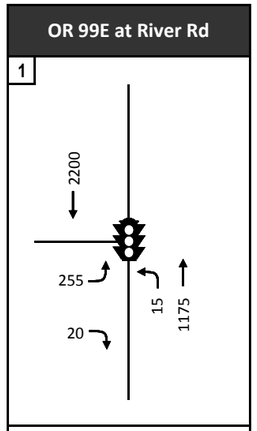
Future Roadway Connectivity for Consideration

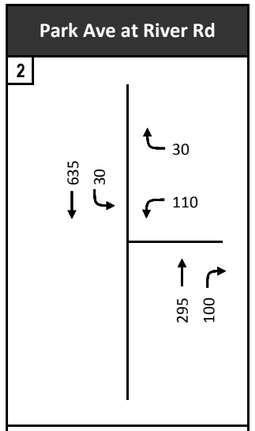
This analysis focuses on circulation connections and new intersections along OR 99E/McLoughlin Boulevard between Park Avenue and Courtney Avenue to foster easier mobility for all modes of travel, specifically in the vicinity of the Park Avenue Station. Two new intersections have been considered for this analysis: Silver Springs and Torbank Roads. These roadways actually span from River Road to Oatfield, however, they are disconnected in various locations. The most noticeable connection missing from these roadways is in the vicinity of the Trolley Trail. While the circulation plan assumed these connections could occur as a multi-use path or single lane for non-motorized travel, future consideration should be given to making a vehicular connection across the trail to provide a more grid-like pattern between River Road and Oatfield Road. If consideration is given to connecting the roadways across the trolley trail, reclassification (in the form of amending the Milwaukie Transportation System Plan) should be given to changing the current local roadway classification to collector status depending on the land use alternative chosen.

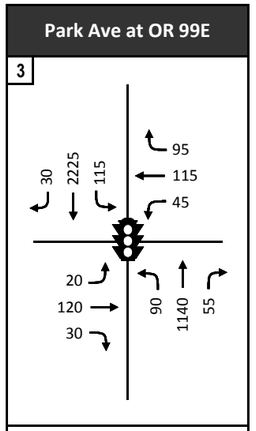
Additionally, the circulation plan assumed the new roadways would be classified as local roads. Based on the 2035 traffic forecasts and assuming that build out is similar to the assumptions presented in this document, this assumption will need to be revisited. Silver Springs, Cinderella, and/or Torbank Roads may be better suited to the collector or arterial status.

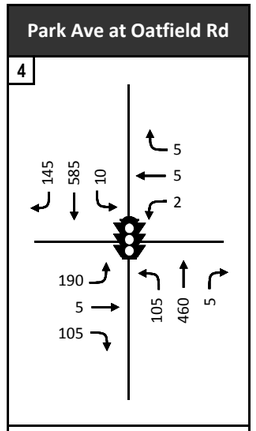
Attachments:
Figure 1a: 2035 No Build Land Use Option Traffic Control Option 1 (2 Signals) - PM Peak Hour Turning Movement Volumes
Figure 2a: 2035 Land Use Option 1 Traffic Control Option 1 (2 Signals) - PM Peak Hour Turning Movement Volumes
Figure 3a: 2035 Land Use Option 2 Traffic Control Option 1 (2 Signals) - PM Peak Hour Turning Movement Volumes
Figure 4a: 2035 No Build Land Use Option Traffic Control Option 2 (1 Signal) - PM Peak Hour Turning Movement Volumes

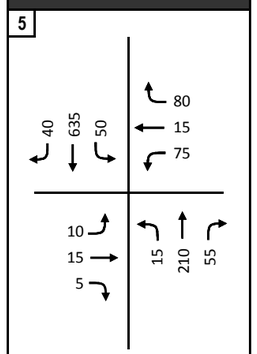
Figure 5a: 2035 Land Use Option 1 Traffic Control Option 2 (1 Signal) - PM Peak Hour Turning Movement Volumes
Figure 6a: 2035 Land Use Option 2 Traffic Control Option 2 (1 Signal) - PM Peak Hour Turning Movement Volumes
Figure 1b: 2035 No Build Land Use Option Traffic Control Option 1 (2 Signals) - PM Peak Hour Traffic Operations
Figure 2b: 2035 Land Use Option 1 Traffic Control Option 1 (2 Signals) - PM Peak Hour Traffic Operations
Figure 3b: 2035 Land Use Option 2 Traffic Control Option 1 (2 Signals) - PM Peak Hour Traffic Operations
Figure 4b: 2035 No Build Land Use Option Traffic Control Option 2 (1 Signal) - PM Peak Hour Traffic Operations
Figure 5b: 2035 Land Use Option 1 Traffic Control Option 2 (1 Signal) - PM Peak Hour Traffic Operations
Figure 6b: 2035 Land Use Option 2 Traffic Control Option 2 (1 Signal) - PM Peak Hour Traffic Operations
Appendix A: Land Use Options
Appendix B: Trip Generation
Appendix C: Preliminary Signal Warrant Worksheets
Appendix D: Synchro/SimTraffic Output
Appendix E: Operational Results

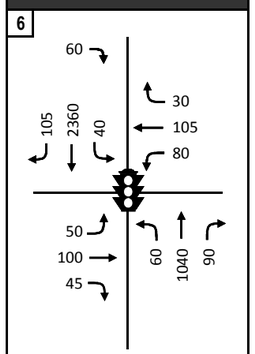


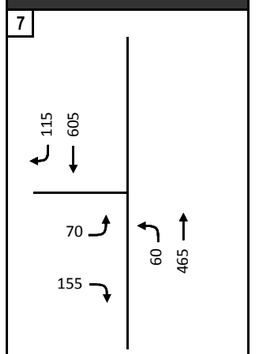


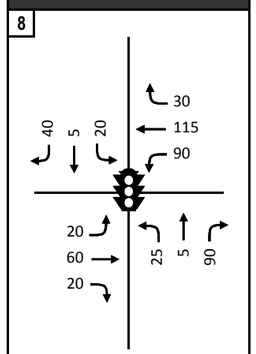


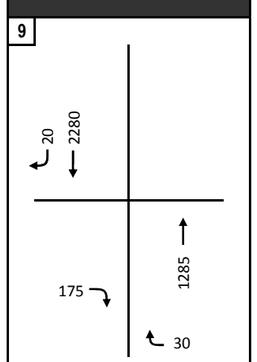


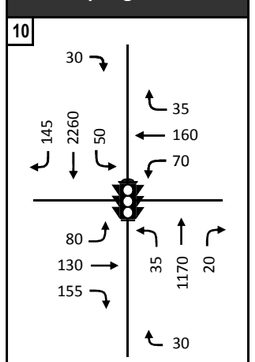


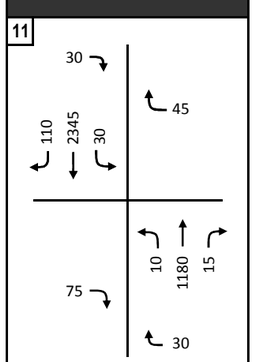


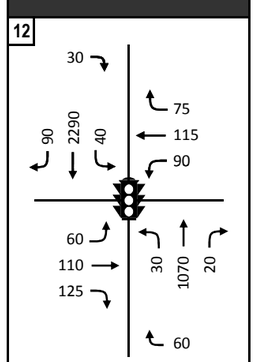












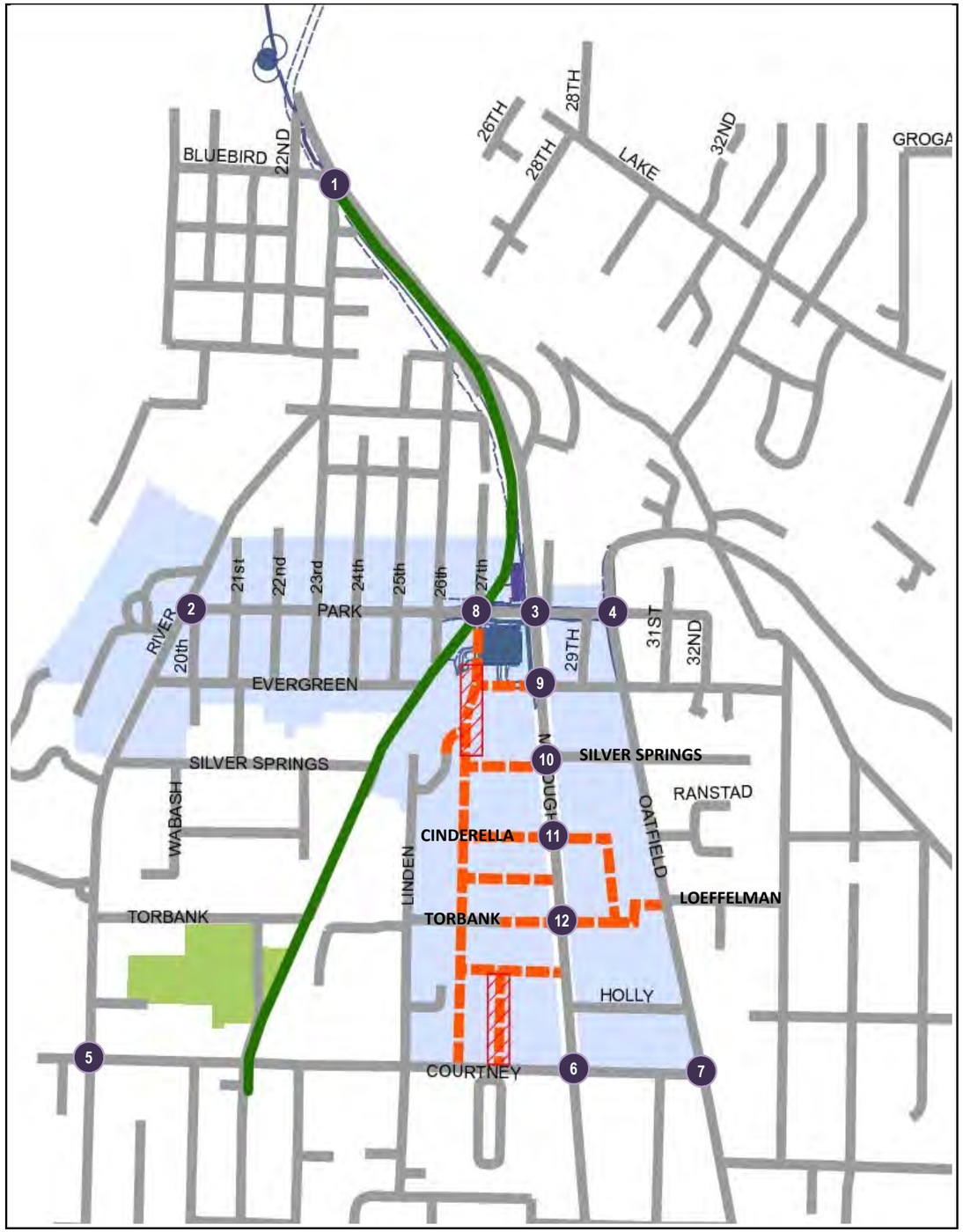


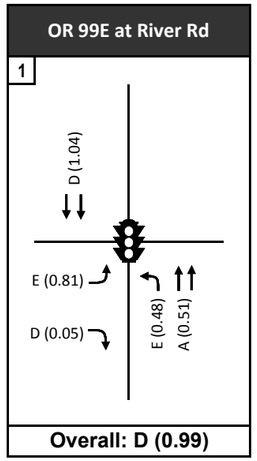
Figure 1-a

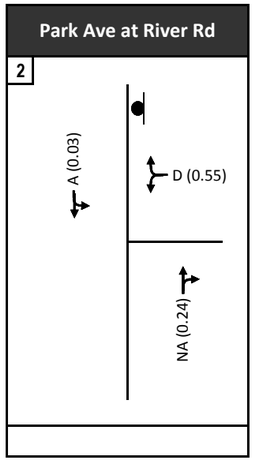
2035 No Build Land Use Option
Traffic Control Option 1
(2 Signals)
PM Peak Hour Turning Movement Volumes

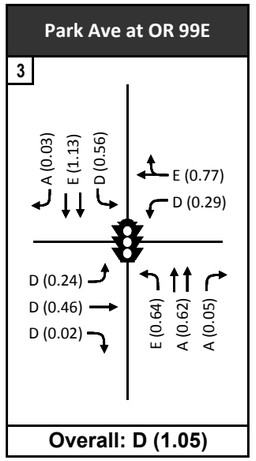
Park Ave Traffic Analysis

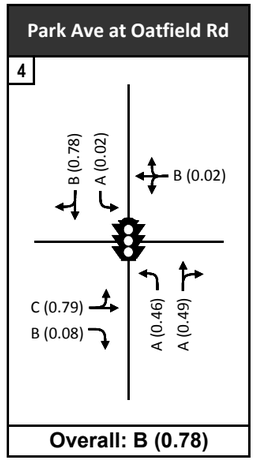
Legend

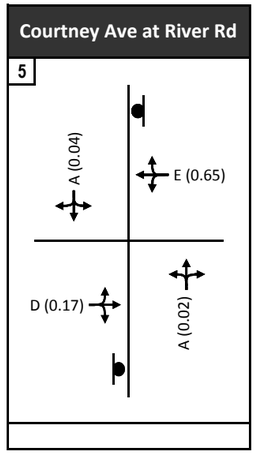
- Traffic Signal
- 99 Study Area Intersection
- → Allowable Movement
- ### PM Peak Hour Volume
- Trolley Trail
- Proposed Roadway Connection

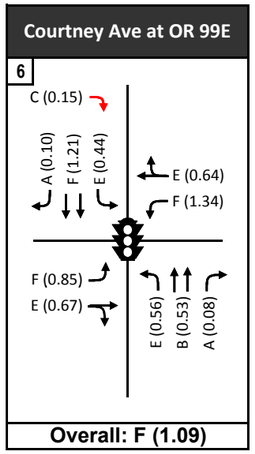


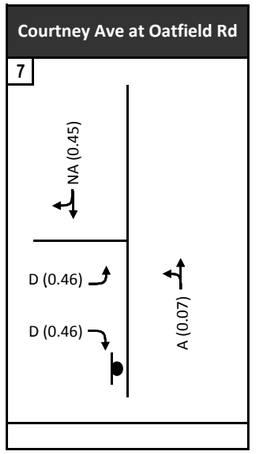


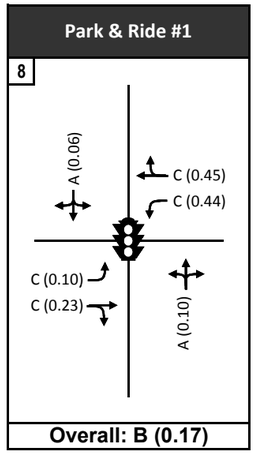


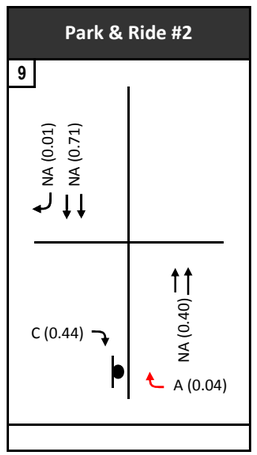


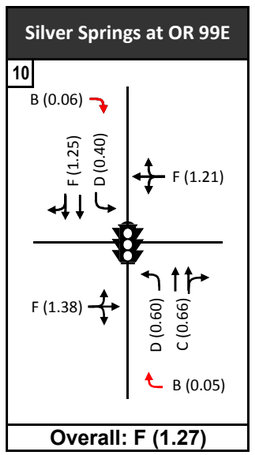


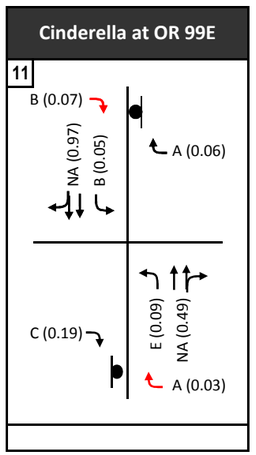


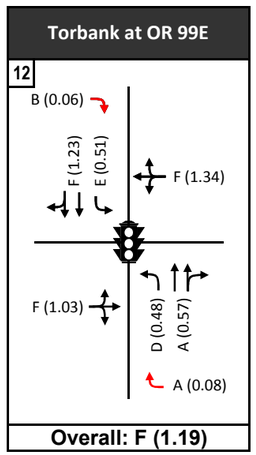












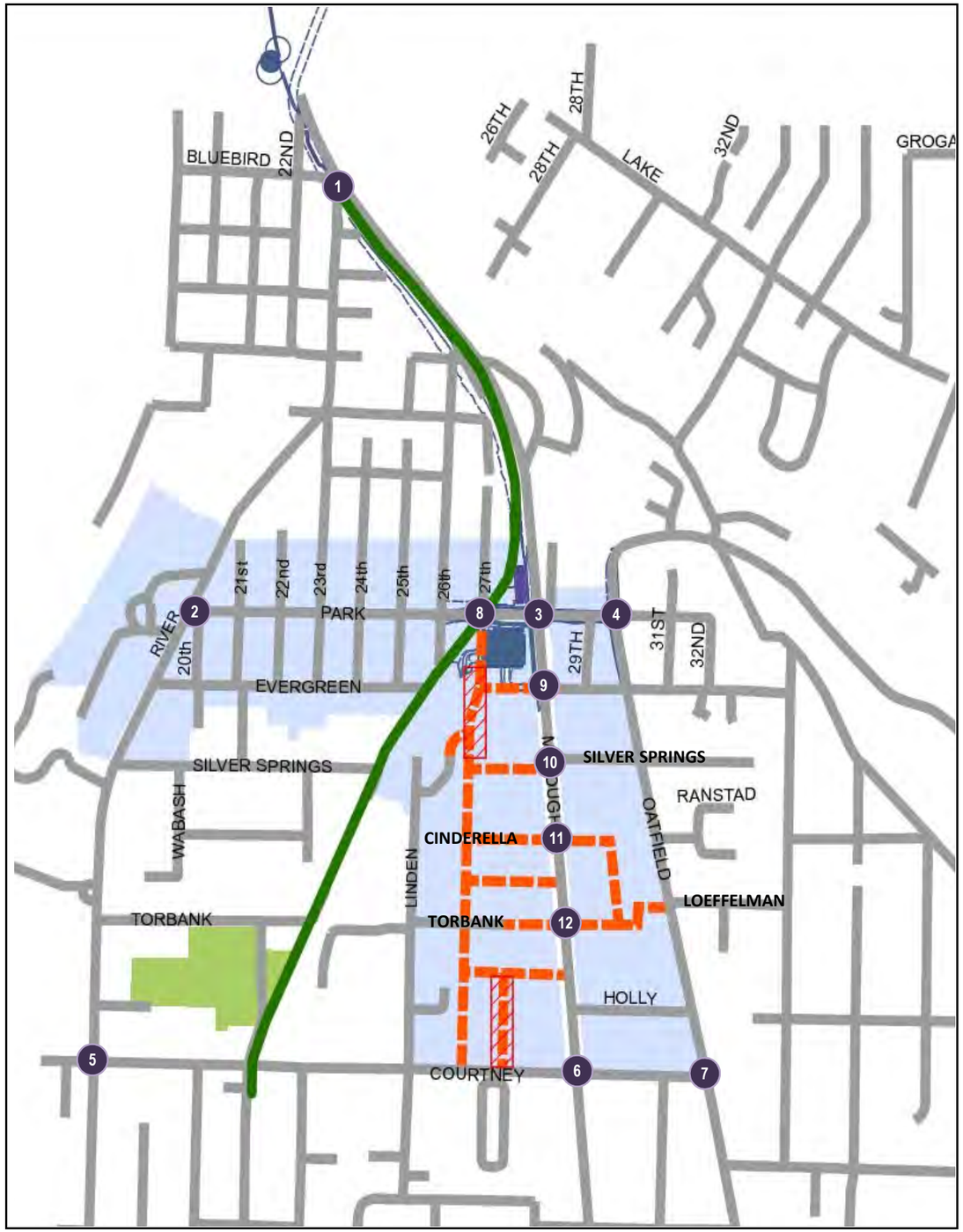


Figure 1-b

2035 No Build Land Use Option
Traffic Control Option 1
(2 Signals)
PM Peak Hour Traffic Operations

Park Ave
Traffic Analysis

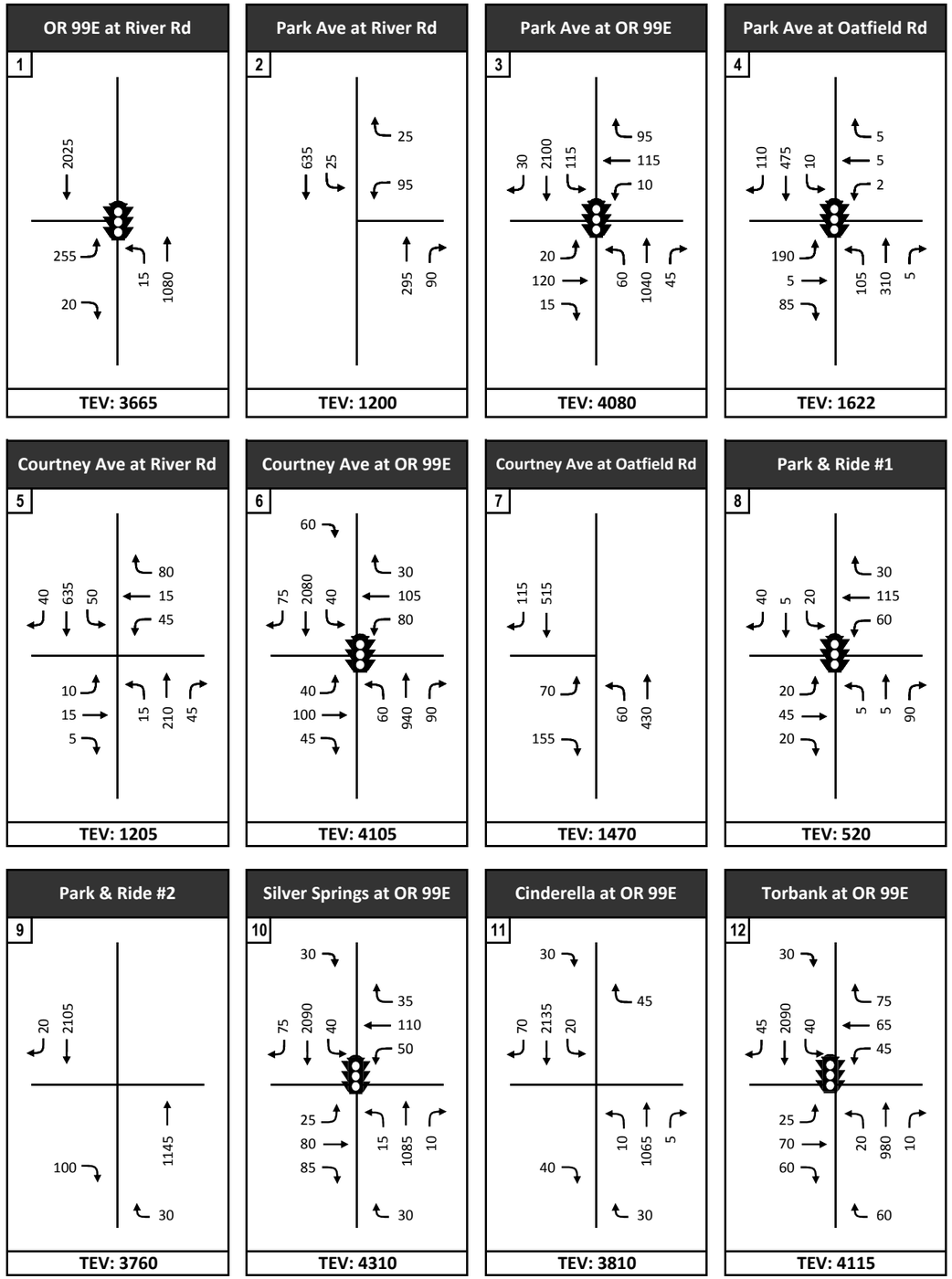
Legend

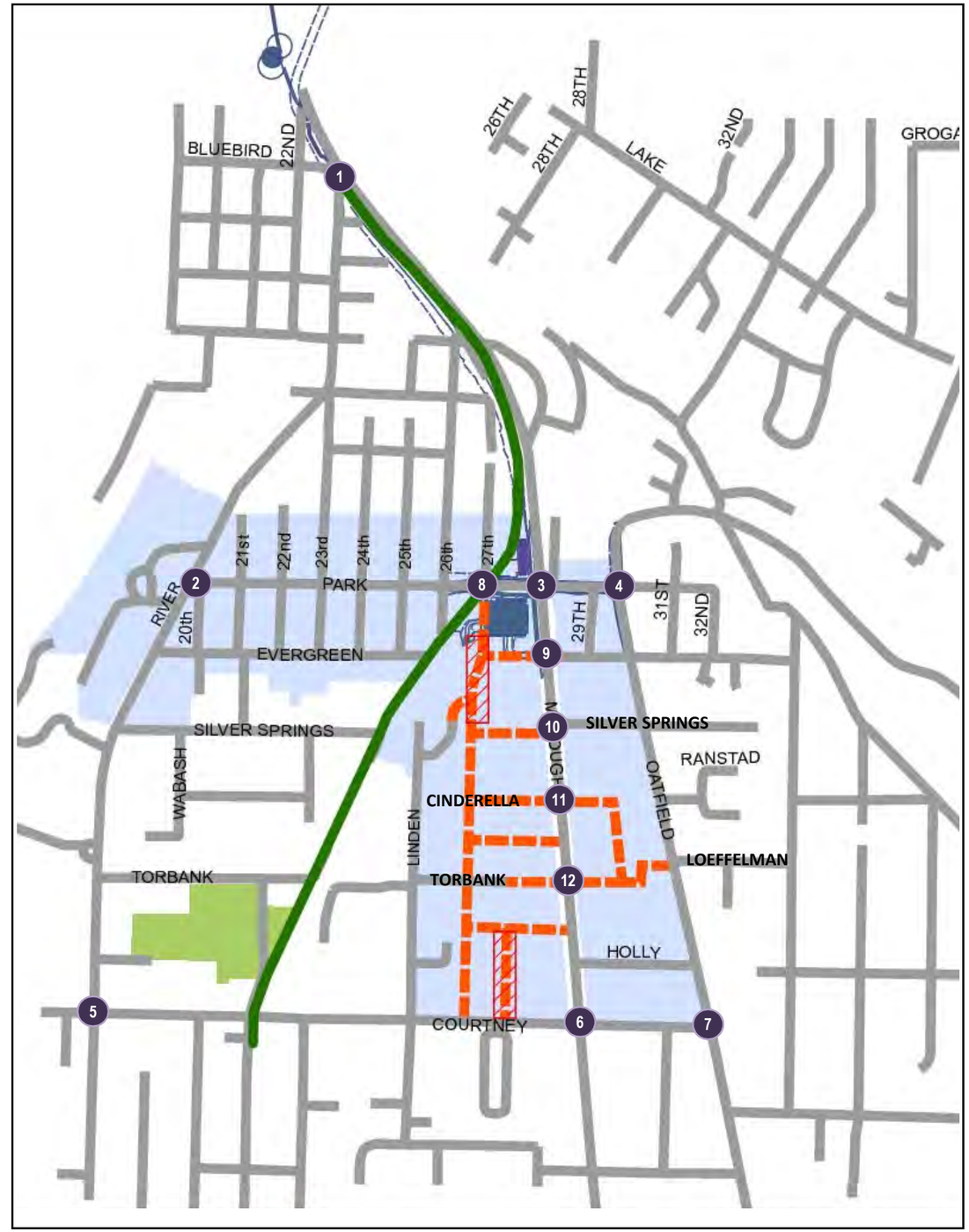
- Traffic Signal
- STOP Controlled Approach
- 99 Study Area Intersection
- Lane Configuration
- A (0.01): LOS (V/C)
- NA: LOS not reported for free movements
- Side Lane STOP Controlled Access
- Trolley Trail
- Proposed Roadway Connection

Figure 2-a

2035 Land Use Option 1
Traffic Control Option 1
(2 Signals)
PM Peak Hour Turning Movement Volumes

Park Ave Traffic Analysis





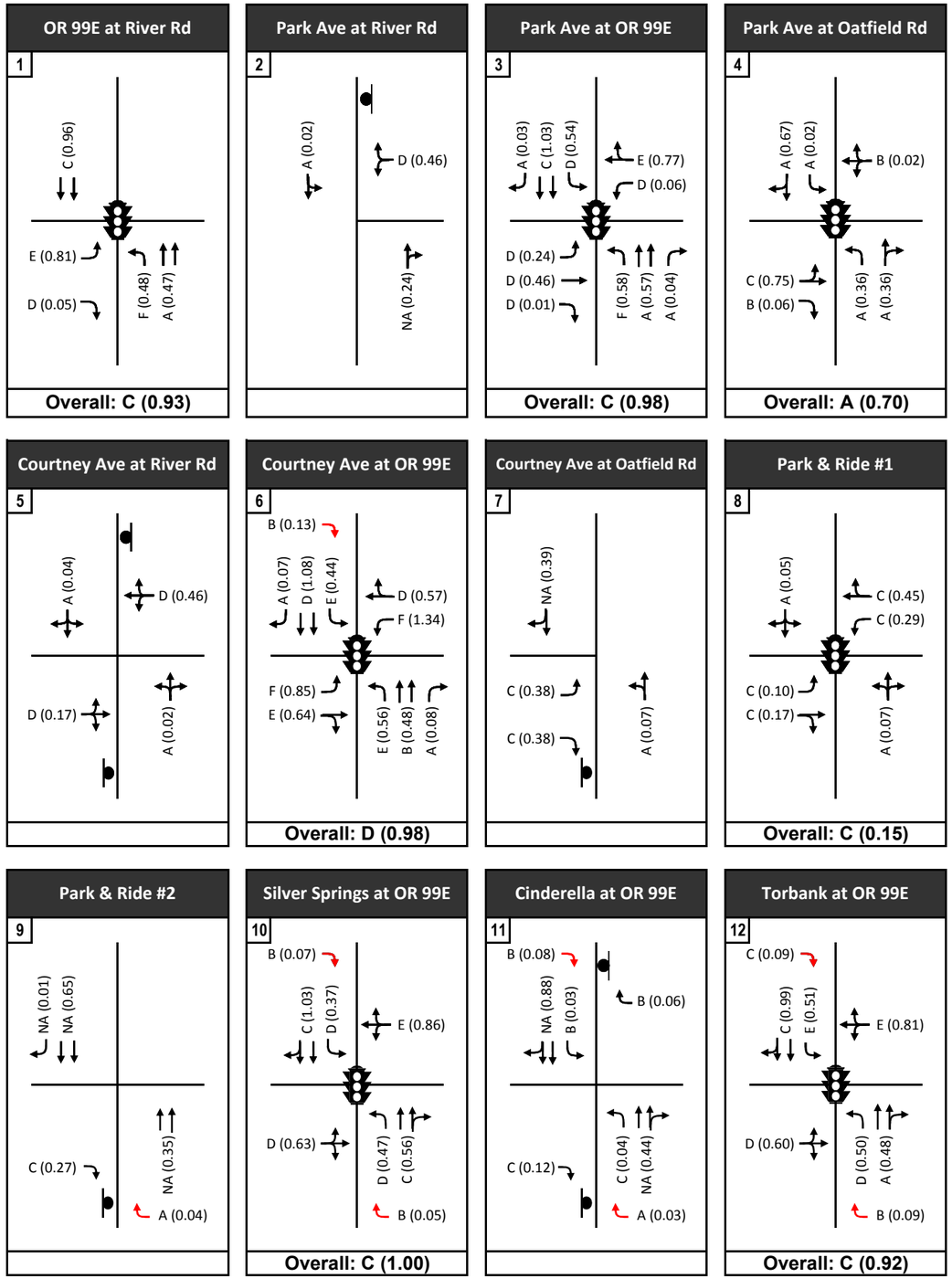
Legend

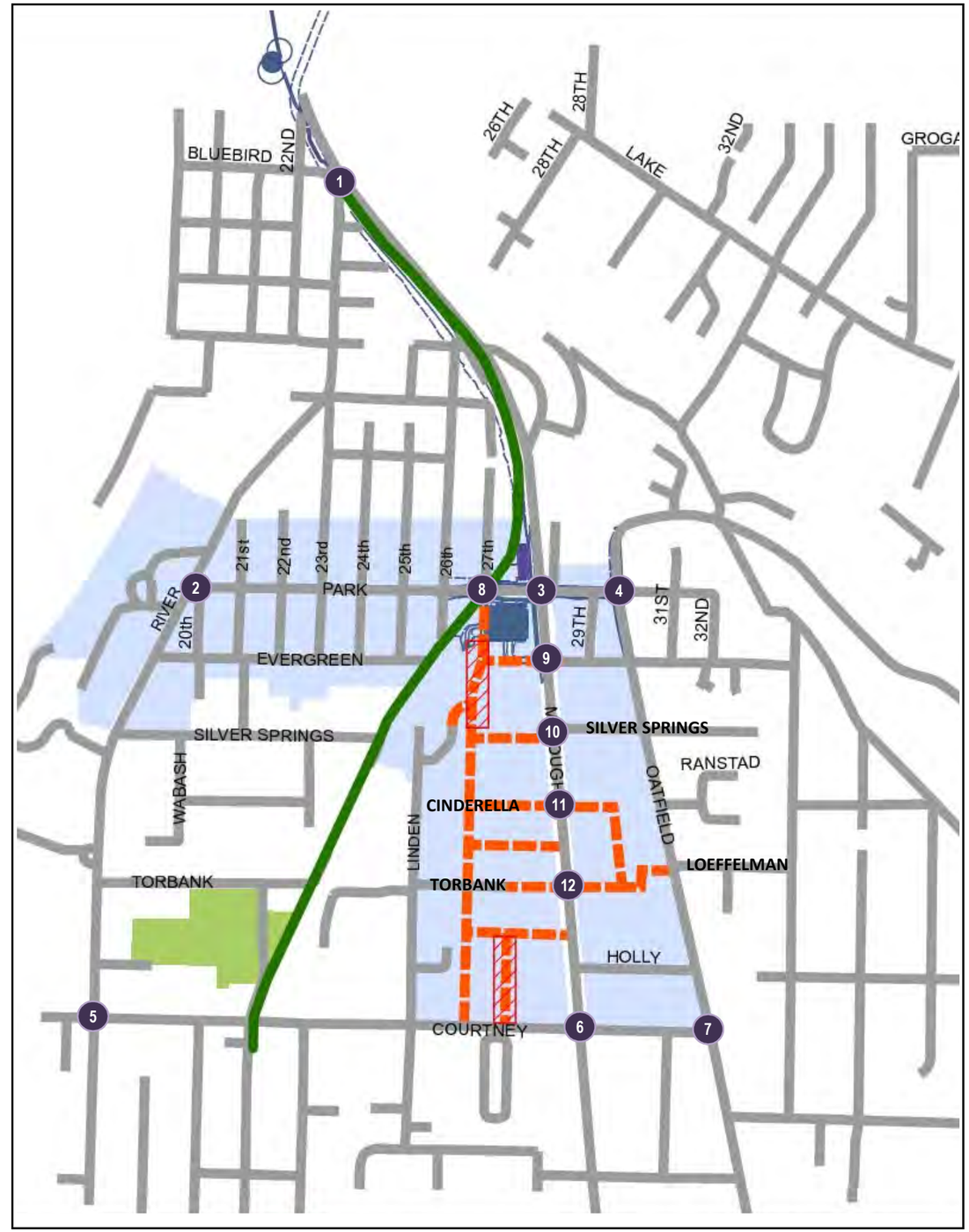
- Traffic Signal
- 99 Study Area Intersection
- → Allowable Movement
- ### PM Peak Hour Volume
- Trolley Trail
- Proposed Roadway Connection

Figure 2-b

2035 Land Use Option 1
Traffic Control Option 1
(2 Signals)
PM Peak Hour Traffic Operations

Park Ave Traffic Analysis





Legend

- Traffic Signal
- STOP Controlled Approach
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- A (0.01): LOS (V/C)
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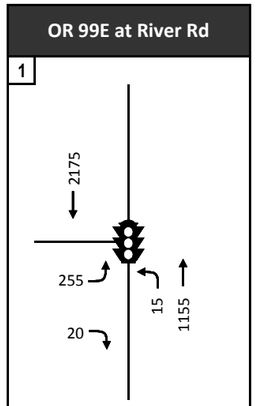
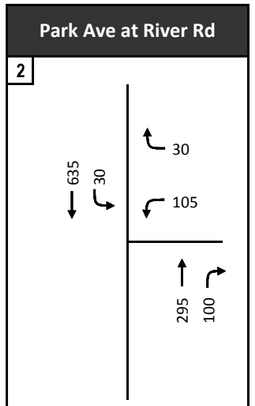
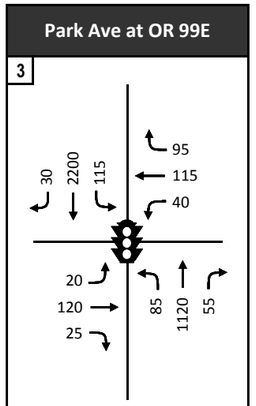
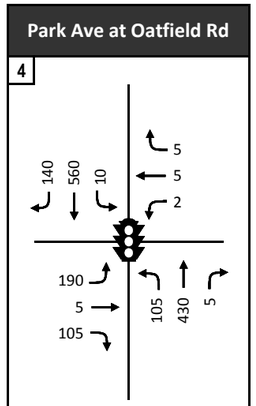
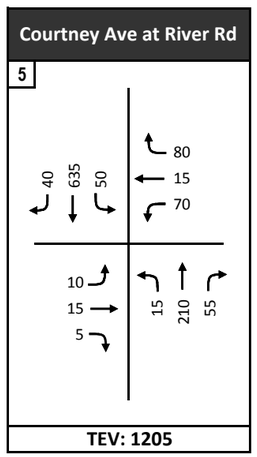
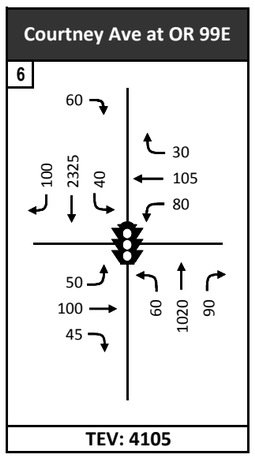


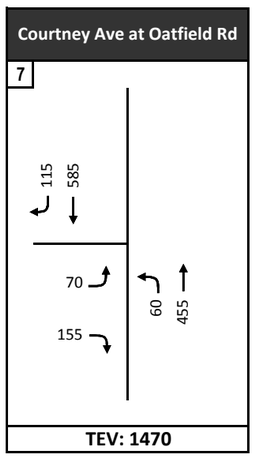


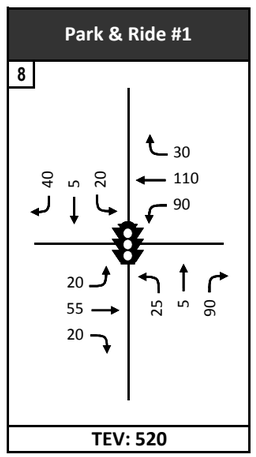


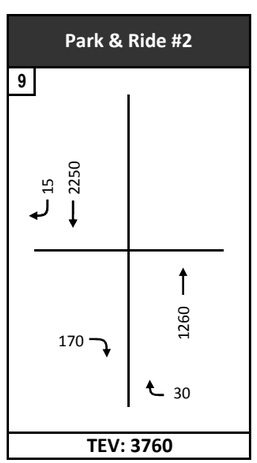


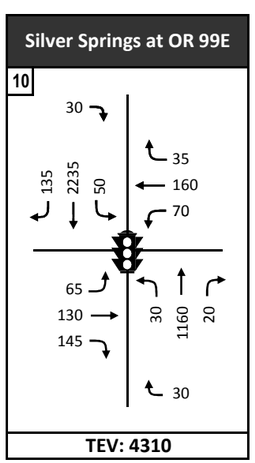


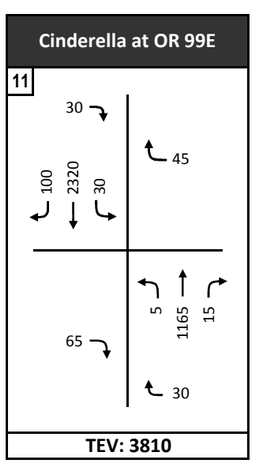


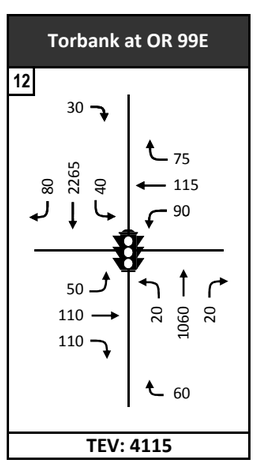












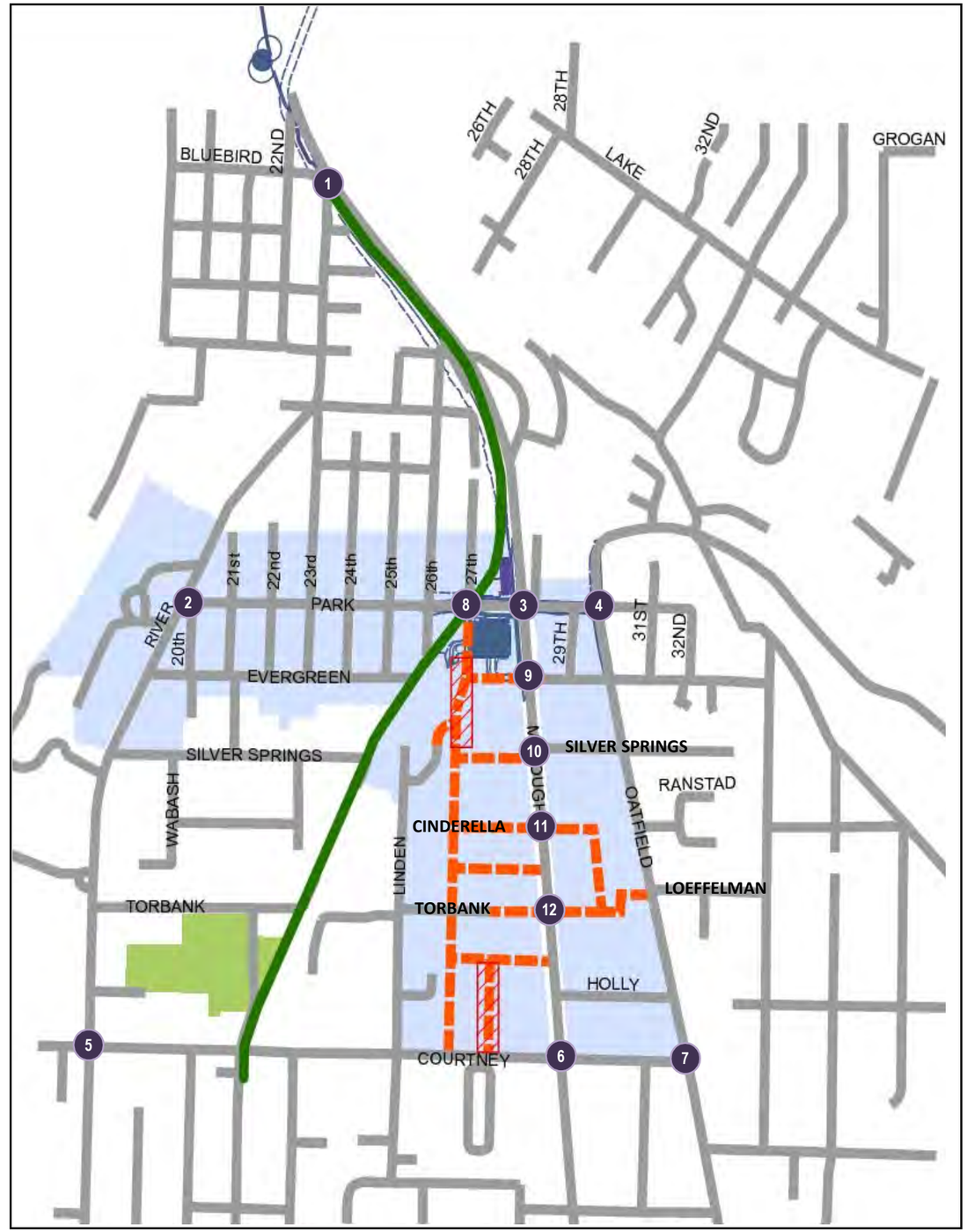


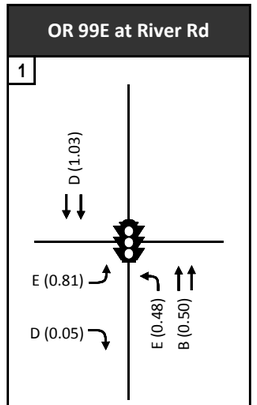
Figure 3-a

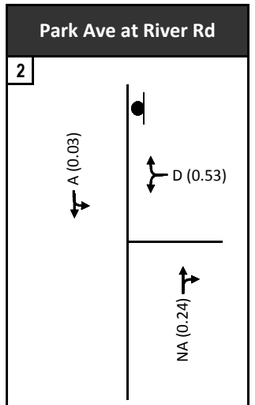
2035 Land Use Option 2
Traffic Control Option 1
(2 Signals)
PM Peak Hour Turning
Movement Volumes

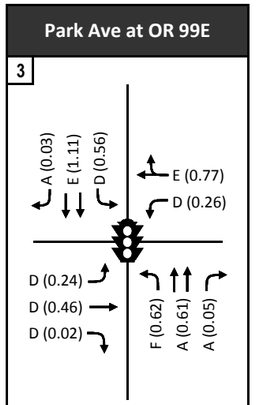
Park Ave
Traffic Analysis

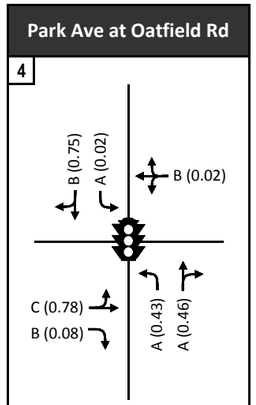
Legend

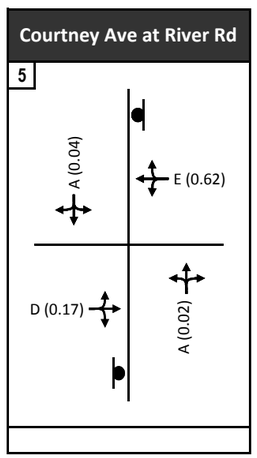
- Traffic Signal
- 99 Study Area Intersection
- → Allowable Movement
- ### PM Peak Hour Volume
- Trolley Trail
- Proposed Roadway Connection

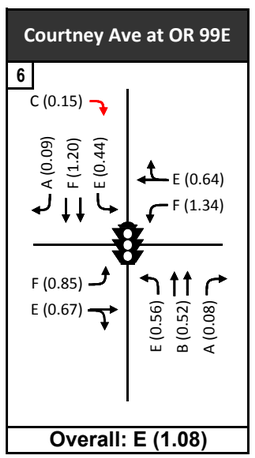


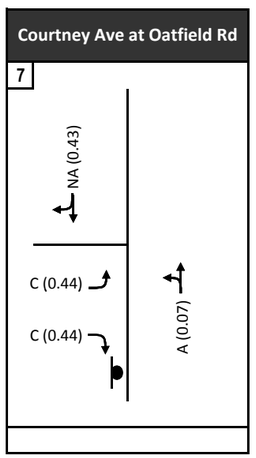


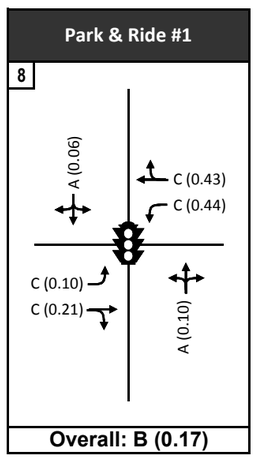


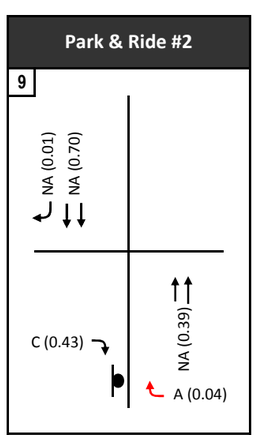


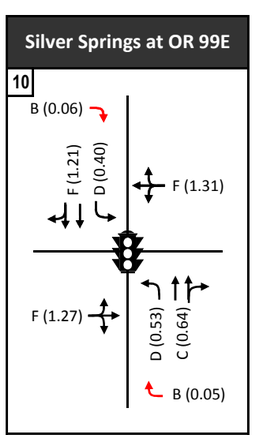


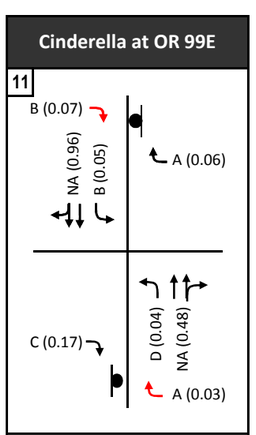


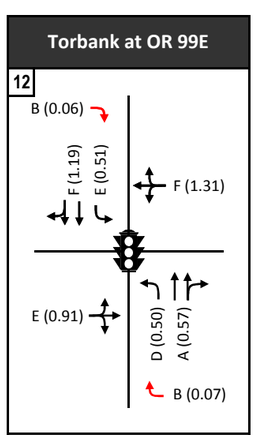












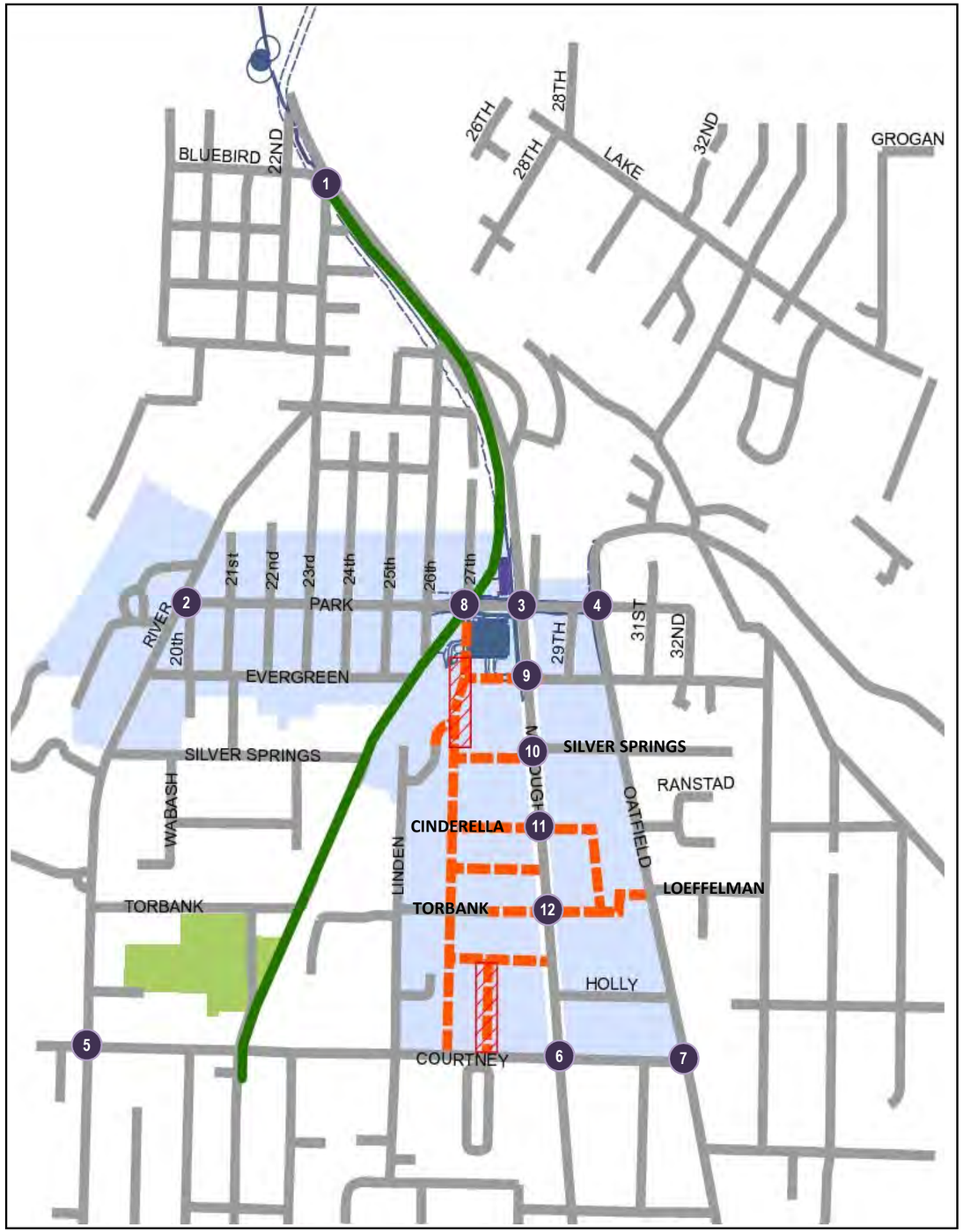


Figure 3-b

2035 Land Use Option 2
Traffic Control Option 1
(2 Signals)
PM Peak Hour Traffic Operations

Park Ave
Traffic Analysis

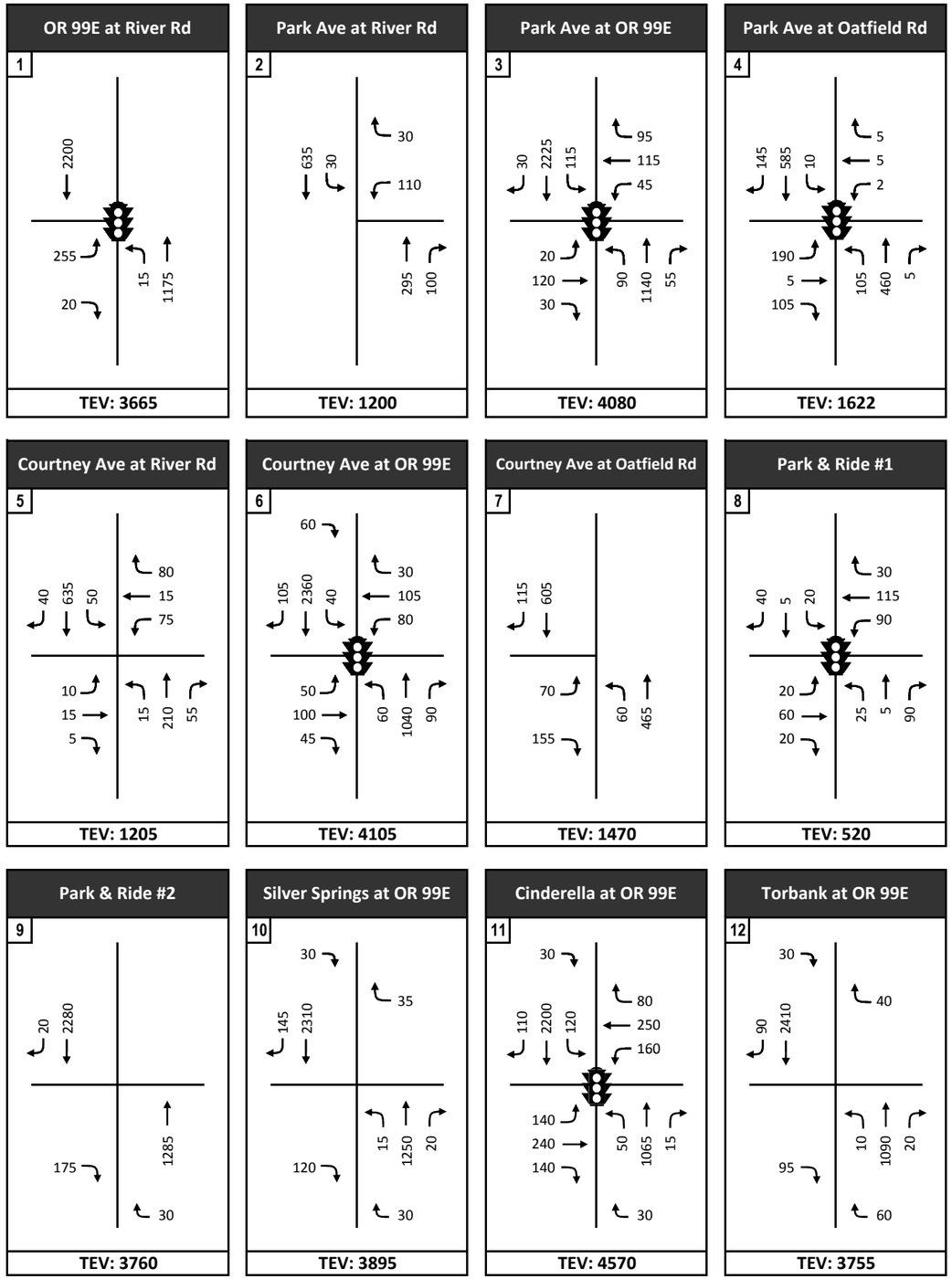
Legend

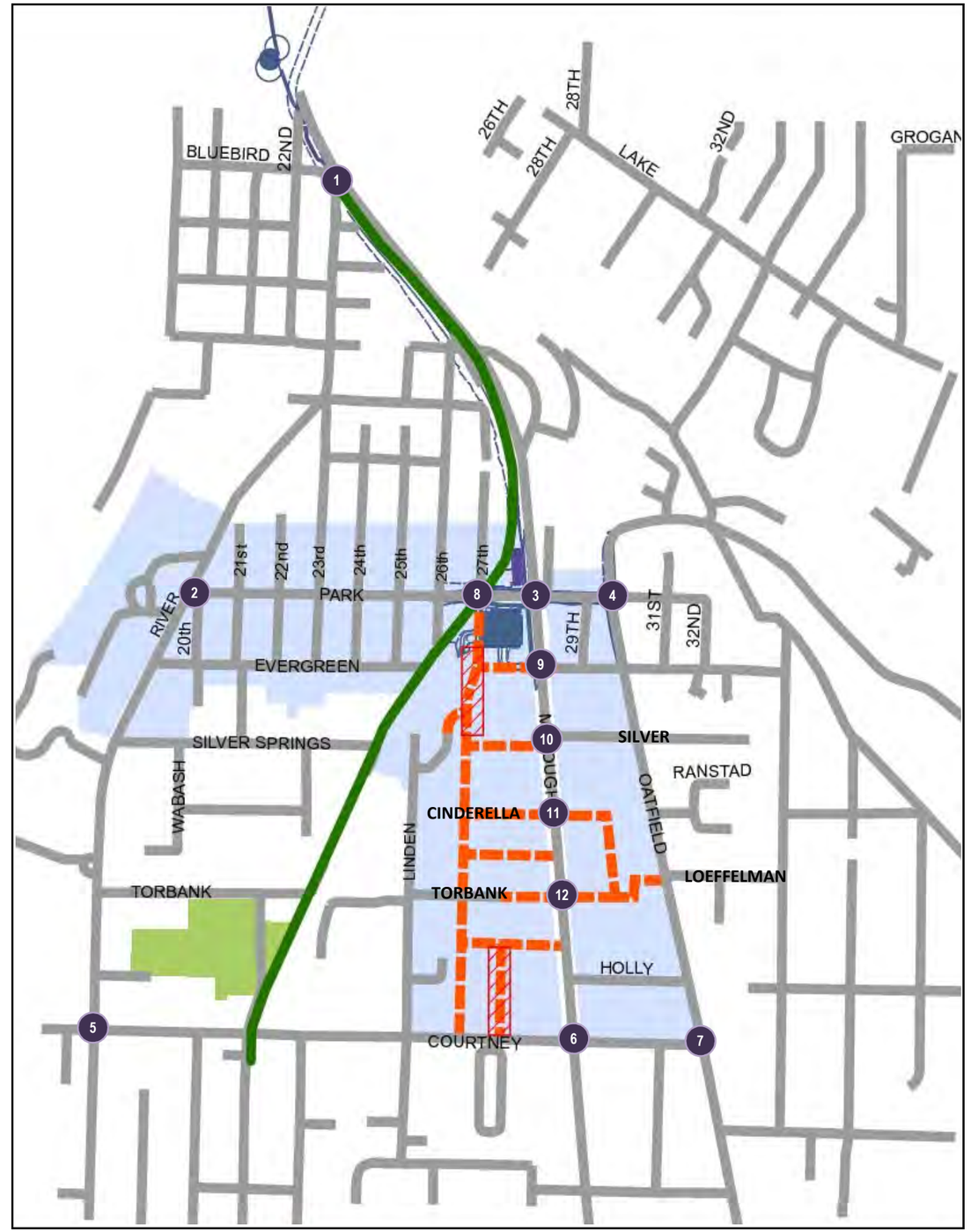
- Traffic Signal
- STOP Controlled Approach
- 99 Study Area Intersection
- Lane Configuration
- A (0.01): LOS (V/C)
- NA: LOS not reported for free movements
- Side Lane STOP Controlled Access
- Trolley Trail
- Proposed Roadway Connection

Figure 4-a

2035 No Build Land Use Option
Traffic Control Option 2
(1 Signal)
PM Peak Hour Turning Movement Volumes

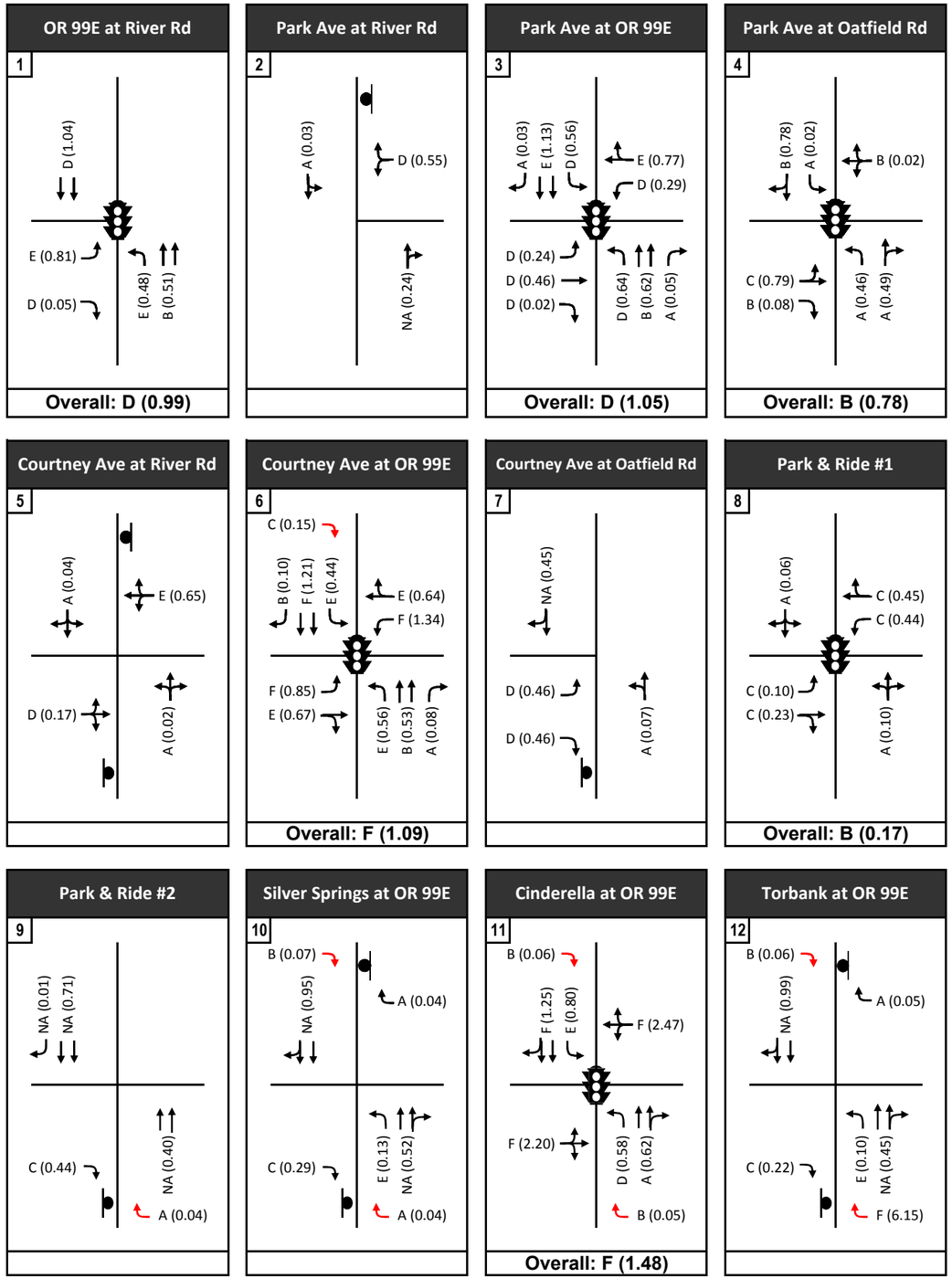
Park Ave Traffic Analysis





Legend

- Traffic Signal
- 99 Study Area Intersection
- → Allowable Movement
- ### PM Peak Hour Volume
- Trolley Trail
- Proposed Roadway Connection



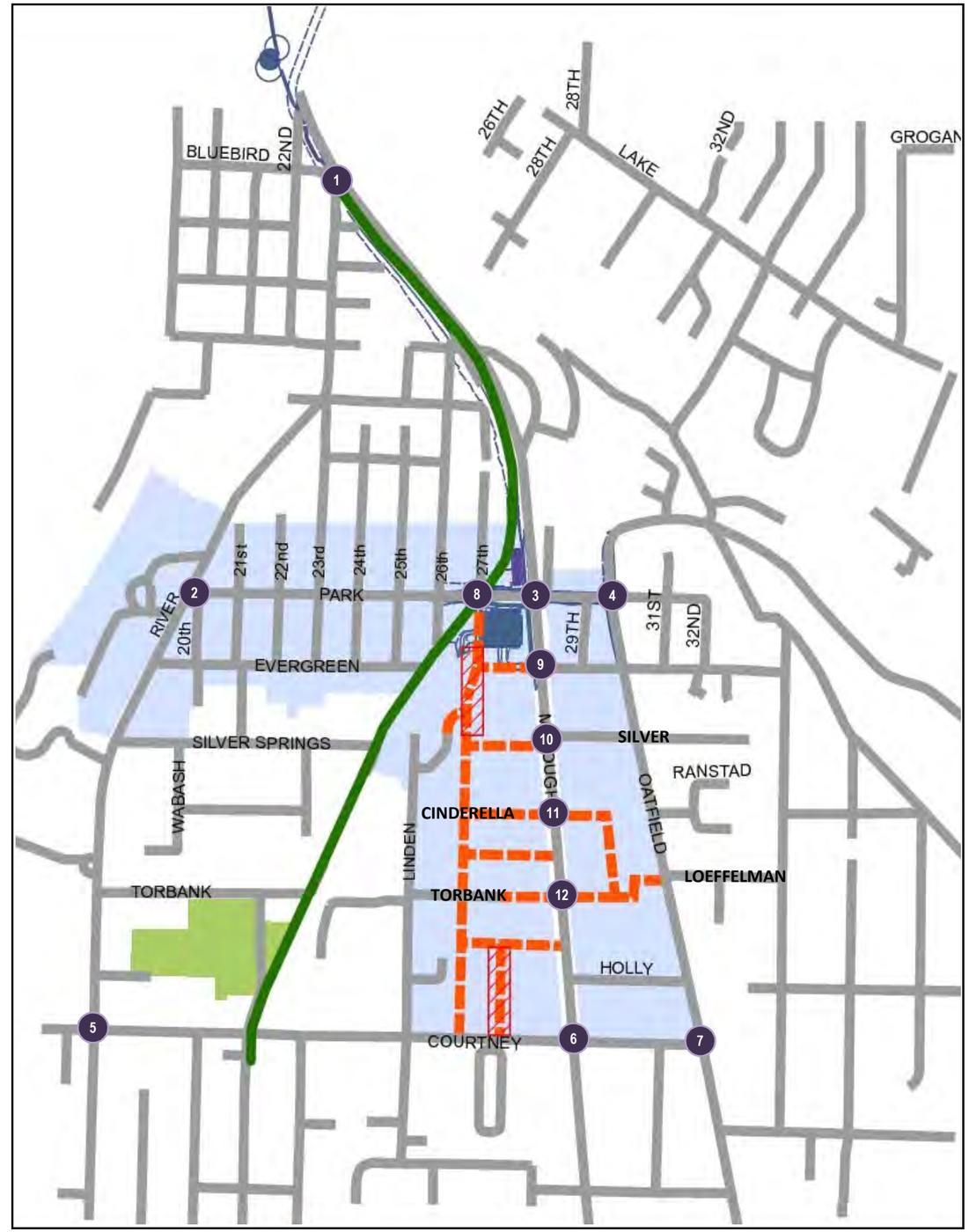


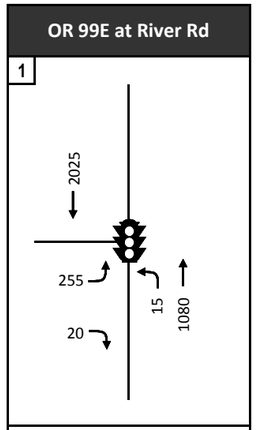
Figure 4-b

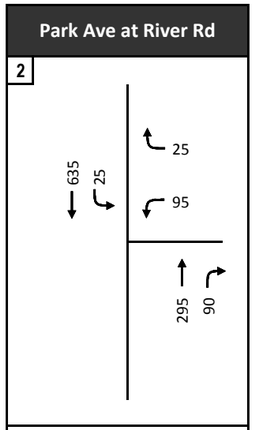
2035 No Build Land Use Option
Traffic Control Option 2
(1 Signal)
PM Peak Hour Traffic Operations

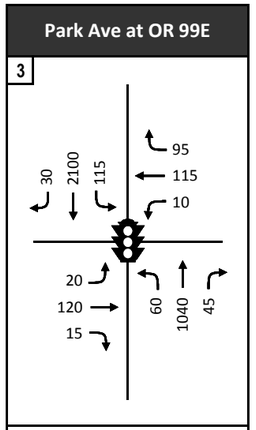
Park Ave
Traffic Analysis

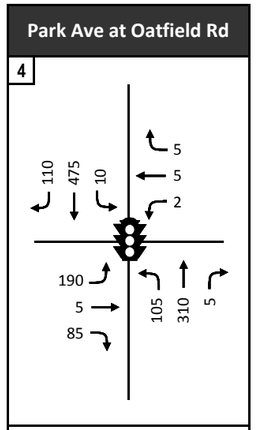
Legend

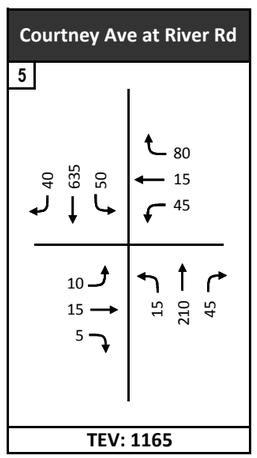
- Traffic Signal
- STOP Controlled Approach
- 99 Study Area Intersection
- Lane Configuration
- A (0.01): LOS (V/C)
- NA: LOS not reported for free movements
- Side Lane STOP Controlled Access
- Trolley Trail
- Proposed Roadway Connection

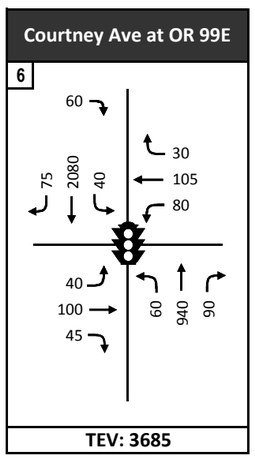


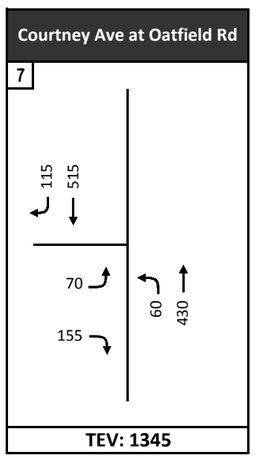


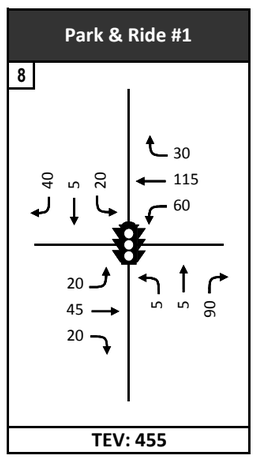


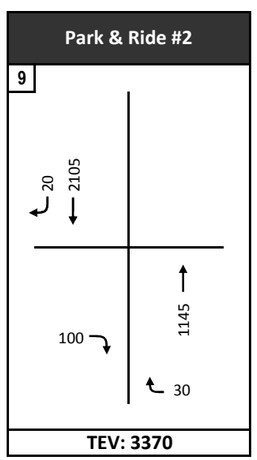


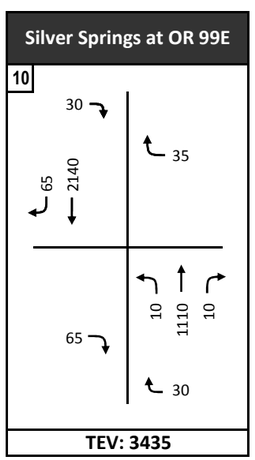


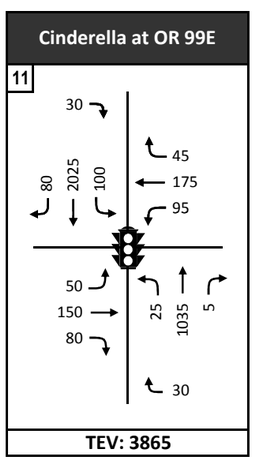


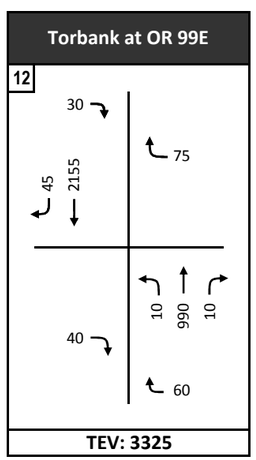












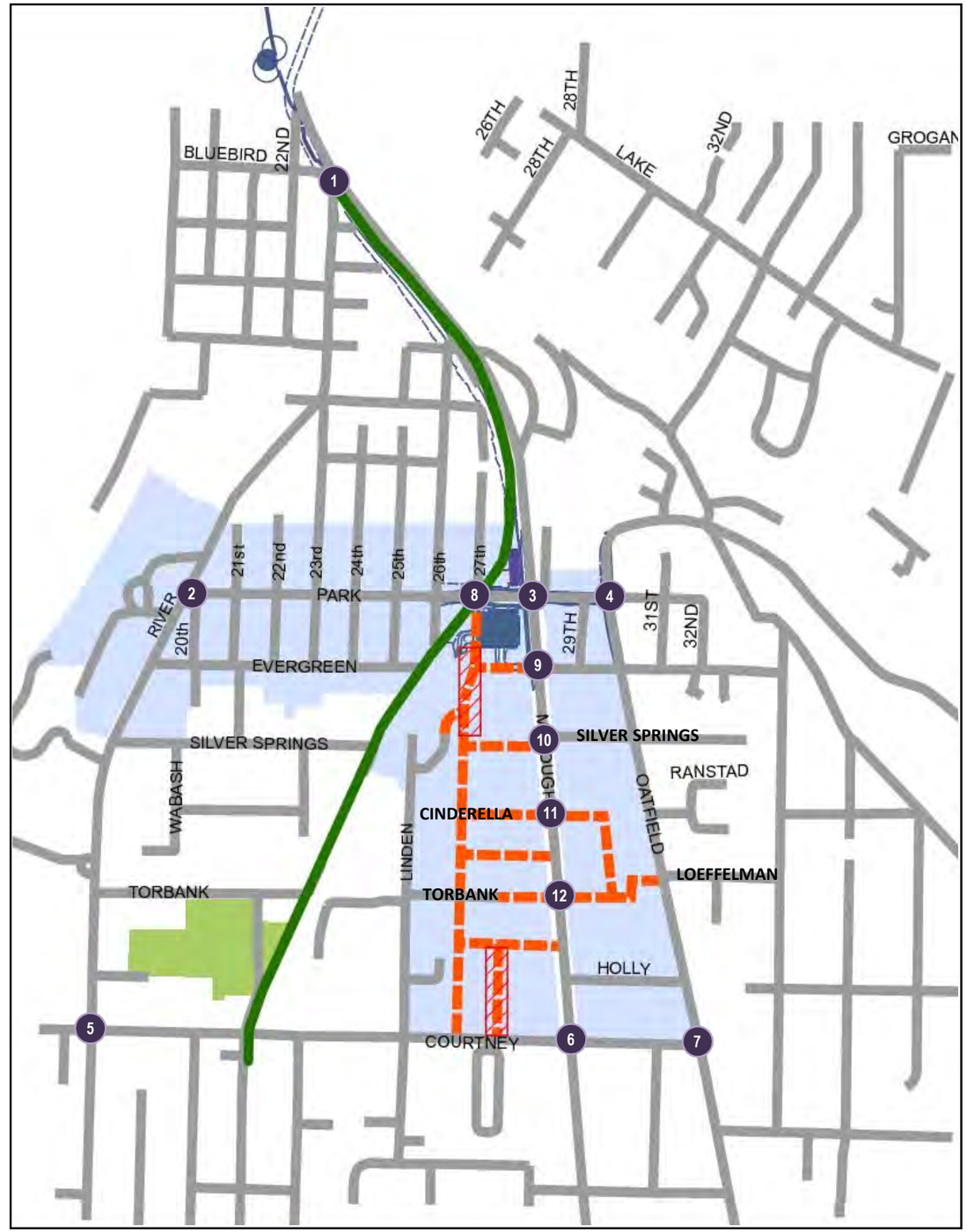


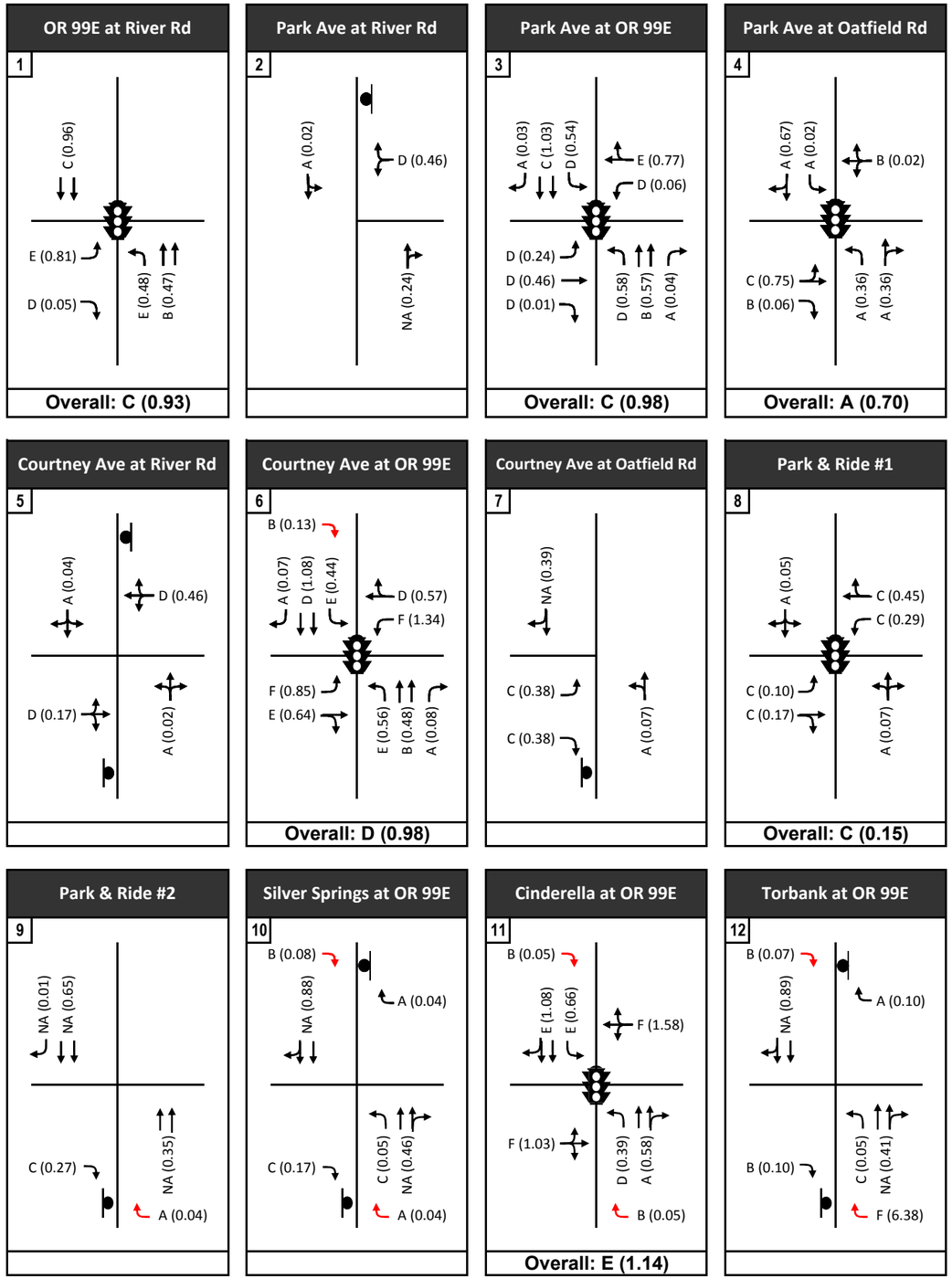
Figure 5-a

2035 Land Use Option 1
Traffic Control Option 2
(1 Signal)
PM Peak Hour Turning
Movement Volumes

Park Ave
Traffic Analysis

Legend

- Traffic Signal
- 99 Study Area Intersection
- Allowable Movement
- ### PM Peak Hour Volume
- Trolley Trail
- Proposed Roadway Connection



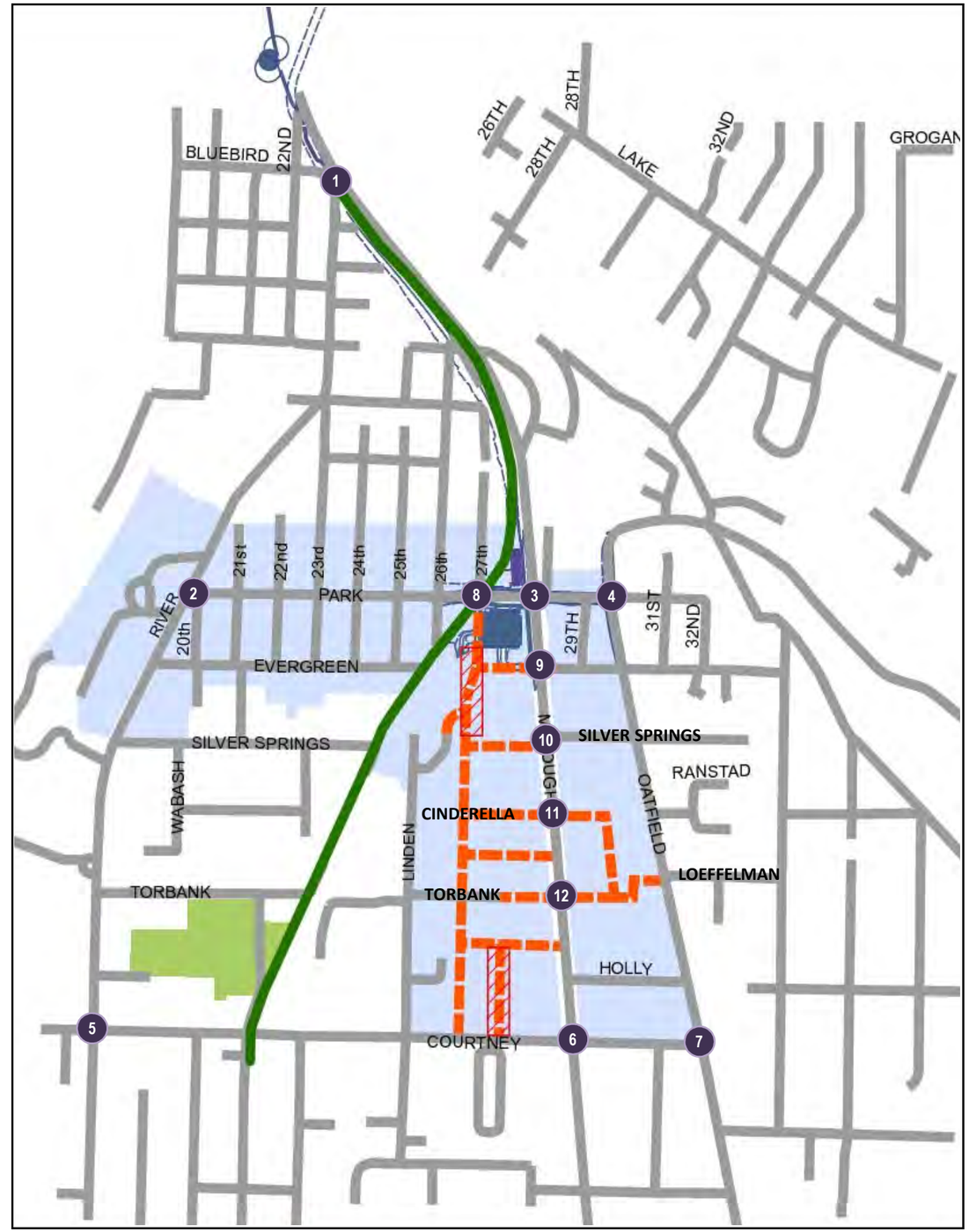


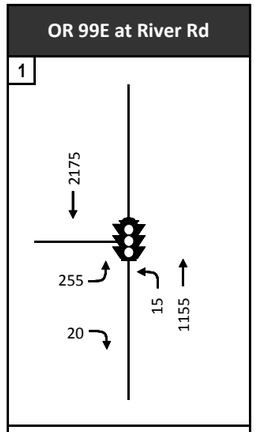
Figure 5-b

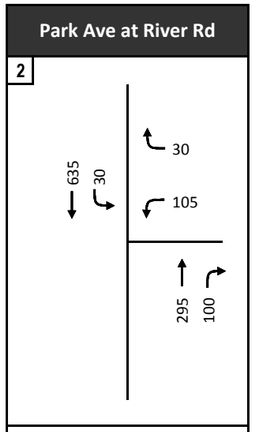
2035 Land Use Option 1
Traffic Control Option 2
(1 Signal)
PM Peak Hour Traffic Operations

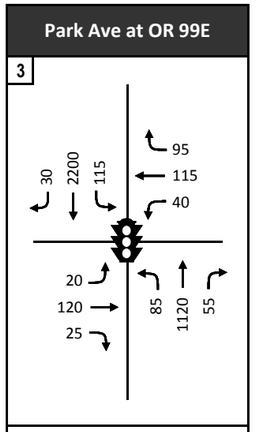
Park Ave
Traffic Analysis

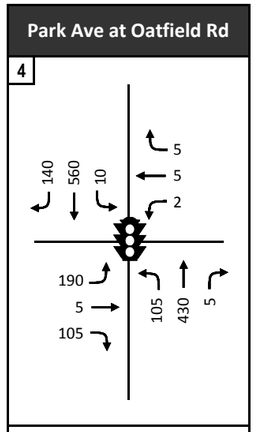
Legend

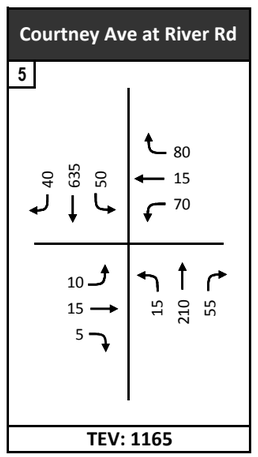
- Traffic Signal
- STOP Controlled Approach
- 99 Study Area Intersection
- Lane Configuration
- A (0.01): LOS (V/C)
- NA: LOS not reported for free movements
- Side Lane STOP Controlled Access
- Trolley Trail
- Proposed Roadway Connection

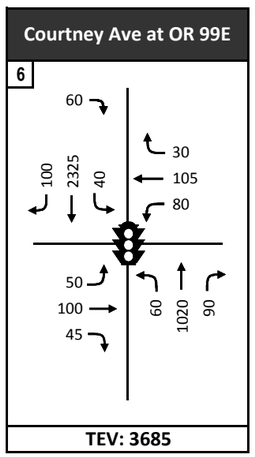


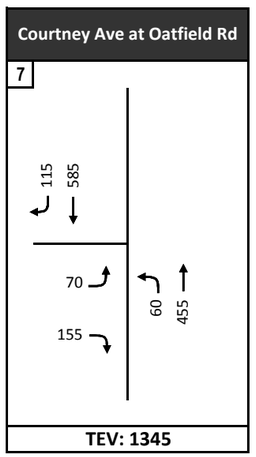


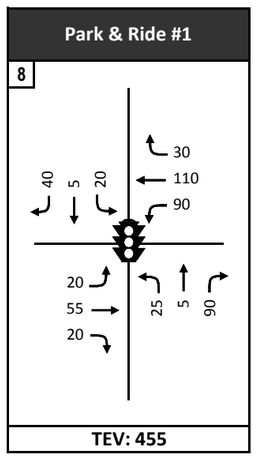


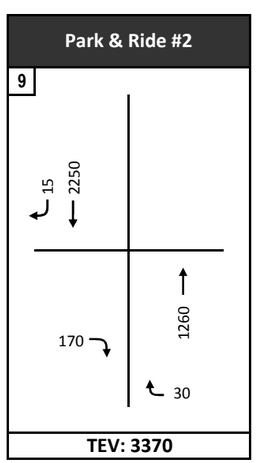


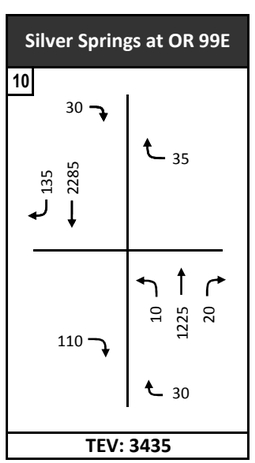


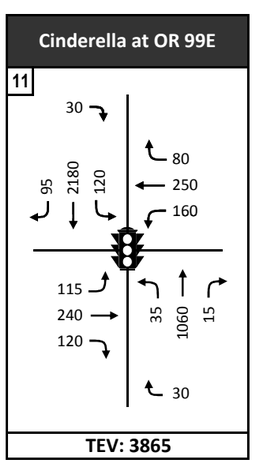


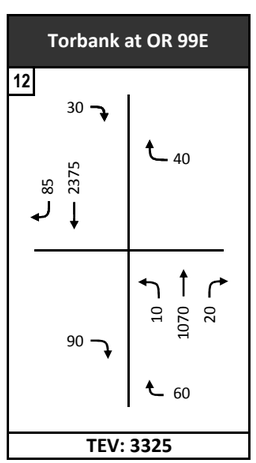












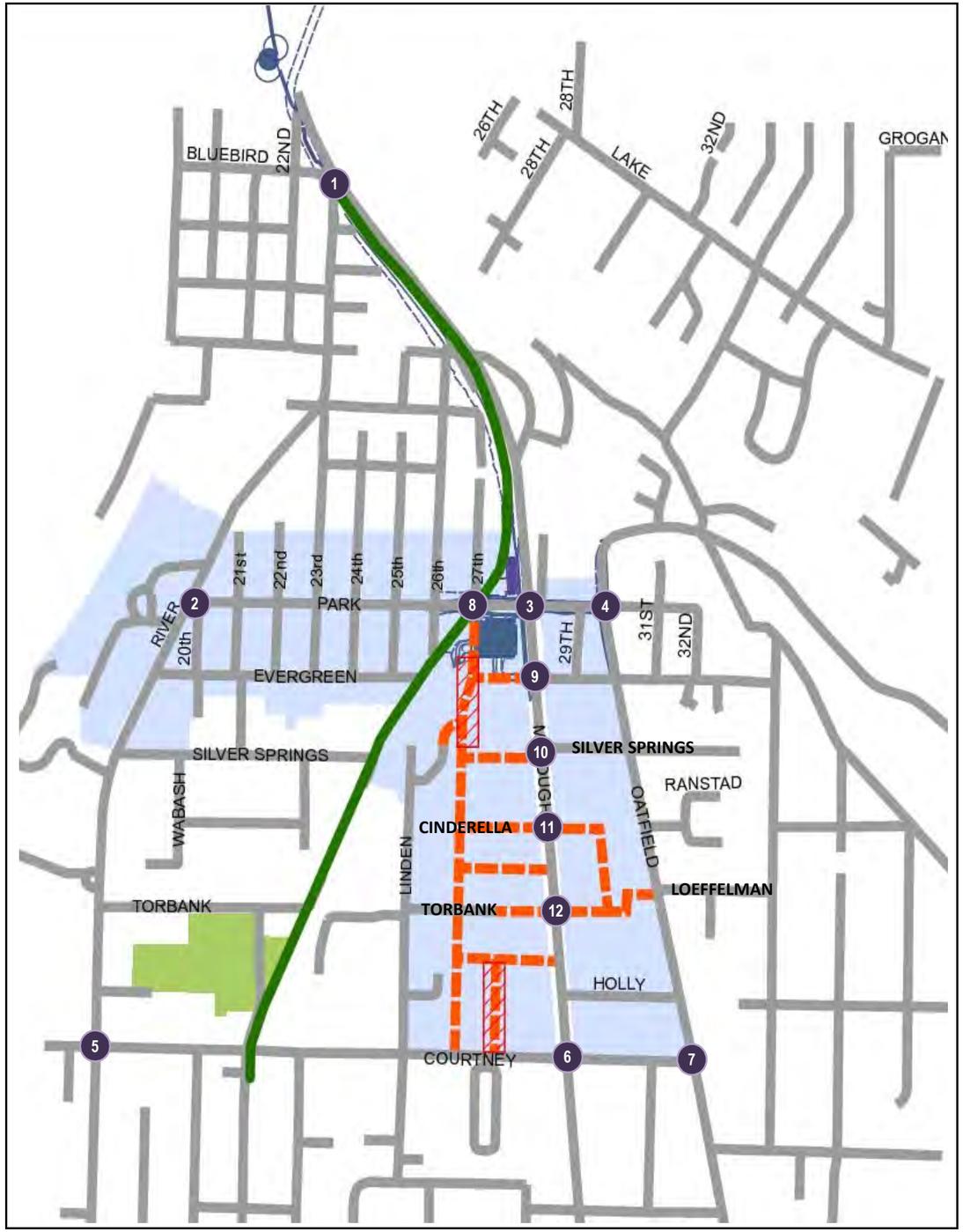


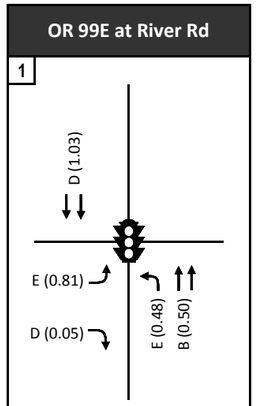
Figure 6-a

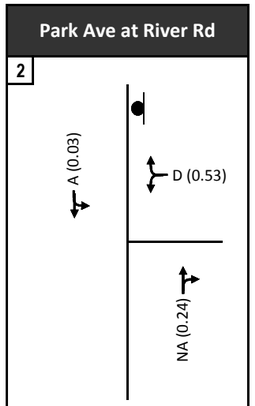
2035 Land Use Option 2
Traffic Control Option 2
(1 Signal)
PM Peak Hour Turning Movement Volumes

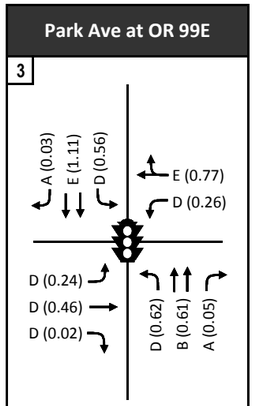
Park Ave Traffic Analysis

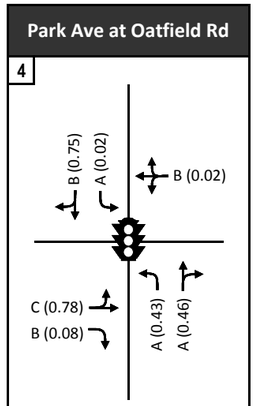
Legend

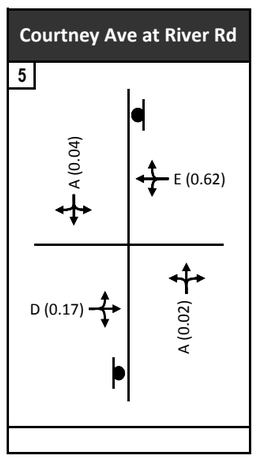
- Traffic Signal
- 99 Study Area Intersection
- → Allowable Movement
- ### PM Peak Hour Volume
- Trolley Trail
- Proposed Roadway Connection

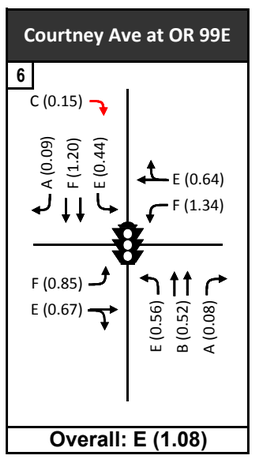


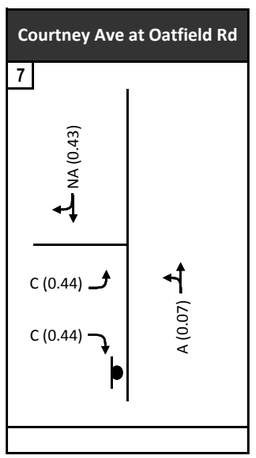


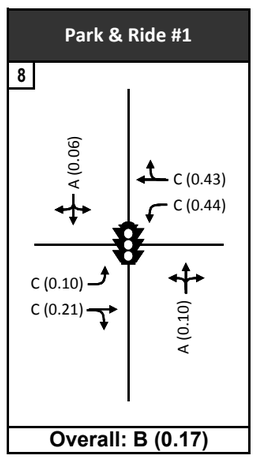


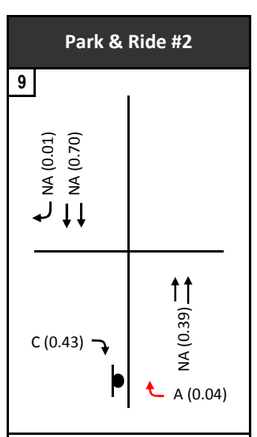


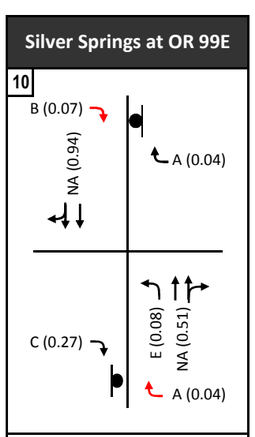


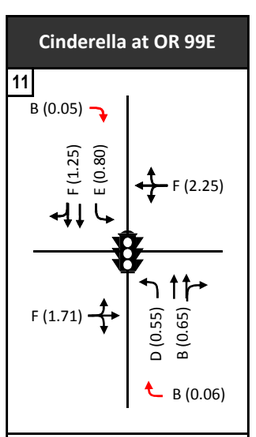


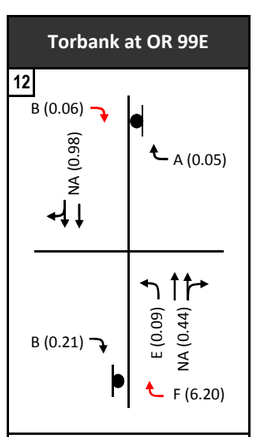












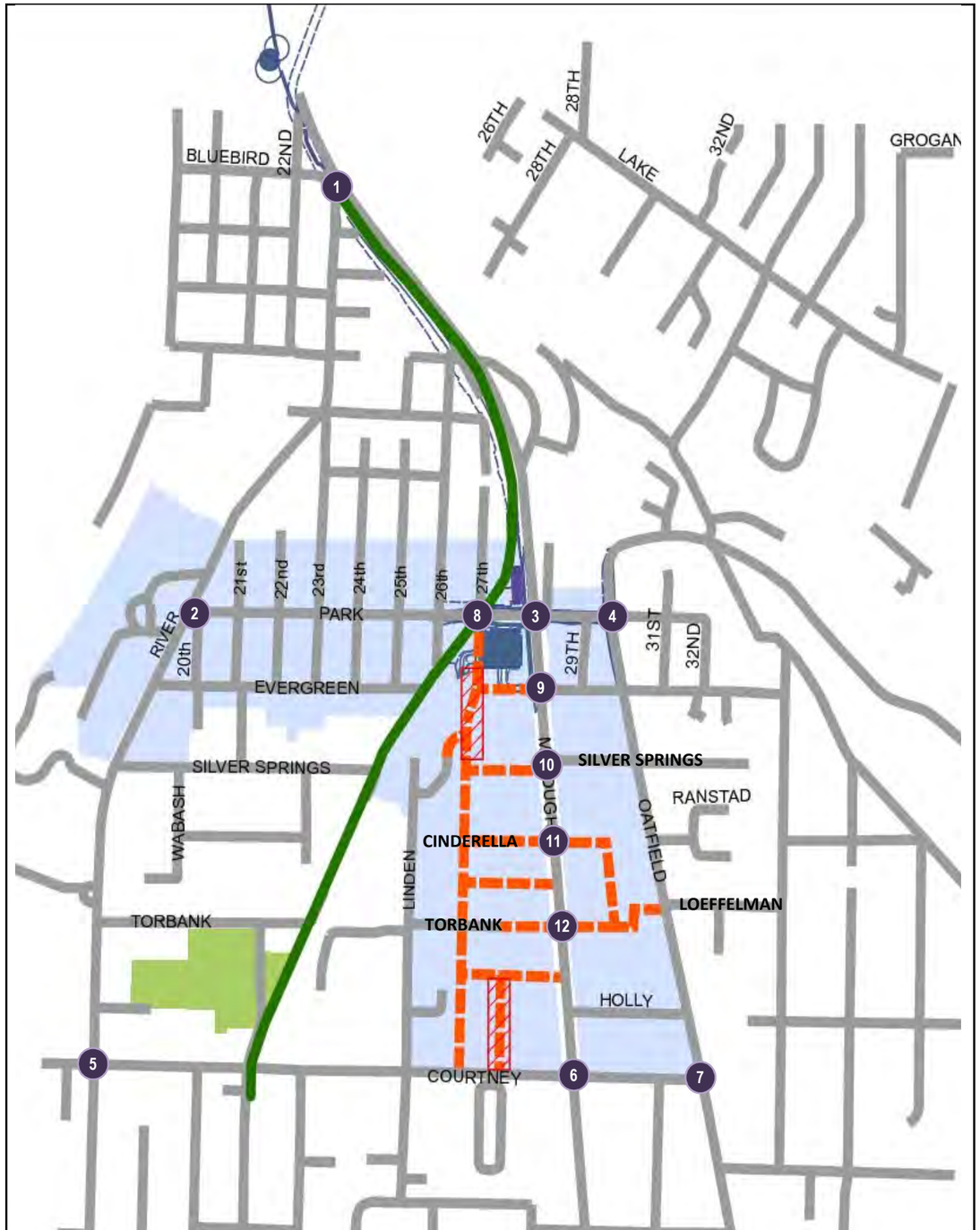


Figure 6-b

2035 Land Use Option 2
Traffic Control Option 2
(1 Signal)
PM Peak Hour Traffic Operations

Park Ave
Traffic Analysis

Legend

- Traffic Signal
- STOP Controlled Approach
- 99 Study Area Intersection
- Lane Configuration
- A (0.01): LOS (V/C)
- NA: LOS not reported for free movements
- Side Lane STOP Controlled Access
- Trolley Trail
- Proposed Roadway Connection

Draft Future Traffic Conditions Memorandum

Park Avenue Neighborhood and Station Area Plan

APPENDIX

September 2011

Appendix A.
Land Use Options

EXISTING ZONING	Acres to Sq. Ft.	Reduction for Landscaping/Parks/parking	Minimum Lot Size Per Dwelling	Maximum Allowable Dwelling Units	Maximum Allowable Leasable Sq. Ft. (for retail)
39.09 Acres Zoned as C-3	1702760	30%	-		1,191,932
9.67 Acres Zoned MR-1	421225	-	3630 Sq. Ft./DU	120	
23.41 Acres Zoned R-7	1019740	-	7000 Sq. Ft./DU	150	
4.14 Acres Zoned R-10	180338	-	10000 Sq. Ft./DU	20	
TOTAL	**3324063**			**290**	**1191932**

ALTERNATIVE 1	Acres to Sq. Ft.	Reduction for Landscaping/Parks/parking	Minimum Lot Size Per Dwelling	Maximum Allowable Dwelling Units	Allowable Leasable Sq. Ft. (for retail)
34.37 Acres Urban Housing	1497157	40%	1675 Sq. Ft./DU	895	
9.48 Acres Main Street Commercial	412949	30%			289,064
14.89 Acres Duplex/Triplex/Live-Work	648607		3630 Sq. Ft./DU	180	
10.5 Acres Mixed Use Neighborhood	457378.95		2178 Sq. Ft./DU	210	
TOTAL	**3016092**			**1285**	**289,064**

ALTERNATIVE 2	Acres to Sq. Ft.	Reduction for Landscaping/Parks/parking	Minimum Lot Size Per Dwelling	Maximum Allowable Dwelling Units	Allowable Leasable Sq. Ft. (for retail)
23.1 Acres Urban Housing	1006236		1675 Sq. Ft./DU	600	
2.1 Acres Mixed Use Neigh Station	91476		3630 Sq. Ft./DU	25	
18.6 Acres Main Street Commercial	810216	30%			567,151
14.9 Acres Duplex/Triplex/Live-Work	649044		3630 Sq. Ft./DU	180	
10.5 Acres Mixed Use Neighborhood	457380	35%			297,297
TOTAL	**3014352**			**805**	**864,448**

Trip Generation Rates
Park Avenue Station Area Planning Zone Change
July-11
Analyst: JODA

DRAFT

Scenario: Existing Zoning

Land Use	ITE Code	Area	PM Peak Hour IN	PM Peak Hour Out	PM Peak Hour Total
Single-Family Detached Housing	210	290 Units	173	101	274
Driveway Trips					
General Office Building	710	238,386 s.f.	59	287	346
Driveway Trips					
Specialty Retail	814	297,983 s.f.	355	453	808
Driveway Trips					
Shopping Center	820	417,176 s.f.	812	845	1657
*Pass-By Trips (26%)***			*-211*	*-220*	*-431*
Driveway Trips			601	625	1226
Supermarket	850	59,597 s.f.	319	307	626
Driveway Trips					
Pharmacy	880	59,597 s.f.	256	246	502
Driveway Trips					
Restaurant	932	95,355 s.f.	627	436	1063
Driveway Trips					
Coffee/Donut Shop	936	23,839 s.f.	486	486	971
Driveway Trips					
Trips Generated			3086	3161	6246
Pass-By Trips			*-211*	*-220*	*-431*
Transit Oriented Development Reduction (0%)			*0*	*0*	*0*
		Driveway Trips Genrated	2875	2941	5815

Notes:

* Internal trip were calculated with the methodology used in chapter 7 of the ITE Trip Generation Handbook, 8th Edition.

** Pass-By trip were calculated with the methodology used in chapter 5 of the ITE Trip Generation Handbook, 8th Edition. The Associated Pass-By percentage, calculated from the fitted curve equation in figure 5.5, was 26%.

Existing Zoning could result in a maximum of 5815 PM peak hour trip ends.

Scenario: Alternative 1

Land Use	ITE Code	Area	PM Peak Hour IN	PM Peak Hour Out	PM Peak Hour Total
Single-Family Detached Housing	210	1,285 Units	659	387	1046
Driveway Trips					
General Office Building	710	57,813 s.f.	24	119	144
Driveway Trips					
Specialty Retail	814	72,266 s.f.	86	110	196
Driveway Trips					
Shopping Center	820	101,172 s.f.	812	845	1657
*Pass-By Trips (38.5%)***			*-313*	*-325*	*-638*
Driveway Trips			499	520	1019
Supermarket	850	14,453 s.f.	77	74	152
Driveway Trips					
Pharmacy	880	14,453 s.f.	62	60	122
Driveway Trips					
Restaurant	932	23,125 s.f.	152	106	258
Driveway Trips					
Coffee/Donut Shop	936	5,781 s.f.	118	118	236
Driveway Trips					
Trips Generated			1991	1818	3809
Pass-By Trips			*-313*	*-325*	*-638*
Transit Oriented Development Reduction (30%)			*-503*	*-448*	*-951*
		Driveway Trips Genrated	1174	1045	2220

Notes:

* Internal trip were calculated with the methodology used in chapter 7 of the ITE Trip Generation Handbook, 8th Edition.

** Pass-By trip were calculated with the methodology used in chapter 5 of the ITE Trip Generation Handbook, 8th Edition. The Associated Pass-By percentage, calculated from the fitted curve equation in figure 5.5, was 38.5%.

Existing Zoning could result in a maximum of 2220 PM peak hour trip ends, or 38% of the existing.

Scenario: Alternative 2

Land Use	ITE Code	Area	PM Peak Hour IN	PM Peak Hour Out	PM Peak Hour Total
Single-Family Detached Housing	210	805 Units	433	254	687
Driveway Trips					
General Office Building	710	172,890 s.f.	46	226	272
Driveway Trips					
Specialty Retail	814	216,112 s.f.	258	328	586
Driveway Trips					
Shopping Center	820	302,557 s.f.	812	845	1657
*Pass-By Trips (28%)***			*-227*	*-237*	*-464*
Driveway Trips			585	608	1193
Supermarket	850	43,222 s.f.	231	222	454
Driveway Trips					
Pharmacy	880	43,222 s.f.	186	178	364
Driveway Trips					
Restaurant	932	69,156 s.f.	455	316	771
Driveway Trips					
Coffee/Donut Shop	936	17,289 s.f.	352	352	705
Driveway Trips					
Trips Generated			2773	2722	5495
Pass-By Trips			*-227*	*-237*	*-464*
Transit Oriented Development Reduction (0%)			*0*	*0*	*0*
		Driveway Trips Genrated	2546	2485	5031

Notes:

* Internal trip were calculated with the methodology used in chapter 7 of the ITE Trip Generation Handbook, 8th Edition.

** Pass-By trip were calculated with the methodology used in chapter 5 of the ITE Trip Generation Handbook, 8th Edition. The Associated Pass-By percentage, calculated from the fitted curve equation in figure 5.5, was 28%.

Existing Zoning could result in a maximum of 5031 PM peak hour trip ends, or 87% of the existing.

680 421.6
884 548.08

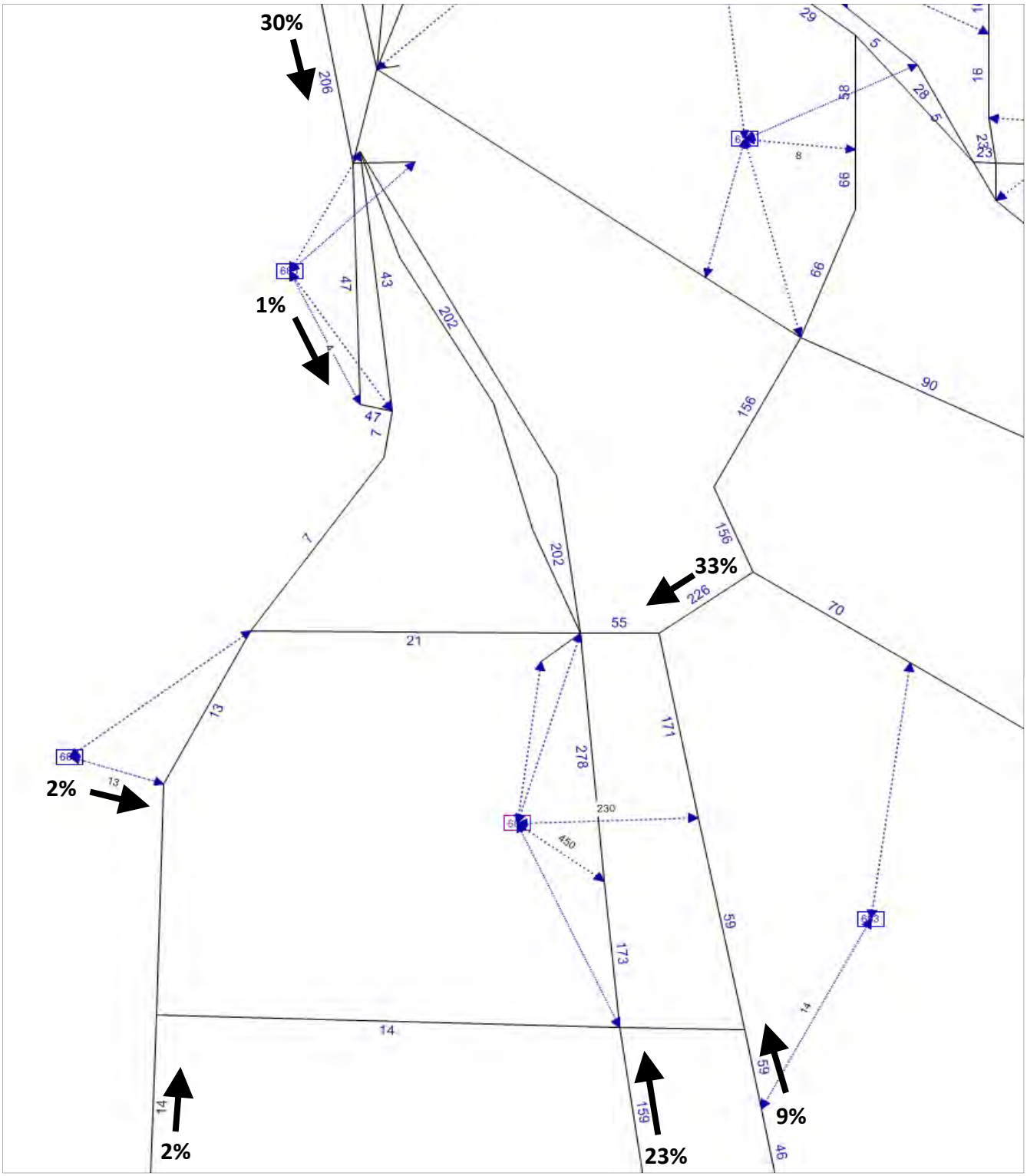
0.3224

680 88.4
884 114.92

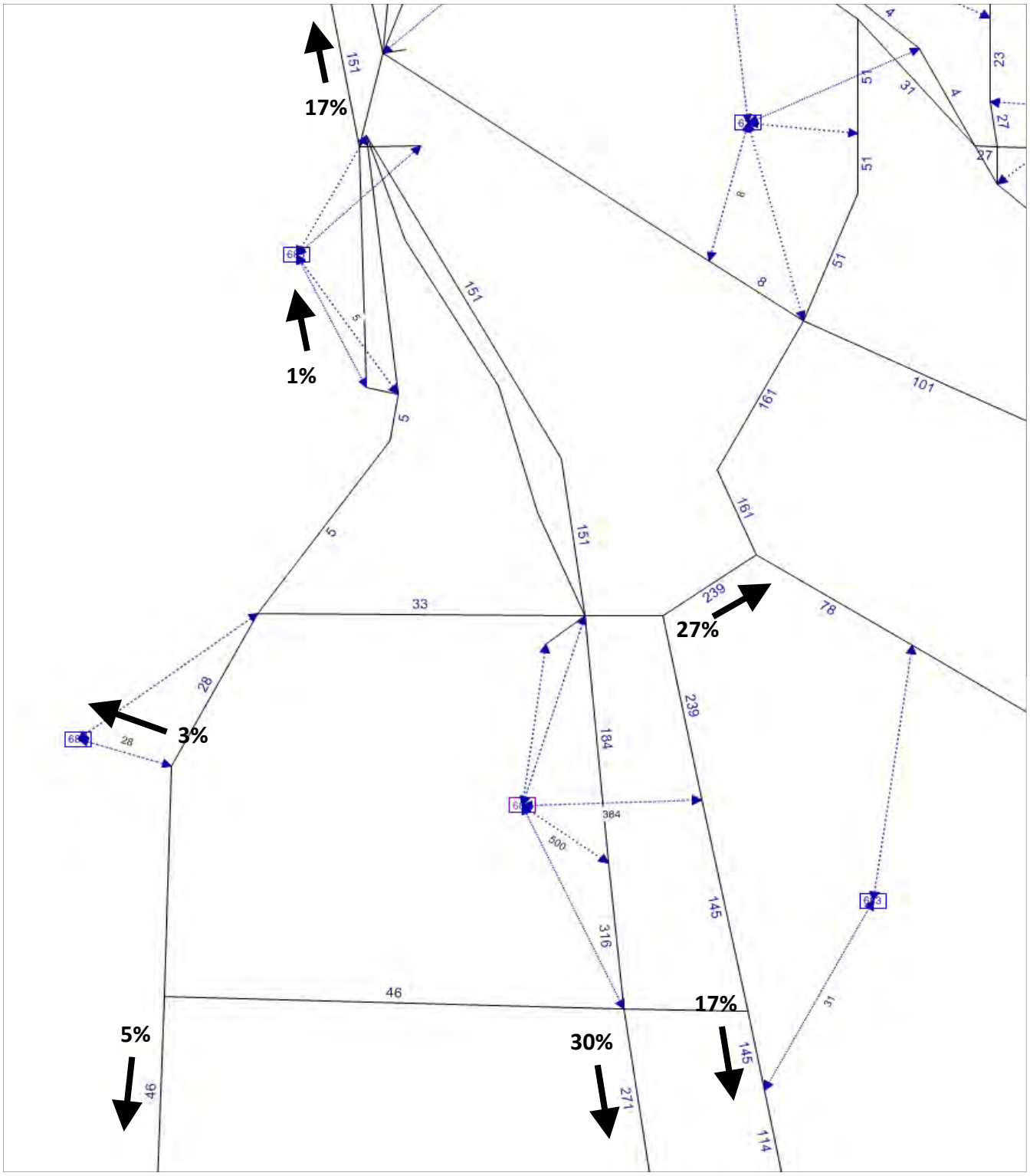
0.0676

Appendix B.
Trip Generation

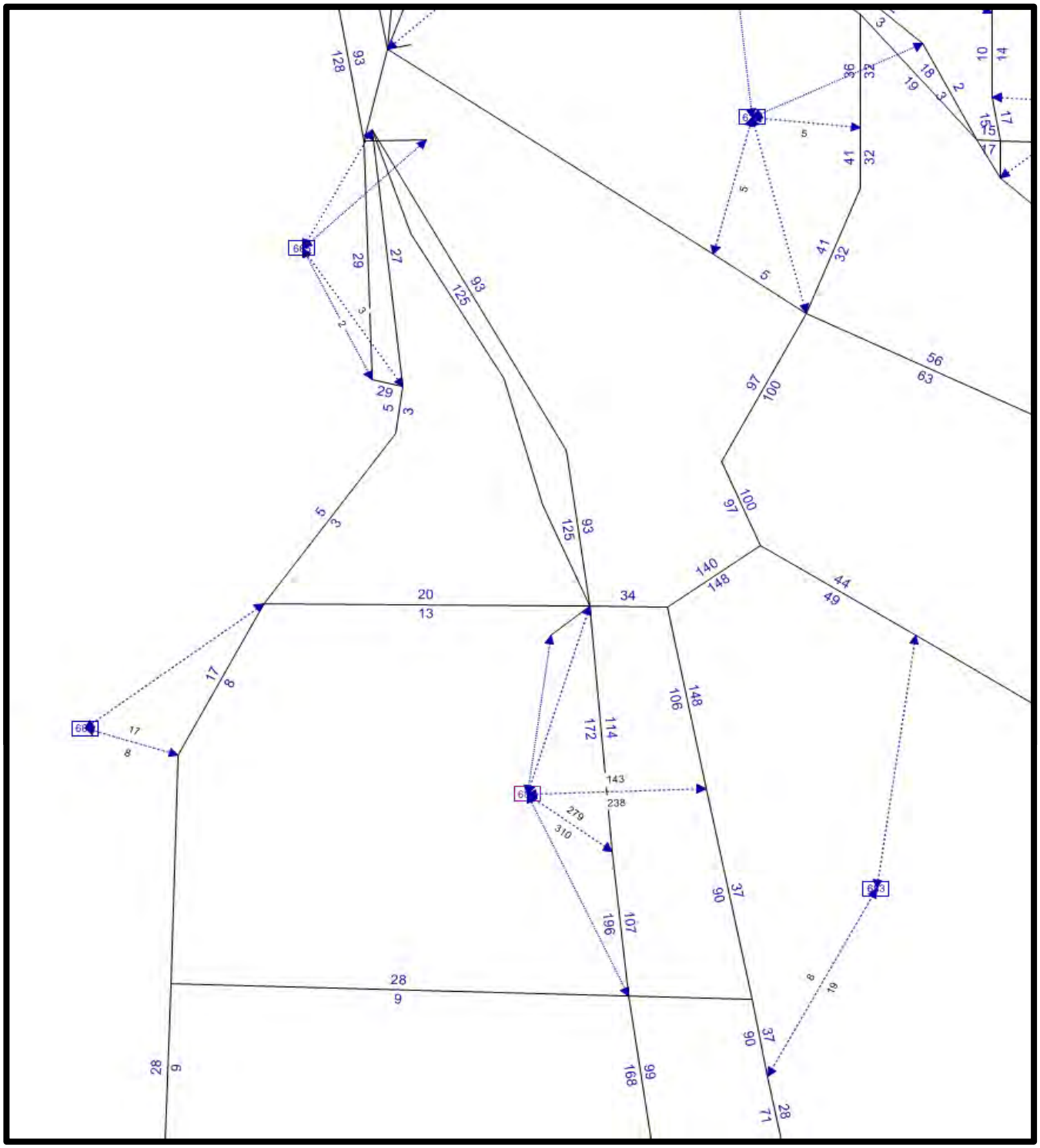
INBOUND TRIP DISTRIBUTION



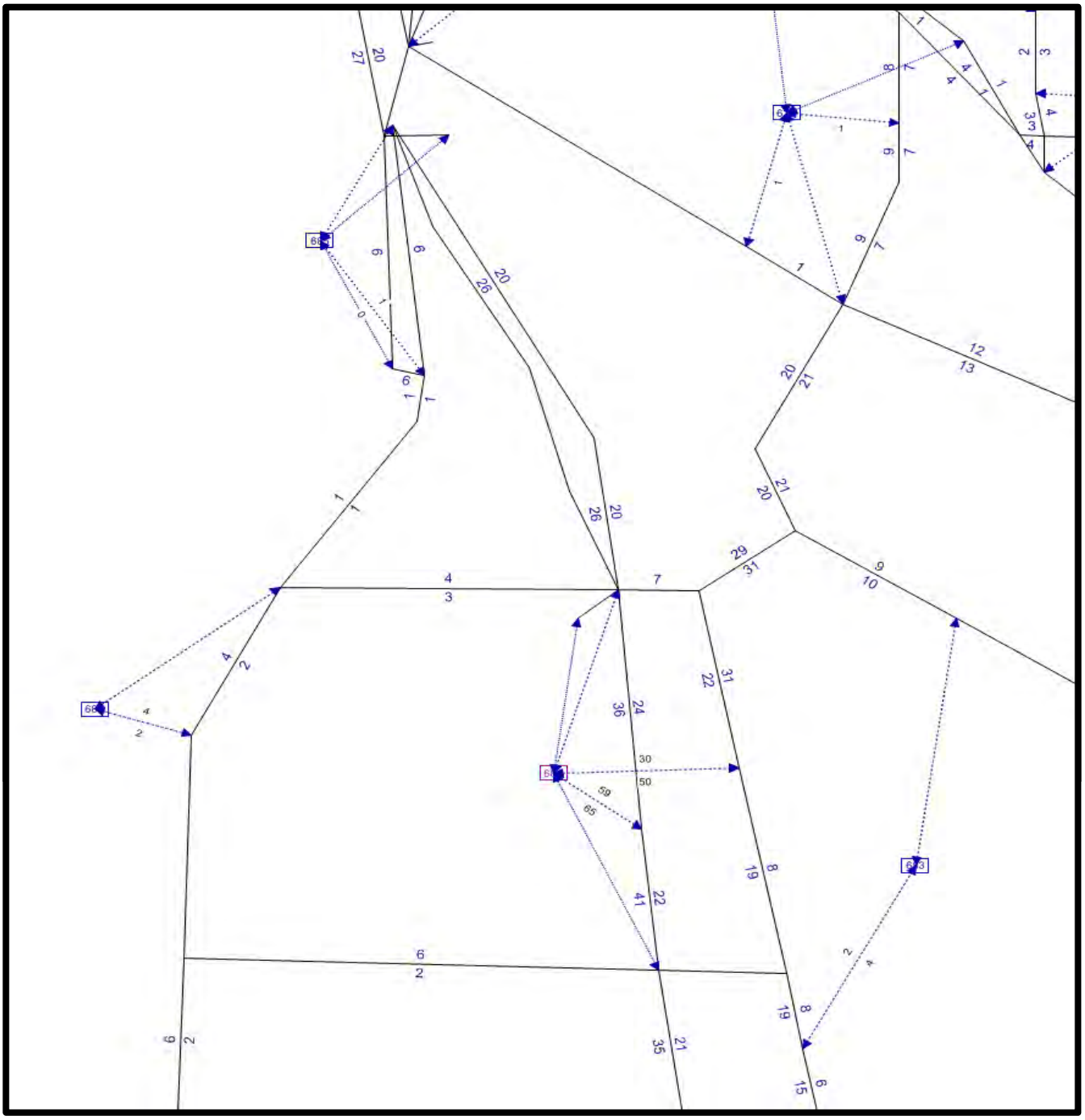
OUTBOUND TRIP DISTRIBUTION



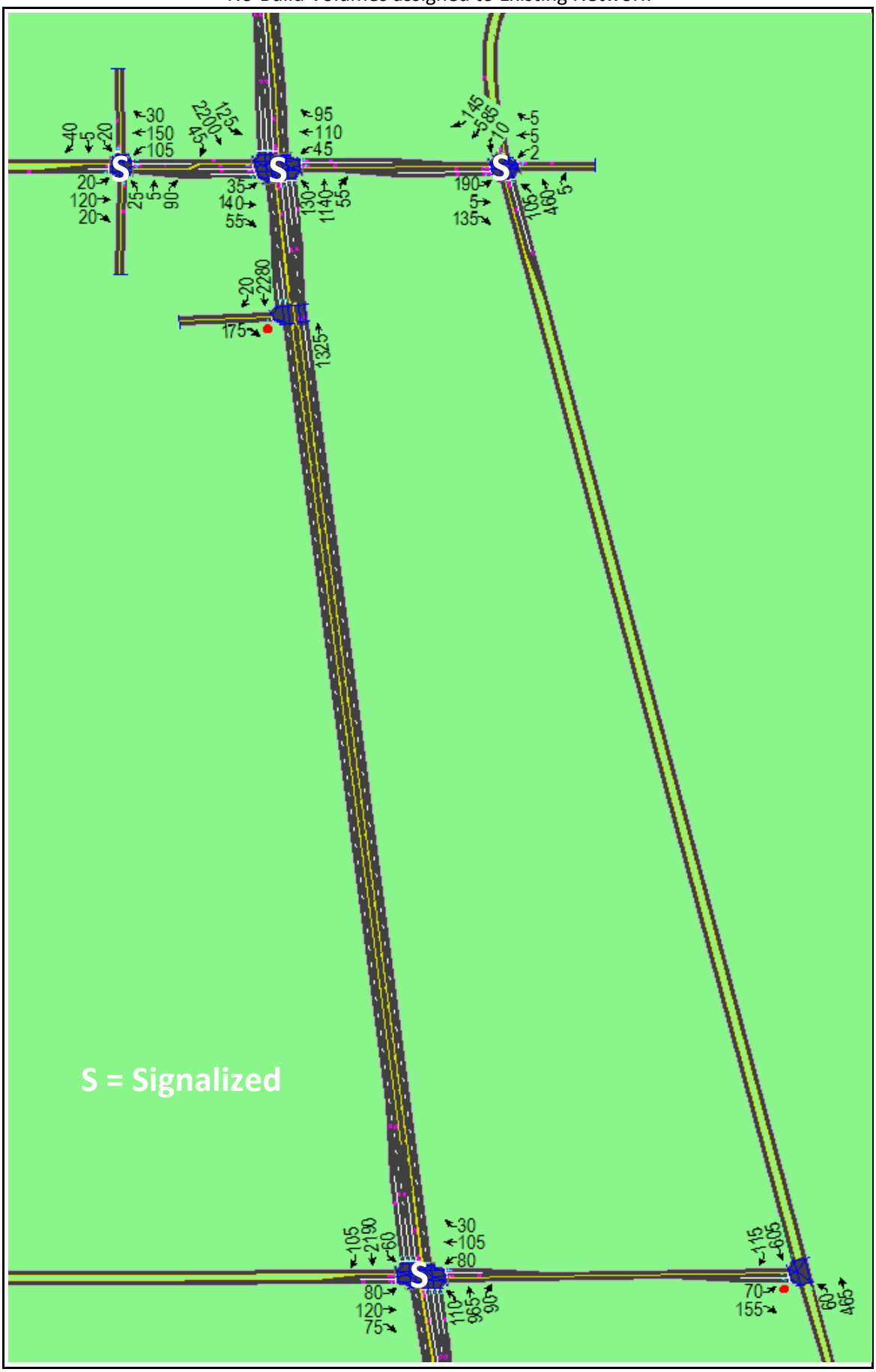
ALTERNATIVE 1 TRIPS TO BE REMOVED



ALTERNATIVE 2 TRIPS TO BE REMOVED

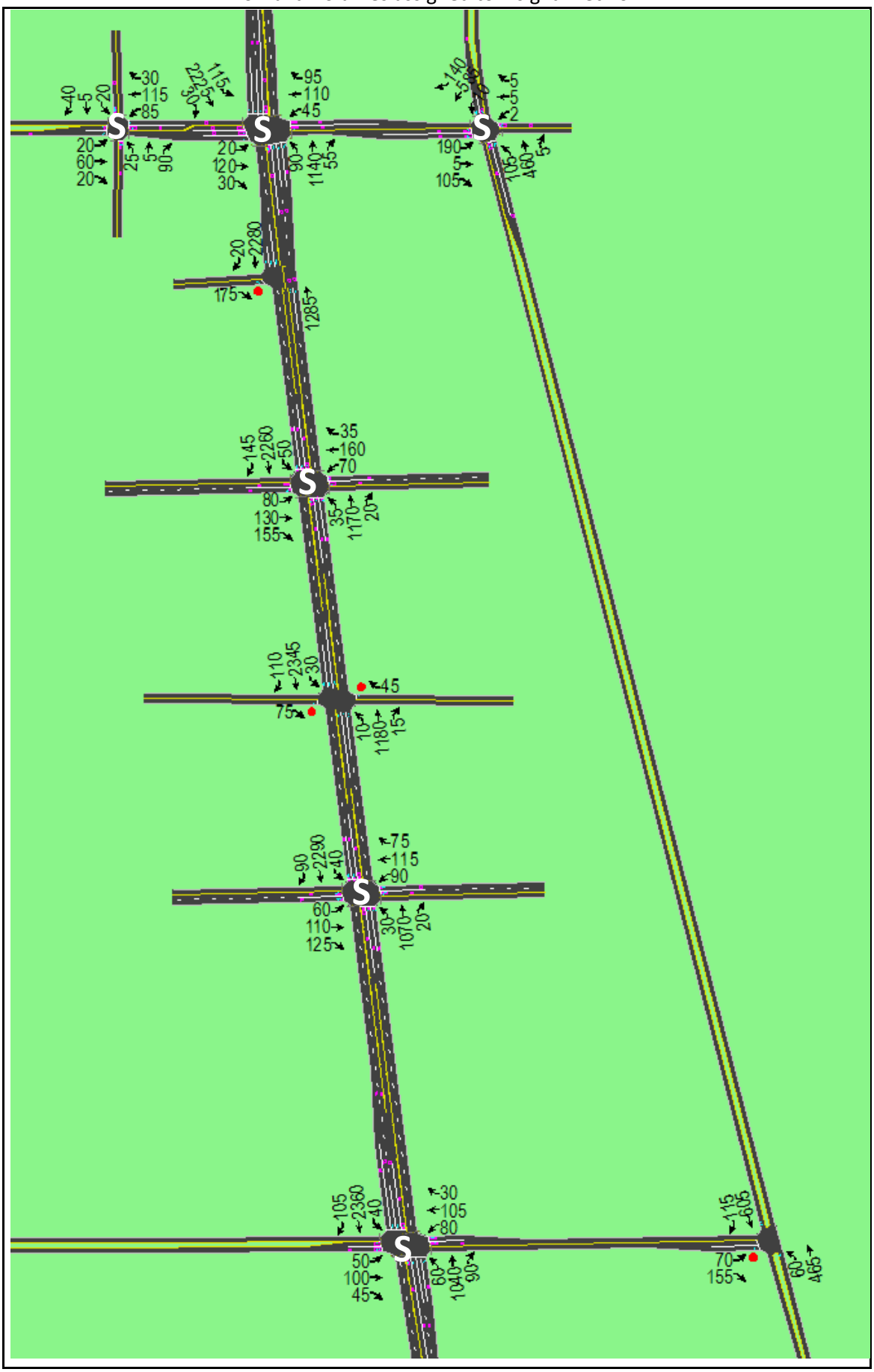


No-Build Volumes assigned to Existing Network



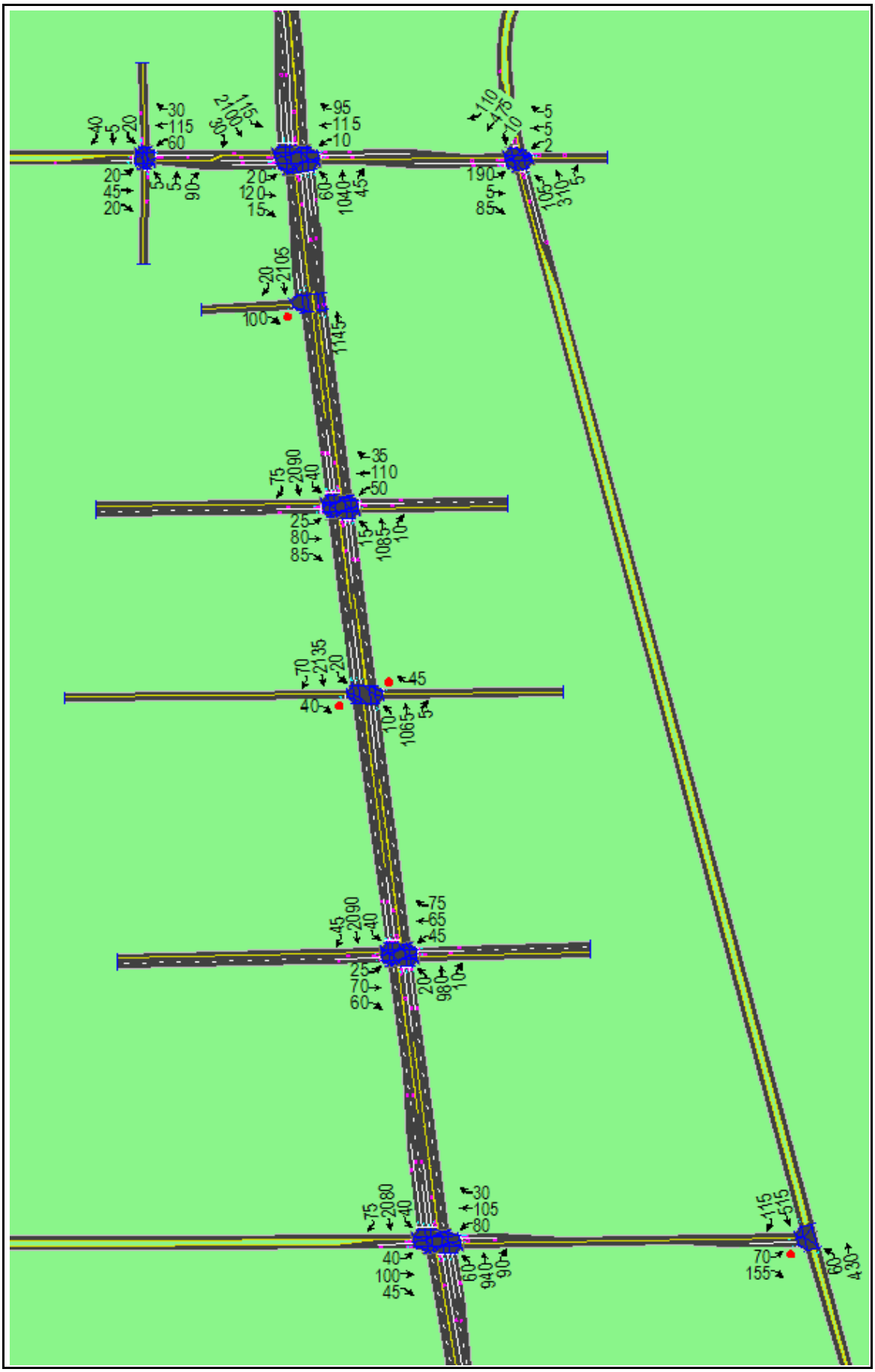
No-Build Volumes assigned to 1 signal network

No-Build Volumes assigned to 2 signal network

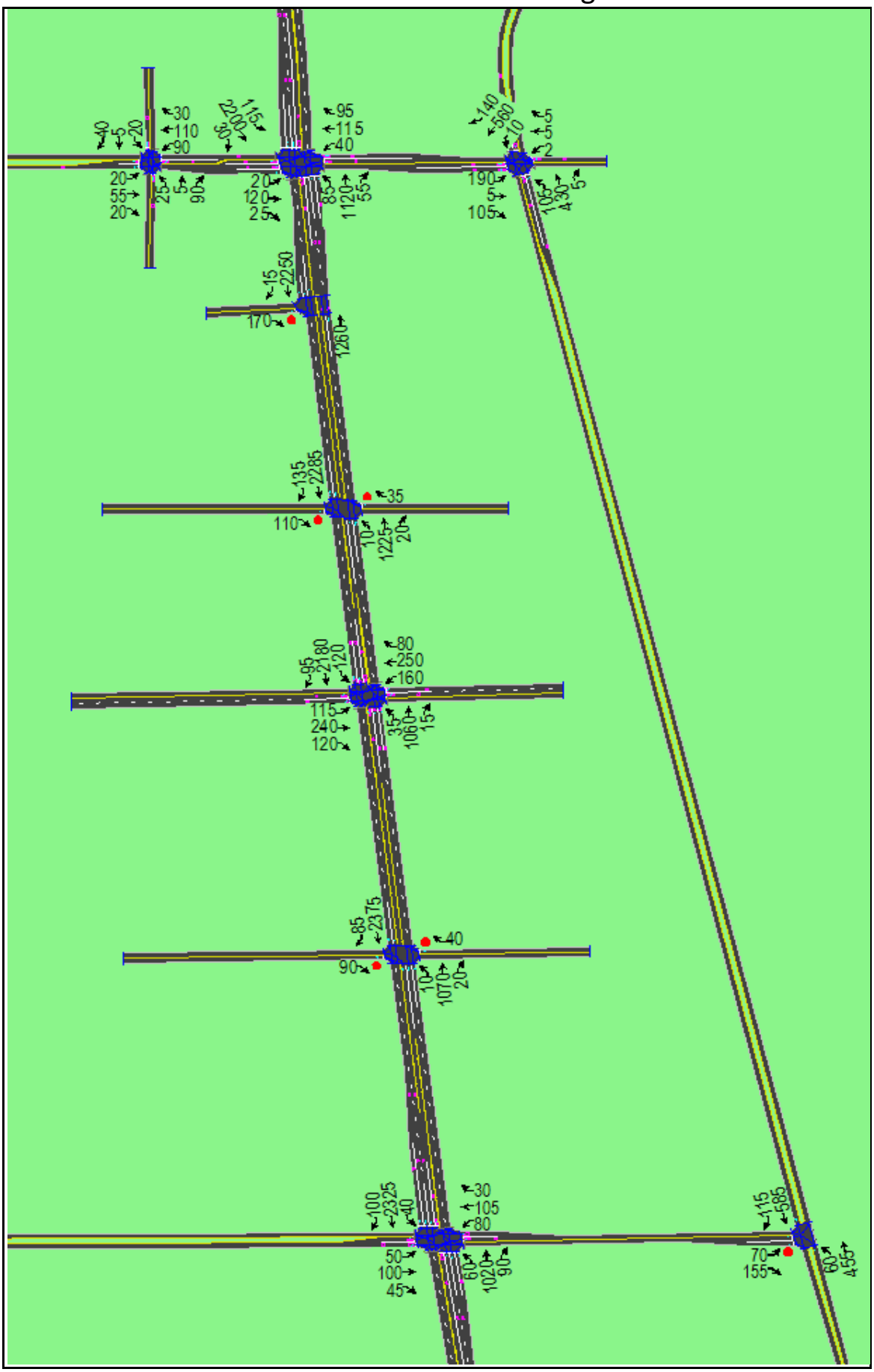


PM - Land Use 1 Volumes on 1 signal network

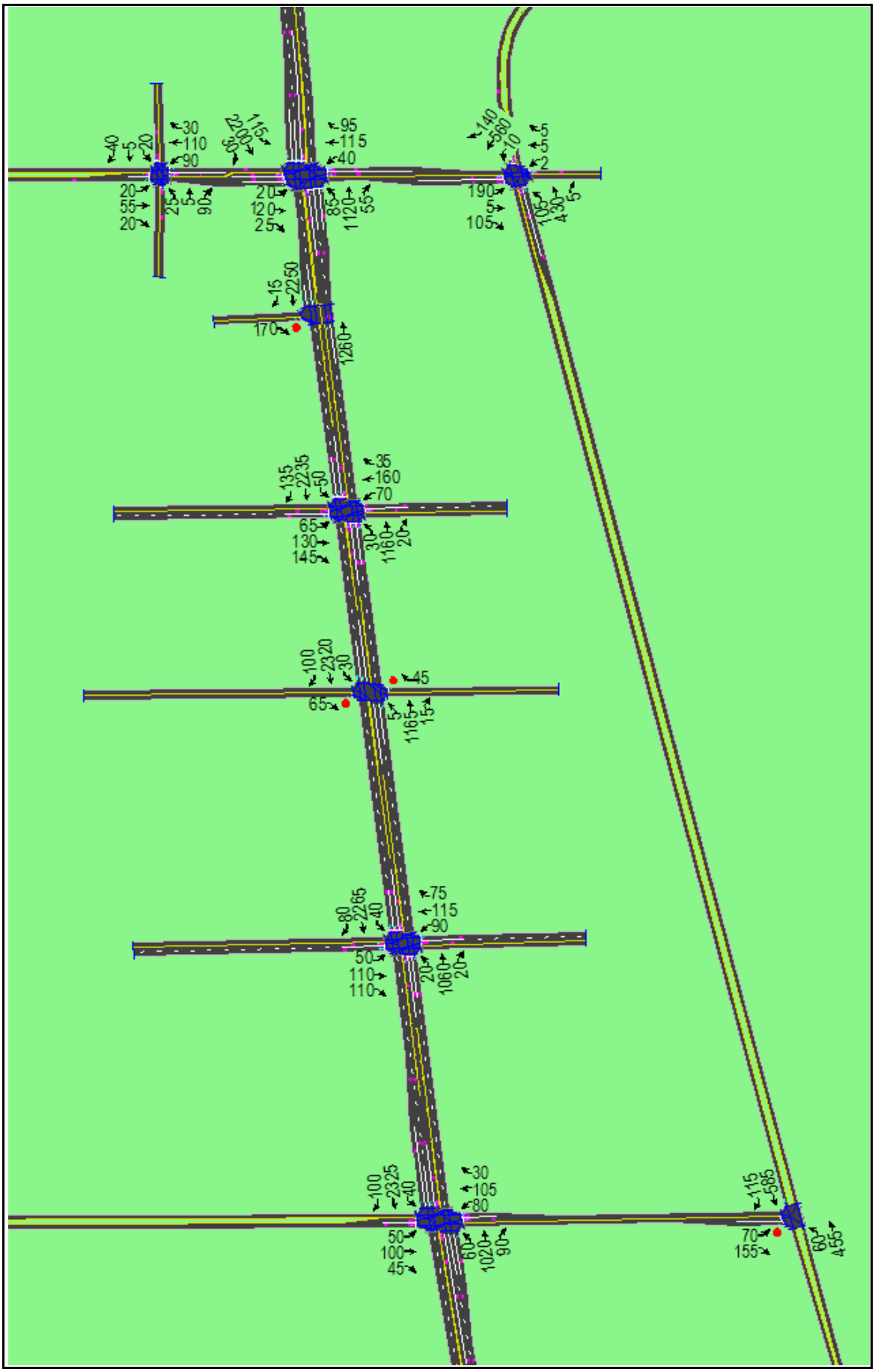
PM - Land Use 1 Volumes on 2 signal network



PM - Land Use 2 Volumes on 1 signal network



PM - Land Use 2 Volumes on 2 signal network



Appendix C.
Preliminary Signal Warrant Worksheets

Oregon Department of Transportation

Transportation Development Branch

Transportation Planning Analysis Unit

Preliminary Traffic Signal Warrant Analysis[1]

Major Street:	OR 99	**Minor Street:**	Torbank
Project:	Park Ave	**City/County:**	Oak Grove/Clackamas Co.
Year:	2034	**Alternative:**	No Build - 2 Signal

Preliminary Signal Warrant Volumes

Number of Approach lanes		ADT on major street approaching from both directions		ADT on minor street, highest approaching volume	
Major Street	Minor Street	Percent of standard warrants 100	70	Percent of standard warrants 100	70
Case A: Minimum Vehicular Traffic					
1	1	8850	6200	2650	1850
2 or more	1	10600	7400	2650	1850
2 or more	2 or more	10600	7400	3550	2500
1	2 or more	8850	6200	3550	2500
Case B: Interruption of Continuous Traffic					
1	1	13300	9300	1350	950
2 or more	1	15900	11100	1350	950
2 or more	2 or more	15900	11100	1750	1250
1	2 or more	13300	9300	1750	1250
X	100 percent of standard warrants				
	70 percent of standard warrants[2]				

Preliminary Signal Warrant Calculation

	Street	Number of Lanes	Warrant Volumes	Approach Volumes	Warrant Met
Case A	Major	2	10600	35400	N
	Minor	1	2650	1930	
Case B	Major	2	15900	35400	Y
	Minor	1	1350	1930	

Analyst and Date:	Reviewer and Date:

[1] Meeting preliminary signal warrants does **not** guarantee that a signal will be installed. When preliminary signal warrants are met, project analysts need to coordinate with Region Traffic to initiate the traffic signal engineering investigation as outlined in the Traffic Manual. Before a signal can be installed, the engineering investigation must be conducted or reviewed by the Region Traffic Manager who will forward signal recommendations to headquarters. Traffic signal warrants must be met and the State Traffic Engineer's approval obtained before a traffic signal can be installed on a state highway.

[2] Used due to 85th percentile speed in excess of 40 mph or isolated community with population of less than 10,000.

Oregon Department of Transportation

Transportation Development Branch

Transportation Planning Analysis Unit

Preliminary Traffic Signal Warrant Analysis[1]

Major Street:	OR 99	**Minor Street:**	Torbank
Project:	Park Ave	**City/County:**	Oak Grove/Clackamas Co.
Year:	2034	**Alternative:**	LU1 - 2 Signal

Preliminary Signal Warrant Volumes

Number of Approach lanes		ADT on major street approaching from both directions		ADT on minor street, highest approaching volume	
Major Street	Minor Street	Percent of standard warrants 100	70	Percent of standard warrants 100	70
Case A: Minimum Vehicular Traffic					
1	1	8850	6200	2650	1850
2 or more	1	10600	7400	2650	1850
2 or more	2 or more	10600	7400	3550	2500
1	2 or more	8850	6200	3550	2500
Case B: Interruption of Continuous Traffic					
1	1	13300	9300	1350	950
2 or more	1	15900	11100	1350	950
2 or more	2 or more	15900	11100	1750	1250
1	2 or more	13300	9300	1750	1250
X	100 percent of standard warrants				
	70 percent of standard warrants[2]				

Preliminary Signal Warrant Calculation

	Street	Number of Lanes	Warrant Volumes	Approach Volumes	Warrant Met
Case A	Major	2	10600	31850	N
	Minor	1	2650	1100	
Case B	Major	2	15900	31850	N
	Minor	1	1350	1100	

Analyst and Date:	Reviewer and Date:

[1] Meeting preliminary signal warrants does **not** guarantee that a signal will be installed. When preliminary signal warrants are met, project analysts need to coordinate with Region Traffic to initiate the traffic signal engineering investigation as outlined in the Traffic Manual. Before a signal can be installed, the engineering investigation must be conducted or reviewed by the Region Traffic Manager who will forward signal recommendations to headquarters. Traffic signal warrants must be met and the State Traffic Engineer's approval obtained before a traffic signal can be installed on a state highway.

[2] Used due to 85th percentile speed in excess of 40 mph or isolated community with population of less than 10,000.

Oregon Department of Transportation

Transportation Development Branch

Transportation Planning Analysis Unit

Preliminary Traffic Signal Warrant Analysis[1]

Major Street:	OR 99	**Minor Street:**	Torbank
Project:	Park Ave	**City/County:**	Oak Grove/Clackamas Co.
Year:	2034	**Alternative:**	LU2 - 2 Signal

Preliminary Signal Warrant Volumes

Number of Approach lanes		ADT on major street approaching from both directions		ADT on minor street, highest approaching volume	
Major Street	Minor Street	Percent of standard warrants 100	70	Percent of standard warrants 100	70
Case A: Minimum Vehicular Traffic					
1	1	8850	6200	2650	1850
2 or more	1	10600	7400	2650	1850
2 or more	2 or more	10600	7400	3550	2500
1	2 or more	8850	6200	3550	2500
Case B: Interruption of Continuous Traffic					
1	1	13300	9300	1350	950
2 or more	1	15900	11100	1350	950
2 or more	2 or more	15900	11100	1750	1250
1	2 or more	13300	9300	1750	1250
X	100 percent of standard warrants				
	70 percent of standard warrants[2]				

Preliminary Signal Warrant Calculation

	Street	Number of Lanes	Warrant Volumes	Approach Volumes	Warrant Met
Case A	Major	2	10600	34850	N
	Minor	1	2650	2050	
Case B	Major	2	15900	34850	Y
	Minor	1	1350	2050	

Analyst and Date:	Reviewer and Date:

[1] Meeting preliminary signal warrants does **not** guarantee that a signal will be installed. When preliminary signal warrants are met, project analysts need to coordinate with Region Traffic to initiate the traffic signal engineering investigation as outlined in the Traffic Manual. Before a signal can be installed, the engineering investigation must be conducted or reviewed by the Region Traffic Manager who will forward signal recommendations to headquarters. Traffic signal warrants must be met and the State Traffic Engineer's approval obtained before a traffic signal can be installed on a state highway.

[2] Used due to 85th percentile speed in excess of 40 mph or isolated community with population of less than 10,000.

Oregon Department of Transportation

Transportation Development Branch

Transportation Planning Analysis Unit

Preliminary Traffic Signal Warrant Analysis[1]

Major Street:	OR 99	**Minor Street:**	Cinderella
Project:	Park Ave	**City/County:**	Oak Grove/Clackamas Co.
Year:	2034	**Alternative:**	No Build - 1 Signal

Preliminary Signal Warrant Volumes

Number of Approach lanes		ADT on major street approaching from both directions		ADT on minor street, highest approaching volume	
Major Street	Minor Street	Percent of standard warrants 100	70	Percent of standard warrants 100	70
Case A: Minimum Vehicular Traffic					
1	1	8850	6200	2650	1850
2 or more	1	10600	7400	2650	1850
2 or more	2 or more	10600	7400	3550	2500
1	2 or more	8850	6200	3550	2500
Case B: Interruption of Continuous Traffic					
1	1	13300	9300	1350	950
2 or more	1	15900	11100	1350	950
2 or more	2 or more	15900	11100	1750	1250
1	2 or more	13300	9300	1750	1250

X	100 percent of standard warrants
	70 percent of standard warrants[2]

Preliminary Signal Warrant Calculation

	Street	Number of Lanes	Warrant Volumes	Approach Volumes	Warrant Met
Case A	Major	2	10600	35600	Y
	Minor	1	2650	4180	
Case B	Major	2	15900	35600	Y
	Minor	1	1350	4180	

Analyst and Date:	Reviewer and Date:

[1] Meeting preliminary signal warrants does **not** guarantee that a signal will be installed. When preliminary signal warrants are met, project analysts need to coordinate with Region Traffic to initiate the traffic signal engineering investigation as outlined in the Traffic Manual. Before a signal can be installed, the engineering investigation must be conducted or reviewed by the Region Traffic Manager who will forward signal recommendations to headquarters. Traffic signal warrants must be met and the State Traffic Engineer's approval obtained before a traffic signal can be installed on a state highway.

[2] Used due to 85th percentile speed in excess of 40 mph or isolated community with population of less than 10,000.

Oregon Department of Transportation

Transportation Development Branch

Transportation Planning Analysis Unit

Preliminary Traffic Signal Warrant Analysis[1]

Major Street:	OR 99	**Minor Street:**	Cinderella
Project:	Park Ave	**City/County:**	Oak Grove/Clackamas Co.
Year:	2034	**Alternative:**	LU1 - 1 Signal

Preliminary Signal Warrant Volumes

Number of Approach lanes		ADT on major street approaching from both directions		ADT on minor street, highest approaching volume	
Major Street	Minor Street	Percent of standard warrants 100	70	Percent of standard warrants 100	70
Case A: Minimum Vehicular Traffic					
1	1	8850	6200	2650	1850
2 or more	1	10600	7400	2650	1850
2 or more	2 or more	10600	7400	3550	2500
1	2 or more	8850	6200	3550	2500
Case B: Interruption of Continuous Traffic					
1	1	13300	9300	1350	950
2 or more	1	15900	11100	1350	950
2 or more	2 or more	15900	11100	1750	1250
1	2 or more	13300	9300	1750	1250

X	100 percent of standard warrants
	70 percent of standard warrants[2]

Preliminary Signal Warrant Calculation

	Street	Number of Lanes	Warrant Volumes	Approach Volumes	Warrant Met
Case A	Major	2	10600	32700	Y
	Minor	1	2650	2700	
Case B	Major	2	15900	32700	Y
	Minor	1	1350	2700	

Analyst and Date:	Reviewer and Date:

[1] Meeting preliminary signal warrants does **not** guarantee that a signal will be installed. When preliminary signal warrants are met, project analysts need to coordinate with Region Traffic to initiate the traffic signal engineering investigation as outlined in the Traffic Manual. Before a signal can be installed, the engineering investigation must be conducted or reviewed by the Region Traffic Manager who will forward signal recommendations to headquarters. Traffic signal warrants must be met and the State Traffic Engineer's approval obtained before a traffic signal can be installed on a state highway.

[2] Used due to 85th percentile speed in excess of 40 mph or isolated community with population of less than 10,000.

Oregon Department of Transportation

Transportation Development Branch

Transportation Planning Analysis Unit

Preliminary Traffic Signal Warrant Analysis[1]

Major Street:	OR 99	**Minor Street:**	Cinderella
Project:	Park Ave	**City/County:**	Oak Grove/Clackamas Co.
Year:	2034	**Alternative:**	LU2 - 1 Signal

Preliminary Signal Warrant Volumes

Number of Approach lanes		ADT on major street approaching from both directions		ADT on minor street, highest approaching volume	
Major Street	Minor Street	Percent of standard warrants 100	70	Percent of standard warrants 100	70
Case A: Minimum Vehicular Traffic					
1	1	8850	6200	2650	1850
2 or more	1	10600	7400	2650	1850
2 or more	2 or more	10600	7400	3550	2500
1	2 or more	8850	6200	3550	2500
Case B: Interruption of Continuous Traffic					
1	1	13300	9300	1350	950
2 or more	1	15900	11100	1350	950
2 or more	2 or more	15900	11100	1750	1250
1	2 or more	13300	9300	1750	1250
X	100 percent of standard warrants				
	70 percent of standard warrants[2]				

Preliminary Signal Warrant Calculation

	Street	Number of Lanes	Warrant Volumes	Approach Volumes	Warrant Met
Case A	Major	2	10600	35050	Y
	Minor	1	2650	4100	
Case B	Major	2	15900	35050	Y
	Minor	1	1350	4100	

Analyst and Date:	Reviewer and Date:

[1] Meeting preliminary signal warrants does **not** guarantee that a signal will be installed. When preliminary signal warrants are met, project analysts need to coordinate with Region Traffic to initiate the traffic signal engineering investigation as outlined in the Traffic Manual. Before a signal can be installed, the engineering investigation must be conducted or reviewed by the Region Traffic Manager who will forward signal recommendations to headquarters. Traffic signal warrants must be met and the State Traffic Engineer's approval obtained before a traffic signal can be installed on a state highway.

[2] Used due to 85th percentile speed in excess of 40 mph or isolated community with population of less than 10,000.

Oregon Department of Transportation

Transportation Development Branch

Transportation Planning Analysis Unit

Preliminary Traffic Signal Warrant Analysis[1]

Major Street:	OR 99	**Minor Street:**	Silver Springs
Project:	Park Ave Multi-Way Blvd	**City/County:**	Oak Grove/Clackamas Co.
Year:	2034	**Alternative:**	No Build - 1 signal

Preliminary Signal Warrant Volumes

Number of Approach lanes		ADT on major street approaching from both directions		ADT on minor street, highest approaching volume	
Major Street	Minor Street	Percent of standard warrants 100	70	Percent of standard warrants 100	70
Case A: Minimum Vehicular Traffic					
1	1	8850	6200	2650	1850
2 or more	1	10600	7400	2650	1850
2 or more	2 or more	10600	7400	3550	2500
1	2 or more	8850	6200	3550	2500
Case B: Interruption of Continuous Traffic					
1	1	13300	9300	1350	950
2 or more	1	15900	11100	1350	950
2 or more	2 or more	15900	11100	1750	1250
1	2 or more	13300	9300	1750	1250
X	100 percent of standard warrants				
	70 percent of standard warrants[2]				

Preliminary Signal Warrant Calculation

	Street	Number of Lanes	Warrant Volumes	Approach Volumes	Warrant Met
Case A	Major	2	10600	36800	N
	Minor	1	2650	2630	
Case B	Major	2	15900	36800	Y
	Minor	1	1350	2630	

Analyst and Date:	Reviewer and Date:

[1] Meeting preliminary signal warrants does **not** guarantee that a signal will be installed. When preliminary signal warrants are met, project analysts need to coordinate with Region Traffic to initiate the traffic signal engineering investigation as outlined in the Traffic Manual. Before a signal can be installed, the engineering investigation must be conducted or reviewed by the Region Traffic Manager who will forward signal recommendations to headquarters. Traffic signal warrants must be met and the State Traffic Engineer's approval obtained before a traffic signal can be installed on a state highway.

[2] Used due to 85th percentile speed in excess of 40 mph or isolated community with population of less than 10,000.

Oregon Department of Transportation

Transportation Development Branch

Transportation Planning Analysis Unit

Preliminary Traffic Signal Warrant Analysis[1]

Major Street:	OR 99	**Minor Street:**	Silver Springs
Project:	Park Ave Multi-Way Blvd	**City/County:**	Oak Grove/Clackamas Co.
Year:	2034	**Alternative:**	No Build - 1 signal

Preliminary Signal Warrant Volumes

Number of Approach lanes		ADT on major street approaching from both directions		ADT on minor street, highest approaching volume	
Major Street	Minor Street	Percent of standard warrants 100	70	Percent of standard warrants 100	70
Case A: Minimum Vehicular Traffic					
1	1	8850	6200	2650	1850
2 or more	1	10600	7400	2650	1850
2 or more	2 or more	10600	7400	3550	2500
1	2 or more	8850	6200	3550	2500
Case B: Interruption of Continuous Traffic					
1	1	13300	9300	1350	950
2 or more	1	15900	11100	1350	950
2 or more	2 or more	15900	11100	1750	1250
1	2 or more	13300	9300	1750	1250
X	100 percent of standard warrants				
	70 percent of standard warrants[2]				

Preliminary Signal Warrant Calculation

	Street	Number of Lanes	Warrant Volumes	Approach Volumes	Warrant Met
Case A	Major	2	10600	33150	N
	Minor	1	2650	1600	
Case B	Major	2	15900	33150	Y
	Minor	1	1350	1600	

Analyst and Date:	Reviewer and Date:

[1] Meeting preliminary signal warrants does **not** guarantee that a signal will be installed. When preliminary signal warrants are met, project analysts need to coordinate with Region Traffic to initiate the traffic signal engineering investigation as outlined in the Traffic Manual. Before a signal can be installed, the engineering investigation must be conducted or reviewed by the Region Traffic Manager who will forward signal recommendations to headquarters. Traffic signal warrants must be met and the State Traffic Engineer's approval obtained before a traffic signal can be installed on a state highway.

[2] Used due to 85th percentile speed in excess of 40 mph or isolated community with population of less than 10,000.

Oregon Department of Transportation

Transportation Development Branch

Transportation Planning Analysis Unit

Preliminary Traffic Signal Warrant Analysis[1]

Major Street:	OR 99	**Minor Street:**	Silver Springs
Project:	Park Ave Multi-Way Blvd	**City/County:**	Oak Grove/Clackamas Co.
Year:	2034	**Alternative:**	No Build - 1 signal

Preliminary Signal Warrant Volumes

Number of Approach lanes		ADT on major street approaching from both directions		ADT on minor street, highest approaching volume	
Major Street	Minor Street	Percent of standard warrants 100	70	Percent of standard warrants 100	70
Case A: Minimum Vehicular Traffic					
1	1	8850	6200	2650	1850
2 or more	1	10600	7400	2650	1850
2 or more	2 or more	10600	7400	3550	2500
1	2 or more	8850	6200	3550	2500
Case B: Interruption of Continuous Traffic					
1	1	13300	9300	1350	950
2 or more	1	15900	11100	1350	950
2 or more	2 or more	15900	11100	1750	1250
1	2 or more	13300	9300	1750	1250
X	100 percent of standard warrants				
	70 percent of standard warrants[2]				

Preliminary Signal Warrant Calculation

	Street	Number of Lanes	Warrant Volumes	Approach Volumes	Warrant Met
Case A	Major	2	10600	36300	N
	Minor	1	2650	2380	
Case B	Major	2	15900	36300	Y
	Minor	1	1350	2380	

Analyst and Date:	Reviewer and Date:

[1] Meeting preliminary signal warrants does **not** guarantee that a signal will be installed. When preliminary signal warrants are met, project analysts need to coordinate with Region Traffic to initiate the traffic signal engineering investigation as outlined in the Traffic Manual. Before a signal can be installed, the engineering investigation must be conducted or reviewed by the Region Traffic Manager who will forward signal recommendations to headquarters. Traffic signal warrants must be met and the State Traffic Engineer's approval obtained before a traffic signal can be installed on a state highway.

[2] Used due to 85th percentile speed in excess of 40 mph or isolated community with population of less than 10,000.

Appendix D.
Synchro/SimTraffic Output

No Build

Option 1 (2 Signals)

Option 2 (1 Signal)

Queues
1: SE River Rd & SE McLoughlin Blvd

9/26/2011

Lane Group	NBL	NBR	SET	NWL	NWT
Lane Group Flow (vph)	268	21	2316	16	1237
v/c Ratio	0.81	0.08	1.02	0.21	0.51
Control Delay	66.9	28.4	42.0	71.5	5.8
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	66.9	28.4	42.0	71.5	5.8
Queue Length 50th (ft)	201	7	746	13	95
Queue Length 95th (ft)	#336	31	#1216	m18	181
Internal Link Dist (ft)	1200		698		2865
Turn Bay Length (ft)		90		300	
Base Capacity (vph)	331	267	2281	211	2431
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.81	0.08	1.02	0.08	0.51

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	NBL	NBR	SET	SER	NWL	NWT
Lane Configurations						
Volume (vph)	255	20	2200	0	15	1175
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5	5.5		4.5	4.5
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frt	1.00	0.85	1.00		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1850	1444	3260		1630	3260
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1850	1444	3260		1630	3260
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	268	21	2316	0	16	1237
RTOR Reduction (vph)	0	8	0	0	0	0
Lane Group Flow (vph)	268	13	2316	0	16	1237
Heavy Vehicles (%)	3%	3%	2%	2%	2%	2%
Turn Type		Prot			Prot	
Protected Phases	7	7	6		5	
Permitted Phases			6			2
Actuated Green, G (s)	22.0	22.0	82.1		2.9	90.0
Effective Green, g (s)	21.5	21.5	81.6		2.4	89.5
Actuated g/C Ratio	0.18	0.18	0.68		0.02	0.75
Clearance Time (s)	4.0	4.0	5.0		4.0	4.0
Vehicle Extension (s)	2.3	2.3	8.0		2.3	2.3
Lane Grp Cap (vph)	331	259	2217		33	2431
v/s Ratio Prot	c0.14	0.01	c0.71		0.01	
v/s Ratio Perm						c0.38
v/c Ratio	0.81	0.05	1.04		0.48	0.51
Uniform Delay, d1	47.3	40.8	19.2		58.2	6.2
Progression Factor	1.00	1.00	1.00		1.22	0.81
Incremental Delay, d2	18.9	0.4	32.0		5.1	0.6
Delay (s)	66.2	41.1	51.2		75.9	5.7
Level of Service	E	D	D		E	A
Approach Delay (s)	64.4		51.2			6.6
Approach LOS	E		D			A

Intersection Summary			
HCM Average Control Delay	37.7	HCM Level of Service	D
HCM Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	89.7%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	110	30	295	100	30	635
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	116	32	311	105	32	668
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1095	363			416	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1095	363			416	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	50	95			97	
cM capacity (veh/h)	230	682			1143	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	147	416	700
Volume Left	116	0	32
Volume Right	32	105	0
cSH	268	1700	1143
Volume to Capacity	0.55	0.24	0.03
Queue Length 95th (ft)	76	0	2
Control Delay (s)	33.7	0.0	0.7
Lane LOS	D		A
Approach Delay (s)	33.7	0.0	0.7
Approach LOS	D		

Intersection Summary			
Average Delay	4.3		
Intersection Capacity Utilization	78.9%	ICU Level of Service	D
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	21	124	31	46	217	93	1175	57	119	2294	31
v/c Ratio	0.24	0.46	0.12	0.29	0.79	0.64	0.62	0.07	0.56	1.13	0.03
Control Delay	44.8	47.3	12.2	47.5	60.9	84.5	7.7	2.7	42.5	77.7	1.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	34.3	0.0
Total Delay	44.8	47.3	12.2	47.5	60.9	84.5	7.7	2.7	42.5	112.0	1.3
Queue Length 50th (ft)	13	88	0	32	141	75	53	0	94	~1137	3
Queue Length 95th (ft)	38	139	21	65	216	m111	m141	m8	m92	m#1191	m2
Internal Link Dist (ft)		264			427		297			2865	
Turn Bay Length (ft)	115		150			325		100	325		125
Base Capacity (vph)	119	365	334	214	364	163	1896	860	211	2027	910
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	4	1	0	0	0	0	0	130	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.18	0.34	0.09	0.22	0.60	0.57	0.62	0.07	0.56	1.21	0.03

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	120	30	45	115	95	90	1140	55	115	2225	30
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0		4.5	6.5	6.5	4.5	6.5	6.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1630	1716	1458	1630	1599		1630	3260	1458	1630	3260	1458
Flt Permitted	0.33	1.00	1.00	0.59	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	560	1716	1458	1007	1599		1630	3260	1458	1630	3260	1458
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	21	124	31	46	119	98	93	1175	57	119	2294	31
RTOR Reduction (vph)	0	0	26	0	26	0	0	0	12	0	0	4
Lane Group Flow (vph)	21	124	5	46	191	0	93	1175	45	119	2294	27
Turn Type	Perm		Perm	Perm			Prot		Perm	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8					2			6
Actuated Green, G (s)	19.2	19.2	19.2	19.2	19.2		11.2	70.3	70.3	16.0	75.1	75.1
Effective Green, g (s)	18.7	18.7	18.7	18.7	18.7		10.7	69.8	69.8	15.5	74.6	74.6
Actuated g/C Ratio	0.16	0.16	0.16	0.16	0.16		0.09	0.58	0.58	0.13	0.62	0.62
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5		4.0	6.0	6.0	4.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	87	267	227	157	249		145	1896	848	211	2027	906
v/s Ratio Prot		0.07			c0.12		0.06	c0.36		0.07	c0.70	
v/s Ratio Perm	0.04		0.00	0.05					0.03			0.02
v/c Ratio	0.24	0.46	0.02	0.29	0.77		0.64	0.62	0.05	0.56	1.13	0.03
Uniform Delay, d1	44.4	46.1	42.9	44.8	48.6		52.8	16.4	10.8	49.1	22.7	8.8
Progression Factor	0.91	0.93	0.85	1.00	1.00		1.34	0.38	0.35	0.79	0.51	0.15
Incremental Delay, d2	1.4	1.3	0.0	1.0	13.2		6.6	1.1	0.1	1.0	61.5	0.0
Delay (s)	41.8	44.1	36.7	45.8	61.7		77.3	7.3	3.9	39.7	73.0	1.4
Level of Service	D	D	D	D	E		E	A	A	D	E	A
Approach Delay (s)		42.5			58.9			12.1			70.4	
Approach LOS		D			E			B			E	

Intersection Summary			
HCM Average Control Delay	50.2	HCM Level of Service	D
HCM Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	103.6%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	EBR	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	205	111	12	111	489	11	769
v/c Ratio	0.65	0.25	0.03	0.42	0.45	0.02	0.72
Control Delay	27.9	5.7	12.6	14.3	8.7	6.0	14.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.9	5.7	12.6	14.3	8.7	6.0	14.4
Queue Length 50th (ft)	50	0	1	17	74	1	147
Queue Length 95th (ft)	124	30	12	68	166	7	#414
Internal Link Dist (ft)	427		122		2589		673
Turn Bay Length (ft)		200		175		50	
Base Capacity (vph)	421	568	538	279	1157	510	1135
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.49	0.20	0.02	0.40	0.42	0.02	0.68

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	190	5	105	2	5	5	105	460	5	10	585	145
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Grade (%)		5%			0%			0%			0%	
Total Lost time (s)		4.5	4.5		4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.94		1.00	1.00		1.00	0.97	
Flt Protected		0.95	1.00		0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1595	1422		1606		1630	1713		1630	1664	
Flt Permitted		0.72	1.00		0.95		0.24	1.00		0.44	1.00	
Satd. Flow (perm)		1209	1422		1533		413	1713		756	1664	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	200	5	111	2	5	5	111	484	5	11	616	153
RTOR Reduction (vph)	0	0	87	0	4	0	0	0	0	0	14	0
Lane Group Flow (vph)	0	205	24	0	8	0	111	489	0	11	755	0
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		10.0	10.0		10.0		26.6	26.6		26.6	26.6	
Effective Green, g (s)		9.5	9.5		9.5		26.1	26.1		26.1	26.1	
Actuated g/C Ratio		0.21	0.21		0.21		0.59	0.59		0.59	0.59	
Clearance Time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		2.5	2.5		2.5		2.5	2.5		2.5	2.5	
Lane Grp Cap (vph)		258	303		327		242	1002		442	974	
v/s Ratio Prot								0.29			c0.45	
v/s Ratio Perm		c0.17	0.02		0.01		0.27			0.01		
v/c Ratio		0.79	0.08		0.02		0.46	0.49		0.02	0.78	
Uniform Delay, d1		16.6	14.0		13.9		5.2	5.4		3.9	7.0	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		15.0	0.1		0.0		1.0	0.3		0.0	3.8	
Delay (s)		31.6	14.1		13.9		6.2	5.6		3.9	10.8	
Level of Service		C	B		B		A	A		A	B	
Approach Delay (s)		25.5			13.9			5.8			10.7	
Approach LOS		C			B			A			B	

Intersection Summary			
HCM Average Control Delay	11.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	44.6	Sum of lost time (s)	9.0
Intersection Capacity Utilization	78.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	10	15	5	75	15	80	15	210	55	50	635	40
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	11	16	5	79	16	84	16	221	58	53	668	42
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1168	1105	689	1089	1097	250	711			279		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1168	1105	689	1089	1097	250	711			279		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	92	92	99	54	92	89	98			96		
cM capacity (veh/h)	137	198	445	171	201	789	889			1284		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	32	179	295	763
Volume Left	11	79	16	53
Volume Right	5	84	58	42
cSH	188	277	889	1284
Volume to Capacity	0.17	0.65	0.02	0.04
Queue Length 95th (ft)	15	103	1	3
Control Delay (s)	28.0	39.1	0.7	1.1
Lane LOS	D	E	A	A
Approach Delay (s)	28.0	39.1	0.7	1.1
Approach LOS	D	E		

Intersection Summary			
Average Delay	7.0		
Intersection Capacity Utilization	80.3%	ICU Level of Service	D
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	52	149	82	139	62	1072	93	41	2433	108
v/c Ratio	0.85	0.70	1.34	0.66	0.48	0.52	0.10	0.38	1.20	0.12
Control Delay	136.2	61.1	275.4	60.3	65.0	14.8	6.3	58.6	110.3	5.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.9	0.0
Total Delay	136.2	61.1	275.4	60.3	65.0	14.8	6.3	58.6	113.2	5.5
Queue Length 50th (ft)	41	99	~83	96	47	233	12	33	~1223	9
Queue Length 95th (ft)	#120	162	#189	156	92	356	42	m27	m#961	m7
Internal Link Dist (ft)		3106		771		404			767	
Turn Bay Length (ft)	75				325		100	175		200
Base Capacity (vph)	61	361	61	361	130	2061	940	145	2026	925
Starvation Cap Reductn	0	0	0	0	0	0	0	0	11	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.85	0.41	1.34	0.39	0.48	0.52	0.10	0.28	1.21	0.12

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	50	100	45	80	105	30	60	1040	90	40	2360	105
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	5.5	5.5	4.5	5.5	5.5
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.95		1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1630	1636		1630	1658		1630	3260	1458	1630	3260	1458
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1630	1636		1630	1658		1630	3260	1458	1630	3260	1458
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	52	103	46	82	108	31	62	1072	93	41	2433	108
RTOR Reduction (vph)	0	15	0	0	10	0	0	0	19	0	0	19
Lane Group Flow (vph)	52	134	0	82	129	0	62	1072	74	41	2433	89
Turn Type	Prot			Prot			Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			6
Actuated Green, G (s)	5.0	15.1		5.0	15.1		8.6	75.5	75.5	7.4	74.3	74.3
Effective Green, g (s)	4.5	14.6		4.5	14.6		8.1	75.0	75.0	6.9	73.8	73.8
Actuated g/C Ratio	0.04	0.12		0.04	0.12		0.07	0.62	0.62	0.06	0.62	0.62
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	5.0	5.0	4.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	61	199		61	202		110	2038	911	94	2005	897
v/s Ratio Prot	0.03	c0.08		c0.05	0.08		c0.04	0.33		0.03	c0.75	
v/s Ratio Perm									0.05			0.06
v/c Ratio	0.85	0.67		1.34	0.64		0.56	0.53	0.08	0.44	1.21	0.10
Uniform Delay, d1	57.4	50.4		57.8	50.2		54.2	12.6	8.9	54.7	23.1	9.5
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.09	0.66	0.78
Incremental Delay, d2	65.3	8.7		231.9	6.8		6.5	1.0	0.2	0.3	96.5	0.0
Delay (s)	122.7	59.1		289.6	57.0		60.7	13.5	9.1	59.8	111.8	7.4
Level of Service	F	E		F	E		E	B	A	E	F	A
Approach Delay (s)		75.6			143.3			15.6			106.6	
Approach LOS		E			F			B			F	

Intersection Summary			
HCM Average Control Delay	80.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	96.4%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	70	155	60	465	605	115
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	74	163	63	489	637	121
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		4				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1313	697	758			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1313	697	758			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	54	63	93			
cM capacity (veh/h)	162	441	853			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	237	553	758
Volume Left	74	63	0
Volume Right	163	0	121
cSH	520	853	1700
Volume to Capacity	0.46	0.07	0.45
Queue Length 95th (ft)	59	6	0
Control Delay (s)	26.2	2.0	0.0
Lane LOS	D	A	
Approach Delay (s)	26.2	2.0	0.0
Approach LOS	D		

Intersection Summary			
Average Delay	4.7		
Intersection Capacity Utilization	87.8%	ICU Level of Service	E
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	21	84	95	153	126	68
v/c Ratio	0.09	0.24	0.40	0.44	0.12	0.07
Control Delay	18.2	16.3	30.5	26.9	2.4	3.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.2	16.3	30.5	26.9	2.4	3.0
Queue Length 50th (ft)	6	18	68	99	4	3
Queue Length 95th (ft)	20	47	m117	165	21	16
Internal Link Dist (ft)		1888		264	174	146
Turn Bay Length (ft)	50		130			
Base Capacity (vph)	403	605	431	612	1057	1037
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.14	0.22	0.25	0.12	0.07

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	60	20	90	115	30	25	5	90	20	5	40
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.96		1.00	0.97			0.90			0.92	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.98	
Satd. Flow (prot)	1630	1651		1630	1662			1525			1549	
Flt Permitted	0.65	1.00		0.70	1.00			0.95			0.93	
Satd. Flow (perm)	1124	1651		1205	1662			1471			1463	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	21	63	21	95	121	32	26	5	95	21	5	42
RTOR Reduction (vph)	0	17	0	0	21	0	0	31	0	0	14	0
Lane Group Flow (vph)	21	67	0	95	132	0	0	95	0	0	54	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	11.2	11.2		11.2	11.2			40.8			40.8	
Effective Green, g (s)	10.7	10.7		10.7	10.7			40.3			40.3	
Actuated g/C Ratio	0.18	0.18		0.18	0.18			0.67			0.67	
Clearance Time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	200	294		215	296			988			983	
v/s Ratio Prot		0.04			c0.08							
v/s Ratio Perm	0.02			0.08				c0.06			0.04	
v/c Ratio	0.10	0.23		0.44	0.45			0.10			0.06	
Uniform Delay, d1	20.6	21.1		22.0	22.0			3.5			3.4	
Progression Factor	1.00	1.00		1.32	1.41			1.00			1.00	
Incremental Delay, d2	0.2	0.4		1.3	0.9			0.2			0.1	
Delay (s)	20.9	21.5		30.4	32.1			3.7			3.5	
Level of Service	C	C		C	C			A			A	
Approach Delay (s)		21.4			31.4			3.7			3.5	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	19.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.17		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	32.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	175	0	1285	2280	20
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	184	0	1353	2400	21
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				424	377	
pX, platoon unblocked	0.52	0.39	0.39			
vC, conflicting volume	3076	1200	2421			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	891	0	1509			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	56	100			
cM capacity (veh/h)	146	421	171			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	184	676	676	1200	1200	21
Volume Left	0	0	0	0	0	0
Volume Right	184	0	0	0	0	21
cSH	421	1700	1700	1700	1700	1700
Volume to Capacity	0.44	0.40	0.40	0.71	0.71	0.01
Queue Length 95th (ft)	54	0	0	0	0	0
Control Delay (s)	20.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	C					
Approach Delay (s)	20.0	0.0		0.0		
Approach LOS	C					

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	87.7%	ICU Level of Service	E
Analysis Period (min)	15		

Lane Group	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	384	279	37	1253	53	2532
v/c Ratio	1.35	1.21	0.40	0.64	0.39	1.22
Control Delay	212.6	168.8	49.7	25.5	35.3	112.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	212.6	168.8	49.7	25.5	35.3	112.1
Queue Length 50th (ft)	~374	~262	28	486	36	~1300
Queue Length 95th (ft)	#572	#437	m43	m536	m36	m#1106
Internal Link Dist (ft)	129	226		369		344
Turn Bay Length (ft)			200		150	
Base Capacity (vph)	285	230	115	1943	156	2077
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.35	1.21	0.32	0.64	0.34	1.22

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	80	130	155	70	160	35	35	1170	20	50	2260	145
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.94			0.98		1.00	1.00		1.00	0.99	
Flt Protected		0.99			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1600			1663		1630	3252		1630	3230	
Flt Permitted		0.74			0.61		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1191			1022		1630	3252		1630	3230	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	84	137	163	74	168	37	37	1232	21	53	2379	153
RTOR Reduction (vph)	0	22	0	0	5	0	0	1	0	0	4	0
Lane Group Flow (vph)	0	362	0	0	274	0	37	1252	0	53	2528	0
Turn Type	Perm			Perm			Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		27.0			27.0		5.1	70.6		10.4	75.9	
Effective Green, g (s)		26.5			26.5		4.6	70.1		9.9	75.4	
Actuated g/C Ratio		0.22			0.22		0.04	0.58		0.08	0.63	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		2.5			2.5		2.5	2.5		2.5	2.5	
Lane Grp Cap (vph)		263			226		62	1900		134	2030	
v/s Ratio Prot							0.02	c0.39		0.03	c0.78	
v/s Ratio Perm		c0.30			0.27							
v/c Ratio		1.38			1.21		0.60	0.66		0.40	1.25	
Uniform Delay, d1		46.8			46.8		56.8	16.9		52.2	22.3	
Progression Factor		1.00			1.00		0.74	1.43		0.67	0.27	
Incremental Delay, d2		191.8			129.8		9.8	1.4		0.1	110.9	
Delay (s)		238.6			176.5		51.6	25.5		35.2	116.9	
Level of Service		F			F		D	C		D	F	
Approach Delay (s)		238.6			176.5			26.2			115.2	
Approach LOS		F			F			C			F	

Intersection Summary			
HCM Average Control Delay	104.1	HCM Level of Service	F
HCM Volume to Capacity ratio	1.27		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	108.6%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	75	0	0	45	10	1180	15	30	2345	110
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	0	79	0	0	47	11	1242	16	32	2468	116
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								512			449	
pX, platoon unblocked	0.49	0.49	0.38	0.49	0.49	0.80	0.38			0.80		
vC, conflicting volume	3279	3868	1292	2647	3918	629	2584			1258		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1681	2893	0	382	2996	19	1917			810		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	81	100	100	94	91			95		
cM capacity (veh/h)	25	7	416	195	6	838	117			646		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	79	47	11	828	430	32	1646	939
Volume Left	0	0	11	0	0	32	0	0
Volume Right	79	47	0	0	16	0	0	116
cSH	416	838	117	1700	1700	646	1700	1700
Volume to Capacity	0.19	0.06	0.09	0.49	0.25	0.05	0.97	0.55
Queue Length 95th (ft)	17	4	7	0	0	4	0	0
Control Delay (s)	15.7	9.6	38.8	0.0	0.0	10.9	0.0	0.0
Lane LOS	C	A	E			B		
Approach Delay (s)	15.7	9.6	0.3			0.1		
Approach LOS	C	A						

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	86.7%	ICU Level of Service	E
Analysis Period (min)	15		

Lane Group	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	311	295	32	1147	42	2506
v/c Ratio	1.02	1.33	0.33	0.57	0.44	1.21
Control Delay	100.0	211.6	49.5	5.6	56.6	120.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	100.0	211.6	49.5	5.6	56.6	120.8
Queue Length 50th (ft)	~238	~289	24	37	30	~1335
Queue Length 95th (ft)	#422	#469	m47	43	m25	m#948
Internal Link Dist (ft)	855	450		767		432
Turn Bay Length (ft)			150		150	
Base Capacity (vph)	304	222	115	2027	115	2073
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.02	1.33	0.28	0.57	0.37	1.21

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	60	110	125	90	115	75	30	1070	20	40	2290	90
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.94			0.96		1.00	1.00		1.00	0.99	
Flt Protected		0.99			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1601			1627		1630	3251		1630	3241	
Flt Permitted		0.79			0.58		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1278			958		1630	3251		1630	3241	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	63	116	132	95	121	79	32	1126	21	42	2411	95
RTOR Reduction (vph)	0	22	0	0	11	0	0	1	0	0	2	0
Lane Group Flow (vph)	0	289	0	0	284	0	32	1146	0	42	2504	0
Turn Type	Perm			Perm			Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		27.0			27.0		5.4	74.5		6.5	75.6	
Effective Green, g (s)		26.5			26.5		4.9	74.0		6.0	75.1	
Actuated g/C Ratio		0.22			0.22		0.04	0.62		0.05	0.63	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		2.5			2.5		2.5	2.5		2.5	2.5	
Lane Grp Cap (vph)		282			212		67	2005		82	2028	
v/s Ratio Prot							0.02	c0.35		0.03	c0.77	
v/s Ratio Perm		0.23			c0.30							
v/c Ratio		1.03			1.34		0.48	0.57		0.51	1.23	
Uniform Delay, d1		46.8			46.8		56.3	13.6		55.6	22.5	
Progression Factor		1.00			1.00		0.78	0.33		1.02	1.22	
Incremental Delay, d2		60.3			181.3		3.4	1.0		0.4	106.0	
Delay (s)		107.1			228.0		47.1	5.5		56.9	133.3	
Level of Service		F			F		D	A		E	F	
Approach Delay (s)		107.1			228.0			6.6			132.1	
Approach LOS		F			F			A			F	

Intersection Summary			
HCM Average Control Delay	102.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.19		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	106.8%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

1: SE River Rd & SE McLoughlin Blvd Performance by approach

Approach	NB	SE	NW	All
Total Delay (hr)	5.7	193.7	2.9	202.3
Delay / Veh (s)	64.6	377.7	8.4	214.0

2: SE Park Ave & SE River Rd Performance by approach

Approach	WB	NB	SB	All
Total Delay (hr)	1.3	0.3	0.4	2.0
Delay / Veh (s)	26.4	2.8	2.1	5.9

3: SE Park Ave & SE McLoughlin Blvd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	1.9	2.8	4.5	179.4	188.6
Delay / Veh (s)	40.4	39.1	12.8	350.4	192.1

4: SE Park Ave & SE Oatfield Rd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	1.0	0.0	2.1	2.6	5.8
Delay / Veh (s)	13.9	9.9	14.3	12.4	13.3

5: Courtney Ave & SE River Rd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	0.1	1.1	0.1	1.2	2.6
Delay / Veh (s)	16.0	17.0	1.4	6.0	7.3

6: Courtney Ave & SE McLoughlin Blvd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	3.0	8.3	4.9	19.4	35.6
Delay / Veh (s)	54.6	142.4	14.6	35.4	35.7

7: Courtney Ave & SE Oatfield Rd Performance by approach

Approach	EB	NB	SB	All
Total Delay (hr)	1.3	0.6	1.2	3.0
Delay / Veh (s)	19.9	4.5	5.9	7.6

8: SE Park Ave & Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	0.5	1.7	0.1	0.1	2.4
Delay / Veh (s)	15.8	28.1	3.4	3.9	16.6

9: Park & Ride #2 & SE McLoughlin Blvd Performance by approach

Approach	EB	NB	SB	All
Total Delay (hr)	53.2	1.3	5.9	60.3
Delay / Veh (s)	2014.3	3.7	11.8	68.9

12: Silver Springs & SE McLoughlin Blvd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	91.9	16.6	7.5	15.3	131.3
Delay / Veh (s)	1432.7	246.8	21.8	29.6	132.4

15: Cinderella & SE McLoughlin Blvd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	3.3	0.3	1.3	7.0	11.9
Delay / Veh (s)	151.9	24.7	3.8	13.4	13.3

18: Loeffelman & SE McLoughlin Blvd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	27.7	32.9	2.4	14.2	77.1
Delay / Veh (s)	362.1	481.6	7.6	27.5	78.9

Total Network Performance

Total Delay (hr)	726.3
Delay / Veh (s)	375.0

1: SE River Rd & SE McLoughlin Blvd Performance by movement

Movement	NBL	NBT	NBR	SET	NWL	NWT	All
Total Delay (hr)	5.5	0.0	0.2	193.7	0.3	2.6	202.3
Delay / Veh (s)	80.9	1.2	35.5	377.7	72.1	7.7	214.0

2: SE Park Ave & SE River Rd Performance by movement

Movement	WBL	WBT	WBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	1.1	0.0	0.2	0.2	0.1	0.0	0.4	2.0
Delay / Veh (s)	35.6	1.8	24.6	2.8	2.6	4.8	2.0	5.9

3: SE Park Ave & SE McLoughlin Blvd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	0.3	1.3	0.3	0.6	1.3	0.9	1.7	2.7	0.1	7.5	168.9	2.9
Delay / Veh (s)	50.2	41.5	30.9	51.5	41.2	31.8	71.0	8.8	4.1	319.5	350.3	456.4

3: SE Park Ave & SE McLoughlin Blvd Performance by movement

Movement	All
Total Delay (hr)	188.6
Delay / Veh (s)	192.1

4: SE Park Ave & SE Oatfield Rd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	0.8	0.0	0.2	0.0	0.0	0.0	0.9	1.2	0.0	0.1	2.0	0.5
Delay / Veh (s)	16.9	19.4	8.4	18.9	12.6	5.2	33.1	10.2	9.1	18.3	12.5	11.5

4: SE Park Ave & SE Oatfield Rd Performance by movement

Movement	All
Total Delay (hr)	5.8
Delay / Veh (s)	13.3

5: Courtney Ave & SE River Rd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	0.0	0.1	0.0	0.6	0.2	0.4	0.0	0.1	0.0	0.1	1.1	0.1
Delay / Veh (s)	18.4	16.9	10.3	29.8	6.4	19.1	7.4	1.1	0.9	7.9	6.0	5.2

5: Courtney Ave & SE River Rd Performance by movement

Movement	All
Total Delay (hr)	2.6
Delay / Veh (s)	7.3

6: Courtney Ave & SE McLoughlin Blvd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	1.0	1.4	0.5	5.2	2.5	0.6	1.2	3.5	0.2	0.5	18.5	0.4
Delay / Veh (s)	82.3	48.9	41.5	247.9	86.7	71.3	66.0	12.0	9.1	68.7	35.6	17.9

6: Courtney Ave & SE McLoughlin Blvd Performance by movement

Movement	All
Total Delay (hr)	35.6
Delay / Veh (s)	35.7

7: Courtney Ave & SE Oatfield Rd Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Total Delay (hr)	0.7	0.0	0.6	0.2	0.5	1.0	0.2	3.0
Delay / Veh (s)	34.5	1.5	14.2	9.2	3.8	6.1	5.3	7.6

8: SE Park Ave & Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	0.2	0.3	0.0	0.7	0.9	0.1	0.1	0.0	0.1	0.0	0.0	0.0
Delay / Veh (s)	26.3	14.7	8.7	30.2	28.7	18.8	7.3	6.7	2.2	6.0	2.9	2.8

8: SE Park Ave & Performance by movement

Movement	All
Total Delay (hr)	2.4
Delay / Veh (s)	16.6

9: Park & Ride #2 & SE McLoughlin Blvd Performance by movement

Movement	EBR	NBT	SBT	SBR	All
Total Delay (hr)	53.2	1.3	5.9	0.0	60.3
Delay / Veh (s)	2014.3	3.7	11.8	6.7	68.9

12: Silver Springs & SE McLoughlin Blvd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	22.0	32.7	37.2	4.6	9.9	2.1	0.7	6.7	0.1	0.5	13.9	0.9
Delay / Veh (s)	1492.0	1454.5	1396.4	260.3	241.0	239.4	66.1	20.5	19.2	65.3	29.1	27.7

12: Silver Springs & SE McLoughlin Blvd Performance by movement

Movement	All
Total Delay (hr)	131.3
Delay / Veh (s)	132.4

15: Cinderella & SE McLoughlin Blvd Performance by movement

Movement	EBR	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Total Delay (hr)	3.3	0.3	0.1	1.2	0.0	0.1	6.6	0.3	11.9
Delay / Veh (s)	151.9	24.7	28.2	3.6	2.4	22.1	13.3	13.4	13.3

18: Loeffelman & SE McLoughlin Blvd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	6.0	10.2	11.5	10.9	12.6	9.4	0.4	1.9	0.0	0.5	13.2	0.5
Delay / Veh (s)	367.8	351.4	365.8	492.7	467.8	495.4	52.5	6.4	5.3	67.5	26.9	26.2

18: Loeffelman & SE McLoughlin Blvd Performance by movement

Movement	All
Total Delay (hr)	77.1
Delay / Veh (s)	78.9

Total Network Performance

Total Delay (hr)	726.3
Delay / Veh (s)	375.0

Intersection: 1: SE River Rd & SE McLoughlin Blvd

Movement	NB	NB	SE	SE	NW	NW	NW
Directions Served	L	R	T	T	L	T	T
Maximum Queue (ft)	563	115	798	802	64	138	171
Average Queue (ft)	264	14	784	784	14	53	81
95th Queue (ft)	505	76	795	794	44	110	150
Link Distance (ft)	1198		766	766		2863	2863
Upstream Blk Time (%)			37	37			
Queuing Penalty (veh)			0	0			
Storage Bay Dist (ft)		90			300		
Storage Blk Time (%)	51	0					
Queuing Penalty (veh)	10	0					

Intersection: 2: SE Park Ave & SE River Rd

Movement	WB	SB
Directions Served	LR	LT
Maximum Queue (ft)	185	139
Average Queue (ft)	85	19
95th Queue (ft)	157	76
Link Distance (ft)	1902	1416
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: SE Park Ave & SE McLoughlin Blvd

Movement	EB	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	TR	L	T	T	R	L	T	T
Maximum Queue (ft)	110	217	91	94	279	168	246	252	66	444	2884	2897
Average Queue (ft)	25	86	21	42	144	91	98	112	15	129	2624	2626
95th Queue (ft)	72	168	57	82	234	156	214	226	48	343	3302	3296
Link Distance (ft)		264		414			307	307			2863	2863
Upstream Blk Time (%)		0									8	8
Queuing Penalty (veh)		0									86	85
Storage Bay Dist (ft)	115		150		200	325			100	325		
Storage Blk Time (%)	0	6			3			15	0		38	43
Queuing Penalty (veh)	0	3			1			8	0		44	13

Intersection: 3: SE Park Ave & SE McLoughlin Blvd

Movement	SB
Directions Served	R
Maximum Queue (ft)	299
Average Queue (ft)	27
95th Queue (ft)	157
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	125
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 4: SE Park Ave & SE Oatfield Rd

Movement	EB	EB	WB	NB	NB	SB	SB
Directions Served	LT	R	LTR	L	TR	L	TR
Maximum Queue (ft)	185	106	42	143	302	65	588
Average Queue (ft)	82	33	8	64	97	7	206
95th Queue (ft)	158	77	30	122	209	37	419
Link Distance (ft)	414		163		2598		722
Upstream Blk Time (%)							0
Queuing Penalty (veh)							0
Storage Bay Dist (ft)		200		175		50	
Storage Blk Time (%)	0			0	1	0	21
Queuing Penalty (veh)	0			1	1	2	2

Intersection: 5: Courtney Ave & SE River Rd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	67	212	106	128
Average Queue (ft)	23	88	13	22
95th Queue (ft)	55	168	55	82
Link Distance (ft)	495	3104	492	2675
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 6: Courtney Ave & SE McLoughlin Blvd

Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	T	R	L	T	T	R
Maximum Queue (ft)	155	256	398	229	165	315	334	195	218	793	804	373
Average Queue (ft)	53	117	199	115	57	168	174	30	34	450	472	46
95th Queue (ft)	115	211	464	238	126	286	290	105	125	738	767	196
Link Distance (ft)		3104	753			448	448			779	779	
Upstream Blk Time (%)			0			0	0			1	1	
Queuing Penalty (veh)			0			0	0			16	17	
Storage Bay Dist (ft)	75			75	325			100	175			200
Storage Blk Time (%)	11	31	73	21		0	14	0		32	32	
Queuing Penalty (veh)	16	16	99	16		0	13	0		13	34	

Intersection: 7: Courtney Ave & SE Oatfield Rd

Movement	EB	EB	NB	SB
Directions Served	L	R	LT	TR
Maximum Queue (ft)	120	167	252	27
Average Queue (ft)	48	66	72	1
95th Queue (ft)	93	130	173	15
Link Distance (ft)	753		521	2598
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		100		
Storage Blk Time (%)	3	3		
Queuing Penalty (veh)	4	2		

Intersection: 8: SE Park Ave &

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LTR	LTR
Maximum Queue (ft)	61	119	154	249	99	70
Average Queue (ft)	20	44	76	117	33	21
95th Queue (ft)	52	97	151	211	70	54
Link Distance (ft)		1902		264	224	195
Upstream Blk Time (%)				0		
Queuing Penalty (veh)				1		
Storage Bay Dist (ft)	50		130			
Storage Blk Time (%)	2	8	2	5		
Queuing Penalty (veh)	1	2	2	5		

Intersection: 9: Park & Ride #2 & SE McLoughlin Blvd

Movement	EB	SB	SB	SB
Directions Served	R	T	T	R
Maximum Queue (ft)	210	335	330	82
Average Queue (ft)	177	113	144	1
95th Queue (ft)	198	321	348	29
Link Distance (ft)	159	307	307	
Upstream Blk Time (%)	97	2	2	
Queuing Penalty (veh)	0	21	26	
Storage Bay Dist (ft)				50
Storage Blk Time (%)			10	
Queuing Penalty (veh)			2	

Intersection: 12: Silver Springs & SE McLoughlin Blvd

Movement	EB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	LTR	L	T	TR	L	T	TR
Maximum Queue (ft)	212	290	224	423	418	284	404	408
Average Queue (ft)	184	254	50	314	345	53	366	381
95th Queue (ft)	197	333	140	434	456	165	411	399
Link Distance (ft)	163	260		389	389		374	374
Upstream Blk Time (%)	89	58		2	4		10	22
Queuing Penalty (veh)	0	0		11	23		126	273
Storage Bay Dist (ft)			200			150		
Storage Blk Time (%)			0	12			35	
Queuing Penalty (veh)			0	4			17	

Intersection: 15: Cinderella & SE McLoughlin Blvd

Movement	EB	WB	NB	NB	NB	SB	SB	SB
Directions Served	R	R	L	T	TR	L	T	TR
Maximum Queue (ft)	271	92	43	153	187	107	436	431
Average Queue (ft)	123	34	8	15	30	13	240	263
95th Queue (ft)	275	72	29	82	115	54	518	529
Link Distance (ft)	905	317		452	452		389	389
Upstream Blk Time (%)							4	5
Queuing Penalty (veh)							44	63
Storage Bay Dist (ft)			150			150		
Storage Blk Time (%)				0			9	
Queuing Penalty (veh)				0			3	

Intersection: 18: Loeffelman & SE McLoughlin Blvd

Movement	EB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	LTR	L	T	TR	L	T	TR
Maximum Queue (ft)	908	520	88	142	183	247	499	497
Average Queue (ft)	747	466	29	46	63	39	441	450
95th Queue (ft)	1074	641	69	112	136	144	533	524
Link Distance (ft)	889	484		779	779		452	452
Upstream Blk Time (%)	30	69					10	12
Queuing Penalty (veh)	0	0					120	144
Storage Bay Dist (ft)			150			150		
Storage Blk Time (%)				0			23	
Queuing Penalty (veh)				0			9	

Network Summary

Network wide Queuing Penalty: 1402

Arterial Level of Service: NB SE River Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Courtney Ave	5	1.1	12.8	0.1	29
SE Park Ave	2	2.8	56.2	0.5	33
	22	1.6	35.5	0.3	28
SE McLoughlin Blvd	1	80.9	110.0	0.2	8
Total		86.4	214.5	1.1	19

Arterial Level of Service: SB SE River Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
	22	1.1	33.1	0.2	26
SE Park Ave	2	2.0	18.7	0.3	56
	5	6.0	67.9	0.5	28
Total		9.2	119.7	1.0	31

Arterial Level of Service: NW SE McLoughlin Blvd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Courtney Ave	6	12.0	20.8	0.1	17
Loeffelman	18	5.1	19.7	0.2	29
Cinderella	15	3.9	12.7	0.1	27
Silver Springs	12	20.8	28.6	0.1	11
Park & Ride #2	9	3.9	11.3	0.1	26
SE Park Ave	3	8.8	14.9	0.1	17
SE River Rd	1	7.2	56.2	0.6	36
Total		61.8	164.2	1.1	25

Arterial Level of Service: SB SE McLoughlin Blvd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
SE River Rd	1	377.7	389.9	0.1	7
SE Park Ave	3	351.4	401.5	0.6	7
Park & Ride #2	9	11.9	18.4	0.1	14
	12	28.6	36.0	0.1	8
Cinderella	15	14.1	21.8	0.1	14
Loeffelman	18	26.6	35.4	0.1	10
Courtney Ave	6	36.0	50.4	0.2	12
Total		846.4	953.4	1.2	8

Arterial Level of Service: NB SE Oatfield Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Courtney Ave	7	3.8	16.0	0.1	24
SE Park Ave	4	10.4	60.8	0.5	30
Total		14.2	76.9	0.6	29

Arterial Level of Service: SB SE Oatfield Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
SE Park Ave	4	12.5	29.4	0.1	18
Courtney Ave	7	6.3	57.9	0.5	31
Total		18.8	87.3	0.6	27

Queues
1: SE River Rd & SE McLoughlin Blvd

9/22/2011

Lane Group	NBL	NBR	SET	NWL	NWT
Lane Group Flow (vph)	268	21	2316	16	1237
v/c Ratio	0.81	0.08	1.02	0.21	0.51
Control Delay	66.9	28.4	42.0	63.3	13.8
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	66.9	28.4	42.0	63.3	13.8
Queue Length 50th (ft)	201	7	746	10	456
Queue Length 95th (ft)	#336	31	#1216	m17	537
Internal Link Dist (ft)	1200		698		2865
Turn Bay Length (ft)		90		300	
Base Capacity (vph)	331	267	2281	211	2431
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.81	0.08	1.02	0.08	0.51

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	NBL	NBR	SET	SER	NWL	NWT
Lane Configurations						
Volume (vph)	255	20	2200	0	15	1175
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5	5.5		4.5	4.5
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frt	1.00	0.85	1.00		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1850	1444	3260		1630	3260
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1850	1444	3260		1630	3260
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	268	21	2316	0	16	1237
RTOR Reduction (vph)	0	8	0	0	0	0
Lane Group Flow (vph)	268	13	2316	0	16	1237
Heavy Vehicles (%)	3%	3%	2%	2%	2%	2%
Turn Type		Prot			Prot	
Protected Phases	7	7	6		5	
Permitted Phases			6			2
Actuated Green, G (s)	22.0	22.0	82.1		2.9	90.0
Effective Green, g (s)	21.5	21.5	81.6		2.4	89.5
Actuated g/C Ratio	0.18	0.18	0.68		0.02	0.75
Clearance Time (s)	4.0	4.0	5.0		4.0	4.0
Vehicle Extension (s)	2.3	2.3	8.0		2.3	2.3
Lane Grp Cap (vph)	331	259	2217		33	2431
v/s Ratio Prot	c0.14	0.01	c0.71		0.01	
v/s Ratio Perm						c0.38
v/c Ratio	0.81	0.05	1.04		0.48	0.51
Uniform Delay, d1	47.3	40.8	19.2		58.2	6.2
Progression Factor	1.00	1.00	1.00		1.07	2.07
Incremental Delay, d2	18.9	0.4	32.0		5.1	0.6
Delay (s)	66.2	41.1	51.2		67.2	13.6
Level of Service	E	D	D		E	B
Approach Delay (s)	64.4		51.2			14.2
Approach LOS	E		D			B

Intersection Summary			
HCM Average Control Delay	40.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	89.7%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	110	30	295	100	30	635
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	116	32	311	105	32	668
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1095	363			416	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1095	363			416	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	50	95			97	
cM capacity (veh/h)	230	682			1143	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	147	416	700
Volume Left	116	0	32
Volume Right	32	105	0
cSH	268	1700	1143
Volume to Capacity	0.55	0.24	0.03
Queue Length 95th (ft)	76	0	2
Control Delay (s)	33.7	0.0	0.7
Lane LOS	D		A
Approach Delay (s)	33.7	0.0	0.7
Approach LOS	D		

Intersection Summary			
Average Delay	4.3		
Intersection Capacity Utilization	78.9%	ICU Level of Service	D
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	21	124	31	46	217	93	1175	57	119	2294	31
v/c Ratio	0.24	0.46	0.12	0.29	0.79	0.64	0.62	0.07	0.56	1.13	0.03
Control Delay	44.8	47.3	12.2	47.5	60.9	53.4	16.2	3.3	42.5	77.7	1.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.8	47.3	12.2	47.5	60.9	53.4	16.2	3.3	42.5	77.7	1.3
Queue Length 50th (ft)	13	88	0	32	141	59	388	8	94	~1137	3
Queue Length 95th (ft)	38	139	21	65	216	m96	m432	m7	m92	m#1191	m2
Internal Link Dist (ft)		264			427		299			2865	
Turn Bay Length (ft)	115		150			325		100	325		125
Base Capacity (vph)	119	365	334	214	364	163	1896	860	211	2027	910
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.18	0.34	0.09	0.21	0.60	0.57	0.62	0.07	0.56	1.13	0.03

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	120	30	45	115	95	90	1140	55	115	2225	30
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0		4.5	6.5	6.5	4.5	6.5	6.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1630	1716	1458	1630	1599		1630	3260	1458	1630	3260	1458
Flt Permitted	0.33	1.00	1.00	0.59	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	560	1716	1458	1007	1599		1630	3260	1458	1630	3260	1458
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	21	124	31	46	119	98	93	1175	57	119	2294	31
RTOR Reduction (vph)	0	0	26	0	26	0	0	0	12	0	0	4
Lane Group Flow (vph)	21	124	5	46	191	0	93	1175	45	119	2294	27
Turn Type	Perm		Perm	Perm			Prot		Perm	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8					2			6
Actuated Green, G (s)	19.2	19.2	19.2	19.2	19.2		11.2	70.3	70.3	16.0	75.1	75.1
Effective Green, g (s)	18.7	18.7	18.7	18.7	18.7		10.7	69.8	69.8	15.5	74.6	74.6
Actuated g/C Ratio	0.16	0.16	0.16	0.16	0.16		0.09	0.58	0.58	0.13	0.62	0.62
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5		4.0	6.0	6.0	4.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	87	267	227	157	249		145	1896	848	211	2027	906
v/s Ratio Prot		0.07			c0.12		0.06	c0.36		0.07	c0.70	
v/s Ratio Perm	0.04		0.00	0.05					0.03			0.02
v/c Ratio	0.24	0.46	0.02	0.29	0.77		0.64	0.62	0.05	0.56	1.13	0.03
Uniform Delay, d1	44.4	46.1	42.9	44.8	48.6		52.8	16.4	10.8	49.1	22.7	8.8
Progression Factor	0.91	0.93	0.85	1.00	1.00		0.83	0.88	0.43	0.79	0.51	0.15
Incremental Delay, d2	1.4	1.3	0.0	1.0	13.2		4.4	0.7	0.1	1.0	61.5	0.0
Delay (s)	41.8	44.1	36.7	45.8	61.7		48.1	15.1	4.7	39.7	73.0	1.4
Level of Service	D	D	D	D	E		D	B	A	D	E	A
Approach Delay (s)		42.5			58.9			17.0			70.4	
Approach LOS		D			E			B			E	

Intersection Summary			
HCM Average Control Delay	51.7	HCM Level of Service	D
HCM Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	103.6%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	EBR	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	205	111	12	111	489	11	769
v/c Ratio	0.65	0.25	0.03	0.42	0.45	0.02	0.72
Control Delay	27.9	5.7	12.6	14.3	8.7	6.0	14.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.9	5.7	12.6	14.3	8.7	6.0	14.4
Queue Length 50th (ft)	50	0	1	17	74	1	147
Queue Length 95th (ft)	124	30	12	68	166	7	#414
Internal Link Dist (ft)	427		122		2589		673
Turn Bay Length (ft)		200		175		50	
Base Capacity (vph)	421	568	538	279	1157	510	1135
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.49	0.20	0.02	0.40	0.42	0.02	0.68

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	190	5	105	2	5	5	105	460	5	10	585	145
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Grade (%)		5%			0%			0%			0%	
Total Lost time (s)		4.5	4.5		4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.94		1.00	1.00		1.00	0.97	
Flt Protected		0.95	1.00		0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1595	1422		1606		1630	1713		1630	1664	
Flt Permitted		0.72	1.00		0.95		0.24	1.00		0.44	1.00	
Satd. Flow (perm)		1209	1422		1533		413	1713		756	1664	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	200	5	111	2	5	5	111	484	5	11	616	153
RTOR Reduction (vph)	0	0	87	0	4	0	0	0	0	0	14	0
Lane Group Flow (vph)	0	205	24	0	8	0	111	489	0	11	755	0
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		10.0	10.0		10.0		26.6	26.6		26.6	26.6	
Effective Green, g (s)		9.5	9.5		9.5		26.1	26.1		26.1	26.1	
Actuated g/C Ratio		0.21	0.21		0.21		0.59	0.59		0.59	0.59	
Clearance Time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		2.5	2.5		2.5		2.5	2.5		2.5	2.5	
Lane Grp Cap (vph)		258	303		327		242	1002		442	974	
v/s Ratio Prot								0.29			c0.45	
v/s Ratio Perm		c0.17	0.02		0.01		0.27			0.01		
v/c Ratio		0.79	0.08		0.02		0.46	0.49		0.02	0.78	
Uniform Delay, d1		16.6	14.0		13.9		5.2	5.4		3.9	7.0	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		15.0	0.1		0.0		1.0	0.3		0.0	3.8	
Delay (s)		31.6	14.1		13.9		6.2	5.6		3.9	10.8	
Level of Service		C	B		B		A	A		A	B	
Approach Delay (s)		25.5			13.9			5.8			10.7	
Approach LOS		C			B			A			B	

Intersection Summary			
HCM Average Control Delay	11.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	44.6	Sum of lost time (s)	9.0
Intersection Capacity Utilization	78.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	10	15	5	75	15	80	15	210	55	50	635	40
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	11	16	5	79	16	84	16	221	58	53	668	42
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1168	1105	689	1089	1097	250	711			279		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1168	1105	689	1089	1097	250	711			279		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	92	92	99	54	92	89	98			96		
cM capacity (veh/h)	137	198	445	171	201	789	889			1284		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	32	179	295	763
Volume Left	11	79	16	53
Volume Right	5	84	58	42
cSH	188	277	889	1284
Volume to Capacity	0.17	0.65	0.02	0.04
Queue Length 95th (ft)	15	103	1	3
Control Delay (s)	28.0	39.1	0.7	1.1
Lane LOS	D	E	A	A
Approach Delay (s)	28.0	39.1	0.7	1.1
Approach LOS	D	E		

Intersection Summary			
Average Delay	7.0		
Intersection Capacity Utilization	80.3%	ICU Level of Service	D
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	52	149	82	139	62	1072	93	41	2433	108
v/c Ratio	0.85	0.70	1.34	0.66	0.48	0.52	0.10	0.38	1.20	0.12
Control Delay	136.2	61.1	275.4	60.3	65.0	14.8	6.3	55.3	111.7	7.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	136.2	61.1	275.4	60.3	65.0	14.8	6.3	55.3	111.7	7.4
Queue Length 50th (ft)	41	99	~83	96	47	233	12	34	~1224	14
Queue Length 95th (ft)	#120	162	#189	156	92	356	42	m26	m#852	m10
Internal Link Dist (ft)		3106		771		404			764	
Turn Bay Length (ft)	75				325		100	175		200
Base Capacity (vph)	61	361	61	361	130	2061	940	145	2026	925
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.85	0.41	1.34	0.39	0.48	0.52	0.10	0.28	1.20	0.12

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	50	100	45	80	105	30	60	1040	90	40	2360	105
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	5.5	5.5	4.5	5.5	5.5
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.95		1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1630	1636		1630	1658		1630	3260	1458	1630	3260	1458
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1630	1636		1630	1658		1630	3260	1458	1630	3260	1458
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	52	103	46	82	108	31	62	1072	93	41	2433	108
RTOR Reduction (vph)	0	15	0	0	10	0	0	0	19	0	0	19
Lane Group Flow (vph)	52	134	0	82	129	0	62	1072	74	41	2433	89
Turn Type	Prot			Prot			Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			6
Actuated Green, G (s)	5.0	15.1		5.0	15.1		8.6	75.5	75.5	7.4	74.3	74.3
Effective Green, g (s)	4.5	14.6		4.5	14.6		8.1	75.0	75.0	6.9	73.8	73.8
Actuated g/C Ratio	0.04	0.12		0.04	0.12		0.07	0.62	0.62	0.06	0.62	0.62
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	5.0	5.0	4.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	61	199		61	202		110	2038	911	94	2005	897
v/s Ratio Prot	0.03	c0.08		c0.05	0.08		c0.04	0.33		0.03	c0.75	
v/s Ratio Perm									0.05			0.06
v/c Ratio	0.85	0.67		1.34	0.64		0.56	0.53	0.08	0.44	1.21	0.10
Uniform Delay, d1	57.4	50.4		57.8	50.2		54.2	12.6	8.9	54.7	23.1	9.5
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.03	0.76	1.06
Incremental Delay, d2	65.3	8.7		231.9	6.8		6.5	1.0	0.2	0.3	96.5	0.0
Delay (s)	122.7	59.1		289.6	57.0		60.7	13.5	9.1	56.5	114.1	10.1
Level of Service	F	E		F	E		E	B	A	E	F	B
Approach Delay (s)		75.6			143.3			15.6			108.9	
Approach LOS		E			F			B			F	

Intersection Summary			
HCM Average Control Delay	82.0	HCM Level of Service	F
HCM Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	96.4%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	70	155	60	465	605	115
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	74	163	63	489	637	121
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		4				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1313	697	758			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1313	697	758			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	54	63	93			
cM capacity (veh/h)	162	441	853			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	237	553	758
Volume Left	74	63	0
Volume Right	163	0	121
cSH	520	853	1700
Volume to Capacity	0.46	0.07	0.45
Queue Length 95th (ft)	59	6	0
Control Delay (s)	26.2	2.0	0.0
Lane LOS	D	A	
Approach Delay (s)	26.2	2.0	0.0
Approach LOS	D		

Intersection Summary			
Average Delay	4.7		
Intersection Capacity Utilization	87.8%	ICU Level of Service	E
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	21	84	95	153	126	68
v/c Ratio	0.09	0.24	0.40	0.44	0.12	0.07
Control Delay	18.2	16.3	30.4	26.8	2.4	3.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.2	16.3	30.4	26.8	2.4	3.0
Queue Length 50th (ft)	6	18	68	99	4	3
Queue Length 95th (ft)	20	47	m117	165	21	16
Internal Link Dist (ft)		1888		264	174	146
Turn Bay Length (ft)	50		130			
Base Capacity (vph)	403	605	431	612	1057	1037
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.14	0.22	0.25	0.12	0.07

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	60	20	90	115	30	25	5	90	20	5	40
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.96		1.00	0.97			0.90			0.92	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.98	
Satd. Flow (prot)	1630	1651		1630	1662			1525			1549	
Flt Permitted	0.65	1.00		0.70	1.00			0.95			0.93	
Satd. Flow (perm)	1124	1651		1205	1662			1471			1463	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	21	63	21	95	121	32	26	5	95	21	5	42
RTOR Reduction (vph)	0	17	0	0	21	0	0	31	0	0	14	0
Lane Group Flow (vph)	21	67	0	95	132	0	0	95	0	0	54	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	11.2	11.2		11.2	11.2			40.8			40.8	
Effective Green, g (s)	10.7	10.7		10.7	10.7			40.3			40.3	
Actuated g/C Ratio	0.18	0.18		0.18	0.18			0.67			0.67	
Clearance Time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	200	294		215	296			988			983	
v/s Ratio Prot		0.04			c0.08							
v/s Ratio Perm	0.02			0.08				c0.06			0.04	
v/c Ratio	0.10	0.23		0.44	0.45			0.10			0.06	
Uniform Delay, d1	20.6	21.1		22.0	22.0			3.5			3.4	
Progression Factor	1.00	1.00		1.32	1.41			1.00			1.00	
Incremental Delay, d2	0.2	0.4		1.3	0.9			0.2			0.1	
Delay (s)	20.9	21.5		30.3	32.0			3.7			3.5	
Level of Service	C	C		C	C			A			A	
Approach Delay (s)		21.4			31.3			3.7			3.5	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	19.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.17		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	32.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	175	0	1285	2280	20
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	184	0	1353	2400	21
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				871	379	
pX, platoon unblocked	0.50	0.39	0.39			
vC, conflicting volume	3076	1200	2421			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1131	0	1510			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	56	100			
cM capacity (veh/h)	99	421	171			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	184	676	676	1200	1200	21
Volume Left	0	0	0	0	0	0
Volume Right	184	0	0	0	0	21
cSH	421	1700	1700	1700	1700	1700
Volume to Capacity	0.44	0.40	0.40	0.71	0.71	0.01
Queue Length 95th (ft)	54	0	0	0	0	0
Control Delay (s)	20.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	C					
Approach Delay (s)	20.0	0.0		0.0		
Approach LOS	C					

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	87.7%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	120	0	0	35	15	1250	20	0	2310	145
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	0	126	0	0	37	16	1316	21	0	2432	153
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								449			801	
pX, platoon unblocked	0.51	0.51	0.40	0.51	0.51	0.77	0.40			0.77		
vC, conflicting volume	3234	3876	1292	2700	3942	668	2584			1337		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1428	2678	0	387	2806	0	1955			836		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	71	100	100	96	87			100		
cM capacity (veh/h)	42	10	431	178	8	833	117			610		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	126	37	16	877	460	1621	963
Volume Left	0	0	16	0	0	0	0
Volume Right	126	37	0	0	21	0	153
cSH	431	833	117	1700	1700	1700	1700
Volume to Capacity	0.29	0.04	0.13	0.52	0.27	0.95	0.57
Queue Length 95th (ft)	30	3	11	0	0	0	0
Control Delay (s)	16.8	9.5	40.4	0.0	0.0	0.0	0.0
Lane LOS	C	A	E				
Approach Delay (s)	16.8	9.5	0.5			0.0	
Approach LOS	C	A					

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	89.9%	ICU Level of Service	E
Analysis Period (min)	15		

Lane Group	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	547	515	53	1137	126	2432
v/c Ratio	2.15	2.43	0.51	0.62	0.80	1.23
Control Delay	552.6	679.4	56.7	10.0	64.6	132.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	552.6	679.4	56.7	10.0	64.6	132.7
Queue Length 50th (ft)	~675	~663	40	82	91	~1290
Queue Length 95th (ft)	#896	#879	m80	94	m90	m#1104
Internal Link Dist (ft)	606	283		435		369
Turn Bay Length (ft)			150		150	
Base Capacity (vph)	255	212	115	1829	170	1975
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	2.15	2.43	0.46	0.62	0.74	1.23

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	140	240	140	160	250	80	50	1065	15	120	2200	110
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.96			0.98		1.00	1.00		1.00	0.99	
Flt Protected		0.99			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1632			1651		1630	3253		1630	3236	
Flt Permitted		0.64			0.53		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1066			897		1630	3253		1630	3236	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	147	253	147	168	263	84	53	1121	16	126	2316	116
RTOR Reduction (vph)	0	11	0	0	6	0	0	1	0	0	3	0
Lane Group Flow (vph)	0	536	0	0	509	0	53	1136	0	126	2429	0
Turn Type	Perm			Perm			Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		28.0			28.0		7.2	67.9		12.1	72.8	
Effective Green, g (s)		27.5			27.5		6.7	67.4		11.6	72.3	
Actuated g/C Ratio		0.23			0.23		0.06	0.56		0.10	0.60	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		2.5			2.5		2.5	2.5		2.5	2.5	
Lane Grp Cap (vph)		244			206		91	1827		158	1950	
v/s Ratio Prot							0.03	c0.35		0.08	c0.75	
v/s Ratio Perm		0.50			c0.57							
v/c Ratio		2.20			2.47		0.58	0.62		0.80	1.25	
Uniform Delay, d1		46.3			46.3		55.3	17.7		53.1	23.9	
Progression Factor		1.00			1.00		0.77	0.47		0.97	1.17	
Incremental Delay, d2		552.1			675.9		6.7	1.4		8.5	112.1	
Delay (s)		598.4			722.1		49.5	9.8		59.8	140.0	
Level of Service		F			F		D	A		E	F	
Approach Delay (s)		598.4			722.1			11.6			136.1	
Approach LOS		F			F			B			F	

Intersection Summary			
HCM Average Control Delay	220.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.48		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	126.2%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	95	0	0	40	10	1090	20	0	2410	90
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	0	100	0	0	42	11	1147	21	0	2537	95
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								844			515	
pX, platoon unblocked	0.50	0.50	0.41	0.50	0.50	0.82	0.41			0.82		
vC, conflicting volume	3221	3774	1316	2547	3811	584	2632			1168		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1848	2954	0	500	3028	64	2104			774		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	78	100	100	95	90			100		
cM capacity (veh/h)	20	6	446	163	6	812	106			689		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	100	42	11	765	404	1691	940
Volume Left	0	0	11	0	0	0	0
Volume Right	100	42	0	0	21	0	95
cSH	446	812	106	1700	1700	1700	1700
Volume to Capacity	0.22	0.05	0.10	0.45	0.24	0.99	0.55
Queue Length 95th (ft)	21	4	8	0	0	0	0
Control Delay (s)	15.4	9.7	42.7	0.0	0.0	0.0	0.0
Lane LOS	C	A	E				
Approach Delay (s)	15.4	9.7	0.4			0.0	
Approach LOS	C	A					

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	89.3%	ICU Level of Service	E
Analysis Period (min)	15		

1: SE River Rd & SE McLoughlin Blvd Performance by approach

Approach	NB	SE	NW	All
Total Delay (hr)	5.3	141.3	4.1	150.6
Delay / Veh (s)	62.5	261.7	12.7	159.7

2: SE Park Ave & SE River Rd Performance by approach

Approach	WB	NB	SB	All
Total Delay (hr)	1.2	0.3	0.4	1.9
Delay / Veh (s)	24.5	2.5	2.3	5.6

3: SE Park Ave & SE McLoughlin Blvd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	1.9	2.9	4.7	177.4	187.0
Delay / Veh (s)	40.9	41.0	14.4	329.5	189.5

4: SE Park Ave & SE Oatfield Rd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	1.1	0.0	2.5	2.8	6.4
Delay / Veh (s)	14.2	11.4	15.9	13.5	14.4

5: Courtney Ave & SE River Rd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	0.2	1.1	0.1	1.3	2.6
Delay / Veh (s)	16.4	16.2	1.2	6.1	7.2

6: Courtney Ave & SE McLoughlin Blvd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	3.2	20.6	5.0	14.2	43.0
Delay / Veh (s)	57.8	366.8	15.0	27.5	44.7

7: Courtney Ave & SE Oatfield Rd Performance by approach

Approach	EB	NB	SB	All
Total Delay (hr)	1.6	10.1	2.8	14.4
Delay / Veh (s)	25.8	69.3	14.0	35.6

8: SE Park Ave & 27th Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	0.5	1.7	0.1	0.1	2.4
Delay / Veh (s)	14.1	27.3	3.6	3.4	15.9

9: Park & Ride #2 & SE McLoughlin Blvd Performance by approach

Approach	EB	NB	SB	All
Total Delay (hr)	53.3	0.8	7.5	61.6
Delay / Veh (s)	2065.1	2.3	14.4	70.5

12: Silver Springs & SE McLoughlin Blvd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	62.8	0.2	0.9	10.9	74.7
Delay / Veh (s)	8375.8	16.2	2.7	20.1	84.5

15: Cinderella & SE McLoughlin Blvd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	186.7	161.3	3.8	17.1	368.9
Delay / Veh (s)	2667.0	2286.1	11.9	33.1	378.9

18: Loeffelman & SE McLoughlin Blvd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	0.7	0.1	1.1	2.5	4.5
Delay / Veh (s)	27.6	12.7	3.6	4.9	5.2

Total Network Performance

Total Delay (hr)	921.5
Delay / Veh (s)	497.6

1: SE River Rd & SE McLoughlin Blvd Performance by movement

Movement	NBL	NBT	NBR	SET	NWL	NWT	All
Total Delay (hr)	5.1	0.0	0.2	141.3	0.3	3.7	150.6
Delay / Veh (s)	77.2	0.8	34.9	261.7	84.7	11.8	159.7

2: SE Park Ave & SE River Rd Performance by movement

Movement	WBL	WBT	WBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	1.0	0.0	0.2	0.2	0.1	0.0	0.4	1.9
Delay / Veh (s)	32.5	2.0	25.6	2.7	2.0	4.6	2.2	5.6

3: SE Park Ave & SE McLoughlin Blvd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	0.2	1.4	0.3	0.7	1.4	0.9	1.5	3.2	0.1	8.3	167.5	1.5
Delay / Veh (s)	52.6	41.1	34.4	58.9	41.1	33.3	65.3	11.0	4.2	308.0	331.4	253.4

3: SE Park Ave & SE McLoughlin Blvd Performance by movement

Movement	All
Total Delay (hr)	187.0
Delay / Veh (s)	189.5

4: SE Park Ave & SE Oatfield Rd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	0.9	0.0	0.2	0.0	0.0	0.0	1.0	1.5	0.0	0.0	2.3	0.5
Delay / Veh (s)	17.3	12.9	8.5	15.6	14.6	4.6	36.1	11.5	7.3	17.0	13.9	11.4

4: SE Park Ave & SE Oatfield Rd Performance by movement

Movement	All
Total Delay (hr)	6.4
Delay / Veh (s)	14.4

5: Courtney Ave & SE River Rd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	0.0	0.1	0.0	0.5	0.2	0.4	0.0	0.1	0.0	0.1	1.1	0.1
Delay / Veh (s)	15.6	18.0	11.2	30.5	5.8	19.5	5.4	1.0	0.7	8.2	6.0	5.7

5: Courtney Ave & SE River Rd Performance by movement

Movement	All
Total Delay (hr)	2.6
Delay / Veh (s)	7.2

6: Courtney Ave & SE McLoughlin Blvd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	1.2	1.5	0.5	11.3	7.5	1.8	1.2	3.6	0.2	0.4	13.5	0.3
Delay / Veh (s)	89.6	53.3	35.9	515.1	280.8	247.8	65.8	12.5	9.0	56.7	27.6	13.8

6: Courtney Ave & SE McLoughlin Blvd Performance by movement

Movement	All
Total Delay (hr)	43.0
Delay / Veh (s)	44.7

7: Courtney Ave & SE Oatfield Rd Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Total Delay (hr)	1.0	0.0	0.7	1.5	8.5	2.3	0.5	14.4
Delay / Veh (s)	50.8	1.1	15.4	91.7	66.4	13.7	15.4	35.6

8: SE Park Ave & 27th Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	0.2	0.3	0.1	0.7	0.9	0.1	0.0	0.0	0.1	0.0	0.0	0.0
Delay / Veh (s)	26.2	12.3	9.1	30.6	27.1	17.8	7.5	5.0	2.5	6.6	4.3	1.9

8: SE Park Ave & 27th Performance by movement

Movement	All
Total Delay (hr)	2.4
Delay / Veh (s)	15.9

9: Park & Ride #2 & SE McLoughlin Blvd Performance by movement

Movement	EBR	NBT	SBT	SBR	All
Total Delay (hr)	53.3	0.8	7.5	0.0	61.6
Delay / Veh (s)	2043.1	2.3	14.5	6.3	70.5

12: Silver Springs & SE McLoughlin Blvd Performance by movement

Movement	EBR	WBR	NBL	NBT	NBR	SBT	SBR	All
Total Delay (hr)	62.8	0.2	0.2	0.7	0.0	10.3	0.6	74.7
Delay / Veh (s)	8375.8	16.2	51.5	2.1	2.0	20.1	19.2	84.5

15: Cinderella & SE McLoughlin Blvd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	47.1	86.1	53.5	51.6	82.0	27.7	0.8	2.9	0.0	2.5	13.8	0.7
Delay / Veh (s)	2691.3	2649.6	2711.5	2291.2	2237.3	2375.1	52.3	9.9	9.5	97.1	29.7	29.9

15: Cinderella & SE McLoughlin Blvd Performance by movement

Movement	All
Total Delay (hr)	368.9
Delay / Veh (s)	378.9

18: Loeffelman & SE McLoughlin Blvd Performance by movement

Movement	EBR	WBR	NBL	NBT	NBR	SBT	SBR	All
Total Delay (hr)	0.7	0.1	0.1	1.0	0.0	2.4	0.1	4.5
Delay / Veh (s)	27.6	13.0	39.5	3.3	3.0	4.9	4.9	5.2

Total Network Performance

Total Delay (hr)	921.5
Delay / Veh (s)	497.6

Intersection: 1: SE River Rd & SE McLoughlin Blvd

Movement	NB	NB	SE	SE	NW	NW	NW
Directions Served	L	R	T	T	L	T	T
Maximum Queue (ft)	498	90	796	795	66	180	198
Average Queue (ft)	245	11	773	773	16	52	91
95th Queue (ft)	494	65	869	864	48	122	169
Link Distance (ft)	1198		766	766		2863	2863
Upstream Blk Time (%)			32	33			
Queuing Penalty (veh)			0	0			
Storage Bay Dist (ft)		90			300		
Storage Blk Time (%)	47	0					
Queuing Penalty (veh)	9	0					

Intersection: 2: SE Park Ave & SE River Rd

Movement	WB	SB
Directions Served	LR	LT
Maximum Queue (ft)	201	154
Average Queue (ft)	84	21
95th Queue (ft)	156	90
Link Distance (ft)	1902	1416
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: SE Park Ave & SE McLoughlin Blvd

Movement	EB	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	TR	L	T	T	R	L	T	T
Maximum Queue (ft)	84	192	77	115	286	201	291	319	137	445	2882	2882
Average Queue (ft)	17	86	20	43	151	80	146	183	15	135	2587	2589
95th Queue (ft)	60	163	55	91	260	148	256	307	71	344	3225	3220
Link Distance (ft)		264		414			309	309			2863	2863
Upstream Blk Time (%)							0	0			5	5
Queuing Penalty (veh)							0	3			57	54
Storage Bay Dist (ft)	115		150		200	325			100	325		
Storage Blk Time (%)		5			5		0	10			36	40
Queuing Penalty (veh)		3			2		0	6			42	12

Intersection: 3: SE Park Ave & SE McLoughlin Blvd

Movement	SB
Directions Served	R
Maximum Queue (ft)	194
Average Queue (ft)	15
95th Queue (ft)	105
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	125
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 4: SE Park Ave & SE Oatfield Rd

Movement	EB	EB	WB	NB	NB	SB	SB
Directions Served	LT	R	LTR	L	TR	L	TR
Maximum Queue (ft)	211	90	37	146	310	24	584
Average Queue (ft)	89	34	8	70	112	4	212
95th Queue (ft)	171	74	28	136	241	21	429
Link Distance (ft)	414		163		2598		722
Upstream Blk Time (%)							0
Queuing Penalty (veh)							0
Storage Bay Dist (ft)		200		175		50	
Storage Blk Time (%)	0			0	2	0	23
Queuing Penalty (veh)	1			1	2	0	2

Intersection: 5: Courtney Ave & SE River Rd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	66	186	108	128
Average Queue (ft)	24	81	10	25
95th Queue (ft)	55	150	48	86
Link Distance (ft)	495	3104	492	2675
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 6: Courtney Ave & SE McLoughlin Blvd

Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	T	R	L	T	T	R
Maximum Queue (ft)	171	282	723	230	153	369	366	152	166	626	656	374
Average Queue (ft)	64	118	411	166	55	179	185	28	33	395	411	51
95th Queue (ft)	138	214	840	297	115	316	321	95	116	564	590	199
Link Distance (ft)		3104	753			448	448			777	777	
Upstream Blk Time (%)			7				0					
Queuing Penalty (veh)			12				0					
Storage Bay Dist (ft)	75			75	325			100	175			200
Storage Blk Time (%)	17	31	82	24		1	14			29	29	
Queuing Penalty (veh)	25	15	111	19		0	13			12	30	

Intersection: 7: Courtney Ave & SE Oatfield Rd

Movement	EB	EB	NB	SB
Directions Served	L	R	LT	TR
Maximum Queue (ft)	168	185	457	552
Average Queue (ft)	58	64	144	92
95th Queue (ft)	137	130	433	575
Link Distance (ft)	753		521	2598
Upstream Blk Time (%)			8	
Queuing Penalty (veh)			0	
Storage Bay Dist (ft)		100		
Storage Blk Time (%)	8	2		
Queuing Penalty (veh)	13	2		

Intersection: 8: SE Park Ave & 27th

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LTR	LTR
Maximum Queue (ft)	60	113	154	269	98	68
Average Queue (ft)	18	44	75	116	32	22
95th Queue (ft)	50	84	146	219	67	56
Link Distance (ft)		1902		264	224	195
Upstream Blk Time (%)				0		
Queuing Penalty (veh)				1		
Storage Bay Dist (ft)	50		130			
Storage Blk Time (%)	1	7	2	6		
Queuing Penalty (veh)	1	1	2	5		

Intersection: 9: Park & Ride #2 & SE McLoughlin Blvd

Movement	EB	NB	NB	SB	SB	SB
Directions Served	R	T	T	T	T	R
Maximum Queue (ft)	197	26	108	334	329	41
Average Queue (ft)	176	1	6	244	254	1
95th Queue (ft)	191	15	43	380	380	29
Link Distance (ft)	159	372	372	309	309	
Upstream Blk Time (%)	97			4	6	
Queuing Penalty (veh)	0			43	71	
Storage Bay Dist (ft)						50
Storage Blk Time (%)					21	
Queuing Penalty (veh)					4	

Intersection: 12: Silver Springs & SE McLoughlin Blvd

Movement	EB	WB	NB	SB	SB
Directions Served	R	R	L	T	TR
Maximum Queue (ft)	188	77	57	442	421
Average Queue (ft)	173	28	12	370	379
95th Queue (ft)	191	64	38	460	451
Link Distance (ft)	163	260		372	372
Upstream Blk Time (%)	100			13	16
Queuing Penalty (veh)	0			159	197
Storage Bay Dist (ft)			200		
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 15: Cinderella & SE McLoughlin Blvd

Movement	EB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	LTR	L	T	TR	L	T	TR
Maximum Queue (ft)	684	366	146	221	268	174	444	442
Average Queue (ft)	659	338	54	103	123	101	406	407
95th Queue (ft)	669	355	122	177	213	187	431	430
Link Distance (ft)	640	317		454	454		389	389
Upstream Blk Time (%)	86	86					22	24
Queuing Penalty (veh)	0	0					266	292
Storage Bay Dist (ft)			150			150		
Storage Blk Time (%)			1	1		8	31	
Queuing Penalty (veh)			5	1		92	38	

Intersection: 18: Loeffelman & SE McLoughlin Blvd

Movement	EB	WB	NB
Directions Served	R	R	L
Maximum Queue (ft)	140	83	44
Average Queue (ft)	53	27	9
95th Queue (ft)	105	61	31
Link Distance (ft)	963	426	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			150
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 1624

Arterial Level of Service: NB SE River Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Courtney Ave	5	1.0	12.7	0.1	29
SE Park Ave	2	2.4	54.6	0.5	34
	22	1.5	35.5	0.3	28
SE McLoughlin Blvd	1	77.2	106.2	0.2	8
Total		82.1	208.9	1.1	20

Arterial Level of Service: SB SE River Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
	22	1.2	32.9	0.2	27
SE Park Ave	2	2.2	19.0	0.3	55
	5	6.1	68.0	0.5	27
Total		9.5	120.0	1.0	31

Arterial Level of Service: NW SE McLoughlin Blvd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Courtney Ave	6	12.5	21.3	0.1	17
Loeffelman	18	3.4	17.9	0.2	32
Cinderella	15	9.6	18.4	0.1	19
Silver Springs	12	2.3	10.0	0.1	31
Park & Ride #2	9	2.3	9.7	0.1	30
SE Park Ave	3	11.0	17.2	0.1	15
SE River Rd	1	11.9	60.9	0.6	33
Total		53.0	155.5	1.1	27

Arterial Level of Service: SB SE McLoughlin Blvd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
SE River Rd	1	261.7	273.9	0.1	7
SE Park Ave	3	332.4	382.4	0.6	8
Park & Ride #2	9	14.5	21.0	0.1	12
	12	20.9	28.2	0.1	10
Cinderella	15	29.6	37.3	0.1	8
Loeffelman	18	5.3	14.1	0.1	25
Courtney Ave	6	27.3	41.6	0.2	14
Total		691.7	798.6	1.2	9

Arterial Level of Service: NB SE Oatfield Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Courtney Ave	7	66.4	78.7	0.1	13
SE Park Ave	4	11.5	62.1	0.5	29
Total		77.9	140.8	0.6	24

Arterial Level of Service: SB SE Oatfield Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
SE Park Ave	4	13.9	30.8	0.1	17
Courtney Ave	7	13.6	65.0	0.5	28
Total		27.5	95.9	0.6	25

Land Use 1

Option 1 (2 Signals)

Option 2 (1 Signal)

Queues
1: SE River Rd & SE McLoughlin Blvd

9/26/2011

Lane Group	NBL	NBR	SET	NWL	NWT
Lane Group Flow (vph)	268	21	2132	16	1137
v/c Ratio	0.81	0.08	0.93	0.21	0.47
Control Delay	66.9	28.4	26.1	82.7	4.7
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	66.9	28.4	26.1	82.7	4.7
Queue Length 50th (ft)	201	7	575	13	56
Queue Length 95th (ft)	#336	31	#1062	m22	85
Internal Link Dist (ft)	1200		698		2865
Turn Bay Length (ft)		90		300	
Base Capacity (vph)	331	267	2281	211	2431
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.81	0.08	0.93	0.08	0.47

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	NBL	NBR	SET	SER	NWL	NWT
Lane Configurations						
Volume (vph)	255	20	2025	0	15	1080
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5	5.5		4.5	4.5
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frt	1.00	0.85	1.00		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1850	1444	3260		1630	3260
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1850	1444	3260		1630	3260
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	268	21	2132	0	16	1137
RTOR Reduction (vph)	0	8	0	0	0	0
Lane Group Flow (vph)	268	13	2132	0	16	1137
Heavy Vehicles (%)	3%	3%	2%	2%	2%	2%
Turn Type		Prot			Prot	
Protected Phases	7	7	6		5	
Permitted Phases			6			2
Actuated Green, G (s)	22.0	22.0	82.1		2.9	90.0
Effective Green, g (s)	21.5	21.5	81.6		2.4	89.5
Actuated g/C Ratio	0.18	0.18	0.68		0.02	0.75
Clearance Time (s)	4.0	4.0	5.0		4.0	4.0
Vehicle Extension (s)	2.3	2.3	8.0		2.3	2.3
Lane Grp Cap (vph)	331	259	2217		33	2431
v/s Ratio Prot	c0.14	0.01	c0.65		0.01	
v/s Ratio Perm						c0.35
v/c Ratio	0.81	0.05	0.96		0.48	0.47
Uniform Delay, d1	47.3	40.8	17.8		58.2	6.0
Progression Factor	1.00	1.00	1.00		1.42	0.68
Incremental Delay, d2	18.9	0.4	12.0		5.4	0.5
Delay (s)	66.2	41.1	29.8		87.9	4.6
Level of Service	E	D	C		F	A
Approach Delay (s)	64.4		29.8			5.8
Approach LOS	E		C			A

Intersection Summary			
HCM Average Control Delay	24.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	84.4%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	95	25	295	90	25	635
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	100	26	311	95	26	668
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1079	358			405	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1079	358			405	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	58	96			98	
cM capacity (veh/h)	236	686			1153	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	126	405	695
Volume Left	100	0	26
Volume Right	26	95	0
cSH	274	1700	1153
Volume to Capacity	0.46	0.24	0.02
Queue Length 95th (ft)	57	0	2
Control Delay (s)	29.0	0.0	0.6
Lane LOS	D		A
Approach Delay (s)	29.0	0.0	0.6
Approach LOS	D		

Intersection Summary			
Average Delay	3.3		
Intersection Capacity Utilization	73.1%	ICU Level of Service	D
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	21	124	15	10	217	62	1072	46	119	2165	31
v/c Ratio	0.24	0.46	0.06	0.06	0.79	0.50	0.57	0.05	0.56	1.02	0.03
Control Delay	45.7	47.9	15.5	40.7	60.9	88.8	4.9	0.2	45.4	33.4	1.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.7	47.9	15.5	40.7	60.9	88.8	4.9	0.2	45.4	33.4	1.1
Queue Length 50th (ft)	13	89	1	7	141	50	28	0	93	~995	3
Queue Length 95th (ft)	38	137	16	22	216	m92	48	m1	m101	m#1231	m3
Internal Link Dist (ft)		264			427		297			2865	
Turn Bay Length (ft)	115		150			325		100	325		125
Base Capacity (vph)	119	365	322	214	364	156	1896	859	211	2125	954
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.18	0.34	0.05	0.05	0.60	0.40	0.57	0.05	0.56	1.02	0.03

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	120	15	10	115	95	60	1040	45	115	2100	30
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0		4.5	6.5	6.5	4.5	6.5	6.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1630	1716	1458	1630	1599		1630	3260	1458	1630	3260	1458
Flt Permitted	0.33	1.00	1.00	0.59	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	560	1716	1458	1007	1599		1630	3260	1458	1630	3260	1458
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	21	124	15	10	119	98	62	1072	46	119	2165	31
RTOR Reduction (vph)	0	0	13	0	26	0	0	0	11	0	0	4
Lane Group Flow (vph)	21	124	2	10	191	0	62	1072	35	119	2165	27
Turn Type	Perm		Perm	Perm			Prot		Perm	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8					2			6
Actuated Green, G (s)	19.2	19.2	19.2	19.2	19.2		8.4	69.5	69.5	16.8	77.9	77.9
Effective Green, g (s)	18.7	18.7	18.7	18.7	18.7		7.9	69.0	69.0	16.3	77.4	77.4
Actuated g/C Ratio	0.16	0.16	0.16	0.16	0.16		0.07	0.57	0.57	0.14	0.64	0.64
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5		4.0	6.0	6.0	4.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	87	267	227	157	249		107	1875	838	221	2103	940
v/s Ratio Prot		0.07			c0.12		0.04	c0.33		0.07	c0.66	
v/s Ratio Perm	0.04		0.00	0.01					0.02			0.02
v/c Ratio	0.24	0.46	0.01	0.06	0.77		0.58	0.57	0.04	0.54	1.03	0.03
Uniform Delay, d1	44.4	46.1	42.8	43.2	48.6		54.4	16.1	11.1	48.3	21.3	7.7
Progression Factor	0.93	0.94	0.89	1.00	1.00		1.46	0.23	0.02	0.81	0.51	0.14
Incremental Delay, d2	1.4	1.3	0.0	0.2	13.2		6.3	1.1	0.1	1.2	21.9	0.0
Delay (s)	42.6	44.8	38.0	43.4	61.7		85.6	4.8	0.3	40.2	32.8	1.1
Level of Service	D	D	D	D	E		F	A	A	D	C	A
Approach Delay (s)		43.9			60.9			8.8			32.7	
Approach LOS		D			E			A			C	

Intersection Summary			
HCM Average Control Delay	27.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	98.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	EBR	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	205	89	12	111	331	11	616
v/c Ratio	0.61	0.19	0.03	0.33	0.32	0.02	0.61
Control Delay	23.5	5.5	11.5	10.5	7.6	6.0	10.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.5	5.5	11.5	10.5	7.6	6.0	10.9
Queue Length 50th (ft)	36	0	1	13	39	1	87
Queue Length 95th (ft)	124	27	12	51	102	7	229
Internal Link Dist (ft)	427		122		2589		673
Turn Bay Length (ft)		200		175		50	
Base Capacity (vph)	473	610	600	392	1177	661	1156
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.43	0.15	0.02	0.28	0.28	0.02	0.53

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	190	5	85	2	5	5	105	310	5	10	475	110
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Grade (%)		5%			0%			0%			0%	
Total Lost time (s)		4.5	4.5		4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.94		1.00	1.00		1.00	0.97	
Flt Protected		0.95	1.00		0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1595	1422		1606		1630	1712		1630	1667	
Flt Permitted		0.72	1.00		0.94		0.33	1.00		0.56	1.00	
Satd. Flow (perm)		1209	1422		1527		570	1712		962	1667	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	200	5	89	2	5	5	111	326	5	11	500	116
RTOR Reduction (vph)	0	0	69	0	4	0	0	1	0	0	15	0
Lane Group Flow (vph)	0	205	20	0	8	0	111	330	0	11	601	0
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		9.1	9.1		9.1		20.8	20.8		20.8	20.8	
Effective Green, g (s)		8.6	8.6		8.6		20.3	20.3		20.3	20.3	
Actuated g/C Ratio		0.23	0.23		0.23		0.54	0.54		0.54	0.54	
Clearance Time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		2.5	2.5		2.5		2.5	2.5		2.5	2.5	
Lane Grp Cap (vph)		274	323		346		305	917		515	893	
v/s Ratio Prot								0.19			c0.36	
v/s Ratio Perm		c0.17	0.01		0.01		0.19			0.01		
v/c Ratio		0.75	0.06		0.02		0.36	0.36		0.02	0.67	
Uniform Delay, d1		13.6	11.5		11.4		5.1	5.1		4.1	6.4	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		10.1	0.1		0.0		0.5	0.2		0.0	1.8	
Delay (s)		23.7	11.5		11.4		5.6	5.2		4.1	8.2	
Level of Service		C	B		B		A	A		A	A	
Approach Delay (s)		20.1			11.4			5.3			8.1	
Approach LOS		C			B			A			A	

Intersection Summary			
HCM Average Control Delay	9.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	37.9	Sum of lost time (s)	9.0
Intersection Capacity Utilization	70.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	10	15	5	45	15	80	15	210	45	50	635	40
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	11	16	5	47	16	84	16	221	47	53	668	42
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1163	1095	689	1084	1092	245	711			268		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1163	1095	689	1084	1092	245	711			268		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	92	92	99	73	92	89	98			96		
cM capacity (veh/h)	138	201	445	173	202	794	889			1295		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	32	147	284	763
Volume Left	11	47	16	53
Volume Right	5	84	47	42
cSH	190	321	889	1295
Volume to Capacity	0.17	0.46	0.02	0.04
Queue Length 95th (ft)	15	57	1	3
Control Delay (s)	27.7	25.3	0.7	1.1
Lane LOS	D	D	A	A
Approach Delay (s)	27.7	25.3	0.7	1.1
Approach LOS	D	D		

Intersection Summary			
Average Delay	4.6		
Intersection Capacity Utilization	75.6%	ICU Level of Service	D
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	41	149	82	139	62	969	93	41	2144	77
v/c Ratio	0.67	0.70	1.34	0.59	0.48	0.47	0.10	0.38	1.06	0.08
Control Delay	103.8	61.1	275.4	55.1	65.0	14.0	5.8	64.3	45.6	3.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	0.0
Total Delay	103.8	61.1	275.4	55.1	65.0	14.0	5.8	64.3	47.3	3.5
Queue Length 50th (ft)	32	99	~83	96	47	201	11	33	~981	4
Queue Length 95th (ft)	#94	162	#189	156	92	310	40	m35	m#1131	m4
Internal Link Dist (ft)		3106		771		404			767	
Turn Bay Length (ft)	75				325		100	175		200
Base Capacity (vph)	61	361	61	361	130	2061	942	145	2026	921
Starvation Cap Reductn	0	0	0	0	0	0	0	0	8	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.67	0.41	1.34	0.39	0.48	0.47	0.10	0.28	1.06	0.08

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	100	45	80	105	30	60	940	90	40	2080	75
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	5.5	5.5	4.5	5.5	5.5
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.95		1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1630	1636		1630	1658		1630	3260	1458	1630	3260	1458
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1630	1636		1630	1658		1630	3260	1458	1630	3260	1458
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	41	103	46	82	108	31	62	969	93	41	2144	77
RTOR Reduction (vph)	0	15	0	0	9	0	0	0	21	0	0	16
Lane Group Flow (vph)	41	134	0	82	130	0	62	969	72	41	2144	61
Turn Type	Prot			Prot			Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			6
Actuated Green, G (s)	4.0	15.9		5.0	16.9		8.6	74.7	74.7	7.4	73.5	73.5
Effective Green, g (s)	3.5	15.4		4.5	16.4		8.1	74.2	74.2	6.9	73.0	73.0
Actuated g/C Ratio	0.03	0.13		0.04	0.14		0.07	0.62	0.62	0.06	0.61	0.61
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	5.0	5.0	4.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	48	210		61	227		110	2016	902	94	1983	887
v/s Ratio Prot	0.03	c0.08		c0.05	0.08		c0.04	0.30		0.03	c0.66	
v/s Ratio Perm									0.05			0.04
v/c Ratio	0.85	0.64		1.34	0.57		0.56	0.48	0.08	0.44	1.08	0.07
Uniform Delay, d1	58.0	49.7		57.8	48.5		54.2	12.4	9.2	54.7	23.5	9.6
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.15	0.45	0.52
Incremental Delay, d2	76.9	6.3		231.9	3.4		6.5	0.8	0.2	1.1	40.2	0.0
Delay (s)	134.9	55.9		289.6	51.9		60.7	13.3	9.4	64.1	50.7	5.0
Level of Service	F	E		F	D		E	B	A	E	D	A
Approach Delay (s)		73.0			140.1			15.6			49.4	
Approach LOS		E			F			B			D	

Intersection Summary			
HCM Average Control Delay	45.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	88.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	70	155	60	430	515	115
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	74	163	63	453	542	121
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		4				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1182	603	663			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1182	603	663			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	62	67	93			
cM capacity (veh/h)	195	499	926			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	237	516	663
Volume Left	74	63	0
Volume Right	163	0	121
cSH	628	926	1700
Volume to Capacity	0.38	0.07	0.39
Queue Length 95th (ft)	44	5	0
Control Delay (s)	21.4	1.9	0.0
Lane LOS	C	A	
Approach Delay (s)	21.4	1.9	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	4.3		
Intersection Capacity Utilization	80.6%	ICU Level of Service	D
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	21	68	63	153	105	68
v/c Ratio	0.09	0.20	0.26	0.44	0.10	0.07
Control Delay	18.2	14.9	28.6	28.6	2.0	3.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.2	14.9	28.6	28.6	2.0	3.0
Queue Length 50th (ft)	6	13	44	100	1	3
Queue Length 95th (ft)	20	39	m77	160	16	16
Internal Link Dist (ft)		1888		264	174	146
Turn Bay Length (ft)	50		130			
Base Capacity (vph)	403	600	438	612	1076	1040
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.11	0.14	0.25	0.10	0.07

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	45	20	60	115	30	5	5	90	20	5	40
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.95		1.00	0.97			0.88			0.92	
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.98	
Satd. Flow (prot)	1630	1636		1630	1662			1503			1549	
Flt Permitted	0.65	1.00		0.71	1.00			0.99			0.93	
Satd. Flow (perm)	1124	1636		1223	1662			1497			1469	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	21	47	21	63	121	32	5	5	95	21	5	42
RTOR Reduction (vph)	0	17	0	0	21	0	0	31	0	0	14	0
Lane Group Flow (vph)	21	51	0	63	132	0	0	74	0	0	54	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	11.2	11.2		11.2	11.2			40.8			40.8	
Effective Green, g (s)	10.7	10.7		10.7	10.7			40.3			40.3	
Actuated g/C Ratio	0.18	0.18		0.18	0.18			0.67			0.67	
Clearance Time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	200	292		218	296			1005			987	
v/s Ratio Prot		0.03			c0.08							
v/s Ratio Perm	0.02			0.05				c0.05			0.04	
v/c Ratio	0.10	0.17		0.29	0.45			0.07			0.05	
Uniform Delay, d1	20.6	20.9		21.4	22.0			3.4			3.4	
Progression Factor	1.00	1.00		1.40	1.51			1.00			1.00	
Incremental Delay, d2	0.2	0.3		0.7	1.0			0.1			0.1	
Delay (s)	20.9	21.2		30.5	34.2			3.5			3.5	
Level of Service	C	C		C	C			A			A	
Approach Delay (s)		21.1			33.1			3.5			3.5	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	20.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.15		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	34.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	100	0	1145	2105	20
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	105	0	1205	2216	21
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				424	377	
pX, platoon unblocked	0.47	0.37	0.37			
vC, conflicting volume	2818	1108	2237			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	671	0	909			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	73	100			
cM capacity (veh/h)	181	396	272			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	105	603	603	1108	1108	21
Volume Left	0	0	0	0	0	0
Volume Right	105	0	0	0	0	21
cSH	396	1700	1700	1700	1700	1700
Volume to Capacity	0.27	0.35	0.35	0.65	0.65	0.01
Queue Length 95th (ft)	26	0	0	0	0	0
Control Delay (s)	17.4	0.0	0.0	0.0	0.0	0.0
Lane LOS	C					
Approach Delay (s)	17.4	0.0		0.0		
Approach LOS	C					

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	77.4%	ICU Level of Service	D
Analysis Period (min)	15		

Lane Group	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	199	206	16	1153	42	2279
v/c Ratio	0.66	0.86	0.21	0.54	0.40	1.00
Control Delay	48.4	76.5	44.9	23.7	40.9	23.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.4	76.5	44.9	23.7	40.9	23.7
Queue Length 50th (ft)	118	146	12	438	30	211
Queue Length 95th (ft)	199	#265	m22	521	m31	m#1047
Internal Link Dist (ft)	129	226		369		344
Turn Bay Length (ft)			200		150	
Base Capacity (vph)	338	270	115	2121	115	2270
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.59	0.76	0.14	0.54	0.37	1.00

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	25	80	85	50	110	35	15	1085	10	40	2090	75
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.94			0.98		1.00	1.00		1.00	0.99	
Flt Protected		0.99			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1602			1653		1630	3255		1630	3243	
Flt Permitted		0.92			0.74		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1475			1241		1630	3255		1630	3243	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	26	84	89	53	116	37	16	1142	11	42	2200	79
RTOR Reduction (vph)	0	25	0	0	7	0	0	0	0	0	2	0
Lane Group Flow (vph)	0	174	0	0	200	0	16	1153	0	42	2277	0
Turn Type	Perm			Perm			Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		23.0			23.0		3.0	76.2		8.8	82.0	
Effective Green, g (s)		22.5			22.5		2.5	75.7		8.3	81.5	
Actuated g/C Ratio		0.19			0.19		0.02	0.63		0.07	0.68	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		2.5			2.5		2.5	2.5		2.5	2.5	
Lane Grp Cap (vph)		277			233		34	2053		113	2203	
v/s Ratio Prot							0.01	c0.35		0.03	c0.70	
v/s Ratio Perm		0.12			c0.16							
v/c Ratio		0.63			0.86		0.47	0.56		0.37	1.03	
Uniform Delay, d1		44.9			47.2		58.1	12.7		53.4	19.2	
Progression Factor		1.00			1.00		0.73	1.79		0.69	0.44	
Incremental Delay, d2		3.8			24.9		6.6	1.0		0.5	21.3	
Delay (s)		48.7			72.1		48.9	23.7		37.1	29.7	
Level of Service		D			E		D	C		D	C	
Approach Delay (s)		48.7			72.1			24.0			29.9	
Approach LOS		D			E			C			C	

Intersection Summary			
HCM Average Control Delay	31.3	HCM Level of Service	C
HCM Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	93.2%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	40	0	0	45	10	1065	5	20	2135	70
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	0	42	0	0	47	11	1121	5	21	2247	74
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								512			449	
pX, platoon unblocked	0.41	0.41	0.33	0.41	0.41	0.85	0.33			0.85		
vC, conflicting volume	2955	3474	1161	2353	3508	563	2321			1126		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1240	2510	0	0	2593	134	965			796		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	88	100	100	94	96			97		
cM capacity (veh/h)	47	11	362	348	9	757	237			698		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	42	47	11	747	379	21	1498	823
Volume Left	0	0	11	0	0	21	0	0
Volume Right	42	47	0	0	5	0	0	74
cSH	362	757	237	1700	1700	698	1700	1700
Volume to Capacity	0.12	0.06	0.04	0.44	0.22	0.03	0.88	0.48
Queue Length 95th (ft)	10	5	3	0	0	2	0	0
Control Delay (s)	16.3	10.1	20.9	0.0	0.0	10.3	0.0	0.0
Lane LOS	C	B	C			B		
Approach Delay (s)	16.3	10.1	0.2			0.1		
Approach LOS	C	B						

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	77.3%	ICU Level of Service	D
Analysis Period (min)	15		

Lane Group	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	163	194	21	1043	42	2247
v/c Ratio	0.63	0.83	0.24	0.47	0.44	0.97
Control Delay	49.9	68.7	46.9	3.6	60.8	27.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	15.1
Total Delay	49.9	68.7	46.9	3.6	60.8	42.3
Queue Length 50th (ft)	100	127	16	45	31	937
Queue Length 95th (ft)	167	205	m34	52	m32	m#1102
Internal Link Dist (ft)	370	450		767		432
Turn Bay Length (ft)			150		150	
Base Capacity (vph)	323	293	115	2206	116	2328
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	1	1	0	0	0	150
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.51	0.66	0.18	0.47	0.36	1.03

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	25	70	60	45	65	75	20	980	10	40	2090	45
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.95			0.95		1.00	1.00		1.00	1.00	
Flt Protected		0.99			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1613			1602		1630	3255		1630	3250	
Flt Permitted		0.88			0.79		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1433			1281		1630	3255		1630	3250	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	26	74	63	47	68	79	21	1032	11	42	2200	47
RTOR Reduction (vph)	0	20	0	0	22	0	0	1	0	0	1	0
Lane Group Flow (vph)	0	143	0	0	172	0	21	1042	0	42	2246	0
Turn Type	Perm			Perm			Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		20.4			20.4		3.6	81.0		6.6	84.0	
Effective Green, g (s)		19.9			19.9		3.1	80.5		6.1	83.5	
Actuated g/C Ratio		0.17			0.17		0.03	0.67		0.05	0.70	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		2.5			2.5		2.5	2.5		2.5	2.5	
Lane Grp Cap (vph)		238			212		42	2184		83	2261	
v/s Ratio Prot							0.01	c0.32		0.03	c0.69	
v/s Ratio Perm		0.10			c0.13							
v/c Ratio		0.60			0.81		0.50	0.48		0.51	0.99	
Uniform Delay, d1		46.4			48.3		57.7	9.6		55.5	18.0	
Progression Factor		1.00			1.00		0.77	0.27		1.04	1.32	
Incremental Delay, d2		3.6			20.2		6.0	0.7		1.0	8.9	
Delay (s)		49.9			68.4		50.3	3.3		58.9	32.5	
Level of Service		D			E		D	A		E	C	
Approach Delay (s)		49.9			68.4			4.2			33.0	
Approach LOS		D			E			A			C	

Intersection Summary			
HCM Average Control Delay	27.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	89.7%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

1: SE River Rd & SE McLoughlin Blvd Performance by approach

Approach	NB	SE	NW	All
Total Delay (hr)	5.0	22.2	2.7	29.8
Delay / Veh (s)	56.0	39.7	8.5	30.9

2: SE Park Ave & SE River Rd Performance by approach

Approach	WB	NB	SB	All
Total Delay (hr)	1.1	0.3	0.4	1.7
Delay / Veh (s)	22.9	2.6	2.0	5.1

3: SE Park Ave & SE McLoughlin Blvd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	2.0	2.6	3.0	149.5	157.0
Delay / Veh (s)	43.2	40.7	9.4	263.2	158.1

4: SE Park Ave & SE Oatfield Rd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	0.8	0.0	1.6	1.8	4.2
Delay / Veh (s)	10.6	8.0	11.1	11.0	11.0

5: Courtney Ave & SE River Rd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	0.1	0.9	0.1	1.2	2.4
Delay / Veh (s)	17.2	14.9	1.1	6.0	6.8

6: Courtney Ave & SE McLoughlin Blvd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	2.9	9.7	4.4	20.0	37.0
Delay / Veh (s)	57.2	176.3	14.6	36.0	38.5

7: Courtney Ave & SE Oatfield Rd Performance by approach

Approach	EB	NB	SB	All
Total Delay (hr)	1.1	0.5	0.9	2.5
Delay / Veh (s)	16.7	3.5	5.3	6.6

8: SE Park Ave & Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	0.5	1.7	0.1	0.1	2.3
Delay / Veh (s)	13.9	30.1	2.3	3.3	16.6

9: Park & Ride #2 & SE McLoughlin Blvd Performance by approach

Approach	EB	NB	SB	All
Total Delay (hr)	8.7	1.1	5.4	15.2
Delay / Veh (s)	378.2	3.5	10.1	17.5

12: Silver Springs & SE McLoughlin Blvd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	3.4	4.5	5.5	14.7	28.1
Delay / Veh (s)	64.1	79.5	18.2	27.0	29.3

15: Cinderella & SE McLoughlin Blvd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	1.2	0.2	0.8	7.3	9.5
Delay / Veh (s)	98.9	17.2	2.8	13.1	10.9

18: Loeffelman & SE McLoughlin Blvd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	2.0	2.8	1.9	14.2	20.9
Delay / Veh (s)	45.4	54.0	6.9	26.0	22.8

Total Network Performance

Total Delay (hr)	314.0
Delay / Veh (s)	172.7

1: SE River Rd & SE McLoughlin Blvd Performance by movement

Movement	NBL	NBT	NBR	SET	NWL	NWT	All
Total Delay (hr)	4.8	0.0	0.2	22.2	0.3	2.4	29.8
Delay / Veh (s)	69.1	0.8	33.5	39.7	77.3	7.7	30.9

2: SE Park Ave & SE River Rd Performance by movement

Movement	WBL	WBT	WBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	0.9	0.0	0.2	0.2	0.1	0.0	0.3	1.7
Delay / Veh (s)	31.7	2.0	22.4	2.7	2.3	4.5	1.9	5.1

3: SE Park Ave & SE McLoughlin Blvd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	0.3	1.5	0.2	0.1	1.5	1.0	1.1	1.8	0.0	7.8	139.8	1.9
Delay / Veh (s)	51.8	43.3	33.8	47.5	43.8	36.0	72.1	6.3	2.9	265.7	263.5	252.1

3: SE Park Ave & SE McLoughlin Blvd Performance by movement

Movement	All
Total Delay (hr)	157.0
Delay / Veh (s)	158.1

4: SE Park Ave & SE Oatfield Rd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	0.7	0.0	0.1	0.0	0.0	0.0	0.7	0.9	0.0	0.1	1.5	0.3
Delay / Veh (s)	13.0	11.3	5.8	14.8	11.9	4.2	23.1	8.1	5.2	16.7	11.5	8.8

4: SE Park Ave & SE Oatfield Rd Performance by movement

Movement	All
Total Delay (hr)	4.2
Delay / Veh (s)	11.0

5: Courtney Ave & SE River Rd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	0.1	0.1	0.0	0.4	0.2	0.4	0.0	0.1	0.0	0.1	1.0	0.1
Delay / Veh (s)	24.0	15.2	10.0	30.2	6.9	17.4	4.8	1.0	0.7	7.8	5.9	5.1

5: Courtney Ave & SE River Rd Performance by movement

Movement	All
Total Delay (hr)	2.4
Delay / Veh (s)	6.8

6: Courtney Ave & SE McLoughlin Blvd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	1.0	1.5	0.5	6.2	3.0	0.6	1.0	3.1	0.2	0.7	19.0	0.3
Delay / Veh (s)	88.3	53.2	38.1	312.2	105.3	81.5	62.3	12.0	8.9	66.6	36.0	18.0

6: Courtney Ave & SE McLoughlin Blvd Performance by movement

Movement	All
Total Delay (hr)	37.0
Delay / Veh (s)	38.5

7: Courtney Ave & SE Oatfield Rd Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Total Delay (hr)	0.5	0.0	0.6	0.1	0.4	0.8	0.1	2.5
Delay / Veh (s)	26.7	1.2	13.1	7.9	2.9	5.5	4.6	6.6

8: SE Park Ave & Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	0.1	0.3	0.1	0.5	1.0	0.2	0.0	0.0	0.1	0.0	0.0	0.0
Delay / Veh (s)	27.3	13.0	8.2	30.5	31.7	22.7	7.0	1.2	2.1	6.9	4.6	1.8

8: SE Park Ave & Performance by movement

Movement	All
Total Delay (hr)	2.3
Delay / Veh (s)	16.6

9: Park & Ride #2 & SE McLoughlin Blvd Performance by movement

Movement	EBR	NBT	SBT	SBR	All
Total Delay (hr)	8.7	1.1	5.4	0.0	15.2
Delay / Veh (s)	382.8	3.5	10.1	5.0	17.5

12: Silver Springs & SE McLoughlin Blvd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	0.4	1.5	1.5	1.2	2.5	0.7	0.2	5.3	0.0	0.6	13.7	0.5
Delay / Veh (s)	71.7	66.7	59.8	86.4	79.5	72.1	58.5	17.8	17.6	61.4	26.4	25.2

12: Silver Springs & SE McLoughlin Blvd Performance by movement

Movement	All
Total Delay (hr)	28.1
Delay / Veh (s)	29.3

15: Cinderella & SE McLoughlin Blvd Performance by movement

Movement	EBR	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Total Delay (hr)	1.2	0.2	0.1	0.7	0.0	0.1	6.9	0.2	9.5
Delay / Veh (s)	98.9	17.6	28.4	2.5	2.4	21.3	13.0	13.5	10.9

18: Loeffelman & SE McLoughlin Blvd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	0.3	0.9	0.8	0.8	1.0	1.1	0.3	1.6	0.0	0.7	13.2	0.2
Delay / Veh (s)	50.0	45.1	44.2	66.1	56.7	46.6	50.8	6.0	5.8	69.0	25.2	23.7

18: Loeffelman & SE McLoughlin Blvd Performance by movement

Movement	All
Total Delay (hr)	20.9
Delay / Veh (s)	22.8

Total Network Performance

Total Delay (hr)	314.0
Delay / Veh (s)	172.7

Intersection: 1: SE River Rd & SE McLoughlin Blvd

Movement	NB	NB	SE	SE	NW	NW	NW
Directions Served	L	R	T	T	L	T	T
Maximum Queue (ft)	479	115	787	787	63	144	195
Average Queue (ft)	246	11	536	554	16	51	86
95th Queue (ft)	416	64	896	898	48	113	156
Link Distance (ft)	1198		766	766		2863	2863
Upstream Blk Time (%)			8	8			
Queuing Penalty (veh)			0	0			
Storage Bay Dist (ft)		90			300		
Storage Blk Time (%)	52	0					
Queuing Penalty (veh)	11	0					

Intersection: 2: SE Park Ave & SE River Rd

Movement	WB	SB
Directions Served	LR	LT
Maximum Queue (ft)	187	151
Average Queue (ft)	77	15
95th Queue (ft)	146	72
Link Distance (ft)	1902	1416
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: SE Park Ave & SE McLoughlin Blvd

Movement	EB	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	TR	L	T	T	R	L	T	T
Maximum Queue (ft)	86	206	56	38	302	124	188	201	53	444	2877	2874
Average Queue (ft)	21	94	12	10	168	58	63	77	8	139	1972	1975
95th Queue (ft)	67	168	38	33	275	113	146	158	34	344	2948	2918
Link Distance (ft)		264		414			307	307			2863	2863
Upstream Blk Time (%)								0			1	1
Queuing Penalty (veh)								0			9	10
Storage Bay Dist (ft)	115		150		200	325			100	325		
Storage Blk Time (%)	0	7			6			7			32	37
Queuing Penalty (veh)	0	2			1			3			37	11

Intersection: 3: SE Park Ave & SE McLoughlin Blvd

Movement	SB
Directions Served	R
Maximum Queue (ft)	298
Average Queue (ft)	27
95th Queue (ft)	151
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	125
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 4: SE Park Ave & SE Oatfield Rd

Movement	EB	EB	WB	NB	NB	SB	SB
Directions Served	LT	R	LTR	L	TR	L	TR
Maximum Queue (ft)	206	76	38	139	219	60	389
Average Queue (ft)	77	27	7	57	76	8	161
95th Queue (ft)	158	65	27	111	159	37	312
Link Distance (ft)	414		163		2598		722
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)		200		175		50	
Storage Blk Time (%)	0			0	1	0	20
Queuing Penalty (veh)	0			0	1	1	2

Intersection: 5: Courtney Ave & SE River Rd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	71	176	68	113
Average Queue (ft)	24	75	11	22
95th Queue (ft)	55	147	45	72
Link Distance (ft)	495	3104	492	2675
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 6: Courtney Ave & SE McLoughlin Blvd

Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	T	R	L	T	T	R
Maximum Queue (ft)	140	231	443	230	138	295	306	111	175	800	808	375
Average Queue (ft)	47	115	232	138	53	145	155	26	36	458	474	46
95th Queue (ft)	106	202	520	269	111	254	267	85	104	814	821	203
Link Distance (ft)		3104	753			448	448			779	779	
Upstream Blk Time (%)			0							2	2	
Queuing Penalty (veh)			0							25	25	
Storage Bay Dist (ft)	75			75	325			100	175			200
Storage Blk Time (%)	10	30	75	17		0	14	0		31	31	
Queuing Penalty (veh)	14	12	101	14		0	12	0		13	23	

Intersection: 7: Courtney Ave & SE Oatfield Rd

Movement	EB	EB	NB	SB
Directions Served	L	R	LT	TR
Maximum Queue (ft)	102	153	203	21
Average Queue (ft)	42	61	58	1
95th Queue (ft)	81	115	156	6
Link Distance (ft)	753		521	2598
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		100		
Storage Blk Time (%)	1	2		
Queuing Penalty (veh)	1	1		

Intersection: 8: SE Park Ave &

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LTR	LTR
Maximum Queue (ft)	73	118	149	253	75	67
Average Queue (ft)	17	44	54	117	26	21
95th Queue (ft)	51	94	124	217	59	53
Link Distance (ft)		1902		264	224	195
Upstream Blk Time (%)				0		
Queuing Penalty (veh)				1		
Storage Bay Dist (ft)	50		130			
Storage Blk Time (%)	2	8	0	8		
Queuing Penalty (veh)	1	2	1	5		

Intersection: 9: Park & Ride #2 & SE McLoughlin Blvd

Movement	EB	SB	SB	SB
Directions Served	R	T	T	R
Maximum Queue (ft)	194	389	399	41
Average Queue (ft)	141	74	84	1
95th Queue (ft)	222	301	315	29
Link Distance (ft)	159	307	307	
Upstream Blk Time (%)	52	2	2	
Queuing Penalty (veh)	0	20	26	
Storage Bay Dist (ft)				50
Storage Blk Time (%)			7	
Queuing Penalty (veh)			1	

Intersection: 12: Silver Springs & SE McLoughlin Blvd

Movement	EB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	LTR	L	T	TR	L	T	TR
Maximum Queue (ft)	186	279	54	402	409	284	445	449
Average Queue (ft)	151	190	13	258	299	57	375	400
95th Queue (ft)	207	301	41	393	430	179	472	483
Link Distance (ft)	163	260		389	389		374	374
Upstream Blk Time (%)	18	11		0	1		11	21
Queuing Penalty (veh)	0	0		2	7		117	236
Storage Bay Dist (ft)			200			150		
Storage Blk Time (%)				8		0	31	
Queuing Penalty (veh)				1		2	12	

Intersection: 15: Cinderella & SE McLoughlin Blvd

Movement	EB	WB	NB	NB	NB	SB	SB	SB
Directions Served	R	R	L	T	TR	L	T	TR
Maximum Queue (ft)	130	70	34	47	107	150	428	430
Average Queue (ft)	56	28	8	2	10	16	250	276
95th Queue (ft)	115	56	30	23	56	67	519	534
Link Distance (ft)	431	317		452	452		389	389
Upstream Blk Time (%)							4	6
Queuing Penalty (veh)							46	61
Storage Bay Dist (ft)			150			150		
Storage Blk Time (%)						0	8	
Queuing Penalty (veh)						0	2	

Intersection: 18: Loeffelman & SE McLoughlin Blvd

Movement	EB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	LTR	L	T	TR	L	T	TR
Maximum Queue (ft)	285	356	82	114	156	244	492	491
Average Queue (ft)	118	148	21	42	58	44	437	447
95th Queue (ft)	215	285	59	95	113	143	551	544
Link Distance (ft)	404	484		779	779		452	452
Upstream Blk Time (%)							10	12
Queuing Penalty (veh)							103	127
Storage Bay Dist (ft)			150			150		
Storage Blk Time (%)				0		0	21	
Queuing Penalty (veh)				0		1	8	

Network Summary

Network wide Queuing Penalty: 1109

Arterial Level of Service: NB SE River Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Courtney Ave	5	1.0	12.6	0.1	29
SE Park Ave	2	2.5	56.3	0.5	33
	22	1.6	35.8	0.3	28
SE McLoughlin Blvd	1	69.1	98.4	0.2	9
Total		74.2	203.1	1.1	20

Arterial Level of Service: SB SE River Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
	22	1.1	33.7	0.2	26
SE Park Ave	2	1.9	18.7	0.3	56
	5	6.0	68.8	0.5	27
Total		9.1	121.2	1.0	31

Arterial Level of Service: NW SE McLoughlin Blvd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Courtney Ave	6	12.0	20.9	0.1	17
Loeffelman	18	5.0	19.6	0.2	30
Cinderella	15	2.7	11.5	0.1	30
Silver Springs	12	18.0	25.8	0.1	12
Park & Ride #2	9	3.6	11.1	0.1	26
SE Park Ave	3	6.3	12.4	0.1	21
SE River Rd	1	7.0	56.1	0.6	36
Total		54.7	157.4	1.1	26

Arterial Level of Service: SB SE McLoughlin Blvd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
SE River Rd	1	39.7	52.7	0.1	11
SE Park Ave	3	264.2	313.9	0.6	10
Park & Ride #2	9	10.2	16.7	0.1	16
	12	26.2	33.6	0.1	9
Cinderella	15	13.5	21.2	0.1	14
Loeffelman	18	25.1	33.9	0.1	10
Courtney Ave	6	36.0	50.3	0.2	12
Total		414.9	522.3	1.2	11

Arterial Level of Service: NB SE Oatfield Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Courtney Ave	7	2.9	15.2	0.1	26
SE Park Ave	4	8.1	55.5	0.5	33
Total		11.0	70.7	0.6	31

Arterial Level of Service: SB SE Oatfield Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
SE Park Ave	4	11.5	28.4	0.1	19
Courtney Ave	7	5.7	55.0	0.5	33
Total		17.2	83.4	0.6	28

Queues
1: SE River Rd & SE McLoughlin Blvd

9/26/2011

Lane Group	NBL	NBR	SET	NWL	NWT
Lane Group Flow (vph)	268	21	2132	16	1137
v/c Ratio	0.81	0.08	0.93	0.21	0.47
Control Delay	66.9	28.4	26.1	61.4	13.9
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	66.9	28.4	26.1	61.4	13.9
Queue Length 50th (ft)	201	7	575	10	432
Queue Length 95th (ft)	#336	31	#1062	m18	511
Internal Link Dist (ft)	1200		698		2865
Turn Bay Length (ft)		90		300	
Base Capacity (vph)	331	267	2281	211	2431
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.81	0.08	0.93	0.08	0.47

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	NBL	NBR	SET	SER	NWL	NWT
Lane Configurations						
Volume (vph)	255	20	2025	0	15	1080
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5	5.5		4.5	4.5
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frt	1.00	0.85	1.00		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1850	1444	3260		1630	3260
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1850	1444	3260		1630	3260
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	268	21	2132	0	16	1137
RTOR Reduction (vph)	0	8	0	0	0	0
Lane Group Flow (vph)	268	13	2132	0	16	1137
Heavy Vehicles (%)	3%	3%	2%	2%	2%	2%
Turn Type		Prot			Prot	
Protected Phases	7	7	6		5	
Permitted Phases			6			2
Actuated Green, G (s)	22.0	22.0	82.1		2.9	90.0
Effective Green, g (s)	21.5	21.5	81.6		2.4	89.5
Actuated g/C Ratio	0.18	0.18	0.68		0.02	0.75
Clearance Time (s)	4.0	4.0	5.0		4.0	4.0
Vehicle Extension (s)	2.3	2.3	8.0		2.3	2.3
Lane Grp Cap (vph)	331	259	2217		33	2431
v/s Ratio Prot	c0.14	0.01	c0.65		0.01	
v/s Ratio Perm						c0.35
v/c Ratio	0.81	0.05	0.96		0.48	0.47
Uniform Delay, d1	47.3	40.8	17.8		58.2	6.0
Progression Factor	1.00	1.00	1.00		1.03	2.22
Incremental Delay, d2	18.9	0.4	12.0		5.4	0.5
Delay (s)	66.2	41.1	29.8		65.2	13.7
Level of Service	E	D	C		E	B
Approach Delay (s)	64.4		29.8			14.5
Approach LOS	E		C			B

Intersection Summary			
HCM Average Control Delay	27.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	84.4%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	95	25	295	90	25	635
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	100	26	311	95	26	668
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1079	358			405	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1079	358			405	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	58	96			98	
cM capacity (veh/h)	236	686			1153	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	126	405	695
Volume Left	100	0	26
Volume Right	26	95	0
cSH	274	1700	1153
Volume to Capacity	0.46	0.24	0.02
Queue Length 95th (ft)	57	0	2
Control Delay (s)	29.0	0.0	0.6
Lane LOS	D		A
Approach Delay (s)	29.0	0.0	0.6
Approach LOS	D		

Intersection Summary			
Average Delay	3.3		
Intersection Capacity Utilization	73.1%	ICU Level of Service	D
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	21	124	15	10	217	62	1072	46	119	2165	31
v/c Ratio	0.24	0.46	0.06	0.06	0.79	0.50	0.57	0.05	0.56	1.02	0.03
Control Delay	45.7	47.9	15.5	40.7	60.9	51.0	16.6	4.3	45.4	33.4	1.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.7	47.9	15.5	40.7	60.9	51.0	16.6	4.3	45.4	33.4	1.1
Queue Length 50th (ft)	13	89	1	7	141	40	362	8	93	~995	3
Queue Length 95th (ft)	38	137	16	22	216	m68	m463	m10	m101	m#1231	m3
Internal Link Dist (ft)		264			427		299			2865	
Turn Bay Length (ft)	115		150			325		100	325		125
Base Capacity (vph)	119	365	322	214	364	156	1896	859	211	2125	954
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.18	0.34	0.05	0.05	0.60	0.40	0.57	0.05	0.56	1.02	0.03

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	120	15	10	115	95	60	1040	45	115	2100	30
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0		4.5	6.5	6.5	4.5	6.5	6.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1630	1716	1458	1630	1599		1630	3260	1458	1630	3260	1458
Flt Permitted	0.33	1.00	1.00	0.59	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	560	1716	1458	1007	1599		1630	3260	1458	1630	3260	1458
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	21	124	15	10	119	98	62	1072	46	119	2165	31
RTOR Reduction (vph)	0	0	13	0	26	0	0	0	11	0	0	4
Lane Group Flow (vph)	21	124	2	10	191	0	62	1072	35	119	2165	27
Turn Type	Perm		Perm	Perm			Prot		Perm	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8					2			6
Actuated Green, G (s)	19.2	19.2	19.2	19.2	19.2		8.4	69.5	69.5	16.8	77.9	77.9
Effective Green, g (s)	18.7	18.7	18.7	18.7	18.7		7.9	69.0	69.0	16.3	77.4	77.4
Actuated g/C Ratio	0.16	0.16	0.16	0.16	0.16		0.07	0.57	0.57	0.14	0.64	0.64
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5		4.0	6.0	6.0	4.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	87	267	227	157	249		107	1875	838	221	2103	940
v/s Ratio Prot		0.07			c0.12		0.04	c0.33		0.07	c0.66	
v/s Ratio Perm	0.04		0.00	0.01					0.02			0.02
v/c Ratio	0.24	0.46	0.01	0.06	0.77		0.58	0.57	0.04	0.54	1.03	0.03
Uniform Delay, d1	44.4	46.1	42.8	43.2	48.6		54.4	16.1	11.1	48.3	21.3	7.7
Progression Factor	0.93	0.94	0.89	1.00	1.00		0.76	0.94	0.58	0.81	0.51	0.14
Incremental Delay, d2	1.4	1.3	0.0	0.2	13.2		5.9	1.0	0.1	1.2	21.9	0.0
Delay (s)	42.6	44.8	38.0	43.4	61.7		47.1	16.1	6.5	40.2	32.8	1.1
Level of Service	D	D	D	D	E		D	B	A	D	C	A
Approach Delay (s)		43.9			60.9			17.4			32.7	
Approach LOS		D			E			B			C	

Intersection Summary			
HCM Average Control Delay	30.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	98.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	EBR	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	205	89	12	111	331	11	616
v/c Ratio	0.61	0.19	0.03	0.33	0.32	0.02	0.61
Control Delay	23.5	5.5	11.5	10.5	7.6	6.0	10.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.5	5.5	11.5	10.5	7.6	6.0	10.9
Queue Length 50th (ft)	36	0	1	13	39	1	87
Queue Length 95th (ft)	124	27	12	51	102	7	229
Internal Link Dist (ft)	427		122		2589		673
Turn Bay Length (ft)		200		175		50	
Base Capacity (vph)	473	610	600	392	1177	661	1156
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.43	0.15	0.02	0.28	0.28	0.02	0.53

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	190	5	85	2	5	5	105	310	5	10	475	110
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Grade (%)		5%			0%			0%			0%	
Total Lost time (s)		4.5	4.5		4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.94		1.00	1.00		1.00	0.97	
Flt Protected		0.95	1.00		0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1595	1422		1606		1630	1712		1630	1667	
Flt Permitted		0.72	1.00		0.94		0.33	1.00		0.56	1.00	
Satd. Flow (perm)		1209	1422		1527		570	1712		962	1667	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	200	5	89	2	5	5	111	326	5	11	500	116
RTOR Reduction (vph)	0	0	69	0	4	0	0	1	0	0	15	0
Lane Group Flow (vph)	0	205	20	0	8	0	111	330	0	11	601	0
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		9.1	9.1		9.1		20.8	20.8		20.8	20.8	
Effective Green, g (s)		8.6	8.6		8.6		20.3	20.3		20.3	20.3	
Actuated g/C Ratio		0.23	0.23		0.23		0.54	0.54		0.54	0.54	
Clearance Time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		2.5	2.5		2.5		2.5	2.5		2.5	2.5	
Lane Grp Cap (vph)		274	323		346		305	917		515	893	
v/s Ratio Prot								0.19			c0.36	
v/s Ratio Perm		c0.17	0.01		0.01		0.19			0.01		
v/c Ratio		0.75	0.06		0.02		0.36	0.36		0.02	0.67	
Uniform Delay, d1		13.6	11.5		11.4		5.1	5.1		4.1	6.4	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		10.1	0.1		0.0		0.5	0.2		0.0	1.8	
Delay (s)		23.7	11.5		11.4		5.6	5.2		4.1	8.2	
Level of Service		C	B		B		A	A		A	A	
Approach Delay (s)		20.1			11.4			5.3			8.1	
Approach LOS		C			B			A			A	

Intersection Summary			
HCM Average Control Delay	9.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	37.9	Sum of lost time (s)	9.0
Intersection Capacity Utilization	70.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	10	15	5	45	15	80	15	210	45	50	635	40
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	11	16	5	47	16	84	16	221	47	53	668	42
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1163	1095	689	1084	1092	245	711			268		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1163	1095	689	1084	1092	245	711			268		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	92	92	99	73	92	89	98			96		
cM capacity (veh/h)	138	201	445	173	202	794	889			1295		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	32	147	284	763
Volume Left	11	47	16	53
Volume Right	5	84	47	42
cSH	190	321	889	1295
Volume to Capacity	0.17	0.46	0.02	0.04
Queue Length 95th (ft)	15	57	1	3
Control Delay (s)	27.7	25.3	0.7	1.1
Lane LOS	D	D	A	A
Approach Delay (s)	27.7	25.3	0.7	1.1
Approach LOS	D	D		

Intersection Summary			
Average Delay	4.6		
Intersection Capacity Utilization	75.6%	ICU Level of Service	D
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	41	149	82	139	62	969	93	41	2144	77
v/c Ratio	0.67	0.70	1.34	0.59	0.48	0.47	0.10	0.38	1.06	0.08
Control Delay	103.8	61.1	275.4	55.1	65.0	14.0	5.8	56.8	46.3	6.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	103.8	61.1	275.4	55.1	65.0	14.0	5.8	56.8	46.3	6.3
Queue Length 50th (ft)	32	99	~83	96	47	201	11	34	~977	8
Queue Length 95th (ft)	#94	162	#189	156	92	310	40	m31	m#953	m7
Internal Link Dist (ft)		3106		771		404			767	
Turn Bay Length (ft)	75				325		100	175		200
Base Capacity (vph)	61	361	61	361	130	2061	942	145	2026	921
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.67	0.41	1.34	0.39	0.48	0.47	0.10	0.28	1.06	0.08

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	100	45	80	105	30	60	940	90	40	2080	75
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	5.5	5.5	4.5	5.5	5.5
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.95		1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1630	1636		1630	1658		1630	3260	1458	1630	3260	1458
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1630	1636		1630	1658		1630	3260	1458	1630	3260	1458
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	41	103	46	82	108	31	62	969	93	41	2144	77
RTOR Reduction (vph)	0	15	0	0	9	0	0	0	21	0	0	16
Lane Group Flow (vph)	41	134	0	82	130	0	62	969	72	41	2144	61
Turn Type	Prot			Prot			Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			6
Actuated Green, G (s)	4.0	15.9		5.0	16.9		8.6	74.7	74.7	7.4	73.5	73.5
Effective Green, g (s)	3.5	15.4		4.5	16.4		8.1	74.2	74.2	6.9	73.0	73.0
Actuated g/C Ratio	0.03	0.13		0.04	0.14		0.07	0.62	0.62	0.06	0.61	0.61
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	5.0	5.0	4.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	48	210		61	227		110	2016	902	94	1983	887
v/s Ratio Prot	0.03	c0.08		c0.05	0.08		c0.04	0.30		0.03	c0.66	
v/s Ratio Perm									0.05			0.04
v/c Ratio	0.85	0.64		1.34	0.57		0.56	0.48	0.08	0.44	1.08	0.07
Uniform Delay, d1	58.0	49.7		57.8	48.5		54.2	12.4	9.2	54.7	23.5	9.6
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.06	0.67	0.95
Incremental Delay, d2	76.9	6.3		231.9	3.4		6.5	0.8	0.2	0.3	37.6	0.0
Delay (s)	134.9	55.9		289.6	51.9		60.7	13.3	9.4	58.0	53.2	9.1
Level of Service	F	E		F	D		E	B	A	E	D	A
Approach Delay (s)		73.0			140.1			15.6			51.8	
Approach LOS		E			F			B			D	

Intersection Summary			
HCM Average Control Delay	47.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	88.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	70	155	60	430	515	115
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	74	163	63	453	542	121
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		4				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1182	603	663			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1182	603	663			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	62	67	93			
cM capacity (veh/h)	195	499	926			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	237	516	663
Volume Left	74	63	0
Volume Right	163	0	121
cSH	628	926	1700
Volume to Capacity	0.38	0.07	0.39
Queue Length 95th (ft)	44	5	0
Control Delay (s)	21.4	1.9	0.0
Lane LOS	C	A	
Approach Delay (s)	21.4	1.9	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	4.3		
Intersection Capacity Utilization	80.6%	ICU Level of Service	D
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	21	68	63	153	105	68
v/c Ratio	0.09	0.20	0.26	0.44	0.10	0.07
Control Delay	18.2	14.9	28.5	28.6	2.0	3.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.2	14.9	28.5	28.6	2.0	3.0
Queue Length 50th (ft)	6	13	44	100	1	3
Queue Length 95th (ft)	20	39	m77	161	16	16
Internal Link Dist (ft)		1888		264	174	146
Turn Bay Length (ft)	50		130			
Base Capacity (vph)	403	600	438	612	1076	1040
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.11	0.14	0.25	0.10	0.07

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	45	20	60	115	30	5	5	90	20	5	40
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.95		1.00	0.97			0.88			0.92	
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.98	
Satd. Flow (prot)	1630	1636		1630	1662			1503			1549	
Flt Permitted	0.65	1.00		0.71	1.00			0.99			0.93	
Satd. Flow (perm)	1124	1636		1223	1662			1497			1469	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	21	47	21	63	121	32	5	5	95	21	5	42
RTOR Reduction (vph)	0	17	0	0	21	0	0	31	0	0	14	0
Lane Group Flow (vph)	21	51	0	63	132	0	0	74	0	0	54	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	11.2	11.2		11.2	11.2			40.8			40.8	
Effective Green, g (s)	10.7	10.7		10.7	10.7			40.3			40.3	
Actuated g/C Ratio	0.18	0.18		0.18	0.18			0.67			0.67	
Clearance Time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	200	292		218	296			1005			987	
v/s Ratio Prot		0.03			c0.08							
v/s Ratio Perm	0.02			0.05				c0.05			0.04	
v/c Ratio	0.10	0.17		0.29	0.45			0.07			0.05	
Uniform Delay, d1	20.6	20.9		21.4	22.0			3.4			3.4	
Progression Factor	1.00	1.00		1.39	1.51			1.00			1.00	
Incremental Delay, d2	0.2	0.3		0.7	1.0			0.1			0.1	
Delay (s)	20.9	21.2		30.4	34.2			3.5			3.5	
Level of Service	C	C		C	C			A			A	
Approach Delay (s)		21.1			33.1			3.5			3.5	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	20.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.15		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	34.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	100	0	1145	2105	20
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	105	0	1205	2216	21
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				871	379	
pX, platoon unblocked	0.47	0.37	0.37			
vC, conflicting volume	2818	1108	2237			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	637	0	910			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	73	100			
cM capacity (veh/h)	192	396	272			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	105	603	603	1108	1108	21
Volume Left	0	0	0	0	0	0
Volume Right	105	0	0	0	0	21
cSH	396	1700	1700	1700	1700	1700
Volume to Capacity	0.27	0.35	0.35	0.65	0.65	0.01
Queue Length 95th (ft)	26	0	0	0	0	0
Control Delay (s)	17.4	0.0	0.0	0.0	0.0	0.0
Lane LOS	C					
Approach Delay (s)	17.4	0.0		0.0		
Approach LOS	C					

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	77.4%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	65	0	0	35	10	1110	10	0	2140	65
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	0	68	0	0	37	11	1168	11	0	2253	68
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								449			801	
pX, platoon unblocked	0.48	0.48	0.37	0.48	0.48	0.79	0.37			0.79		
vC, conflicting volume	2929	3487	1161	2389	3516	589	2321			1179		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	879	2042	0	0	2102	0	1187			694		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	83	100	100	96	95			100		
cM capacity (veh/h)	107	25	406	393	23	856	219			709		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	68	37	11	779	400	1502	819
Volume Left	0	0	11	0	0	0	0
Volume Right	68	37	0	0	11	0	68
cSH	406	856	219	1700	1700	1700	1700
Volume to Capacity	0.17	0.04	0.05	0.46	0.24	0.88	0.48
Queue Length 95th (ft)	15	3	4	0	0	0	0
Control Delay (s)	15.7	9.4	22.3	0.0	0.0	0.0	0.0
Lane LOS	C	A	C				
Approach Delay (s)	15.7	9.4	0.2			0.0	
Approach LOS	C	A					

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	78.3%	ICU Level of Service	D
Analysis Period (min)	15		

Lane Group	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	295	331	26	1094	105	2216
v/c Ratio	1.02	1.56	0.27	0.58	0.66	1.06
Control Delay	104.0	307.0	48.0	9.2	59.5	56.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	104.0	307.0	48.0	9.2	59.5	56.7
Queue Length 50th (ft)	~234	~362	19	92	75	~1079
Queue Length 95th (ft)	#414	#550	m43	108	m72	m#1062
Internal Link Dist (ft)	213	283		432		369
Turn Bay Length (ft)			150		150	
Base Capacity (vph)	288	212	115	1882	211	2100
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.02	1.56	0.23	0.58	0.50	1.06

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	50	150	80	95	175	45	25	1035	5	100	2025	80
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.96			0.98		1.00	1.00		1.00	0.99	
Flt Protected		0.99			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1635			1658		1630	3258		1630	3241	
Flt Permitted		0.79			0.58		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1300			975		1630	3258		1630	3241	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	53	158	84	100	184	47	26	1089	5	105	2132	84
RTOR Reduction (vph)	0	12	0	0	5	0	0	0	0	0	2	0
Lane Group Flow (vph)	0	283	0	0	326	0	26	1094	0	105	2214	0
Turn Type	Perm			Perm			Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		26.0			26.0		5.4	69.8		12.2	76.6	
Effective Green, g (s)		25.5			25.5		4.9	69.3		11.7	76.1	
Actuated g/C Ratio		0.21			0.21		0.04	0.58		0.10	0.63	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		2.5			2.5		2.5	2.5		2.5	2.5	
Lane Grp Cap (vph)		276			207		67	1881		159	2055	
v/s Ratio Prot							0.02	c0.34		0.06	c0.68	
v/s Ratio Perm		0.22			c0.33							
v/c Ratio		1.03			1.58		0.39	0.58		0.66	1.08	
Uniform Delay, d1		47.2			47.2		56.1	16.1		52.2	22.0	
Progression Factor		1.00			1.00		0.78	0.47		0.99	1.24	
Incremental Delay, d2		61.0			281.2		2.5	1.2		3.6	39.0	
Delay (s)		108.3			328.5		46.2	8.8		55.4	66.3	
Level of Service		F			F		D	A		E	E	
Approach Delay (s)		108.3			328.5			9.7			65.8	
Approach LOS		F			F			A			E	

Intersection Summary			
HCM Average Control Delay	74.8	HCM Level of Service	E
HCM Volume to Capacity ratio	1.14		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	109.3%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	40	0	0	75	10	990	10	0	2155	45
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	0	42	0	0	79	11	1042	11	0	2268	47
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								847			512	
pX, platoon unblocked	0.46	0.46	0.38	0.46	0.46	0.85	0.38			0.85		
vC, conflicting volume	2913	3366	1158	2245	3384	526	2316			1053		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1311	2306	0	0	2346	85	1196			705		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	90	100	100	90	95			100		
cM capacity (veh/h)	46	16	411	402	15	812	220			754		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	42	79	11	695	358	1512	804
Volume Left	0	0	11	0	0	0	0
Volume Right	42	79	0	0	11	0	47
cSH	411	812	220	1700	1700	1700	1700
Volume to Capacity	0.10	0.10	0.05	0.41	0.21	0.89	0.47
Queue Length 95th (ft)	8	8	4	0	0	0	0
Control Delay (s)	14.7	9.9	22.2	0.0	0.0	0.0	0.0
Lane LOS	B	A	C				
Approach Delay (s)	14.7	9.9	0.2			0.0	
Approach LOS	B	A					

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	77.1%	ICU Level of Service	D
Analysis Period (min)	15		

1: SE River Rd & SE McLoughlin Blvd Performance by approach

Approach	NB	SE	NW	All
Total Delay (hr)	5.6	17.2	4.4	27.2
Delay / Veh (s)	63.6	30.5	13.6	27.9

2: SE Park Ave & SE River Rd Performance by approach

Approach	WB	NB	SB	All
Total Delay (hr)	1.0	0.3	0.4	1.7
Delay / Veh (s)	23.5	2.7	2.0	5.0

3: SE Park Ave & SE McLoughlin Blvd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	2.3	3.4	4.7	133.5	143.9
Delay / Veh (s)	52.7	56.5	14.6	231.3	143.1

4: SE Park Ave & SE Oatfield Rd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	0.9	0.0	1.7	1.9	4.5
Delay / Veh (s)	11.7	8.2	12.8	11.5	12.0

5: Courtney Ave & SE River Rd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	0.1	0.7	0.1	1.2	2.1
Delay / Veh (s)	13.6	11.9	1.1	5.9	6.1

6: Courtney Ave & SE McLoughlin Blvd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	2.9	25.2	4.4	19.3	51.8
Delay / Veh (s)	53.4	449.2	14.4	35.2	53.6

7: Courtney Ave & SE Oatfield Rd Performance by approach

Approach	EB	NB	SB	All
Total Delay (hr)	1.5	16.5	2.6	20.6
Delay / Veh (s)	24.2	122.2	15.0	55.9

8: SE Park Ave & 27th Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	0.5	1.6	0.1	0.1	2.2
Delay / Veh (s)	14.6	28.7	2.0	5.0	16.6

9: Park & Ride #2 & SE McLoughlin Blvd Performance by approach

Approach	EB	NB	SB	All
Total Delay (hr)	6.0	0.8	6.1	12.9
Delay / Veh (s)	211.4	2.6	11.2	14.4

12: Silver Springs & SE McLoughlin Blvd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	22.3	0.1	0.7	10.0	33.2
Delay / Veh (s)	2295.1	15.3	2.3	17.8	36.9

15: Cinderella & SE McLoughlin Blvd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	31.0	62.7	3.0	15.2	111.8
Delay / Veh (s)	451.5	976.8	9.7	27.5	112.8

18: Loeffelman & SE McLoughlin Blvd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	0.4	0.3	1.0	3.7	5.3
Delay / Veh (s)	38.2	12.2	3.4	6.7	6.1

Total Network Performance

Total Delay (hr)	420.7
Delay / Veh (s)	235.6

1: SE River Rd & SE McLoughlin Blvd Performance by movement

Movement	NBL	NBT	NBR	SET	NWL	NWT	All
Total Delay (hr)	5.4	0.0	0.2	17.2	0.2	4.2	27.2
Delay / Veh (s)	76.8	0.9	40.1	30.5	74.6	12.9	27.9

2: SE Park Ave & SE River Rd Performance by movement

Movement	WBL	WBT	WBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	0.8	0.0	0.2	0.2	0.1	0.0	0.3	1.7
Delay / Veh (s)	32.3	1.9	24.6	2.8	2.5	4.7	1.9	5.0

3: SE Park Ave & SE McLoughlin Blvd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	0.4	1.8	0.2	0.1	2.0	1.3	1.0	3.7	0.1	8.3	123.7	1.4
Delay / Veh (s)	57.5	53.6	38.9	48.7	65.1	47.8	56.7	12.5	4.9	280.9	229.3	182.8

3: SE Park Ave & SE McLoughlin Blvd Performance by movement

Movement	All
Total Delay (hr)	143.9
Delay / Veh (s)	143.1

4: SE Park Ave & SE Oatfield Rd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	0.7	0.0	0.2	0.0	0.0	0.0	0.8	0.9	0.0	0.0	1.5	0.3
Delay / Veh (s)	13.8	14.0	7.0	15.3	12.2	2.9	30.0	8.3	7.8	16.2	11.8	9.6

4: SE Park Ave & SE Oatfield Rd Performance by movement

Movement	All
Total Delay (hr)	4.5
Delay / Veh (s)	12.0

5: Courtney Ave & SE River Rd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	0.0	0.1	0.0	0.3	0.1	0.3	0.0	0.1	0.0	0.1	1.0	0.1
Delay / Veh (s)	17.2	13.3	9.9	23.2	4.9	14.7	5.6	0.9	0.6	7.8	5.8	5.0

5: Courtney Ave & SE River Rd Performance by movement

Movement	All
Total Delay (hr)	2.1
Delay / Veh (s)	6.1

6: Courtney Ave & SE McLoughlin Blvd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	1.1	1.3	0.5	14.2	8.5	2.5	1.0	3.2	0.2	0.6	18.3	0.4
Delay / Veh (s)	78.8	47.4	39.8	655.7	324.8	302.2	65.9	11.9	8.5	63.6	35.3	18.5

6: Courtney Ave & SE McLoughlin Blvd Performance by movement

Movement	All
Total Delay (hr)	51.8
Delay / Veh (s)	53.6

7: Courtney Ave & SE Oatfield Rd Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Total Delay (hr)	0.9	0.0	0.6	2.5	14.0	2.1	0.5	20.6
Delay / Veh (s)	44.4	1.2	15.2	146.4	119.1	14.8	15.9	55.9

8: SE Park Ave & 27th Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	0.1	0.3	0.1	0.4	1.0	0.2	0.0	0.0	0.0	0.1	0.0	0.0
Delay / Veh (s)	26.4	13.1	9.7	28.3	31.1	21.7	7.1	3.1	1.7	9.8	6.3	2.6

8: SE Park Ave & 27th Performance by movement

Movement	All
Total Delay (hr)	2.2
Delay / Veh (s)	16.6

9: Park & Ride #2 & SE McLoughlin Blvd Performance by movement

Movement	EBR	NBT	SBT	SBR	All
Total Delay (hr)	6.0	0.8	6.0	0.0	12.9
Delay / Veh (s)	211.4	2.6	11.2	5.6	14.4

12: Silver Springs & SE McLoughlin Blvd Performance by movement

Movement	EBR	WBR	NBL	NBT	NBR	SBT	SBR	All
Total Delay (hr)	22.3	0.1	0.1	0.6	0.0	9.7	0.3	33.2
Delay / Veh (s)	2295.1	15.3	45.4	2.0	1.4	17.8	16.7	36.9

15: Cinderella & SE McLoughlin Blvd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	5.3	16.0	9.7	18.2	35.0	9.5	0.4	2.5	0.0	2.0	12.7	0.5
Delay / Veh (s)	420.4	443.8	478.1	934.4	1007.7	951.8	55.1	8.5	12.0	81.5	25.1	24.5

15: Cinderella & SE McLoughlin Blvd Performance by movement

Movement	All
Total Delay (hr)	111.8
Delay / Veh (s)	112.8

18: Loeffelman & SE McLoughlin Blvd Performance by movement

Movement	EBR	WBR	NBL	NBT	NBR	SBT	SBR	All
Total Delay (hr)	0.4	0.3	0.1	0.9	0.0	3.6	0.1	5.3
Delay / Veh (s)	38.2	12.2	40.7	3.0	2.7	6.7	6.5	6.1

Total Network Performance

Total Delay (hr)	420.7
Delay / Veh (s)	235.6

Intersection: 1: SE River Rd & SE McLoughlin Blvd

Movement	NB	NB	SE	SE	NW	NW	NW
Directions Served	L	R	T	T	L	T	T
Maximum Queue (ft)	459	114	791	787	71	160	253
Average Queue (ft)	258	11	447	469	12	68	106
95th Queue (ft)	436	65	785	790	43	142	207
Link Distance (ft)	1198		766	766		2863	2863
Upstream Blk Time (%)			3	4			
Queuing Penalty (veh)			0	0			
Storage Bay Dist (ft)		90			300		
Storage Blk Time (%)	56	0					
Queuing Penalty (veh)	11	0					

Intersection: 2: SE Park Ave & SE River Rd

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (ft)	166	12	80
Average Queue (ft)	71	0	11
95th Queue (ft)	140	9	51
Link Distance (ft)	1902	2675	1416
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: SE Park Ave & SE McLoughlin Blvd

Movement	EB	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	TR	L	T	T	R	L	T	T
Maximum Queue (ft)	86	242	91	274	325	204	367	379	274	444	2359	2336
Average Queue (ft)	23	102	12	52	181	63	180	217	25	139	1727	1723
95th Queue (ft)	65	204	54	252	325	134	328	370	121	338	2568	2538
Link Distance (ft)		264		414			309	309			2863	2863
Upstream Blk Time (%)		1	0	2		0	0	1			0	0
Queuing Penalty (veh)		1	0	5		0	3	7			3	3
Storage Bay Dist (ft)	115		150		200	325			100	325		
Storage Blk Time (%)	0	10			13	0	0	12	0	0	31	36
Queuing Penalty (veh)	0	4			1	0	0	5	0	0	35	11

Intersection: 3: SE Park Ave & SE McLoughlin Blvd

Movement	SB
Directions Served	R
Maximum Queue (ft)	300
Average Queue (ft)	28
95th Queue (ft)	151
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	125
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 4: SE Park Ave & SE Oatfield Rd

Movement	EB	EB	WB	NB	NB	SB	SB
Directions Served	LT	R	LTR	L	TR	L	TR
Maximum Queue (ft)	192	101	28	174	237	39	415
Average Queue (ft)	79	28	5	64	73	6	158
95th Queue (ft)	163	69	22	133	170	26	313
Link Distance (ft)	414		163		2598		722
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)		200		175		50	
Storage Blk Time (%)	0			1	1	0	22
Queuing Penalty (veh)	0			3	1	1	2

Intersection: 5: Courtney Ave & SE River Rd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	66	151	86	109
Average Queue (ft)	25	66	9	22
95th Queue (ft)	54	125	46	76
Link Distance (ft)	495	3104	492	2675
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 6: Courtney Ave & SE McLoughlin Blvd

Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	T	R	L	T	T	R
Maximum Queue (ft)	153	205	732	230	131	288	304	100	149	796	805	373
Average Queue (ft)	55	106	493	184	52	160	169	22	34	500	523	70
95th Queue (ft)	119	187	880	299	107	274	276	68	91	787	811	271
Link Distance (ft)		3104	753			448	448			780	780	
Upstream Blk Time (%)			15							1	1	
Queuing Penalty (veh)			25							10	14	
Storage Bay Dist (ft)	75			75	325			100	175			200
Storage Blk Time (%)	13	28	90	23		0	14		0	30	30	
Queuing Penalty (veh)	18	11	122	18		0	12		0	12	23	

Intersection: 7: Courtney Ave & SE Oatfield Rd

Movement	EB	EB	NB	SB
Directions Served	L	R	LT	TR
Maximum Queue (ft)	171	163	472	639
Average Queue (ft)	56	58	190	116
95th Queue (ft)	118	116	537	512
Link Distance (ft)	753		521	2598
Upstream Blk Time (%)			17	
Queuing Penalty (veh)			0	
Storage Bay Dist (ft)		100		
Storage Blk Time (%)	6	3		
Queuing Penalty (veh)	9	2		

Intersection: 8: SE Park Ave & 27th

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LTR	LTR
Maximum Queue (ft)	61	121	154	244	63	59
Average Queue (ft)	17	41	58	121	24	24
95th Queue (ft)	48	89	124	226	55	54
Link Distance (ft)		1902		264	224	195
Upstream Blk Time (%)				0		
Queuing Penalty (veh)				0		
Storage Bay Dist (ft)	50		130			
Storage Blk Time (%)	1	6	0	7		
Queuing Penalty (veh)	1	1	0	4		

Intersection: 9: Park & Ride #2 & SE McLoughlin Blvd

Movement	EB	NB	NB	SB	SB	SB
Directions Served	R	T	T	T	T	R
Maximum Queue (ft)	186	42	75	376	378	114
Average Queue (ft)	139	1	5	172	178	4
95th Queue (ft)	223	23	37	397	398	49
Link Distance (ft)	159	371	371	309	309	
Upstream Blk Time (%)	44			3	4	
Queuing Penalty (veh)	0			35	40	
Storage Bay Dist (ft)						50
Storage Blk Time (%)					13	
Queuing Penalty (veh)					3	

Intersection: 12: Silver Springs & SE McLoughlin Blvd

Movement	EB	WB	NB	SB	SB
Directions Served	R	R	L	T	TR
Maximum Queue (ft)	188	73	52	459	449
Average Queue (ft)	156	26	9	346	355
95th Queue (ft)	221	61	33	593	590
Link Distance (ft)	162	261		371	371
Upstream Blk Time (%)	80			10	12
Queuing Penalty (veh)	0			114	131
Storage Bay Dist (ft)			200		
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 15: Cinderella & SE McLoughlin Blvd

Movement	EB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	LTR	L	T	TR	L	T	TR
Maximum Queue (ft)	283	354	100	200	243	166	431	435
Average Queue (ft)	267	335	28	97	121	85	390	398
95th Queue (ft)	276	351	71	171	196	169	471	459
Link Distance (ft)	248	317		452	452		390	390
Upstream Blk Time (%)	81	86					16	18
Queuing Penalty (veh)	0	0					176	197
Storage Bay Dist (ft)			150			150		
Storage Blk Time (%)			0	1		4	25	
Queuing Penalty (veh)			0	0		37	25	

Intersection: 18: Loeffelman & SE McLoughlin Blvd

Movement	EB	WB	NB	SB	SB
Directions Served	R	R	L	T	TR
Maximum Queue (ft)	94	92	54	316	365
Average Queue (ft)	33	38	9	23	37
95th Queue (ft)	77	72	34	151	205
Link Distance (ft)	952	426		452	452
Upstream Blk Time (%)				0	0
Queuing Penalty (veh)				2	2
Storage Bay Dist (ft)			150		
Storage Blk Time (%)					
Queuing Penalty (veh)					

Network Summary

Network wide Queuing Penalty: 1144

Arterial Level of Service: NB SE River Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Courtney Ave	5	0.9	12.6	0.1	30
SE Park Ave	2	2.5	55.8	0.5	34
	22	1.7	35.8	0.3	28
SE McLoughlin Blvd	1	76.8	105.8	0.2	8
Total		82.0	210.0	1.1	20

Arterial Level of Service: SB SE River Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
	22	0.9	32.3	0.2	27
SE Park Ave	2	1.9	18.6	0.3	56
	5	5.9	68.5	0.5	27
Total		8.8	119.4	1.0	32

Arterial Level of Service: NW SE McLoughlin Blvd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Courtney Ave	6	11.9	20.8	0.1	17
Loeffelman	18	3.2	17.7	0.2	33
Cinderella	15	7.8	16.6	0.1	21
Silver Springs	12	2.1	9.8	0.1	31
Park & Ride #2	9	2.6	10.0	0.1	29
SE Park Ave	3	12.5	18.7	0.1	14
SE River Rd	1	12.9	61.8	0.6	32
Total		53.0	155.5	1.1	27

Arterial Level of Service: SB SE McLoughlin Blvd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
SE River Rd	1	30.5	43.7	0.1	14
SE Park Ave	3	229.9	279.7	0.6	11
Park & Ride #2	9	11.3	17.8	0.1	15
	12	18.4	25.8	0.1	11
Cinderella	15	24.9	32.6	0.1	9
Loeffelman	18	7.1	15.9	0.1	22
Courtney Ave	6	35.2	49.6	0.2	12
Total		357.3	465.0	1.2	12

Arterial Level of Service: NB SE Oatfield Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Courtney Ave	7	119.1	131.3	0.1	8
SE Park Ave	4	8.6	56.0	0.5	33
Total		127.6	187.3	0.6	22

Arterial Level of Service: SB SE Oatfield Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
SE Park Ave	4	11.8	28.8	0.1	18
Courtney Ave	7	15.1	64.6	0.5	28
Total		27.0	93.3	0.6	25

Land Use 2

Option 1 (2 Signals)

Option 2 (1 Signal)

Queues
1: SE River Rd & SE McLoughlin Blvd

9/26/2011

Lane Group	NBL	NBR	SET	NWL	NWT
Lane Group Flow (vph)	268	21	2289	16	1216
v/c Ratio	0.81	0.08	1.00	0.21	0.50
Control Delay	66.9	28.4	38.8	77.3	5.5
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	66.9	28.4	38.8	77.3	5.5
Queue Length 50th (ft)	201	7	717	13	84
Queue Length 95th (ft)	#336	31	#1194	m20	133
Internal Link Dist (ft)	1200		698		2865
Turn Bay Length (ft)		90		300	
Base Capacity (vph)	331	267	2281	211	2431
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.81	0.08	1.00	0.08	0.50

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	NBL	NBR	SET	SER	NWL	NWT
Lane Configurations						
Volume (vph)	255	20	2175	0	15	1155
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5	5.5		4.5	4.5
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frt	1.00	0.85	1.00		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1850	1444	3260		1630	3260
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1850	1444	3260		1630	3260
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	268	21	2289	0	16	1216
RTOR Reduction (vph)	0	8	0	0	0	0
Lane Group Flow (vph)	268	13	2289	0	16	1216
Heavy Vehicles (%)	3%	3%	2%	2%	2%	2%
Turn Type		Prot			Prot	
Protected Phases	7	7	6		5	
Permitted Phases			6			2
Actuated Green, G (s)	22.0	22.0	82.1		2.9	90.0
Effective Green, g (s)	21.5	21.5	81.6		2.4	89.5
Actuated g/C Ratio	0.18	0.18	0.68		0.02	0.75
Clearance Time (s)	4.0	4.0	5.0		4.0	4.0
Vehicle Extension (s)	2.3	2.3	8.0		2.3	2.3
Lane Grp Cap (vph)	331	259	2217		33	2431
v/s Ratio Prot	c0.14	0.01	c0.70		0.01	
v/s Ratio Perm						c0.37
v/c Ratio	0.81	0.05	1.03		0.48	0.50
Uniform Delay, d1	47.3	40.8	19.2		58.2	6.2
Progression Factor	1.00	1.00	1.00		1.32	0.78
Incremental Delay, d2	18.9	0.4	28.1		5.2	0.6
Delay (s)	66.2	41.1	47.3		82.1	5.4
Level of Service	E	D	D		F	A
Approach Delay (s)	64.4		47.3			6.4
Approach LOS	E		D			A

Intersection Summary			
HCM Average Control Delay	35.4	HCM Level of Service	D
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	88.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	105	30	295	100	30	635
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	111	32	311	105	32	668
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1095	363			416	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1095	363			416	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	52	95			97	
cM capacity (veh/h)	230	682			1143	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	142	416	700
Volume Left	111	0	32
Volume Right	32	105	0
cSH	270	1700	1143
Volume to Capacity	0.53	0.24	0.03
Queue Length 95th (ft)	71	0	2
Control Delay (s)	32.3	0.0	0.7
Lane LOS	D		A
Approach Delay (s)	32.3	0.0	0.7
Approach LOS	D		

Intersection Summary			
Average Delay	4.1		
Intersection Capacity Utilization	78.6%	ICU Level of Service	D
Analysis Period (min)	15		

Queues
3: SE Park Ave & SE McLoughlin Blvd

9/26/2011

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	21	124	26	41	217	88	1155	57	119	2268	31
v/c Ratio	0.24	0.46	0.10	0.26	0.79	0.63	0.61	0.07	0.56	1.11	0.03
Control Delay	45.3	47.4	13.2	46.5	60.9	88.1	6.2	1.2	42.8	70.1	1.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.0	0.0
Total Delay	45.3	47.4	13.2	46.5	60.9	88.1	6.2	1.2	42.8	98.1	1.3
Queue Length 50th (ft)	13	88	0	28	141	71	45	0	93	~1109	3
Queue Length 95th (ft)	38	138	19	60	216	m110	m95	m4	m93	m#1191	m2
Internal Link Dist (ft)		264			427		297			2865	
Turn Bay Length (ft)	115		150			325		100	325		125
Base Capacity (vph)	119	365	330	214	364	161	1896	860	211	2035	914
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	3	1	0	0	0	0	0	110	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.18	0.34	0.08	0.19	0.60	0.55	0.61	0.07	0.56	1.18	0.03

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	120	25	40	115	95	85	1120	55	115	2200	30
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0		4.5	6.5	6.5	4.5	6.5	6.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1630	1716	1458	1630	1599		1630	3260	1458	1630	3260	1458
Flt Permitted	0.33	1.00	1.00	0.59	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	560	1716	1458	1007	1599		1630	3260	1458	1630	3260	1458
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	21	124	26	41	119	98	88	1155	57	119	2268	31
RTOR Reduction (vph)	0	0	22	0	26	0	0	0	13	0	0	4
Lane Group Flow (vph)	21	124	4	41	191	0	88	1155	44	119	2268	27
Turn Type	Perm		Perm	Perm			Prot		Perm	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8					2			6
Actuated Green, G (s)	19.2	19.2	19.2	19.2	19.2		10.9	70.3	70.3	16.0	75.4	75.4
Effective Green, g (s)	18.7	18.7	18.7	18.7	18.7		10.4	69.8	69.8	15.5	74.9	74.9
Actuated g/C Ratio	0.16	0.16	0.16	0.16	0.16		0.09	0.58	0.58	0.13	0.62	0.62
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5		4.0	6.0	6.0	4.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	87	267	227	157	249		141	1896	848	211	2035	910
v/s Ratio Prot		0.07			c0.12		0.05	c0.35		0.07	c0.70	
v/s Ratio Perm	0.04		0.00	0.04					0.03			0.02
v/c Ratio	0.24	0.46	0.02	0.26	0.77		0.62	0.61	0.05	0.56	1.11	0.03
Uniform Delay, d1	44.4	46.1	42.9	44.6	48.6		52.9	16.3	10.8	49.1	22.5	8.6
Progression Factor	0.92	0.93	0.88	1.00	1.00		1.40	0.30	0.14	0.79	0.51	0.15
Incremental Delay, d2	1.4	1.3	0.0	0.9	13.2		6.1	1.1	0.1	1.1	54.2	0.0
Delay (s)	42.2	44.2	37.6	45.5	61.7		80.0	5.9	1.7	39.8	65.6	1.3
Level of Service	D	D	D	D	E		F	A	A	D	E	A
Approach Delay (s)		42.9			59.1			10.7			63.5	
Approach LOS		D			E			B			E	

Intersection Summary			
HCM Average Control Delay	45.9	HCM Level of Service	D
HCM Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	102.5%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	EBR	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	205	111	12	111	458	11	736
v/c Ratio	0.64	0.24	0.03	0.40	0.42	0.02	0.69
Control Delay	27.1	5.7	12.5	13.1	8.4	6.0	13.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.1	5.7	12.5	13.1	8.4	6.0	13.4
Queue Length 50th (ft)	46	0	1	16	66	1	131
Queue Length 95th (ft)	124	30	12	63	152	7	#350
Internal Link Dist (ft)	427		122		2589		673
Turn Bay Length (ft)		200		175		50	
Base Capacity (vph)	432	579	550	301	1160	539	1138
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.47	0.19	0.02	0.37	0.39	0.02	0.65

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	190	5	105	2	5	5	105	430	5	10	560	140
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Grade (%)		5%			0%			0%			0%	
Total Lost time (s)		4.5	4.5		4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.94		1.00	1.00		1.00	0.97	
Flt Protected		0.95	1.00		0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1595	1422		1606		1630	1713		1630	1664	
Flt Permitted		0.72	1.00		0.95		0.26	1.00		0.46	1.00	
Satd. Flow (perm)		1209	1422		1532		444	1713		795	1664	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	200	5	111	2	5	5	111	453	5	11	589	147
RTOR Reduction (vph)	0	0	87	0	4	0	0	0	0	0	14	0
Lane Group Flow (vph)	0	205	24	0	8	0	111	458	0	11	722	0
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		9.9	9.9		9.9		25.5	25.5		25.5	25.5	
Effective Green, g (s)		9.4	9.4		9.4		25.0	25.0		25.0	25.0	
Actuated g/C Ratio		0.22	0.22		0.22		0.58	0.58		0.58	0.58	
Clearance Time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		2.5	2.5		2.5		2.5	2.5		2.5	2.5	
Lane Grp Cap (vph)		262	308		332		256	987		458	959	
v/s Ratio Prot								0.27			c0.43	
v/s Ratio Perm		c0.17	0.02		0.01		0.25			0.01		
v/c Ratio		0.78	0.08		0.02		0.43	0.46		0.02	0.75	
Uniform Delay, d1		16.0	13.5		13.4		5.2	5.3		4.0	6.9	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		13.6	0.1		0.0		0.9	0.3		0.0	3.2	
Delay (s)		29.7	13.6		13.4		6.1	5.6		4.0	10.1	
Level of Service		C	B		B		A	A		A	B	
Approach Delay (s)		24.0			13.4			5.7			10.0	
Approach LOS		C			B			A			B	

Intersection Summary			
HCM Average Control Delay	11.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	43.4	Sum of lost time (s)	9.0
Intersection Capacity Utilization	77.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	10	15	5	70	15	80	15	210	55	50	635	40
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	11	16	5	74	16	84	16	221	58	53	668	42
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1168	1105	689	1089	1097	250	711			279		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1168	1105	689	1089	1097	250	711			279		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	92	92	99	57	92	89	98			96		
cM capacity (veh/h)	137	198	445	171	201	789	889			1284		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	32	174	295	763
Volume Left	11	74	16	53
Volume Right	5	84	58	42
cSH	188	282	889	1284
Volume to Capacity	0.17	0.62	0.02	0.04
Queue Length 95th (ft)	15	94	1	3
Control Delay (s)	28.0	36.3	0.7	1.1
Lane LOS	D	E	A	A
Approach Delay (s)	28.0	36.3	0.7	1.1
Approach LOS	D	E		

Intersection Summary			
Average Delay	6.5		
Intersection Capacity Utilization	79.5%	ICU Level of Service	D
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	52	149	82	139	62	1052	93	41	2397	103
v/c Ratio	0.85	0.70	1.34	0.66	0.48	0.51	0.10	0.38	1.18	0.11
Control Delay	136.2	61.1	275.4	60.3	65.0	14.7	6.2	59.7	102.0	4.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	0.0
Total Delay	136.2	61.1	275.4	60.3	65.0	14.7	6.2	59.7	104.6	4.6
Queue Length 50th (ft)	41	99	~83	96	47	227	12	33	~1200	12
Queue Length 95th (ft)	#120	162	#189	156	92	347	41	m29	m#1023	m4
Internal Link Dist (ft)		3106		771		404			767	
Turn Bay Length (ft)	75				325		100	175		200
Base Capacity (vph)	61	361	61	361	130	2061	941	145	2026	925
Starvation Cap Reductn	0	0	0	0	0	0	0	0	10	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.85	0.41	1.34	0.39	0.48	0.51	0.10	0.28	1.19	0.11

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	50	100	45	80	105	30	60	1020	90	40	2325	100
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	5.5	5.5	4.5	5.5	5.5
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.95		1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1630	1636		1630	1658		1630	3260	1458	1630	3260	1458
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1630	1636		1630	1658		1630	3260	1458	1630	3260	1458
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	52	103	46	82	108	31	62	1052	93	41	2397	103
RTOR Reduction (vph)	0	15	0	0	10	0	0	0	19	0	0	18
Lane Group Flow (vph)	52	134	0	82	129	0	62	1052	74	41	2397	85
Turn Type	Prot			Prot			Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			6
Actuated Green, G (s)	5.0	15.1		5.0	15.1		8.6	75.5	75.5	7.4	74.3	74.3
Effective Green, g (s)	4.5	14.6		4.5	14.6		8.1	75.0	75.0	6.9	73.8	73.8
Actuated g/C Ratio	0.04	0.12		0.04	0.12		0.07	0.62	0.62	0.06	0.62	0.62
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	5.0	5.0	4.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	61	199		61	202		110	2038	911	94	2005	897
v/s Ratio Prot	0.03	c0.08		c0.05	0.08		c0.04	0.32		0.03	c0.74	
v/s Ratio Perm									0.05			0.06
v/c Ratio	0.85	0.67		1.34	0.64		0.56	0.52	0.08	0.44	1.20	0.09
Uniform Delay, d1	57.4	50.4		57.8	50.2		54.2	12.5	8.9	54.7	23.1	9.4
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.11	0.65	0.66
Incremental Delay, d2	65.3	8.7		231.9	6.8		6.5	0.9	0.2	0.3	88.5	0.0
Delay (s)	122.7	59.1		289.6	57.0		60.7	13.4	9.1	61.0	103.4	6.2
Level of Service	F	E		F	E		E	B	A	E	F	A
Approach Delay (s)		75.6			143.3			15.5			98.8	
Approach LOS		E			F			B			F	

Intersection Summary			
HCM Average Control Delay	75.9	HCM Level of Service	E
HCM Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	95.4%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	70	155	60	455	585	115
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	74	163	63	479	616	121
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		4				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1282	676	737			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1282	676	737			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	56	64	93			
cM capacity (veh/h)	169	453	869			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	237	542	737
Volume Left	74	63	0
Volume Right	163	0	121
cSH	544	869	1700
Volume to Capacity	0.44	0.07	0.43
Queue Length 95th (ft)	55	6	0
Control Delay (s)	24.9	1.9	0.0
Lane LOS	C	A	
Approach Delay (s)	24.9	1.9	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	4.6		
Intersection Capacity Utilization	86.1%	ICU Level of Service	E
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	21	79	95	148	126	68
v/c Ratio	0.09	0.23	0.40	0.43	0.12	0.07
Control Delay	18.2	15.9	30.7	26.6	2.4	3.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.2	15.9	30.7	26.6	2.4	3.0
Queue Length 50th (ft)	6	16	67	94	4	3
Queue Length 95th (ft)	20	45	m117	160	21	16
Internal Link Dist (ft)		1888		264	174	146
Turn Bay Length (ft)	50		130			
Base Capacity (vph)	408	604	434	612	1058	1038
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.13	0.22	0.24	0.12	0.07

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	55	20	90	110	30	25	5	90	20	5	40
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.96		1.00	0.97			0.90			0.92	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.98	
Satd. Flow (prot)	1630	1647		1630	1660			1525			1549	
Flt Permitted	0.66	1.00		0.71	1.00			0.95			0.93	
Satd. Flow (perm)	1137	1647		1211	1660			1471			1463	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	21	58	21	95	116	32	26	5	95	21	5	42
RTOR Reduction (vph)	0	17	0	0	21	0	0	31	0	0	14	0
Lane Group Flow (vph)	21	62	0	95	127	0	0	95	0	0	54	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	11.2	11.2		11.2	11.2			40.8			40.8	
Effective Green, g (s)	10.7	10.7		10.7	10.7			40.3			40.3	
Actuated g/C Ratio	0.18	0.18		0.18	0.18			0.67			0.67	
Clearance Time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	203	294		216	296			988			983	
v/s Ratio Prot		0.04			0.08							
v/s Ratio Perm	0.02			c0.08				c0.06			0.04	
v/c Ratio	0.10	0.21		0.44	0.43			0.10			0.06	
Uniform Delay, d1	20.6	21.0		22.0	21.9			3.5			3.4	
Progression Factor	1.00	1.00		1.33	1.43			1.00			1.00	
Incremental Delay, d2	0.2	0.4		1.3	0.9			0.2			0.1	
Delay (s)	20.9	21.4		30.6	32.3			3.7			3.5	
Level of Service	C	C		C	C			A			A	
Approach Delay (s)		21.3			31.6			3.7			3.5	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	19.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.17		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	32.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	170	0	1260	2250	15
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	179	0	1326	2368	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				424	377	
pX, platoon unblocked	0.51	0.39	0.39			
vC, conflicting volume	3032	1184	2384			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	854	0	1404			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	57	100			
cM capacity (veh/h)	152	418	186			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	179	663	663	1184	1184	16
Volume Left	0	0	0	0	0	0
Volume Right	179	0	0	0	0	16
cSH	418	1700	1700	1700	1700	1700
Volume to Capacity	0.43	0.39	0.39	0.70	0.70	0.01
Queue Length 95th (ft)	52	0	0	0	0	0
Control Delay (s)	19.9	0.0	0.0	0.0	0.0	0.0
Lane LOS	C					
Approach Delay (s)	19.9	0.0		0.0		
Approach LOS	C					

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	86.5%	ICU Level of Service	E
Analysis Period (min)	15		

Lane Group	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	358	279	32	1242	53	2495
v/c Ratio	1.25	1.30	0.36	0.63	0.39	1.18
Control Delay	175.7	204.2	49.0	24.8	38.3	97.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	175.7	204.2	49.0	24.8	38.3	97.8
Queue Length 50th (ft)	~330	~275	24	480	36	~1254
Queue Length 95th (ft)	#522	#450	m37	m539	m36	m#1090
Internal Link Dist (ft)	129	226		369		344
Turn Bay Length (ft)			200		150	
Base Capacity (vph)	286	214	115	1970	156	2107
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.25	1.30	0.28	0.63	0.34	1.18

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	65	130	145	70	160	35	30	1160	20	50	2235	135
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.94			0.98		1.00	1.00		1.00	0.99	
Flt Protected		0.99			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1601			1663		1630	3252		1630	3232	
Flt Permitted		0.77			0.59		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1245			986		1630	3252		1630	3232	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	68	137	153	74	168	37	32	1221	21	53	2353	142
RTOR Reduction (vph)	0	22	0	0	5	0	0	1	0	0	3	0
Lane Group Flow (vph)	0	336	0	0	274	0	32	1241	0	53	2492	0
Turn Type	Perm			Perm			Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		26.0			26.0		4.9	71.6		10.4	77.1	
Effective Green, g (s)		25.5			25.5		4.4	71.1		9.9	76.6	
Actuated g/C Ratio		0.21			0.21		0.04	0.59		0.08	0.64	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		2.5			2.5		2.5	2.5		2.5	2.5	
Lane Grp Cap (vph)		265			210		60	1927		134	2063	
v/s Ratio Prot							0.02	c0.38		0.03	c0.77	
v/s Ratio Perm		0.27			c0.28							
v/c Ratio		1.27			1.31		0.53	0.64		0.40	1.21	
Uniform Delay, d1		47.2			47.2		56.8	16.1		52.2	21.7	
Progression Factor		1.00			1.00		0.75	1.46		0.70	0.36	
Incremental Delay, d2		146.9			167.8		5.6	1.3		0.3	94.8	
Delay (s)		194.1			215.0		47.9	24.8		37.1	102.5	
Level of Service		F			F		D	C		D	F	
Approach Delay (s)		194.1			215.0			25.4			101.2	
Approach LOS		F			F			C			F	

Intersection Summary			
HCM Average Control Delay	94.1	HCM Level of Service	F
HCM Volume to Capacity ratio	1.22		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	104.7%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	65	0	0	45	5	1165	15	30	2320	100
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	0	68	0	0	47	5	1226	16	32	2442	105
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								512			449	
pX, platoon unblocked	0.47	0.47	0.37	0.47	0.47	0.80	0.37			0.80		
vC, conflicting volume	3229	3811	1274	2597	3855	621	2547			1242		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1569	2793	0	239	2887	19	1790			797		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	83	100	100	94	96			95		
cM capacity (veh/h)	31	8	406	256	7	842	128			655		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	68	47	5	818	425	32	1628	919
Volume Left	0	0	5	0	0	32	0	0
Volume Right	68	47	0	0	16	0	0	105
cSH	406	842	128	1700	1700	655	1700	1700
Volume to Capacity	0.17	0.06	0.04	0.48	0.25	0.05	0.96	0.54
Queue Length 95th (ft)	15	4	3	0	0	4	0	0
Control Delay (s)	15.7	9.5	34.4	0.0	0.0	10.8	0.0	0.0
Lane LOS	C	A	D			B		
Approach Delay (s)	15.7	9.5	0.1			0.1		
Approach LOS	C	A						

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	85.0%	ICU Level of Service	E
Analysis Period (min)	15		

Lane Group	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	285	295	21	1137	42	2468
v/c Ratio	0.91	1.29	0.24	0.56	0.44	1.15
Control Delay	75.2	197.7	46.2	5.5	57.0	94.9
Queue Delay	0.7	2.5	0.0	0.0	0.0	86.6
Total Delay	75.9	200.2	46.2	5.5	57.0	181.6
Queue Length 50th (ft)	199	~285	16	51	30	~1160
Queue Length 95th (ft)	#367	#465	m30	58	m25	m#970
Internal Link Dist (ft)	916	450		767		432
Turn Bay Length (ft)			150		150	
Base Capacity (vph)	312	228	115	2027	115	2146
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	2	1	0	0	0	310
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.92	1.30	0.18	0.56	0.37	1.34

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	50	110	110	90	115	75	20	1060	20	40	2265	80
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.95			0.96		1.00	1.00		1.00	0.99	
Flt Protected		0.99			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1606			1627		1630	3251		1630	3243	
Flt Permitted		0.82			0.59		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1323			982		1630	3251		1630	3243	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	53	116	116	95	121	79	21	1116	21	42	2384	84
RTOR Reduction (vph)	0	20	0	0	11	0	0	1	0	0	2	0
Lane Group Flow (vph)	0	265	0	0	284	0	21	1136	0	42	2466	0
Turn Type	Perm			Perm			Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		27.0			27.0		3.6	74.5		6.5	77.4	
Effective Green, g (s)		26.5			26.5		3.1	74.0		6.0	76.9	
Actuated g/C Ratio		0.22			0.22		0.03	0.62		0.05	0.64	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		2.5			2.5		2.5	2.5		2.5	2.5	
Lane Grp Cap (vph)		292			217		42	2005		82	2078	
v/s Ratio Prot							0.01	c0.35		0.03	c0.76	
v/s Ratio Perm		0.20			c0.29							
v/c Ratio		0.91			1.31		0.50	0.57		0.51	1.19	
Uniform Delay, d1		45.5			46.8		57.7	13.6		55.6	21.5	
Progression Factor		1.00			1.00		0.76	0.32		1.02	1.32	
Incremental Delay, d2		29.5			168.2		5.8	1.0		0.4	84.6	
Delay (s)		75.1			214.9		49.6	5.4		57.3	113.0	
Level of Service		E			F		D	A		E	F	
Approach Delay (s)		75.1			214.9			6.2			112.1	
Approach LOS		E			F			A			F	

Intersection Summary			
HCM Average Control Delay	87.9	HCM Level of Service	F
HCM Volume to Capacity ratio	1.16		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	107.0%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

1: SE River Rd & SE McLoughlin Blvd Performance by approach

Approach	NB	SE	NW	All
Total Delay (hr)	7.1	159.5	2.7	169.3
Delay / Veh (s)	77.6	300.9	8.2	176.9

2: SE Park Ave & SE River Rd Performance by approach

Approach	WB	NB	SB	All
Total Delay (hr)	1.2	0.3	0.4	1.9
Delay / Veh (s)	25.5	2.7	2.3	5.8

3: SE Park Ave & SE McLoughlin Blvd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	1.8	2.8	3.9	175.7	184.3
Delay / Veh (s)	41.3	40.7	11.5	331.6	187.1

4: SE Park Ave & SE Oatfield Rd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	0.9	0.0	2.1	2.4	5.5
Delay / Veh (s)	12.8	9.2	13.9	12.1	12.8

5: Courtney Ave & SE River Rd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	0.1	1.2	0.1	1.3	2.7
Delay / Veh (s)	17.0	16.8	1.3	6.2	7.5

6: Courtney Ave & SE McLoughlin Blvd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	3.5	6.2	4.7	19.1	33.4
Delay / Veh (s)	62.5	103.9	14.5	34.7	33.8

7: Courtney Ave & SE Oatfield Rd Performance by approach

Approach	EB	NB	SB	All
Total Delay (hr)	1.4	0.5	1.1	3.1
Delay / Veh (s)	21.2	3.7	5.9	7.7

8: SE Park Ave & Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	0.5	1.6	0.1	0.1	2.3
Delay / Veh (s)	13.2	27.6	3.8	3.9	15.7

9: Park & Ride #2 & SE McLoughlin Blvd Performance by approach

Approach	EB	NB	SB	All
Total Delay (hr)	37.2	1.3	5.3	43.7
Delay / Veh (s)	1351.6	3.8	10.3	49.8

12: Silver Springs & SE McLoughlin Blvd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	69.4	22.0	7.1	14.7	113.2
Delay / Veh (s)	1046.1	327.6	21.3	27.5	113.2

15: Cinderella & SE McLoughlin Blvd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	1.1	0.3	1.2	6.1	8.7
Delay / Veh (s)	60.3	22.6	3.7	11.3	9.7

18: Loeffelman & SE McLoughlin Blvd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	9.0	30.9	2.4	13.3	55.6
Delay / Veh (s)	121.3	448.5	7.8	25.3	57.1

Total Network Performance

Total Delay (hr)	627.6
Delay / Veh (s)	324.4

1: SE River Rd & SE McLoughlin Blvd Performance by movement

Movement	NBL	NBT	NBR	SET	NWL	NWT	All
Total Delay (hr)	6.8	0.0	0.2	159.5	0.2	2.5	169.3
Delay / Veh (s)	95.8	1.5	43.5	300.7	74.4	7.5	176.9

2: SE Park Ave & SE River Rd Performance by movement

Movement	WBL	WBT	WBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	1.0	0.0	0.2	0.2	0.1	0.0	0.4	1.9
Delay / Veh (s)	34.6	1.8	24.4	2.8	2.4	5.5	2.1	5.8

3: SE Park Ave & SE McLoughlin Blvd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	0.3	1.3	0.2	0.6	1.4	0.8	1.6	2.3	0.1	8.5	165.3	1.9
Delay / Veh (s)	49.6	42.4	29.0	52.8	43.8	31.3	75.6	7.4	3.6	324.0	332.6	291.2

3: SE Park Ave & SE McLoughlin Blvd Performance by movement

Movement	All
Total Delay (hr)	184.3
Delay / Veh (s)	187.1

4: SE Park Ave & SE Oatfield Rd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	0.7	0.0	0.2	0.0	0.0	0.0	0.9	1.2	0.0	0.0	2.0	0.4
Delay / Veh (s)	15.3	19.1	7.5	12.6	12.9	4.1	31.7	10.0	5.7	16.4	12.7	9.5

4: SE Park Ave & SE Oatfield Rd Performance by movement

Movement	All
Total Delay (hr)	5.5
Delay / Veh (s)	12.8

5: Courtney Ave & SE River Rd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	0.0	0.1	0.0	0.5	0.2	0.5	0.0	0.1	0.0	0.1	1.1	0.1
Delay / Veh (s)	15.9	19.2	13.1	28.8	6.9	20.4	6.2	1.0	0.9	7.6	6.1	5.1

5: Courtney Ave & SE River Rd Performance by movement

Movement	All
Total Delay (hr)	2.7
Delay / Veh (s)	7.5

6: Courtney Ave & SE McLoughlin Blvd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	1.4	1.5	0.6	3.8	1.9	0.5	1.0	3.4	0.2	0.6	18.1	0.4
Delay / Veh (s)	115.0	50.6	42.5	187.1	64.8	49.8	63.1	12.2	8.7	65.3	34.9	17.9

6: Courtney Ave & SE McLoughlin Blvd Performance by movement

Movement	All
Total Delay (hr)	33.4
Delay / Veh (s)	33.8

7: Courtney Ave & SE Oatfield Rd Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Total Delay (hr)	0.8	0.0	0.6	0.1	0.4	1.0	0.2	3.1
Delay / Veh (s)	39.9	1.4	14.1	8.5	3.1	6.0	5.3	7.7

8: SE Park Ave & Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	0.1	0.3	0.0	0.6	0.8	0.2	0.1	0.0	0.1	0.0	0.0	0.0
Delay / Veh (s)	23.3	12.0	8.5	29.6	28.3	19.2	7.5	4.7	2.5	7.1	4.7	2.3

8: SE Park Ave & Performance by movement

Movement	All
Total Delay (hr)	2.3
Delay / Veh (s)	15.7

9: Park & Ride #2 & SE McLoughlin Blvd Performance by movement

Movement	EBR	NBT	SBT	SBR	All
Total Delay (hr)	37.2	1.3	5.3	0.0	43.7
Delay / Veh (s)	1338.1	3.8	10.3	6.0	49.8

12: Silver Springs & SE McLoughlin Blvd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	13.2	26.7	29.5	5.7	13.1	3.1	0.6	6.4	0.1	0.7	13.1	0.8
Delay / Veh (s)	1108.9	1035.0	1029.8	323.3	330.9	322.2	61.5	20.2	17.5	59.2	26.7	26.4

12: Silver Springs & SE McLoughlin Blvd Performance by movement

Movement	All
Total Delay (hr)	113.2
Delay / Veh (s)	113.2

15: Cinderella & SE McLoughlin Blvd Performance by movement

Movement	EBR	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Total Delay (hr)	1.1	0.3	0.0	1.2	0.0	0.2	5.7	0.2	8.7
Delay / Veh (s)	60.3	22.6	25.5	3.6	3.0	21.1	11.2	10.9	9.7

18: Loeffelman & SE McLoughlin Blvd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	1.9	3.6	3.5	9.8	13.5	7.6	0.2	2.1	0.0	0.6	12.3	0.5
Delay / Veh (s)	126.4	117.8	123.7	445.8	458.9	427.9	41.4	7.2	8.0	69.2	24.6	25.3

18: Loeffelman & SE McLoughlin Blvd Performance by movement

Movement	All
Total Delay (hr)	55.6
Delay / Veh (s)	57.1

Total Network Performance

Total Delay (hr)	627.6
Delay / Veh (s)	324.4

Intersection: 1: SE River Rd & SE McLoughlin Blvd

Movement	NB	NB	SE	SE	NW	NW	NW
Directions Served	L	R	T	T	L	T	T
Maximum Queue (ft)	610	92	798	798	60	133	171
Average Queue (ft)	304	8	782	781	13	42	75
95th Queue (ft)	557	56	813	815	44	103	138
Link Distance (ft)	1198		766	766		2863	2863
Upstream Blk Time (%)			34	35			
Queuing Penalty (veh)			0	0			
Storage Bay Dist (ft)		90			300		
Storage Blk Time (%)	60	0					
Queuing Penalty (veh)	12	0					

Intersection: 2: SE Park Ave & SE River Rd

Movement	WB	SB
Directions Served	LR	LT
Maximum Queue (ft)	176	127
Average Queue (ft)	82	22
95th Queue (ft)	155	86
Link Distance (ft)	1902	1416
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: SE Park Ave & SE McLoughlin Blvd

Movement	EB	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	TR	L	T	T	R	L	T	T
Maximum Queue (ft)	109	213	69	177	295	156	270	268	56	444	2886	2884
Average Queue (ft)	24	82	15	46	152	80	75	89	12	150	2594	2599
95th Queue (ft)	63	157	48	115	260	142	185	196	40	387	3310	3313
Link Distance (ft)		264		414			307	307			2863	2863
Upstream Blk Time (%)		0					0	0			6	6
Queuing Penalty (veh)		0					1	1			68	70
Storage Bay Dist (ft)	115		150		200	325			100	325		
Storage Blk Time (%)	0	4			4		0	10	0		37	41
Queuing Penalty (veh)	0	2			2		0	6	0		42	12

Intersection: 3: SE Park Ave & SE McLoughlin Blvd

Movement	SB
Directions Served	R
Maximum Queue (ft)	249
Average Queue (ft)	24
95th Queue (ft)	141
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	125
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 4: SE Park Ave & SE Oatfield Rd

Movement	EB	EB	WB	NB	NB	SB	SB
Directions Served	LT	R	LTR	L	TR	L	TR
Maximum Queue (ft)	214	81	33	189	243	56	506
Average Queue (ft)	85	29	7	65	96	7	200
95th Queue (ft)	168	65	27	133	189	35	388
Link Distance (ft)	414		163		2598		722
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)		200		175		50	
Storage Blk Time (%)	0			0	1	0	21
Queuing Penalty (veh)	0			1	1	0	2

Intersection: 5: Courtney Ave & SE River Rd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	69	238	73	124
Average Queue (ft)	24	84	11	23
95th Queue (ft)	56	174	45	85
Link Distance (ft)	495	3104	492	2675
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 6: Courtney Ave & SE McLoughlin Blvd

Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	T	R	L	T	T	R
Maximum Queue (ft)	174	267	388	230	120	311	325	78	221	797	808	316
Average Queue (ft)	62	130	146	118	51	165	171	21	36	437	456	57
95th Queue (ft)	141	232	353	229	104	279	285	57	117	748	764	224
Link Distance (ft)		3104	753			448	448			779	779	
Upstream Blk Time (%)										1	1	
Queuing Penalty (veh)										13	14	
Storage Bay Dist (ft)	75			75	325			100	175			200
Storage Blk Time (%)	17	33	54	21		0	15	0	0	31	30	
Queuing Penalty (veh)	24	16	73	17		0	13	0	1	12	30	

Intersection: 7: Courtney Ave & SE Oatfield Rd

Movement	EB	EB	NB	SB
Directions Served	L	R	LT	TR
Maximum Queue (ft)	140	149	235	15
Average Queue (ft)	52	63	55	1
95th Queue (ft)	108	121	151	9
Link Distance (ft)	753		521	2598
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		100		
Storage Blk Time (%)	5	2		
Queuing Penalty (veh)	7	2		

Intersection: 8: SE Park Ave &

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LTR	LTR
Maximum Queue (ft)	55	112	154	245	92	74
Average Queue (ft)	16	41	76	115	30	24
95th Queue (ft)	47	88	153	210	69	60
Link Distance (ft)		1902		264	224	195
Upstream Blk Time (%)				0		
Queuing Penalty (veh)				0		
Storage Bay Dist (ft)	50		130			
Storage Blk Time (%)	1	7	2	5		
Queuing Penalty (veh)	1	1	2	4		

Intersection: 9: Park & Ride #2 & SE McLoughlin Blvd

Movement	EB	NB	NB	SB	SB
Directions Served	R	T	T	T	T
Maximum Queue (ft)	208	6	7	332	331
Average Queue (ft)	176	0	0	90	120
95th Queue (ft)	199	4	5	291	330
Link Distance (ft)	159	374	374	307	307
Upstream Blk Time (%)	96			1	2
Queuing Penalty (veh)	0			11	18
Storage Bay Dist (ft)					
Storage Blk Time (%)					8
Queuing Penalty (veh)					1

Intersection: 12: Silver Springs & SE McLoughlin Blvd

Movement	EB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	LTR	L	T	TR	L	T	TR
Maximum Queue (ft)	211	301	171	419	416	216	408	408
Average Queue (ft)	183	271	40	300	329	56	362	381
95th Queue (ft)	194	319	117	433	449	153	411	404
Link Distance (ft)	163	260		389	389		374	374
Upstream Blk Time (%)	88	68		2	3		9	20
Queuing Penalty (veh)	0	0		10	20		107	249
Storage Bay Dist (ft)			200			150		
Storage Blk Time (%)			0	11		0	32	
Queuing Penalty (veh)			0	3		0	16	

Intersection: 15: Cinderella & SE McLoughlin Blvd

Movement	EB	B73	WB	NB	NB	NB	SB	SB	SB
Directions Served	R	T	R	L	T	TR	L	T	TR
Maximum Queue (ft)	102	137	96	29	134	176	131	418	416
Average Queue (ft)	55	32	33	3	15	28	19	189	223
95th Queue (ft)	93	127	73	18	74	110	66	455	480
Link Distance (ft)	4	426	317		452	452		389	389
Upstream Blk Time (%)	56							2	3
Queuing Penalty (veh)	0							24	34
Storage Bay Dist (ft)				150			150		
Storage Blk Time (%)					0		0	5	
Queuing Penalty (veh)					0		0	2	

Intersection: 18: Loeffelman & SE McLoughlin Blvd

Movement	EB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	LTR	L	T	TR	L	T	TR
Maximum Queue (ft)	669	524	64	170	206	206	493	494
Average Queue (ft)	348	483	19	55	76	37	429	451
95th Queue (ft)	624	578	52	119	150	125	536	520
Link Distance (ft)	950	484		779	779		452	452
Upstream Blk Time (%)	0	65					7	10
Queuing Penalty (veh)	0	0					81	115
Storage Bay Dist (ft)			150			150		
Storage Blk Time (%)				0			20	
Queuing Penalty (veh)				0			8	

Network Summary

Network wide Queuing Penalty: 1156

Arterial Level of Service: NB SE River Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Courtney Ave	5	1.0	12.7	0.1	29
SE Park Ave	2	2.7	54.5	0.5	34
	22	1.6	35.7	0.3	28
SE McLoughlin Blvd	1	95.8	124.7	0.2	7
Total		101.1	227.6	1.1	18

Arterial Level of Service: SB SE River Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
	22	1.4	33.8	0.2	26
SE Park Ave	2	2.1	18.9	0.3	55
	5	6.2	68.3	0.5	27
Total		9.7	121.0	1.0	31

Arterial Level of Service: NW SE McLoughlin Blvd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Courtney Ave	6	12.2	21.1	0.1	17
Loeffelman	18	6.0	20.6	0.2	28
Cinderella	15	3.9	12.7	0.1	27
Silver Springs	12	20.5	28.3	0.1	11
Park & Ride #2	9	4.0	11.4	0.1	25
SE Park Ave	3	7.4	13.6	0.1	19
SE River Rd	1	7.1	56.4	0.6	36
Total		61.1	164.1	1.1	25

Arterial Level of Service: SB SE McLoughlin Blvd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
SE River Rd	1	300.7	312.9	0.1	7
SE Park Ave	3	333.5	383.6	0.6	8
Park & Ride #2	9	10.4	16.9	0.1	15
	12	26.3	33.7	0.1	9
Cinderella	15	11.9	19.6	0.1	16
Loeffelman	18	24.3	33.2	0.1	11
Courtney Ave	6	35.1	49.5	0.2	12
Total		742.2	849.3	1.2	9

Arterial Level of Service: NB SE Oatfield Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Courtney Ave	7	3.1	15.3	0.1	25
SE Park Ave	4	10.1	61.7	0.5	30
Total		13.1	77.0	0.6	29

Arterial Level of Service: SB SE Oatfield Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
SE Park Ave	4	12.7	29.6	0.1	18
Courtney Ave	7	6.3	57.5	0.5	32
Total		19.1	87.1	0.6	27

Queues
1: SE River Rd & SE McLoughlin Blvd

9/26/2011

Lane Group	NBL	NBR	SET	NWL	NWT
Lane Group Flow (vph)	268	21	2289	16	1216
v/c Ratio	0.81	0.08	1.00	0.21	0.50
Control Delay	66.9	28.4	38.8	62.9	14.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	66.9	28.4	38.8	62.9	14.0
Queue Length 50th (ft)	201	7	717	10	450
Queue Length 95th (ft)	#336	31	#1194	m18	535
Internal Link Dist (ft)	1200		698		2865
Turn Bay Length (ft)		90		300	
Base Capacity (vph)	331	267	2281	211	2431
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.81	0.08	1.00	0.08	0.50

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	NBL	NBR	SET	SER	NWL	NWT
Lane Configurations						
Volume (vph)	255	20	2175	0	15	1155
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5	5.5		4.5	4.5
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frt	1.00	0.85	1.00		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1850	1444	3260		1630	3260
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1850	1444	3260		1630	3260
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	268	21	2289	0	16	1216
RTOR Reduction (vph)	0	8	0	0	0	0
Lane Group Flow (vph)	268	13	2289	0	16	1216
Heavy Vehicles (%)	3%	3%	2%	2%	2%	2%
Turn Type		Prot			Prot	
Protected Phases	7	7	6		5	
Permitted Phases			6			2
Actuated Green, G (s)	22.0	22.0	82.1		2.9	90.0
Effective Green, g (s)	21.5	21.5	81.6		2.4	89.5
Actuated g/C Ratio	0.18	0.18	0.68		0.02	0.75
Clearance Time (s)	4.0	4.0	5.0		4.0	4.0
Vehicle Extension (s)	2.3	2.3	8.0		2.3	2.3
Lane Grp Cap (vph)	331	259	2217		33	2431
v/s Ratio Prot	c0.14	0.01	c0.70		0.01	
v/s Ratio Perm						c0.37
v/c Ratio	0.81	0.05	1.03		0.48	0.50
Uniform Delay, d1	47.3	40.8	19.2		58.2	6.2
Progression Factor	1.00	1.00	1.00		1.06	2.12
Incremental Delay, d2	18.9	0.4	28.1		5.2	0.6
Delay (s)	66.2	41.1	47.3		66.8	13.7
Level of Service	E	D	D		E	B
Approach Delay (s)	64.4		47.3			14.4
Approach LOS	E		D			B

Intersection Summary			
HCM Average Control Delay	37.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	88.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	105	30	295	100	30	635
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	111	32	311	105	32	668
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1095	363			416	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1095	363			416	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	52	95			97	
cM capacity (veh/h)	230	682			1143	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	142	416	700
Volume Left	111	0	32
Volume Right	32	105	0
cSH	270	1700	1143
Volume to Capacity	0.53	0.24	0.03
Queue Length 95th (ft)	71	0	2
Control Delay (s)	32.3	0.0	0.7
Lane LOS	D		A
Approach Delay (s)	32.3	0.0	0.7
Approach LOS	D		

Intersection Summary			
Average Delay	4.1		
Intersection Capacity Utilization	78.6%	ICU Level of Service	D
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	21	124	26	41	217	88	1155	57	119	2268	31
v/c Ratio	0.24	0.46	0.10	0.26	0.79	0.63	0.61	0.07	0.56	1.11	0.03
Control Delay	45.3	47.4	13.2	46.5	60.9	52.4	16.9	3.8	42.8	70.1	1.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.3	47.4	13.2	46.5	60.9	52.4	16.9	3.8	42.8	70.1	1.3
Queue Length 50th (ft)	13	88	0	28	141	54	394	10	93	~1109	3
Queue Length 95th (ft)	38	138	19	60	216	m86	m453	m9	m93	m#1191	m2
Internal Link Dist (ft)		264			427		299			2865	
Turn Bay Length (ft)	115		150			325		100	325		125
Base Capacity (vph)	119	365	330	214	364	161	1896	860	211	2035	914
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.18	0.34	0.08	0.19	0.60	0.55	0.61	0.07	0.56	1.11	0.03

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	120	25	40	115	95	85	1120	55	115	2200	30
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0		4.5	6.5	6.5	4.5	6.5	6.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1630	1716	1458	1630	1599		1630	3260	1458	1630	3260	1458
Flt Permitted	0.33	1.00	1.00	0.59	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	560	1716	1458	1007	1599		1630	3260	1458	1630	3260	1458
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	21	124	26	41	119	98	88	1155	57	119	2268	31
RTOR Reduction (vph)	0	0	22	0	26	0	0	0	13	0	0	4
Lane Group Flow (vph)	21	124	4	41	191	0	88	1155	44	119	2268	27
Turn Type	Perm		Perm	Perm			Prot		Perm	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8					2			6
Actuated Green, G (s)	19.2	19.2	19.2	19.2	19.2		10.9	70.3	70.3	16.0	75.4	75.4
Effective Green, g (s)	18.7	18.7	18.7	18.7	18.7		10.4	69.8	69.8	15.5	74.9	74.9
Actuated g/C Ratio	0.16	0.16	0.16	0.16	0.16		0.09	0.58	0.58	0.13	0.62	0.62
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5		4.0	6.0	6.0	4.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	87	267	227	157	249		141	1896	848	211	2035	910
v/s Ratio Prot		0.07			c0.12		0.05	c0.35		0.07	c0.70	
v/s Ratio Perm	0.04		0.00	0.04					0.03			0.02
v/c Ratio	0.24	0.46	0.02	0.26	0.77		0.62	0.61	0.05	0.56	1.11	0.03
Uniform Delay, d1	44.4	46.1	42.9	44.6	48.6		52.9	16.3	10.8	49.1	22.5	8.6
Progression Factor	0.92	0.93	0.88	1.00	1.00		0.78	0.92	0.50	0.79	0.51	0.15
Incremental Delay, d2	1.4	1.3	0.0	0.9	13.2		4.6	0.8	0.1	1.1	54.2	0.0
Delay (s)	42.2	44.2	37.6	45.5	61.7		46.2	15.8	5.5	39.8	65.6	1.3
Level of Service	D	D	D	D	E		D	B	A	D	E	A
Approach Delay (s)		42.9			59.1			17.4			63.5	
Approach LOS		D			E			B			E	

Intersection Summary			
HCM Average Control Delay	48.0	HCM Level of Service	D
HCM Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	102.5%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	EBR	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	205	111	12	111	458	11	736
v/c Ratio	0.64	0.24	0.03	0.40	0.42	0.02	0.69
Control Delay	27.1	5.7	12.5	13.1	8.4	6.0	13.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.1	5.7	12.5	13.1	8.4	6.0	13.4
Queue Length 50th (ft)	46	0	1	16	66	1	131
Queue Length 95th (ft)	124	30	12	63	152	7	#350
Internal Link Dist (ft)	427		122		2589		673
Turn Bay Length (ft)		200		175		50	
Base Capacity (vph)	432	579	550	301	1160	539	1138
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.47	0.19	0.02	0.37	0.39	0.02	0.65

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	190	5	105	2	5	5	105	430	5	10	560	140
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Grade (%)		5%			0%			0%			0%	
Total Lost time (s)		4.5	4.5		4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.94		1.00	1.00		1.00	0.97	
Flt Protected		0.95	1.00		0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1595	1422		1606		1630	1713		1630	1664	
Flt Permitted		0.72	1.00		0.95		0.26	1.00		0.46	1.00	
Satd. Flow (perm)		1209	1422		1532		444	1713		795	1664	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	200	5	111	2	5	5	111	453	5	11	589	147
RTOR Reduction (vph)	0	0	87	0	4	0	0	0	0	0	14	0
Lane Group Flow (vph)	0	205	24	0	8	0	111	458	0	11	722	0
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		9.9	9.9		9.9		25.5	25.5		25.5	25.5	
Effective Green, g (s)		9.4	9.4		9.4		25.0	25.0		25.0	25.0	
Actuated g/C Ratio		0.22	0.22		0.22		0.58	0.58		0.58	0.58	
Clearance Time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		2.5	2.5		2.5		2.5	2.5		2.5	2.5	
Lane Grp Cap (vph)		262	308		332		256	987		458	959	
v/s Ratio Prot								0.27			c0.43	
v/s Ratio Perm		c0.17	0.02		0.01		0.25			0.01		
v/c Ratio		0.78	0.08		0.02		0.43	0.46		0.02	0.75	
Uniform Delay, d1		16.0	13.5		13.4		5.2	5.3		4.0	6.9	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		13.6	0.1		0.0		0.9	0.3		0.0	3.2	
Delay (s)		29.7	13.6		13.4		6.1	5.6		4.0	10.1	
Level of Service		C	B		B		A	A		A	B	
Approach Delay (s)		24.0			13.4			5.7			10.0	
Approach LOS		C			B			A			B	

Intersection Summary			
HCM Average Control Delay	11.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	43.4	Sum of lost time (s)	9.0
Intersection Capacity Utilization	77.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	10	15	5	70	15	80	15	210	55	50	635	40
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	11	16	5	74	16	84	16	221	58	53	668	42
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1168	1105	689	1089	1097	250	711			279		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1168	1105	689	1089	1097	250	711			279		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	92	92	99	57	92	89	98			96		
cM capacity (veh/h)	137	198	445	171	201	789	889			1284		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	32	174	295	763
Volume Left	11	74	16	53
Volume Right	5	84	58	42
cSH	188	282	889	1284
Volume to Capacity	0.17	0.62	0.02	0.04
Queue Length 95th (ft)	15	94	1	3
Control Delay (s)	28.0	36.3	0.7	1.1
Lane LOS	D	E	A	A
Approach Delay (s)	28.0	36.3	0.7	1.1
Approach LOS	D	E		

Intersection Summary			
Average Delay	6.5		
Intersection Capacity Utilization	79.5%	ICU Level of Service	D
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	52	149	82	139	62	1052	93	41	2397	103
v/c Ratio	0.85	0.70	1.34	0.66	0.48	0.51	0.10	0.38	1.18	0.11
Control Delay	136.2	61.1	275.4	60.3	65.0	14.7	6.2	56.8	102.8	6.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	136.2	61.1	275.4	60.3	65.0	14.7	6.2	56.8	102.8	6.0
Queue Length 50th (ft)	41	99	~83	96	47	227	12	33	~1191	9
Queue Length 95th (ft)	#120	162	#189	156	92	347	41	m27	m#860	m7
Internal Link Dist (ft)		3106		771		404			767	
Turn Bay Length (ft)	75				325		100	175		200
Base Capacity (vph)	61	361	61	361	130	2061	941	145	2026	925
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.85	0.41	1.34	0.39	0.48	0.51	0.10	0.28	1.18	0.11

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	50	100	45	80	105	30	60	1020	90	40	2325	100
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	5.5	5.5	4.5	5.5	5.5
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.95		1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1630	1636		1630	1658		1630	3260	1458	1630	3260	1458
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1630	1636		1630	1658		1630	3260	1458	1630	3260	1458
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	52	103	46	82	108	31	62	1052	93	41	2397	103
RTOR Reduction (vph)	0	15	0	0	10	0	0	0	19	0	0	18
Lane Group Flow (vph)	52	134	0	82	129	0	62	1052	74	41	2397	85
Turn Type	Prot			Prot			Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			6
Actuated Green, G (s)	5.0	15.1		5.0	15.1		8.6	75.5	75.5	7.4	74.3	74.3
Effective Green, g (s)	4.5	14.6		4.5	14.6		8.1	75.0	75.0	6.9	73.8	73.8
Actuated g/C Ratio	0.04	0.12		0.04	0.12		0.07	0.62	0.62	0.06	0.62	0.62
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	5.0	5.0	4.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	61	199		61	202		110	2038	911	94	2005	897
v/s Ratio Prot	0.03	c0.08		c0.05	0.08		c0.04	0.32		0.03	c0.74	
v/s Ratio Perm									0.05			0.06
v/c Ratio	0.85	0.67		1.34	0.64		0.56	0.52	0.08	0.44	1.20	0.09
Uniform Delay, d1	57.4	50.4		57.8	50.2		54.2	12.5	8.9	54.7	23.1	9.4
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.06	0.70	0.86
Incremental Delay, d2	65.3	8.7		231.9	6.8		6.5	0.9	0.2	0.3	88.5	0.0
Delay (s)	122.7	59.1		289.6	57.0		60.7	13.4	9.1	58.0	104.6	8.1
Level of Service	F	E		F	E		E	B	A	E	F	A
Approach Delay (s)		75.6			143.3			15.5			99.9	
Approach LOS		E			F			B			F	

Intersection Summary			
HCM Average Control Delay	76.6	HCM Level of Service	E
HCM Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	95.4%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	70	155	60	455	585	115
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	74	163	63	479	616	121
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		4				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1282	676	737			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1282	676	737			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	56	64	93			
cM capacity (veh/h)	169	453	869			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	237	542	737
Volume Left	74	63	0
Volume Right	163	0	121
cSH	544	869	1700
Volume to Capacity	0.44	0.07	0.43
Queue Length 95th (ft)	55	6	0
Control Delay (s)	24.9	1.9	0.0
Lane LOS	C	A	
Approach Delay (s)	24.9	1.9	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	4.6		
Intersection Capacity Utilization	86.1%	ICU Level of Service	E
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	21	79	95	148	126	68
v/c Ratio	0.09	0.23	0.40	0.43	0.12	0.07
Control Delay	18.2	15.9	30.6	26.6	2.4	3.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.2	15.9	30.6	26.6	2.4	3.0
Queue Length 50th (ft)	6	16	68	95	4	3
Queue Length 95th (ft)	20	45	m117	160	21	16
Internal Link Dist (ft)		1888		264	174	146
Turn Bay Length (ft)	50		130			
Base Capacity (vph)	408	604	434	612	1058	1038
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.13	0.22	0.24	0.12	0.07

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	55	20	90	110	30	25	5	90	20	5	40
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.96		1.00	0.97			0.90			0.92	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.98	
Satd. Flow (prot)	1630	1647		1630	1660			1525			1549	
Flt Permitted	0.66	1.00		0.71	1.00			0.95			0.93	
Satd. Flow (perm)	1137	1647		1211	1660			1471			1463	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	21	58	21	95	116	32	26	5	95	21	5	42
RTOR Reduction (vph)	0	17	0	0	21	0	0	31	0	0	14	0
Lane Group Flow (vph)	21	62	0	95	127	0	0	95	0	0	54	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	11.2	11.2		11.2	11.2			40.8			40.8	
Effective Green, g (s)	10.7	10.7		10.7	10.7			40.3			40.3	
Actuated g/C Ratio	0.18	0.18		0.18	0.18			0.67			0.67	
Clearance Time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	203	294		216	296			988			983	
v/s Ratio Prot		0.04			0.08							
v/s Ratio Perm	0.02			c0.08				c0.06			0.04	
v/c Ratio	0.10	0.21		0.44	0.43			0.10			0.06	
Uniform Delay, d1	20.6	21.0		22.0	21.9			3.5			3.4	
Progression Factor	1.00	1.00		1.33	1.43			1.00			1.00	
Incremental Delay, d2	0.2	0.4		1.3	0.9			0.2			0.1	
Delay (s)	20.9	21.4		30.5	32.3			3.7			3.5	
Level of Service	C	C		C	C			A			A	
Approach Delay (s)		21.3			31.6			3.7			3.5	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	19.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.17		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	32.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	170	0	1260	2250	15
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	179	0	1326	2368	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				871	379	
pX, platoon unblocked	0.50	0.39	0.39			
vC, conflicting volume	3032	1184	2384			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	946	0	1405			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	57	100			
cM capacity (veh/h)	131	419	186			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	179	663	663	1184	1184	16
Volume Left	0	0	0	0	0	0
Volume Right	179	0	0	0	0	16
cSH	419	1700	1700	1700	1700	1700
Volume to Capacity	0.43	0.39	0.39	0.70	0.70	0.01
Queue Length 95th (ft)	52	0	0	0	0	0
Control Delay (s)	19.9	0.0	0.0	0.0	0.0	0.0
Lane LOS	C					
Approach Delay (s)	19.9	0.0		0.0		
Approach LOS	C					

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	86.5%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	110	0	0	35	10	1225	20	0	2285	135
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	0	116	0	0	37	11	1289	21	0	2405	142
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								449			801	
pX, platoon unblocked	0.52	0.52	0.40	0.52	0.52	0.76	0.40			0.76		
vC, conflicting volume	3179	3808	1274	2639	3868	655	2547			1311		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1227	2443	0	183	2560	0	1855			767		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	73	100	100	96	92			100		
cM capacity (veh/h)	62	15	429	269	12	820	127			637		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	116	37	11	860	451	1604	944
Volume Left	0	0	11	0	0	0	0
Volume Right	116	37	0	0	21	0	142
cSH	429	820	127	1700	1700	1700	1700
Volume to Capacity	0.27	0.04	0.08	0.51	0.27	0.94	0.56
Queue Length 95th (ft)	27	4	7	0	0	0	0
Control Delay (s)	16.5	9.6	35.8	0.0	0.0	0.0	0.0
Lane LOS	C	A	E				
Approach Delay (s)	16.5	9.6	0.3			0.0	
Approach LOS	C	A					

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	88.1%	ICU Level of Service	E
Analysis Period (min)	15		

Lane Group	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	500	515	37	1132	126	2395
v/c Ratio	1.69	2.22	0.38	0.65	0.80	1.22
Control Delay	353.8	586.3	50.9	12.3	66.4	126.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	353.8	586.3	50.9	12.3	66.4	126.8
Queue Length 50th (ft)	~564	~646	28	105	91	~1294
Queue Length 95th (ft)	#779	#862	m55	121	m91	m#1133
Internal Link Dist (ft)	316	283		432		369
Turn Bay Length (ft)			150		150	
Base Capacity (vph)	296	232	115	1747	170	1965
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.69	2.22	0.32	0.65	0.74	1.22

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	115	240	120	160	250	80	35	1060	15	120	2180	95
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.97			0.98		1.00	1.00		1.00	0.99	
Flt Protected		0.99			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1638			1651		1630	3253		1630	3239	
Flt Permitted		0.68			0.53		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1124			889		1630	3253		1630	3239	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	121	253	126	168	263	84	37	1116	16	126	2295	100
RTOR Reduction (vph)	0	10	0	0	6	0	0	1	0	0	2	0
Lane Group Flow (vph)	0	490	0	0	509	0	37	1131	0	126	2393	0
Turn Type	Perm			Perm			Prot			Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		31.0			31.0		5.4	64.9		12.1	71.6	
Effective Green, g (s)		30.5			30.5		4.9	64.4		11.6	71.1	
Actuated g/C Ratio		0.25			0.25		0.04	0.54		0.10	0.59	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		2.5			2.5		2.5	2.5		2.5	2.5	
Lane Grp Cap (vph)		286			226		67	1746		158	1919	
v/s Ratio Prot							0.02	c0.35		0.08	c0.74	
v/s Ratio Perm		0.44			c0.57							
v/c Ratio		1.71			2.25		0.55	0.65		0.80	1.25	
Uniform Delay, d1		44.8			44.8		56.5	19.7		53.1	24.5	
Progression Factor		1.00			1.00		0.76	0.53		0.99	1.14	
Incremental Delay, d2		334.8			577.5		6.8	1.7		8.8	112.6	
Delay (s)		379.5			622.3		49.8	12.0		61.6	140.4	
Level of Service		F			F		D	B		E	F	
Approach Delay (s)		379.5			622.3			13.2			136.5	
Approach LOS		F			F			B			F	

Intersection Summary			
HCM Average Control Delay	184.9	HCM Level of Service	F
HCM Volume to Capacity ratio	1.46		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	127.2%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	90	0	0	40	10	1070	20	0	2375	85
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	0	95	0	0	42	11	1126	21	0	2500	89
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								847			512	
pX, platoon unblocked	0.51	0.51	0.42	0.51	0.51	0.83	0.42			0.83		
vC, conflicting volume	3171	3713	1295	2503	3747	574	2589			1147		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1816	2886	0	496	2953	72	2025			764		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	79	100	100	95	91			100		
cM capacity (veh/h)	22	7	456	171	7	808	116			700		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	95	42	11	751	396	1667	923
Volume Left	0	0	11	0	0	0	0
Volume Right	95	42	0	0	21	0	89
cSH	456	808	116	1700	1700	1700	1700
Volume to Capacity	0.21	0.05	0.09	0.44	0.23	0.98	0.54
Queue Length 95th (ft)	19	4	7	0	0	0	0
Control Delay (s)	14.9	9.7	39.0	0.0	0.0	0.0	0.0
Lane LOS	B	A	E				
Approach Delay (s)	14.9	9.7	0.4			0.0	
Approach LOS	B	A					

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	87.8%	ICU Level of Service	E
Analysis Period (min)	15		

1: SE River Rd & SE McLoughlin Blvd Performance by approach

Approach	NB	SE	NW	All
Total Delay (hr)	7.0	123.9	4.2	135.2
Delay / Veh (s)	78.0	225.9	13.0	140.1

2: SE Park Ave & SE River Rd Performance by approach

Approach	WB	NB	SB	All
Total Delay (hr)	1.2	0.3	0.4	1.9
Delay / Veh (s)	26.0	2.7	2.3	5.6

3: SE Park Ave & SE McLoughlin Blvd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	3.1	4.4	5.3	162.4	175.2
Delay / Veh (s)	72.8	67.6	15.8	296.3	176.8

4: SE Park Ave & SE Oatfield Rd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	1.1	0.0	2.2	2.6	5.9
Delay / Veh (s)	14.6	9.4	14.8	13.0	13.9

5: Courtney Ave & SE River Rd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	0.1	1.0	0.1	1.3	2.5
Delay / Veh (s)	14.5	15.5	0.9	6.1	6.9

6: Courtney Ave & SE McLoughlin Blvd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	3.0	15.7	4.7	13.2	36.6
Delay / Veh (s)	57.8	280.4	14.1	25.0	37.8

7: Courtney Ave & SE Oatfield Rd Performance by approach

Approach	EB	NB	SB	All
Total Delay (hr)	1.3	2.1	1.6	5.0
Delay / Veh (s)	22.1	14.3	8.2	12.4

8: SE Park Ave & 27th Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	0.5	1.5	0.2	0.1	2.3
Delay / Veh (s)	14.6	25.4	7.2	6.0	16.3

9: Park & Ride #2 & SE McLoughlin Blvd Performance by approach

Approach	EB	NB	SB	All
Total Delay (hr)	52.6	0.9	8.0	61.5
Delay / Veh (s)	2428.9	2.8	15.0	69.5

12: Silver Springs & SE McLoughlin Blvd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	54.8	0.1	0.9	12.5	68.4
Delay / Veh (s)	9402.0	14.8	2.8	22.9	76.6

15: Cinderella & SE McLoughlin Blvd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	165.0	158.9	4.1	17.5	345.5
Delay / Veh (s)	2224.7	2110.6	12.8	33.7	350.1

18: Loeffelman & SE McLoughlin Blvd Performance by approach

Approach	EB	WB	NB	SB	All
Total Delay (hr)	0.8	0.2	1.2	2.6	4.7
Delay / Veh (s)	32.2	14.2	3.8	5.0	5.5

Total Network Performance

Total Delay (hr)	847.9
Delay / Veh (s)	458.3

1: SE River Rd & SE McLoughlin Blvd Performance by movement

Movement	NBL	NBT	NBR	SET	NWL	NWT	All
Total Delay (hr)	6.8	0.0	0.3	123.9	0.4	3.9	135.2
Delay / Veh (s)	94.6	2.1	49.3	225.9	74.8	12.0	140.1

2: SE Park Ave & SE River Rd Performance by movement

Movement	WBL	WBT	WBR	NBT	NBR	SBL	SBT	All
Total Delay (hr)	1.0	0.0	0.2	0.2	0.1	0.0	0.4	1.9
Delay / Veh (s)	36.5	1.6	24.6	2.9	2.3	5.1	2.1	5.6

3: SE Park Ave & SE McLoughlin Blvd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	0.4	2.4	0.3	0.8	2.2	1.5	1.3	3.9	0.1	7.0	153.6	1.7
Delay / Veh (s)	72.3	81.4	40.9	66.8	74.4	59.8	58.8	13.3	5.1	275.7	297.9	242.2

3: SE Park Ave & SE McLoughlin Blvd Performance by movement

Movement	All
Total Delay (hr)	175.2
Delay / Veh (s)	176.8

4: SE Park Ave & SE Oatfield Rd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	0.8	0.0	0.2	0.0	0.0	0.0	1.0	1.2	0.0	0.0	2.2	0.4
Delay / Veh (s)	18.0	23.9	8.6	14.6	14.1	3.8	34.9	10.0	10.4	17.7	13.6	10.3

4: SE Park Ave & SE Oatfield Rd Performance by movement

Movement	All
Total Delay (hr)	5.9
Delay / Veh (s)	13.9

5: Courtney Ave & SE River Rd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	0.0	0.1	0.0	0.5	0.2	0.4	0.0	0.0	0.0	0.1	1.1	0.1
Delay / Veh (s)	17.3	14.1	11.2	27.4	6.0	18.3	4.5	0.8	0.5	7.0	6.1	5.1

5: Courtney Ave & SE River Rd Performance by movement

Movement	All
Total Delay (hr)	2.5
Delay / Veh (s)	6.9

6: Courtney Ave & SE McLoughlin Blvd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	1.1	1.4	0.5	9.1	5.5	1.0	1.0	3.5	0.2	0.4	12.5	0.3
Delay / Veh (s)	87.8	51.7	39.1	426.0	197.9	150.9	63.5	11.9	8.8	57.5	25.1	11.4

6: Courtney Ave & SE McLoughlin Blvd Performance by movement

Movement	All
Total Delay (hr)	36.6
Delay / Veh (s)	37.8

7: Courtney Ave & SE Oatfield Rd Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Total Delay (hr)	0.6	0.0	0.7	0.3	1.8	1.4	0.3	5.0
Delay / Veh (s)	38.5	0.9	16.6	17.2	13.9	8.3	7.7	12.4

8: SE Park Ave & 27th Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	0.1	0.3	0.1	0.6	0.7	0.1	0.1	0.0	0.1	0.1	0.0	0.0
Delay / Veh (s)	19.6	14.4	10.1	28.5	26.1	15.5	11.4	6.9	6.1	11.6	4.4	3.4

8: SE Park Ave & 27th Performance by movement

Movement	All
Total Delay (hr)	2.3
Delay / Veh (s)	16.3

9: Park & Ride #2 & SE McLoughlin Blvd Performance by movement

Movement	EBR	NBT	SBT	SBR	All
Total Delay (hr)	52.6	0.9	7.9	0.0	61.5
Delay / Veh (s)	2428.9	2.8	15.1	7.0	69.5

12: Silver Springs & SE McLoughlin Blvd Performance by movement

Movement	EBR	WBR	NBL	NBT	NBR	SBT	SBR	All
Total Delay (hr)	54.8	0.1	0.1	0.8	0.0	11.8	0.7	68.4
Delay / Veh (s)	9402.0	14.8	56.3	2.4	2.1	22.9	22.7	76.6

15: Cinderella & SE McLoughlin Blvd Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	38.5	80.4	46.1	52.3	80.1	26.4	0.5	3.6	0.1	2.5	14.5	0.6
Delay / Veh (s)	2099.0	2210.5	2369.9	2216.8	2031.4	2211.3	50.8	11.7	9.1	93.3	30.7	26.6

15: Cinderella & SE McLoughlin Blvd Performance by movement

Movement	All
Total Delay (hr)	345.5
Delay / Veh (s)	350.1

18: Loeffelman & SE McLoughlin Blvd Performance by movement

Movement	EBR	WBR	NBL	NBT	NBR	SBT	SBR	All
Total Delay (hr)	0.8	0.2	0.1	1.0	0.0	2.5	0.1	4.7
Delay / Veh (s)	32.2	14.2	47.3	3.4	3.1	5.0	4.8	5.5

Total Network Performance

Total Delay (hr)	847.9
Delay / Veh (s)	458.3

Intersection: 1: SE River Rd & SE McLoughlin Blvd

Movement	NB	NB	SE	SE	NW	NW	NW
Directions Served	L	R	T	T	L	T	T
Maximum Queue (ft)	589	115	803	808	63	150	197
Average Queue (ft)	307	12	776	776	18	47	85
95th Queue (ft)	571	71	863	859	49	109	167
Link Distance (ft)	1198		766	766		2863	2863
Upstream Blk Time (%)			31	32			
Queuing Penalty (veh)			0	0			
Storage Bay Dist (ft)		90			300		
Storage Blk Time (%)	60	0					
Queuing Penalty (veh)	12	0					

Intersection: 2: SE Park Ave & SE River Rd

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (ft)	179	5	130
Average Queue (ft)	78	0	20
95th Queue (ft)	154	4	79
Link Distance (ft)	1902	2675	1416
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: SE Park Ave & SE McLoughlin Blvd

Movement	EB	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	TR	L	T	T	R	L	T	T
Maximum Queue (ft)	88	271	213	418	334	241	378	380	183	444	2897	2881
Average Queue (ft)	22	114	24	77	185	77	194	231	20	141	2474	2467
95th Queue (ft)	64	237	101	259	330	165	334	376	96	367	3315	3297
Link Distance (ft)		264		414			309	309			2863	2863
Upstream Blk Time (%)		4	0	2		0	1	1			4	4
Queuing Penalty (veh)		7	0	4		0	4	9			46	43
Storage Bay Dist (ft)	115		150		200	325			100	325		
Storage Blk Time (%)	0	18		0	16	0	1	13	0		36	39
Queuing Penalty (veh)	0	8		0	6	0	0	7	0		41	12

Intersection: 3: SE Park Ave & SE McLoughlin Blvd

Movement	SB
Directions Served	R
Maximum Queue (ft)	249
Average Queue (ft)	24
95th Queue (ft)	128
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	125
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 4: SE Park Ave & SE Oatfield Rd

Movement	EB	EB	WB	NB	NB	SB	SB
Directions Served	LT	R	LTR	L	TR	L	TR
Maximum Queue (ft)	227	97	33	187	261	36	560
Average Queue (ft)	82	33	8	68	97	6	199
95th Queue (ft)	173	72	28	135	213	25	425
Link Distance (ft)	414		163		2598		722
Upstream Blk Time (%)							0
Queuing Penalty (veh)							0
Storage Bay Dist (ft)		200		175		50	
Storage Blk Time (%)	1			1	1	0	22
Queuing Penalty (veh)	1			3	1	1	2

Intersection: 5: Courtney Ave & SE River Rd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	57	154	56	153
Average Queue (ft)	22	79	7	19
95th Queue (ft)	53	142	33	76
Link Distance (ft)	495	3104	492	2675
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 6: Courtney Ave & SE McLoughlin Blvd

Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	T	R	L	T	T	R
Maximum Queue (ft)	138	256	689	230	120	360	339	184	162	630	686	375
Average Queue (ft)	57	112	347	167	48	166	174	27	30	371	392	57
95th Queue (ft)	119	206	721	293	101	302	297	101	102	547	585	224
Link Distance (ft)		3104	753			448	448			780	780	
Upstream Blk Time (%)			3			0	0				0	
Queuing Penalty (veh)			5			0	0				0	
Storage Bay Dist (ft)	75			75	325			100	175			200
Storage Blk Time (%)	13	28	82	22		0	14			27	27	
Queuing Penalty (veh)	19	14	111	18		0	13			11	27	

Intersection: 7: Courtney Ave & SE Oatfield Rd

Movement	EB	EB	NB	SB
Directions Served	L	R	LT	TR
Maximum Queue (ft)	112	166	346	269
Average Queue (ft)	42	70	95	23
95th Queue (ft)	89	136	299	231
Link Distance (ft)	753		521	2598
Upstream Blk Time (%)			2	
Queuing Penalty (veh)			0	
Storage Bay Dist (ft)		100		
Storage Blk Time (%)	3	4		
Queuing Penalty (veh)	4	3		

Intersection: 8: SE Park Ave & 27th

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LTR	LTR
Maximum Queue (ft)	50	113	154	257	157	73
Average Queue (ft)	17	40	70	108	37	21
95th Queue (ft)	48	86	148	219	98	59
Link Distance (ft)		1902		264	224	195
Upstream Blk Time (%)				0	0	
Queuing Penalty (veh)				0	0	
Storage Bay Dist (ft)	50		130			
Storage Blk Time (%)	1	8	1	5		
Queuing Penalty (veh)	1	2	2	4		

Intersection: 9: Park & Ride #2 & SE McLoughlin Blvd

Movement	EB	NB	NB	SB	SB	SB
Directions Served	R	T	T	T	T	R
Maximum Queue (ft)	193	74	111	398	401	123
Average Queue (ft)	174	2	5	252	262	4
95th Queue (ft)	205	28	43	427	420	52
Link Distance (ft)	159	372	372	309	309	
Upstream Blk Time (%)	95			8	9	
Queuing Penalty (veh)	0			90	100	
Storage Bay Dist (ft)						50
Storage Blk Time (%)					20	
Queuing Penalty (veh)					3	

Intersection: 12: Silver Springs & SE McLoughlin Blvd

Movement	EB	WB	NB	SB	SB
Directions Served	R	R	L	T	TR
Maximum Queue (ft)	186	76	41	465	462
Average Queue (ft)	170	26	9	420	427
95th Queue (ft)	197	57	32	529	503
Link Distance (ft)	163	260		372	372
Upstream Blk Time (%)	97			14	18
Queuing Penalty (veh)	0			165	217
Storage Bay Dist (ft)			200		
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 15: Cinderella & SE McLoughlin Blvd

Movement	EB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	LTR	L	T	TR	L	T	TR
Maximum Queue (ft)	392	368	110	228	268	174	438	440
Average Queue (ft)	370	337	33	120	141	97	403	406
95th Queue (ft)	380	349	80	203	228	181	423	425
Link Distance (ft)	350	317		452	452		389	389
Upstream Blk Time (%)	85	85					24	26
Queuing Penalty (veh)	0	0					283	313
Storage Bay Dist (ft)			150			150		
Storage Blk Time (%)				3		6	33	
Queuing Penalty (veh)				1		65	40	

Intersection: 18: Loeffelman & SE McLoughlin Blvd

Movement	EB	WB	NB	SB
Directions Served	R	R	L	TR
Maximum Queue (ft)	153	78	45	14
Average Queue (ft)	57	29	10	1
95th Queue (ft)	114	63	34	8
Link Distance (ft)	547	426		452
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)			150	
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 1717

Arterial Level of Service: NB SE River Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Courtney Ave	5	0.8	12.5	0.1	30
SE Park Ave	2	2.7	55.6	0.5	34
	22	1.6	35.6	0.3	28
SE McLoughlin Blvd	1	94.6	123.4	0.2	7
Total		99.8	227.1	1.1	18

Arterial Level of Service: SB SE River Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
	22	1.2	32.7	0.2	27
SE Park Ave	2	2.1	18.9	0.3	55
	5	6.2	68.3	0.5	27
Total		9.4	119.9	1.0	31

Arterial Level of Service: NW SE McLoughlin Blvd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Courtney Ave	6	11.9	20.7	0.1	17
Loeffelman	18	3.5	18.1	0.2	32
Cinderella	15	11.4	20.3	0.1	17
Silver Springs	12	2.6	10.3	0.1	30
Park & Ride #2	9	2.8	10.2	0.1	28
SE Park Ave	3	13.3	19.5	0.1	13
SE River Rd	1	11.9	61.1	0.6	33
Total		57.3	160.2	1.1	26

Arterial Level of Service: SB SE McLoughlin Blvd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
SE River Rd	1	225.9	238.1	0.1	7
SE Park Ave	3	298.7	348.6	0.6	8
Park & Ride #2	9	15.3	21.8	0.1	12
	12	23.5	30.8	0.1	9
Cinderella	15	30.7	38.4	0.1	8
Loeffelman	18	5.4	14.2	0.1	25
Courtney Ave	6	24.8	39.1	0.2	15
Total		624.1	731.0	1.2	9

Arterial Level of Service: NB SE Oatfield Rd

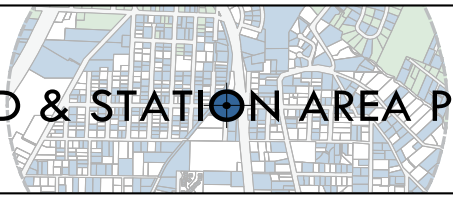
Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Courtney Ave	7	13.9	26.1	0.1	19
SE Park Ave	4	10.1	61.6	0.5	30
Total		24.1	87.7	0.6	27

Arterial Level of Service: SB SE Oatfield Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
SE Park Ave	4	13.6	30.5	0.1	17
Courtney Ave	7	8.3	59.6	0.5	31
Total		21.9	90.1	0.6	26

Appendix I: Implementation Plan

PARK AVENUE NEIGHBORHOOD & STATION AREA PLAN



Implementation Plan

DAVID EVANS AND ASSOCIATES, INC.
LELAND CONSULTING GROUP

JANUARY 2012

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1 Purpose

The purpose of this Implementation Plan is to provide direction to public officials, citizens and property owners on the actions required to transform an area dominated by an auto-oriented McLoughlin Boulevard and auto-oriented development design into a vibrant, mixed use, pedestrian-oriented neighborhood as defined in the Park Avenue Neighborhood and Station Area (PASA) Plan. This Implementation Plan identifies the actions required, the approximate costs of those actions and the best way to complete those actions. This Implementation Plan also assigns responsibility for implementation of the actions so that it is clear who is accountable for completing the actions required to convert vision into reality. The Action Item Summary and Prioritized List of Improvements are included in **Appendix A**. The Proposed PASA Plan maps are in included in **Appendix B**.

The collaborative efforts of the area's residents have been impressive and important. The challenge is to convert these planning successes into real action so that the promise of the plan becomes reality.

This Implementation Plan recommends actions that are grouped into four major categories of public interventions:

- Regulatory actions;
- Infrastructure investment;
- Incentives and public-private partnerships; and
- Leadership, management and organization.

Public funds will be required in order to build and implement the transportation, park and other improvements envisioned by the PASA Plan, although private investment will also be required as public funds are limited and often over allocated. The transportation, park and other investments in the PASA have the potential to spur housing, retail, commercial and institutional development, and that it has the potential to develop into an attractive and desirable area. All of these outcomes have the potential to bring in new property and income taxes, and fees. Therefore, the PASA Plan should be viewed not as a subsidy, but as an investment that generates a significant and positive return.

1.1 Regulatory Actions

The following sections describe the recommended regulatory actions, and also present, for each of those regulatory actions, what the specific action items are and what their related estimated costs might be.

1.1.1 Regulatory Actions for Comprehensive Plan and Code Amendments

<u>Regulatory Action Item 1a: Adopt Form-Based Design Requirements</u>

- Adopt and implement form-based requirements for the PASA Plan area.

Form-based design requirements, coupled with an underlying zoning district, are proposed for the PASA Plan to implement a series of design standards.

These are development regulations used that emphasize the physical character of development and deemphasize the regulation of land use.

The form-based requirements will use the street type (corridor, mixed and residential, as shown on **Figure 3** in the Appendix) as the basis for developing design standards that relate to the intended form and use of the street frontage. The proposed regulating standards are identified in the PASA Plan, **Figure 4,** and the recommended form-based design requirements are illustrated on **Figure 3a** in the appendix.

Regulatory Action Item 1b: Designate the McLoughlin Corridor as a Station Community Mixed Use District

- As identified on **Figure 4**, designate the existing General Commercial (C-3) zoning district along McLoughlin Boulevard as a Station Community Mixed Use District (SCMU).

Along the McLoughlin corridor, the PASA Plan proposes a Station Community Mixed Use District in place of the existing C-3 District that will permit a more intensive land use pattern than is currently permitted. This district will permit urban housing densities with a minimum of 20 dwelling units per acre with no maximum residential densities, and also permit retail, office, and other commercial and flex space on main street and corridor street frontages (see **Figure 3** in the Appendix for street frontage type). Ground-floor retail uses will be required on corners fronting McLoughlin Boulevard. The goal of this district is to increase flexibility in the types of uses permitted, while restricting auto-oriented uses such as gas stations, car dealerships and drive-throughs that are not consistent with the transit oriented development community. Along with the Station Community Mixed Use District, form-based design requirements will regulate the form of the structures, parking location and general development pattern.

This district provides a more transit-focused development pattern, while still providing significant opportunities for landowners and developers to take advantage of the proximity to the Park Avenue Station and McLoughlin Boulevard.

Regulatory Action Item 1c: Designate the River Road Location as a Neighborhood Mixed Use District by Zoning It Multifamily Residential

- As identified on **Figure 4,** designate the area along River Road south of Park Avenue Multifamily Residential, which in addition to housing, would permit limited retail and civic uses.

The PASA Plan proposes a Neighborhood Mixed Use District along River Road between Park Avenue and Silver Springs Road, adjacent to the high density residential development that already exists along the River Road corridor. While this development pattern is not assumed to be at the densities proposed within the Station Community Mixed Use District along McLoughlin Boulevard, it does take advantage of the high density residential

developments in the area and the existing transportation corridors that provide good circulation.

The Neighborhood Mixed Use District includes apartments, triplexes, attached single family homes and cottage style homes as permitted uses. Cottage style developments typically include several small homes surrounding a central common area and are often targeted for empty nesters, small families, or retirees. Cottage style development would preserve a single-family residential environment, would provide more housing options for various demographics and would support slightly higher residential densities than exist today. Unlike the Station Community Mixed Use District along McLoughlin, the Neighborhood Mixed Use District would permit, but not require, retail and commercial uses as part of a residential development. Retail and commercial uses include small, neighborhood-scale storefronts to support existing and future residents. Minimum residential densities are 12 to 15 dwelling units per acre.

The zoning change to Multifamily Residential is consistent with the dense residential development on the west side of River Road, but transitions to the lower densities of the existing single-family residential development pattern in the vicinity. For these reasons, densities and uses should not be as intense as those along the McLoughlin corridor.

Regulatory Action Item 1d: Establish standards to evaluate future proposals for higher density, residential plan and zone amendments in the area.

As shown on **Figure 4**, establish standards establish standards, including those for on-street parking needs, driveway and alley access, minimum development site size, design standards, and buffers to single family developments, to evaluate future proposals for higher density residential zoning.

Stable, primarily single-family neighborhoods are located between River Road and McLoughlin Boulevard, and preserving these neighborhoods is an important part of the PASA Plan. However, when reviewing the existing zoning and lot pattern, there may be some limited opportunity to diversify housing in this area, particularly on corner lots.

The existing R-7 (7,000-square-foot lot minimum) zoning for the areas along Evergreen and Park Avenue allow duplex and triplex development as conditional uses for lots large enough to meet the minimum lot size standard of 4,662 square feet per unit. Home occupations and accessory dwelling units are already permitted as accessory uses. However, the majority of existing lots are platted, 5,000-square-foot parcels in subdivisions that were created in the early 1900s. The R-7 standard was likely applied as opposed to an R-5 designation because at the time Clackamas County did not have an R-5 district.

Because of the limited infill potential within this area, housing densities in this area are not anticipated to increase significantly, but where feasible, this change will provide landowners the opportunity to take advantage of larger parcels around the light rail station to provide a more diverse housing stock.

Estimated Cost[1] (1a-1d): Not applicable. Zone changes are assumed to be an internal Clackamas County task.

Regulatory Action Item 1e: Amend the Transportation System Plan and Capital Improvement Plan (CIP)

The County's Transportation System Plan (TSP) identifies the capital transportation projects that will be needed over a 20-year time frame, and the project list is adopted in the County Comprehensive Plan (Chapter 5). Transportation projects from the PASA Plan will be included in the planned road network when the TSP is next updated in 2012-2013.

The County's Capital Improvement Plan (CIP) implements the TSP goals and projects by prioritizing all the transportation projects, identifying funding sources, and selecting projects that will be funded within a five-year period. The CIP provides for interim updates if the County Commissioners determine the need to add (or delete) projects. In the 2012 update of the CIP, the applicable PASA transportation projects will be recommended to be included in the CIP project list.

Estimated Cost: Not applicable. TSP and CIP changes are assumed to be an internal Clackamas County task.

Regulatory Action Item 1f: Adopt Station Community Boundary

- As shown on **Figure 5**, adopt the Station Community Boundary as part of the Comprehensive Plan.

The PASA Plan identifies a Station Community Boundary that implements Title 6 of Metro's Urban Growth Management Functional Plan.

Estimated Cost: Not applicable. Comprehensive Plan changes are assumed to be an internal Clackamas County task.

Regulatory Action Item 1g: Amend the Trolley Trail Master Plan

- The PASA Plan identifies four new multi-use trail connections between Park Avenue and Courtney Avenue as described in Section 1.2.2 and shown on **Figure 1**. These connections should be included in the Trolley Trail Master Plan when it is next revised.

Estimated Cost: Not applicable. Trolley Trail Master Plan changes are assumed to be an internal Clackamas County task.

[1] "Estimated Costs" are costs associated with an implementation item that would require outside assistance, such as hiring a consultant to complete the task. If the task will be completed by County staff, no cost is associated with the task.

1.1.2 Parking Strategies

A regulatory tool that is compatible with TOD is regulating parking. Generally, reductions in parking minimum/maximum requirements tend to support the development of transit oriented districts and a pedestrian-oriented urban form in mixed use areas. If less area is committed to parking, then there is more area to devote to the desired uses that shape a successful mixed use area. Perhaps more importantly, parking is expensive to build. Avoiding or minimizing parking requirements improves the financial feasibility of new development. Adequate transit and shared parking saves developers money and reduces their risk; it also leads to buildings that are better designed.

Regulatory Action Item 1g: Develop a Parking Strategy

Parking within the PASA Plan area should be managed, if necessary, to reduce spillover parking from the transit parking structure or adjacent development into adjacent neighborhoods while still minimizing the amount of off-street parking permitted in the plan area. Although parking will be needed to support residential, commercial, and retail uses, the area should take advantage of its proximity to the light rail station and should encourage transit rather than auto use. The following strategies should be considered to minimize the amount of space provided for parking:

- Establish only maximum parking space requirements by use. Do not require minimum space requirements.
- If zoning standards require some minimum parking, define how on-street parking can be calculated for meeting parking standards for adjacent uses (such as using frontage building frontage length) to clearly articulate parking requirements.
- Post limitations on residential streets that limit parking without a permit to a set number of hours (requires that residents have parking permits).
- Require that commercial/retail/business and multi-family developments have a program to manage parking demand, such as initiating programs to support carpooling and using mass transit or parking pricing strategies, as a condition of approval for land use decision.
- Permit adjacent land uses to count on-street parking towards meeting their parking requirement. All other parking must be provided in an off-street location.
- Implement the Clackamas County Zoning and Development Ordinance shared parking regulation in the PASA Plan so various uses can use unused parking spaces. For example, permit parking in the TriMet park-and-ride parking area during non-peak hours for surrounding uses. Additionally, the parking along the McLoughlin Boulevard slip lanes could provide additional parking for surrounding land uses with ODOT's approval.

Estimated Cost: To be determined.

1.2 Infrastructure Investment

Public infrastructure, including roads, sidewalks and parks, provides the bones for a complete community. The quality, location and character of infrastructure significantly influence the livability of an area. Public infrastructure intervention means that the public bears some or all of the cost of infrastructure improvements. This type of investment can be a powerful tool in transforming communities and increasing the viability of desirable forms of development.

The quality, location and character of infrastructure also influence the cost and feasibility of development. For example, a park is an amenity that can increase the value of adjacent land. Pedestrian, bicycle and vehicular connections that provide access to property and link to transit enhance the marketability of commercial and residential development. Short, walkable blocks promote an urban environment and robust pedestrian network. Safe, attractive pedestrian and bicycle connections improve the vitality of an area and boost the development potential of property. Effective access management, providing safe and efficient street crossings and business access, can turn a major thoroughfare, such as McLoughlin Boulevard, from a barrier into a bridge and create the opportunity for new, desirable neighborhoods and parks.

1.2.1 McLoughlin Boulevard and New Streets

The backbone of the PASA Plan is the concept of converting McLoughlin Boulevard to a multi-way boulevard. The multi-way boulevard utilizes a design that provides a separation of through traffic from local access traffic, while supporting and encouraging pedestrian movement.

Infrastructure Action Item 2a: Reconstruct McLoughlin Boulevard as a Multi-way Boulevard

- Reconstruct McLoughlin Boulevard as a multi-way boulevard between Park Avenue and Courtney Avenue.

Design features of the multi-way boulevard include two through travel lanes on each side of the street; a raised and planted center median (14 feet) with left-turn pockets at Park, Silver Springs, Torbank, and Courtney Avenues; bike lanes (6 feet); and a side median (8 feet) separating the through lanes and slip lane (10 feet) with on-street parallel parking in the slip lanes both on the east side and west side of McLoughlin. Wide sidewalks are provided on both sides of the street (12 feet). If necessary, the CIP should be amended to include this project.

Estimated Cost:

Phase	Description	Cost
Phase 1	Median Island	$626,000
Phase 2	Shoulder Islands and Resurface Existing Travel Lanes	$3,824,000

Phase 3	Slip Lanes and Parking	$4,736,000
Total Cost		**$9,186,000**

Infrastructure Action Item 2b: 27th Avenue Extension

- Extend 27th Avenue from Park Avenue to Courtney Avenue.

  This connection provides local access and an alternative to McLoughlin Boulevard and also provides a critical link for the local circulation plan. This project will include additional right-of-way purchase and construction of new road. The road would include two 10-foot travel lanes, parallel parking on both sides of the street, sidewalks and planter strips within a new 54-foot right-of-way.

  Estimated Cost: $8,759,000

Infrastructure Action Item 2c: Evergreen Extension

- Extend Evergreen from the existing stub on the east side of McLoughlin Boulevard to the new 27th Avenue extension. *This project could also be constructed as part of a development where the private developer assumes all or a portion of the cost.*

  This project will include additional right-of-way purchase and construction of new road. The road would include two 10-foot travel lanes, parallel parking on both sides of the street, sidewalks and planter strips within a new 54-foot right-of-way.

  Estimated Cost: $1,172,000

Infrastructure Action Item 2d: Torbank Extension

- Extend Torbank from the existing stub on the west side of McLoughlin Boulevard to Oatfield Road.

  This project would include an intersection at McLoughlin Boulevard and Torbank. Torbank would be extended from the east side of McLoughlin Boulevard to Oatfield Road, providing a new direct east/west connection through the PASA Plan area. This project will include additional right-of-way purchase and construction of new road. The road would include two 10-foot travel lanes, parallel parking on both sides of the street, sidewalks and planter strips within a new 54-foot right-of-way.

  Estimated Cost: $1,458,000

Infrastructure Action Item 2e: Silver Springs Extension

- Using the existing parking lot, create a main street between the new 27th Avenue extension and McLoughlin Boulevard.

  This modification assumes that the two-lane road cross section will be used to create the desired street pattern. This road would also extend to the east side of McLoughlin Boulevard to Oatfield Road. This project will include additional right-of-way purchase and construction of new road. The road

would include two 10-foot travel lanes, parallel parking on both sides of the street, sidewalks and planter strips within a new 54-foot right-of-way.

Estimated Cost: $1,715,000

Infrastructure Action Item 2f: Cinderella Extension

- Extend Cinderella Road from the new 27th Avenue extension east, across McLoughlin Boulevard. *This project could also be constructed as part of a development where the private developer assumes all or a portion of the cost.*

East of McLoughlin Boulevard, Cinderella Avenue turns south and connects with the new Torbank extension. This extension would require new right-of-way and include two 10-foot travel lanes, parallel parking on both sides of the street, sidewalks and planter strips within a new 54-foot right of way.

Estimated Cost: $4,067,000

Infrastructure Action Item 2g: Local Access Roads

- Create new connectivity and access through extension of local access roads. *These projects could also be constructed as part of a development where the private developer assumes all or a portion of the cost.*

On the west side of McLoughlin Boulevard, three local access roads would provide connectivity within the PASA Plan area for future local access and additional access for residential and retail uses. These extensions would require new right-of-way and include two 10-foot travel lanes, parallel parking on one or both sides of the street, sidewalks and planter strips within a new 54-foot right-of-way. These connections could also be constructed as part of a development.

Estimated Cost: $4,846,000

Infrastructure Action Item 2h: Convert SE Linden Place to a Public Street

- Convert the private road SE Linden Place to a public road and connect it to the new 27th Avenue extension.

SE Linden Place is a private road that dead ends at the Elks Lodge property line. The plan proposes converting this street to a public road and linking it via a new road connection to the new 27th Avenue extension. No construction or changes to the existing street cross section are proposed.

Estimated Cost: $20,000 for survey and transfer documentation (assumes the road is deeded to the County)

Infrastructure Action Item 2i: Linden Place to the 27th Avenue Connection

- Connect SE Linden Place to the new 27th Avenue extension.

SE Linden Place dead ends at the Elks Lodge property line. The plan proposes linking the existing street to the new 27th Avenue extension via a new road connection.

Estimated Cost: $614,000

1.2.2 Multi-Use Path Connections

Pedestrian and bike-friendly environments encourage transit use, walking and bicycling, which in turn promote a sense of community that improves livability. Pedestrian and bicycle facilities are critical to a successful mixed use development. The Trolley Trail is a primary multi-use connection for north/south travel and a direct link to the light rail station, the existing residential neighborhoods and future TOD development. The four proposed connections will provide links to and across the Trolley Trail.

Infrastructure Action Item 2j: Multi-Use Connections to Trolley Trail

- Provide multi-use (bicycle/pedestrian) connections across the Trolley Trail at Evergreen, Silver Springs, Torbank and Lindenbrook.

Estimated Cost: $925,000

1.2.3 Parks, Plazas and Open Space

More parks and open space are needed throughout the area, and this need will surely increase as more residents move into the area. In addition to providing neighborhood parks, providing greater access to the Trolley Trail and connecting neighborhoods to the future development and the light rail station received wide support in discussions with area stakeholders. Several park locations are being considered for inclusion in the PASA Plan. All of the potential locations are on the west side of McLoughlin Boulevard. Any park site that becomes a viable option will also need to be recognized in other County documents to facilitate development of that park.

Infrastructure Action Item 2k: Amend Adopted Parks-related Plans

For public funds to be allocated for park acquisition and development, specific acquisition and development projects would have to be identified in the North Clackamas Parks & Recreation District "Master Plan" and elevated in priority level above many other currently listed projects.

Early in the planning process, several potential park locations were explored, including an area adjacent to the Trolley Trail near Park Avenue, an area along River Road between Park and Evergreen, and an area that includes existing oak trees on the Smith Manufactured Home Park property as examples of how parks can be located to serve the area. Estimated costs for acquiring and developing the park space within the PASA Plan area were developed using the North Clackamas Parks and Recreation District's acquisition/development assumptions, although several questions remain about the feasibility of creating new parks and the specific location of new parks. Policy decisions regarding new parks will need to be determined before specific action items can be identified for new parks within the area.

Estimated Cost: $TBD

1.3 Incentives and Partnerships

Private investment follows public investment. This has been true for previous eras of investment in the PASA, when commercial strip-style development followed the construction of McLoughlin Boulevard in the second half of the 20th century, and when Oak Grove and other neighborhoods developed following the original Portland-to-Oregon City trolley line. Today, in order to realize the type of community envisioned by PASA residents and to a larger degree the McLoughlin Area Plan participants, the public sector should expect to play an active role in incentivizing desired development types, discouraging some undesirable development types, and establishing public-private partnerships that result in attractive real estate development and communities.

Communities throughout the metropolitan region and across the country incentivize development and create partnerships in order to achieve a number of outcomes. These include encouraging projects that would not otherwise be built; achieving higher qualities through better materials, more public spaces, or other amenities; leveraging public investments to spur private development; and achieving specific goals such as economic development or providing certain kinds of housing. Successful mixed use areas such as downtown Milwaukie, Lake Oswego, and Hillsboro use a variety of the tools described below. For example, the North Main project in downtown Milwaukie combined staffing and funding assistance from the City of Milwaukie, Metro, and several state agencies, and federal tax credits, along with developer equity and a traditional bank loan.

In this era of constrained public budgets and an increased desire for fiscal moderation, it is important that development incentives be implemented carefully. This can be achieved by using techniques such as competitive proposal processes, carefully reviewing firms' past track records, creating binding development agreements, and setting targets for quality, total investment and other outcomes.

Incentives will be most important in the early phases of the development when the private sector—particularly lenders and developers—are most hesitant to invest because there are few precedents in the immediate area for the types of mixed use, pedestrian-friendly development envisioned by the PASA Plan. As positive development occurs, the perceived risk will lessen and help to stimulate more investment by developers in the PASA, thus reducing the need for incentives. Some suggested incentives are listed below. Different incentives will attract different developers during various circumstances, thus an open dialog between the County and the community is important to ensure a relevant program. Regardless of the type of incentives offered, the County must be certain to "get the word out" that incentives are available.

Examples of "soft incentives" include:

- Brand/marketing – A County-funded effort to promote PASA and seek broad, positive media attention to encourage development and businesses in the PASA.

- Leadership – Both political and community support to see the project receive funding and succeed

Examples of more financially tangible incentives to attract development include:

- Local Improvement District: A Local Improvement District (LID) is a method by which a group of property owners can share in the cost of transportation infrastructure improvements or other types of public improvements such as improving a street, building sidewalks and installing a stormwater management system.
- Urban Renewal District – The basic idea behind creating an Urban Renewal District is that the taxes from the Urban Renewal District fund the infrastructure necessary to encourage redevelopment. While urban renewal is a funding source, it is also a signal to developers that the area has the funding to share in the cost of some of the needed improvements. The County, if successful in developing an urban renewal district for the PASA, could use those funds for improvements within the district.
- Lower Cost System Development Charges – This involves lowering fees in recognition of developments that create fewer impacts (e.g., vehicle trips generated).

Incentives and Partnerships Action Item 3a: Incentives Toolkit

With input from the community, the County should evaluate and implement a development incentives toolkit that supports the PASA vision. Models for some of these programs already exist within the Clackamas County Development Agency and some of the economic development and redevelopment departments managed by local cities. Another source for information is Metro's Community Investment Tool series. Note that these are tools in a toolkit, so not every tool needs to be used for every potential project. On the other hand, it is important to have the tools available so that they can be applied when necessary. The following elements should be considered:

- **Staff assistance.** As described above, proactive staff can be enormously helpful to redevelopment in the PASA Plan area. Simply having a staff point person who can explain the community's goals, entitlement process, potential incentives available and other issues will encourage the type of development envisioned by the PASA Plan.
- **Expedited review process.** In the development world, time is money. Time spent seeking land use approvals means greater expenditures in terms of debt service on loans, professional fees for architects, planners, and other professionals, taxes and a range of other fees. Therefore, land use reviews that are clear and efficient are a strong incentive to developers to build in a particular area. The County should work to make sure that the new zoning and any other regulation developed for the PASA is clear, concise and easy to interpret, and that staff work proactively with developers to get the first few high-quality projects off the ground in order to establish positive examples for others to follow.

- **Development opportunity study grant program.** This type of program (which can go by other names) provides property owners with professional assistance to evaluate the potential rehabilitation or redevelopment of their property. It encourages property owners that might otherwise be reluctant given other financial constraints. Professional assistance can include architectural, real estate, civil engineering, legal or other expertise.
- **Facade/storefront improvement program.** Such programs include a range of loans and grants through which public agencies help property owners with aesthetic upgrades such as repainting, new signage, reroofing and other improvements. There is often an investment matching requirement from property owners or a loan payback to ensure a good return on public investment.
- **Low interest loans for redevelopment**. This is similar to the tools mentioned above but is offered as loans only, for major redevelopment projects. Public agencies can often access lower-interest debt, which can be extended to private projects in certain cases.
- **Public infrastructure improvements and "place making."** Perhaps the most basic type of incentive is already covered elsewhere in this Implementation Plan but bears repeating: the County and other public partners can improve development outcomes by investing in public improvements such as improved sidewalks, landscaping, pocket parks and plazas, and more.
- **Tax abatement**. Various jurisdictions throughout the state have implemented different types of property tax abatement for desired types of development. Perhaps the most common program implemented in locations similar to the PASA is the state's Vertical Housing Program (VHP), which offers 10 years of partial property tax abatement for compact, residential projects. Abatement for affordable housing is also common and can be implemented with or without the VHP.
- **Land acquisition, assembly, or write-down.** Two keys to successful redevelopment are "site control" and properties that are large enough in size to accommodate significant development. Acquisitions and/or assembly of properties enable the public sector to secure control over sites that are of key importance to redevelopment. For example, Metro's large property ownership in Gresham has enabled the development of a new City Hall, retail and compact urban housing since the late 1990s. Properties need not always be purchased—there are other methods of site control available including purchase options and legal agreements—and therefore large public expenditures need not be made. A write-down is the reduction of a property sale price in order to attract particular types of development proposals.
- **Brownfields assessment and cleanup.** Soil contamination—or even the perception of potential soil contamination—can be a major deterrent to redevelopment. A range of regional (Metro), state, and federal grants and loans exists to evaluate and remediate brownfield sites, which can include former gas stations, car dealerships, and other commercial and industrial properties.
- **Smart-growth System Development Charge (SDC) frameworks.** Compact, mixed use, transit-oriented development within already developed areas often

imposes lower impacts to existing public infrastructure. This is particularly true for roads, since more residents walk and use transit, and can also be true for water, sewer and educational infrastructure. SDC frameworks that recognize this and assess fees at a lower rate for TOD encourage that type of development.

- **Local Improvement District (LID).** LIDs enable the public and private sectors to share the cost of needed infrastructure and to finance it over long-term bond repayments with low interest rates, rather than paying up front. Thus, they could be used to build out various streets and other capital improvements described in the PASA Plan. LIDs must be supported by local property owners through an official vote since they are partially or wholly supported by an additional tax assessment within the directly affected area.
- **Grants and loans from other government agencies such as Metro, TriMet, State of Oregon, and various federal agencies.** These include Metropolitan Transportation Improvement Program (MTIP) and Transit Oriented Development programs (Metro), Main Street and Transportation Growth Management (TGM) programs at the state, and the federal Sustainable Communities program, a partnership between Housing and Urban Development, the Environmental Protection Agency, and the U.S. Department of Transportation.

This toolkit is not intended to be comprehensive—other tools and incentives should be explored and evaluated by staff and stakeholders as implementation progresses. Solutions should be customized to the need at hand.

Estimated Cost: Varies. Cost would be reflected in the kind of action identified in the toolkit. Some items are assumed to be handled internally within the County.

Incentives and Partnerships Action Item 3b: Program Marketing

- Market the incentives program and the PASA Vision to suitable developers. This effort will require the commitment of personnel and marketing materials.

Estimated Cost: Not Applicable. This task is assumed to be handled internally by County staff.

1.4 Leadership, Management and Organization

Revitalization and redevelopment are not a one-time plan or project. The PASA Plan marks a beginning, not an end, to the efforts necessary to enable the PASA to realize its potential. Rather, redevelopment should be seen as an ongoing endeavor. Like any organization or business, the PASA Plan area must plan, budget, staff, market and conduct maintenance activities in order to be successful.

A type of public intervention that is broadly applicable to developing the PASA Plan is leadership. Public agencies and public officials have the unique position to advocate for good development and essential infrastructure development. A public agency, such as the local government, or a public official, such as the Board of County Commissioners, has the institutional responsibility and authority to advocate for the interests of the community.

Implementing a development strategy is complex. The goal is to produce good development as the result of many factors—markets, demographics, engaged property owners. Public intervention leadership is essential to make effective implementation actions. There are several leadership actions that would be useful for the PASA Plan.

Leadership, Management and Organization Action Item 4a: Adopt the Plan

Leadership must adopt the PASA Plan vision and stick to it as a consistent rationale for action. A lot of work went into creating the vision for the PASA, and many actions have already been taken. The public and stakeholder groups have confirmed the land use alternative. The Stakeholder Advisory Group and Policy Advisory Committee have endorsed a multi-way boulevard for McLoughlin Boulevard. Development code will be adopted that reflects that vision. All of these actions are based upon a vision and provide a rationale for a long series of recommended public investments.

Leadership, Management and Organization Action Item 4b: Assign Public Agency Staff to help implement PASA

A designated public agency representative/point person will be necessary in order to coordinate public investments and expenditures, facilitate meetings and keep all the wheels of implementation outlined in this memo in motion. The point person should be a Clackamas County staff person, unless there is a compelling reason to assign someone from another agency. This project has benefited from the efforts of numerous public agency staff people, so there is already a good group of candidates who know the PASA and who could help going forward. Although there should be one point person who is responsible for managing all aspects of PASA revitalization and redevelopment, additional staffing will of course also be needed for activities ranging from civil engineering to drafting regulatory code.

Leadership, Management and Organization Action Item 4c: Create an Advisory Committee to Provide Ongoing Guidance

There are already several advisory committees for this project, including committees that consist of elected leaders, local residents, public agency technical staff, and members of the McLoughlin Area Plan Committee. One or more of these committees should retain their role of ensuring the ongoing implementation of the PASA Plan. Because there are a number of public agencies that are working in the PASA and that are committed to its success—including Clackamas County, TriMet, ODOT, and Metro—it is important that these agencies remain engaged in decision making and implementation. It should be recognized, however, that a proposed committee may have an advisory, rather than decision making role, in many cases, since final funding will come from other sources, such as the Clackamas County Board of Commissioners or ODOT, for example.

Leadership, Management and Organization Action Item 4d: Create a Year-One Action Plan

One of the first orders of business for the PASA Advisory Committee should be to use this Implementation Plan to create a one-year action plan—to clarify its highest priorities for the coming year. Things are more likely to get done when individual deadlines and priorities are set and responsibilities are assigned. Both the short-term and long-term plans should become reference documents against which the community can assess its progress. This implementation plan has identified specific short and long term projects but early action items such as stakeholder engagement should be prioritized within the first year.

Leadership, Management and Organization Action Item 4e: Consider the formation of a Business Improvement District (BID)

A BID is a locally-funded district that supports operational activities—such as marketing, maintenance, event planning, landscaping, cleanliness and safety programs within a defined area. BIDs are often implemented along with a "Main Street" program, such as those found in Oregon City, McMinnville, Salem and elsewhere. BIDs are an effective way of tying together "local ownership" of implementation, outcomes, funding and decision-making, since funding comes from local businesses and property owners who are also in charge of deciding how the money gets spent. Because BIDs present another local fee, local businesses are naturally wary. However, BIDs have proven to be a successful tool, providing local control. Nationwide, more than 400 BIDs have been successfully implemented in more than 40 states. Within Oregon, the state and Clackamas County Main Street programs are an informational resource.

Leadership, Management and Organization Action Item 4f: Encourage Stakeholder Advocacy

If the people who live and work in the PASA support the vision, then they have a responsibility to advocate for change. This is especially true if the PASA is not considered an immediate priority among the public partners. This citizen-driven leadership may be the most effective leadership of all. Examples of active citizen and business groups include Urban Green, Citizens Informed and Aware, the Oak Grove Community Council, and the McLoughlin Area Business Association.

Leadership, Management and Organization Action Item 4g: Identify Project Advocates

Every project needs champions. To succeed, the project needs to have a strong sense of support from citizens and elected officials. The support should be well articulated to define why this project is important and motivate others to participate in making it happen.

Estimated Cost (Action Items 4a-4g): Not Applicable. These tasks are assumed to be handled internally by County staff.

2 Funding Strategies and Sources

Private development is also a key to dramatically increase the effectiveness of some of the local funding tools described below. In successful urban districts over many years, the ratio of private to public investments can be five to one or more.. For example, both Tax Increment Financing (TIF) and LIDs capture the tax revenue generated by development within a defined area in order to invest it in local capital projects and operations. This makes development and public-private partnerships all the more important.

While there is reason for optimism and determination in executing a funding plan for the project, there is no "golden goose." Most sources of public funds are oversubscribed, meaning there is much greater demand for funds than availability. Project stakeholders will need to build their case for funding, cultivate partnerships between numerous public agencies (for example, between the County, Metro and state agencies), understand the outcomes that public agencies hope to achieve through funding awards, and be both persistent and patient.

The action items listed below are organized in order or priority and likelihood for securing funding. In addition to the information below, PASA stakeholders should also consult the McLoughlin Area Funding Alternatives memorandum produced for the McLoughlin Area Plan process.

Funding Strategies and Sources Action Item 5a: Include Key Infrastructure Projects in Clackamas County's Transportation and Capital Plans

Clackamas County completes several periodic transportation and capital planning processes, and PASA stakeholders should work within these processes to make sure that the capital projects identified by the PASA Plan are included, and ultimately, funded. It is likely that the most expensive element of public infrastructure to be funded by the PASA Plan is transportation, and therefore transportation-related funding processes are most important.

The first planning process is the County's TSP, a long-term, county-wide transportation plan that was recently initiated and is expected to list all probable and potential transportation improvements in the County. The TSP will inform the County's CIP, a master list of capital projects to be considered and funded during both the short term (next five years) and long term (next 20 years). Funding from the CIP can serve as "seed" funding that can attract other funding from Metro, the state, or federal sources. The TSP and CIP are the first places to look for significant capital funding in the County, particularly for transportation projects. County funds are probably most likely to be directed towards collector and arterial roads, rather than state highways such as McLoughlin Boulevard, which is maintained by ODOT. However, County plans can still identify improvements on McLoughlin, whether they will be funded by the County or a range of other agencies.

The County also manages other capital funding processes with significant potential relevance for this plan, including the County Parks Fund and Community Development Block Grant (CDBG) application process.

Estimated Cost: Not applicable. This task is assumed to be handled internally by County staff.

Funding Strategies and Sources Action Item 5b: Include Key Infrastructure Projects in Metro's Regional Transportation Plan (RTP) and Metropolitan Transportation Improvement Plan (MTIP)

The RTP and MTIP are in many ways a regional (Metro) equivalent to the County's CIP. Because the plans are regional in scope, they generally apply only to improvements of regional significance, but the way that this is defined can vary. In any case, only a small number of improvements within the PASA Plan—led by the McLoughlin Boulevard improvements—are appropriate for consideration by Metro. The RTP is a long-term (20-year) plan, while the MTIP is a short-term (about four-year) plan. Like the County's CIP, the Metro plans are themselves an assembly of funds from a variety of federal, state and other funding sources. In addition to these plans, Metro is working on a "new look" at how to prioritize and fund infrastructure throughout the region, called the Community Investment Initiative, because the region is facing such a significant funding shortage over the long term. PASA staff and stakeholders should monitor this effort. PASA stakeholders should make an effort to define the benefits of local investments within these categories.

Estimated Cost: Not applicable. This task is assumed to be handled internally by County staff.

Funding Strategies and Sources Action Item 5c: Evaluate Tax Increment Financing (TIF) as a Funding Tool

Tax increment financing (TIF, sometimes also called "urban renewal") is a funding tool that captures the net new property taxes generated by real estate development within a defined district and directs those funds towards needed infrastructure improvements in the district. Therefore, when working properly, TIF creates a beneficial cycle of needed public infrastructure and actions, and private investments. TIF is typically the most powerful tool to fund local redevelopment and revitalization and is used in many of the state's cities and counties, including Clackamas County and the cities of Portland, Hillsboro, Lake Oswego and Salem. Based on preliminary calculations conducted by the MAP project team, a TIF district covering a portion of the MAP area including the PASA could probably fund in excess of $150 million in infrastructure improvements.

Despite its potential benefits, TIF will be very difficult to implement in the PASA because of ballot Measure 3-386, which was approved by Clackamas County residents as this report was being written. The measure requires that all new TIF districts be referred to the residents of the entire county for a public vote. New TIF districts are currently quite controversial, since they capture some funding that would otherwise go to other taxing districts, such as the County general fund, school and utility districts, and others. Therefore, such a County-wide vote would be an expensive, politically uncertain and labor-intensive effort.

That said, several jurisdictions within the state have recently evaluated and implemented TIF programs within this new legal environment, while balancing the needs and expectations of other local taxing districts. The City of Redmond, Oregon, approved a major amendment to its urban renewal plan in collaboration with Deschutes County, the local school district, and other districts in 2011. The City of Beaverton has also been managing a multiparty process that includes the County, school district, and others.

Estimated Cost: Varies. This task is assumed to be handled internally by County staff or the County could hire a consultant to complete the analysis.

Funding Strategies and Sources Action Item 5d: Evaluate and Implement Local Improvement Districts (LIDs) for Specific Projects

LIDs are also described briefly in the Development Incentives section above. LIDs typically fund clearly defined local improvements, such as a local road, and therefore will be best suited to some of the connector roadways recommended by the PASA Plan. In many LIDs, the cost burden is borne entirely by private property owners who are adjacent to or nearby the new improvement; however, costs can also be shared by the public sector. Affected property owners must vote to approve the formation of an LID. The benefits of an LID are that improvements are financed over a long time period (often 20 years) rather than paid in one lump sum, can take advantage of lower interest rates through municipal bond markets, are flexible in terms of assessment rates, are not paid by unaffected property owners, and can be shared among numerous property owners and, if desired, public sector agencies.

Funding Strategies and Sources Action Item 5e: Evaluate the Viability of a System Development Charge (SDC) Pool

SDCs are fees paid by new development proportionate to the impacts that they will have on public infrastructure systems such as roads and schools; Clackamas County has an existing SDC framework in place and uses SDCs to pay for transportation improvements. An SDC "pool" is a smaller (not County-wide) local area in which transportation or other improvements are needed, and in which new development will take advantage of and use the new improvements. In some circumstances, the PASA may fit this description—for example, in the areas along McLoughlin where compact housing is envisioned and where new roads will be required. Local SDC pools do not necessarily require higher SDCs from a given project; rather, they ensure that a greater share of the SDCs paid go towards local projects. The County has implemented such an SDC framework in the Happy Valley area.

Estimated Cost: Varies. This task is assumed to be handled internally by County staff or the County could hire a consultant to complete an analysis.

Funding Strategies and Sources Action Item 5f: Pursue Other Grants and Loans

Other grant and loan programs are available at the regional (Metro), state and federal levels and should be pursued proactively by PASA staff and stakeholders. These include Metro's Nature in Neighborhoods, TOD, and Regional Travel Options programs; Clackamas County Main Street program; and the federal CDBG, New Market Tax

Credits (NMTC), and Sustainable Communities programs, as well as any future one-time stimulus programs initiated by the federal government.

Incorporation of the PASA as an independent City within Clackamas County has also been discussed. This would significantly increase the revenues available to implement the PASA Plan by increasing tax rates and allowing the area to capture more state and federal funds that are distributed on a formula basis. It would also, of course, mean higher taxes for residents and businesses within the PASA. For that reason, and because of the associated controversy, it is not specifically recommended here.

Estimated Cost: Varies. This task is assumed to be handled internally by the County.

3 Making it Happen

Great things are possible for the PASA. Over the last year, property owners, business owners and residents have worked hard to create a vision and a plan that can transform their community into a vibrant, mixed use urban neighborhood. The challenge is this: How does the community make it happen? This section provides specific guidance on the actions needed, phasing of those actions and the role of each participant in the planning process.

3.1 Partners

An important way to build support for community change is to engage those most affected as partners in achieving the vision. The role of a partner may only be to lend support. Ideally, though, partners facilitate implementation by providing dollars or making a nonmonetary commitment such as changing regulations to facilitate achieving the vision. Potential partners for the actions are listed in the Implementation Phasing table. They include:

Metro: As the MPO for the area, Metro can take multiple roles in the success of the PASA Plan. Metro can fund improvements to the local road system and encourage changes on McLoughlin Boulevard (at a corridor-wide level). Metro has already been active in its support through the Nature in Neighborhoods grant to Urban Green to transform the Park Avenue Station and park-and-ride into a unique setting. Metro can continue to support these types of projects and encourage an active street environment for supporting land uses.

Private Property Owners: There are multiple private commercial property owners on both sides of McLoughlin Boulevard. The PASA Plan's effect on these property owners varies. Property owners adjacent to McLoughlin Boulevard may find their access changed. Property owners away from McLoughlin Boulevard may experience a change in parking resources that could be very valuable to them.

Neighborhood Organizations: Residents in the Park Avenue area have the most at stake in the PASA Plan. Implementation of the plan will create an extension of the walkable neighborhood they live in. An appropriate role for the neighborhood is to convey support for the policy changes and infrastructure investments.

Business Community: The larger McLoughlin area business community, through organizations such as the Chamber of Commerce, has an interest in maintaining the viability of businesses on McLoughlin Boulevard. They may oppose changes in policy that are viewed as contrary to the interests of their members, but they can also be powerful allies once convinced of the merits of the PASA Plan. An appropriate role for the business community is to provide support for the political decisions required to fund the project.

County Agencies: The County has diverse interests. Its planning and redevelopment departments are most invested in the implementation of the PASA Plan. The role of each department is central to a successful plan. The Planning Department will be responsible for drafting the zoning code changes, while the redevelopment agency can guide the creation of an urban renewal district or other local funding mechanism. The County Engineering Department will be taking the lead on the street improvements, including coordination with ODOT on McLoughlin Boulevard.

TriMet: TriMet owns and operates the most substantial investment that has been made on McLoughlin Boulevard—the Portland to Milwaukie LRT Line from Park Avenue to Downtown Portland. TriMet has an interest in serving transit patrons by facilitating high quality connections between its stations and the businesses and residents adjacent to McLoughlin Boulevard.

Oregon Department of Transportation: ODOT owns McLoughlin Boulevard. It has an interest in protecting the capacity and safety of its facility. ODOT also has a substantial role in administering highway funding programs and supporting transportation and land use planning efforts such as the PASA Plan.

3.2 Phasing Actions

The phasing of the actions needed to implement the plan is determined by practical and strategic considerations. For the Park Avenue area, the key considerations affecting the phasing schedule are these:

- **Funding:** A high proportion of the actions needed are infrastructure investments that are expensive, so the availability of resources is a key issue in deciding how to phase actions.
- **Business and Property Owners:** The conversion of McLoughlin Boulevard and many of the other infrastructure changes in the area would affect the access to properties along the street. While many of these changes will be positive in the long run, short-term impacts are inevitable. How these businesses and property owners feel about the proposed changes should be considered in deciding when to invest.
- **Development Feasibility:** A main objective of the plan is to promote more mixed use development. Many of the recommended actions are intended to facilitate that type of development. The County should implement the

recommended actions as soon as possible so that new development can benefit when the market recovers. However, some actions could be delayed because there is virtually no market at the present time.

With these factors in mind, two alternative approaches to phasing the recommended actions are considered

***The Big Move**:* The most powerful way to accelerate change in the PASA would be to begin to immediately convert McLoughlin Boulevard to a multi-way boulevard. The approximate cost for the conversion is $9,186,000. The advantage of this approach is that it will demonstrate to the community, property owners and investors that the County is serious about transforming the area into a pedestrian-friendly, mixed use neighborhood. In turn, this commitment will lead to new private investment in development. The disadvantage of this approach is that it would require substantial funding up front and require the County and ODOT to immediately confront the opposition of many property owners and businesses.

The "Big Move" approach should also incorporate several other actions including new streets that provide improved connectivity and a marketing strategy to help sell the Park Avenue Station brand to private investors.

***Incremental Change*:** If adequate resources are not immediately available to pursue the Big Move strategy, then the alternative approach is to pursue change on an incremental basis. The Implementation Phasing table below describes a sequence of actions that can be taken in stages or simultaneously. The advantage of this approach is that investments can be made when resources are available. It also provides for a longer period for the market to recover and business owners to become comfortable with the multi-way boulevard concept. The disadvantage is that change could be a long time in coming. Developers may not be willing to invest until the public investment is made and there is predictability about the character of the neighborhood and the County's commitment to change.

3.3 Essential Actions

The table that follows this section lists the full set of recommended actions. However, the following three major actions are essential:

1. Redesign McLoughlin Boulevard as a Multi-way Boulevard: McLoughlin Boulevard serves many purposes. It is the front door for neighborhoods and businesses on and adjacent to the street and a gateway to other parts of the region. In these ways, McLoughlin Boulevard plays a central role in the Park Avenue area, which is why it is so important to change it.

   There is nothing more fundamental to community character than the nature of its public spaces and the ways in which people move within those spaces. McLoughlin Boulevard is the dominant public space in the Park Avenue area. In its current form, it is an auto-dominated right-of-way and has auto-dominated

land uses adjacent to it. This current form is inconsistent with the community's vision of a vibrant, pedestrian-friendly, mixed use neighborhood.

McLoughlin Boulevard should be converted to a multi-way boulevard. Doing so will be expensive and controversial, but failing to change it will limit the vision of changing an auto-dominated, suburban environment to a more dynamic place to live.

2. Facilitate Mixed Use Development: Changing the street is essential, but it must also be accompanied by actions to promote mixed use development. This will have a number of benefits. Denser development will provide more residents, thereby increasing the viability of local businesses and the effectiveness of the light rail system. The form and uses in this new development will reduce automobile dependence and help create a pedestrian-oriented character.

   Although the overall desired form of mixed use development is multistory, it may not be financially viable in the near term. The County can help close the gap by using its regulatory tools to facilitate mixed use development forms and by dedicating financial resources to reduce the costs for infrastructure, such as the costs associated with the road connections described earlier.

3. Stick to the Vision: Planning is easy, implementation is the hard part. Stick with the vision and, most importantly, put someone in charge. The best way to get staff, elected officials and the County's partners to focus on making changes is to identify an individual, such as a county staff person, who is responsible for the implementing actions and the agency and stakeholder coordination needed to transform the Park Avenue area. The vision, plan and implementation strategies provide the place to start, but some dedicated attention to the implementation actions, backed by a commitment to invest in the required infrastructure, will yield near-term results for the County and its residents.

Appendix A: Action Items Summary List

Regulatory	**Incentives and Partnerships**
1a: Adopt Form-Based Design Requirements	3a: Incentives Toolkit
1b: Designate the McLoughlin Corridor as a Station Community Mixed Use District	3b: Program Marketing
1c: Designate the River Road Location as a Neighborhood Mixed Use District	**Leadership, Management and Organization**
1d: Permit Duplex/Triplex/Live-Work in Residential Areas in the Station Community	4a: Adopt the Vision
1e: Amend the Transportation System Plan and Capital Improvement Plan (CIP)	4b. Assign Public Agency Staff to PASA
1f: Adopt Station Community Boundary	4c. Create an Advisory Committee to Provide Ongoing Guidance
1g: Amend the Trolley Trail Master Plan	4d. Create a Year-One Action Plan
1h: Develop a Parking Strategy	4e. Consider the Formation of a Business Improvement District (BID)
Infrastructure Investment	4f: Encourage Stakeholder Advocacy
2a: Reconstruct McLoughlin Boulevard as a Multi-way Boulevard	4g: Identify Project Advocates
2b: 27th Avenue Extension	**Funding Strategies**
2c: Evergreen Extension	5a: Include Key Infrastructure Projects in Clackamas County's Transportation and Capital Plans
2d: Torbank Extension	5b: Include Key Infrastructure Projects in Metro's Regional Transportation Plan (RTP) and Metropolitan Transportation Improvement Plan (MTIP)
2e: Silver Springs Extension	5c: Evaluate Tax Increment Financing (TIF) as a Funding Tool
2f: Cinderella Extension	5d: Evaluate and Implement Local Improvement Districts (LID) for Specific Projects
2g: Local Access Roads	5e: Evaluate the Viability of a System Development Charge (SDC) Pool
2h: Convert SE Linden Place to a Public Street	5f: Pursue Other Grants and Loans
2i: SE Linden Place Connection	
2j: Multi-Use Connections to Trolley Trail	
2k: Amend Adopted Parks-related Plans	

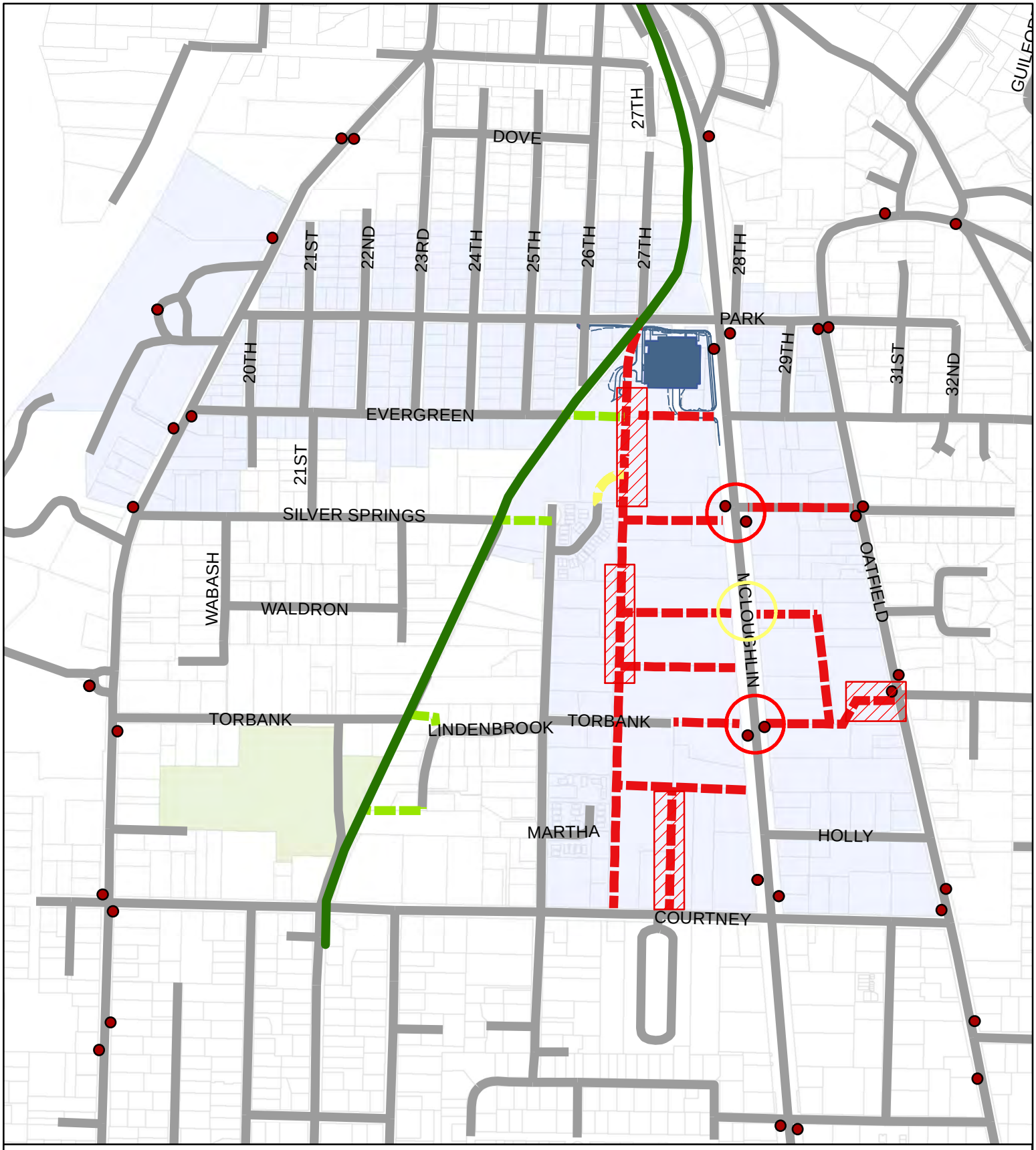
Implementation Plan Partners, Responsibility and Timing *(note: actions may run concurrently)*

		Timing				
	Estimated Cost	**Short (1-5 yrs)**	**Medium (6-10 yrs)**	**Long (11-20 yrs)**	**Primary Responsible Parties**	**Partners**
Regulatory						
1a: Adopt Form-Based Design Requirements	N/A				County Planning Division/ Board of County Commissioners	Neighborhood groups, property owners, key stakeholders
1b: Designate the McLoughlin Corridor as a Station Community Mixed Use District	N/A					
1c: Designate the River Road Location as a Neighborhood Mixed Use District	N/A					
1d: Establish criteria for future plan/zone amendments that would increase residential density in the Station Community	N/A					
1e: Amend the Transportation System Plan and Capital Improvement Plan (CIP)	N/A					
1f: Adopt Station Community Boundary						
1g: Amend the Trolley Trail Master Plan	N/A				North Clackamas Parks & Rec District, Board of County Commissioners	
1h: Develop a Parking Strategy	TBD				County Planning and Engineering Divisions, ODOT	TriMet, residents, property owners, and businesses
Infrastructure Investment						
2a: Reconstruct McLoughlin Boulevard as a Multi-way Boulevard	$9.2 million				County Planning and Engineering Divisions, ODOT	Metro, residents, property owners, key stakeholders, and businesses
2b: 27th Avenue Extension	$8.8 million				County Planning and Engineering Divisions, North Clackamas Parks & Rec District (2i only), Private developers	
2c: Evergreen Extension (could be privately funded with development)	$1.2 million					
2d: Torbank Extension	$1.5 million					
2e: Silver Springs Extension (could be privately funded with development)	$1.7 million					
2f: Cinderella Extension (could be privately funded with development)	$4.1 million					
2g: Local Access Roads (could be privately funded with development)	$4.9 million					
2h: Convert SE Linden Place to a Public Street	$20,000					Residents, property owners
2i: Linden Place to the 27th Avenue Connection	$614,000					
2j: Multi-Use Connections to Trolley Trail	$925,000					

2k: Amend Adopted Parks-related Plans	TBD				North Clackamas Parks & Rec District, Board of County Commissioners	Neighborhood groups, property owners, key stakeholders
Incentives and Partnerships						
3a: Incentives Toolkit	TBD				County Development Agency	Property owners, project advocates, key stakeholders, and businesses
3b: Program Marketing	N/A				County Development Agency	County Planning Department/ County Commissioners
Leadership, Management and Organization						
4a: Adopt the Vision	N/A				County Planning Division, Board of County Commissioners	Residents, property owners, project advocates, key stakeholders, and businesses
4b. Assign Public Agency Staff to PASA	N/A				County Planning Division, County Development Agency	Board of County Commissioners
4c. Create an Advisory Committee to Provide Ongoing Guidance	N/A					TriMet, ODOT, Metro, residents, property owners, project advocates, key stakeholders, and businesses
4d. Create a Year-One Action Plan	N/A					
4e. Consider the Formation of a Business Improvement District (BID)	N/A				County Development Agency	Property owners, project advocates, key stakeholders, and businesses
4f: Encourage Stakeholder Advocacy	N/A				County Planning Division	
4g: Identify Project Advocates	N/A					
Funding Strategies						
5a: Include Key Infrastructure Projects in Clackamas County's Transportation and Capital Plans	N/A				County Planning and Engineering Divisions.	Board of County Commissioners
5b: Include Key Infrastructure Projects in Metro's Regional Transportation Plan (RTP) and Metropolitan Transportation Improvement Plan (MTIP)	N/A				County Planning and Engineering Divions, Board of County Commissioners	Metro, ODOT
5c: Evaluate Tax Increment Financing (TIF) as a Funding Tool	TBD				County Development Agency	Board of County Commissioners
5d: Evaluate and Implement Local Improvement Districts (LID) for Specific Projects	TBD				County Development Agency, property owners, businesses	Key stakeholders and businesses
5e: Evaluate the Viability of a System Development Charge (SDC) Pool	TBD				County Engineering Division, County Development Agency	Board of County Commissioners

5f: Pursue Other Grants and Loans	TBD				County Planning and Engineering Divisions, County Development Agency	Project advocates, key stakeholders

Appendix B: Proposed PASA Plan Figures



Multi-Use Path
Two-Lane Street/Sharrow
Skinny Street
Existing Street
Trolley Trail
Bus Stop
School
Future LRT and Park and Ride
Station Community Boundary
Unsignalized Intersection
Future Signalized Intersection

Figure 1: Circulation Plan

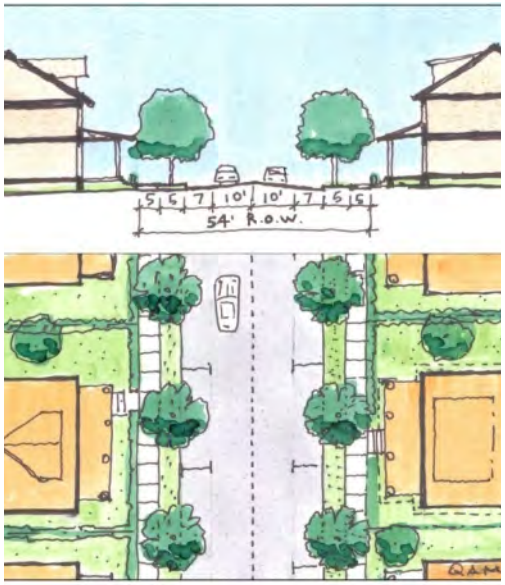
N

0 300 600 Feet

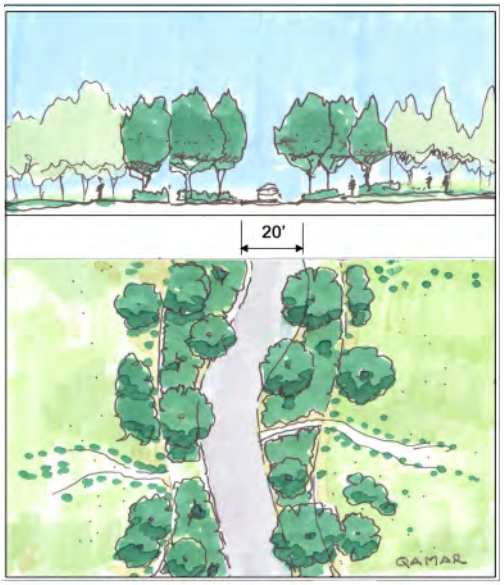
Note: New street locations within the cross-hatched area are flexible due to close proximity to builings and topography, but the connection must occur to provide local circulation.

Date: 2/23/2012

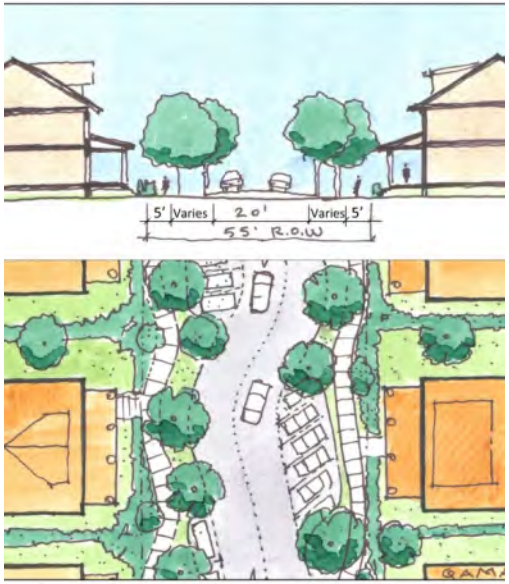
Skinny Street



Two Lane Street



Pathway



Two Way Sharrow Street

Potential street cross sections for new connections.

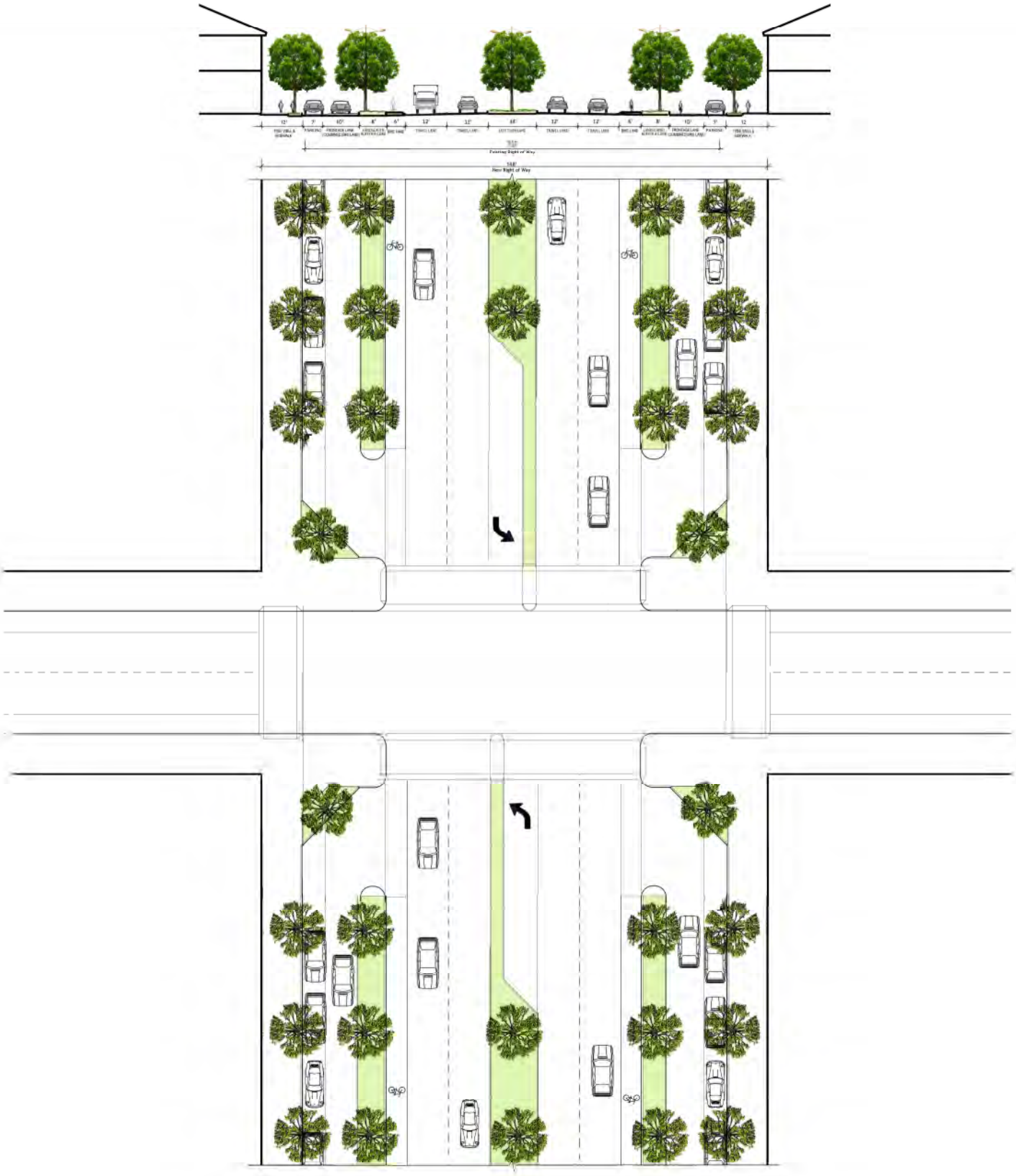


Figure 1a: McLoughlin Boulevard (Multi-Way Boulevard)

0 10 20 30 ft

Damar Architecture & Town Planning Co.

Pedestrian Civic Space (Parks, sidewalks, planting strips, schools, plazas

Private Front Encroachment Areas

Tree Canopy (In parks and along streets)

Specialty Uses (Transit stations, schools, park pavillions, post office, municipal parking, live/work, etc.

Taxlots

Figure 2: Open Space/Street Environment

0 300 600 Feet

Date: 12/15/2011

Urban design elements and frontages identify the types of uses and densities of development within the PASA by frontage type. Figures 6 illustrates the street frontages, and development densities proposed.

Figure 3: Urban Design Elements and Frontages

- Corridor Design
- Mixed Design
- Residential Design
- Trolley Trail/Trail Connection
- School
- Station Area Boundary

N

0 300 600 Feet

Date: 2/23/2012

3-Story townhomes with front stoops and shallow front garden setback

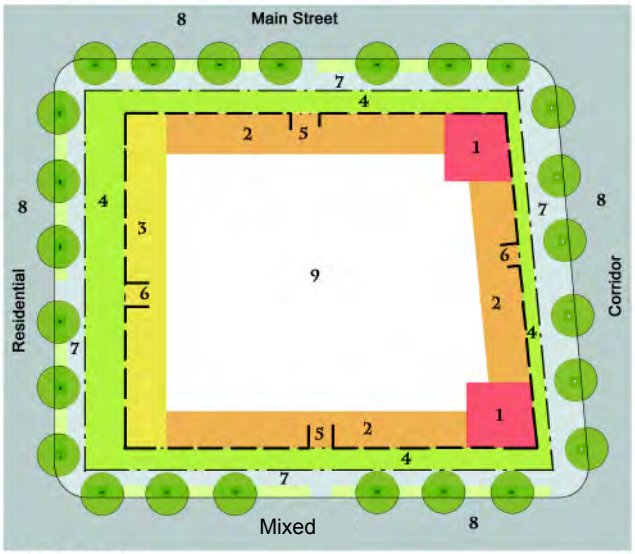
3-Story townhomes with front stoops and porches and deeper front lawn setback

Townhomes with front stoops and bay windows encroaching into shallow front garden setback

A double house with deep front lawn setback and porch porch projecting into encroachment zone

3-4 Story apartment buildings with landscaped front setbacks and entrances from courtyard (beyond)

3-4 story apartment buildings with Julliette balconies and green wall



1- Retail required
2- Residential with retail allowed
3- Residential without retail allowed
4- Encroachment frontages (See frontage types for permitted building elements
5- Vehicle service access permitted only mid-block
6- Pedestrian/bicycle access permitted mid-block or at corners
7- Sidewalk with seperated from curb by planting strip or tree wells
8- Street with on-street parking
9- Mid-Block permitted parking courts, gardens courts, or upper level decks
Public Right of Way- - —— - —— - —— -
Building Frontage line- — — — — —

2-story live/work townhomes above half-under shops

3-story live/work townhomes with ground floor shops upto the sidewalk

Corner sidewalk cafe at base of multistory apartment with awnings encroaching over the sidewalk seating

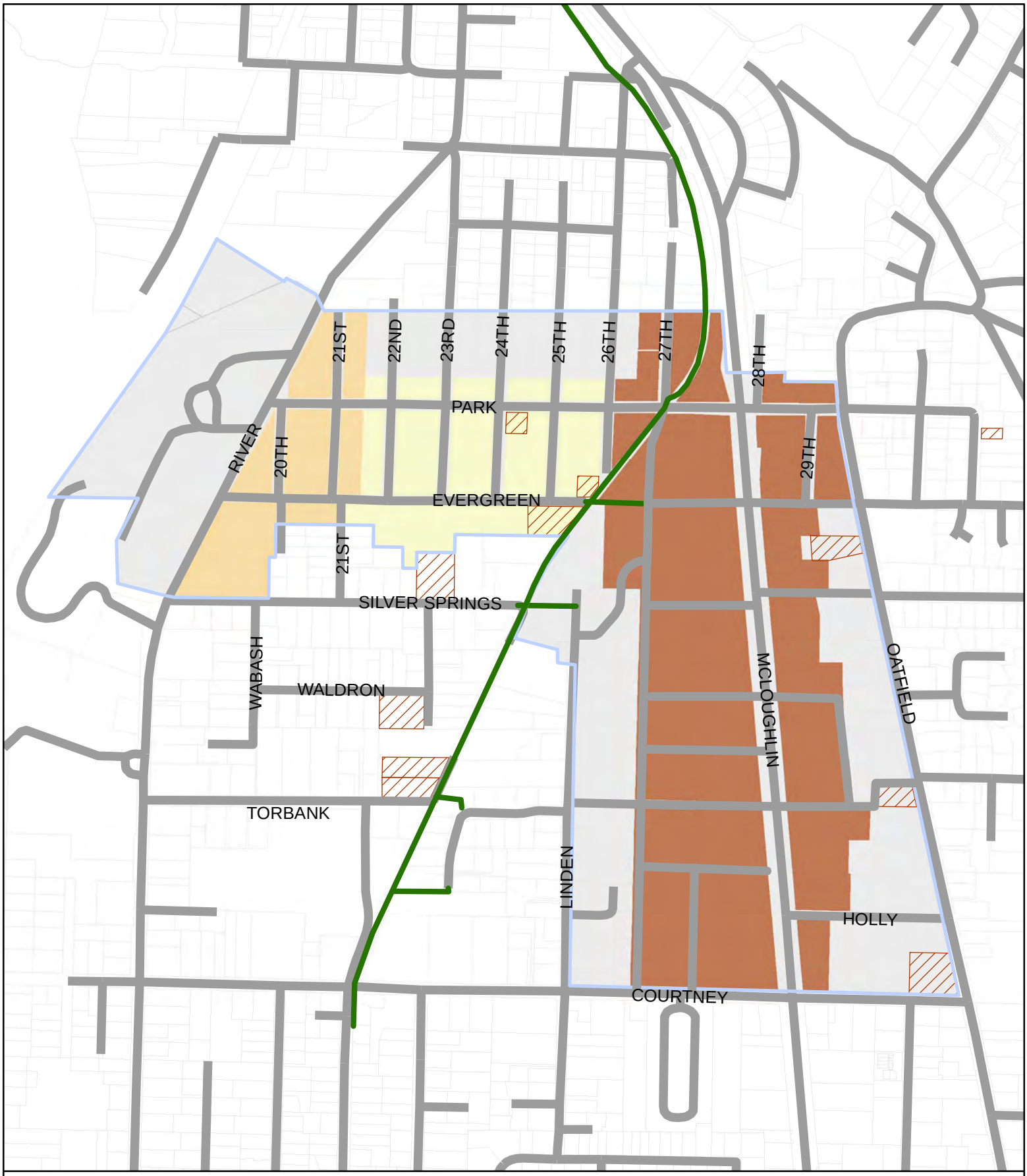
One story corner retail shop.

3-story live/work townhomes with flexible ground floor spaces that can be either shops, offices or living

Multi-story apartments with balconies, bay windows, and awnings encroaching over sidewalk cafe seating.

Figure 3a: Concept Block Design

Date: 11/10/2011



Neighborhood Mixed-Use

Residential/Potential Higher Density

Station Community MU

Historic Properties

No Change Proposed

Station Area Boundary

Trolley Trail/Trail Connection

Figure 4: Regulating Plan/ Desired Land Use

N

0 300 600 Feet

Date: 2/23/2012

Figure 5: Proposed Station Community Boundary

- Proposed Station Community
- School
- Trolley_Trail
- Milwaukie City Limits
- Future LRT Station and Park and Ride
- 1/4 Mile Buffer
- 1/2 Mile Buffer

0 400 800 Feet

N

Date: 5/18/2011