EXHIBIT C

City of Damascus

TRANSPORTATION SYSTEM PLAN

July 2013

Prepared for:

City of Damascus
19920 SE Highway 212
Damascus, OR 97089

Prepared by:

Kittelson & Associates, Inc.
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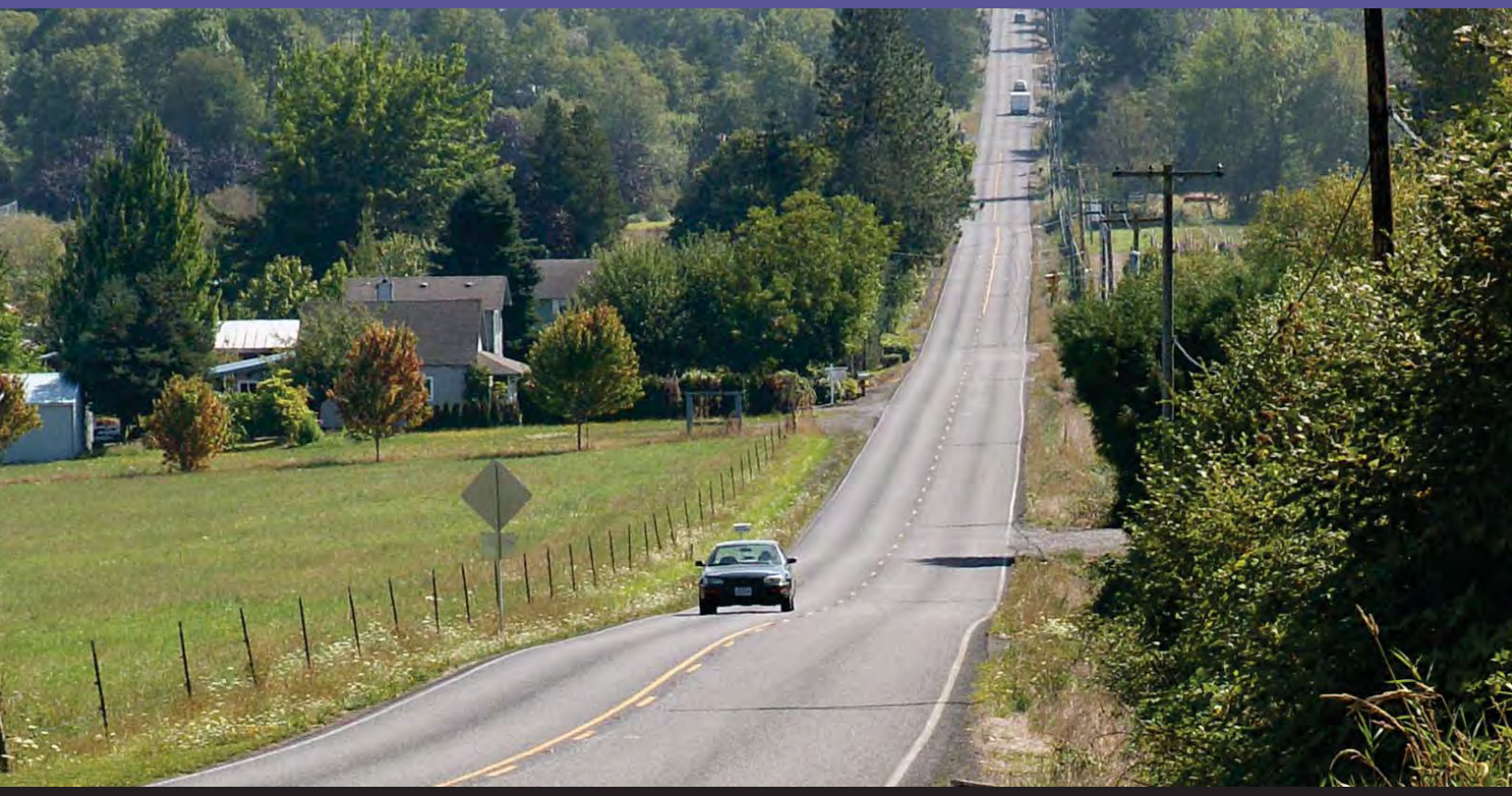
Portland, OR 97205



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City of Damascus

Damascus, Oregon

Prepared For:
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Damascus, Oregon 97089
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Project No. 12779

July 2013

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PREFACE

The 2035 City of Damascus Transportation System Plan (TSP) has been created through a collaboration of local residents, city staff, and other agency representatives. The progress of the plan was led by a Project Management Team (PMT) and guided by the Technical Advisory Committee (TAC), Citizens Advisory Committee (CAC), Committee for Citizen Involvement (CCI), City Council, and Planning Commission.

The TAC provided guidance on technical aspects of the TSP and consisted of staff members from the surrounding communities. The CAC consisted of resident volunteers who provided input throughout the process and ensured that the needs of people in the community of are incorporated in the TSP. The CCI consisted of community volunteers that worked to facilitate the public involvement process throughout the development of the TSP. The Project Management Team would like to acknowledge the hard work and dedication of members of each group.

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Section 1

Introduction

INTRODUCTION

PURPOSE

A transportation system plan (TSP) outlines the transportation-related projects, programs and policies needed to support the continued growth and economic development of our cities, counties, regions and at the state level. In Oregon, all counties and cities with more than 2,500 people must create transportation system plans; these TSPs must be consistent with the goals and policies contained in the Comprehensive Plans. The TSP should be updated every 5 – 7 years in accordance with changing priorities, funding realities, and realized and projected growth.

This Transportation System Plan is the first of its kind for the City of Damascus. It has been created over the course of several years and is the product of the hard work and dedication by Damascus' residents, business owners, council members, city staff, and neighboring jurisdictions. It reflects the issues, needs, and opportunities identified by those stakeholders and provides guidance for the development of a comprehensive, efficient, and multi-modal transportation system in Damascus over the next 20 to 40 years.

This document meets the state requirements for a TSP and can serve as a resource for staff, decision makers, and the public. The TSP identifies the multi-modal transportation system that is envisioned to serve the city for the next 20 to 40 years, designating the function, capacity and location of future facilities in order to serve local, regional, and statewide needs. It also recommends areas for future refinement plans that will look in more detail at the Damascus Town Center and Carver Village area.

The Transportation System Plan also serves as part of the Damascus Comprehensive Plan. The Comprehensive Plan and the TSP were developed in tandem in order to ensure that the transportation policies are aligned with the overall goals and vision outlined by the community in the Comprehensive Plan and to allow for the development of an integrated land use and transportation system in the City of Damascus.

PLANNING CONTEXT AND PROCESS

Formerly a rural, unincorporated area of Clackamas County, the City of Damascus was brought into the Metro Urban Growth Boundary and incorporated in 2004, serving as the first new city in Oregon in 22 years. The City of Damascus' core values are reflective of the rural character and the strong community vision to maintain the character and values as they transition into a more urban environment over the next 20 – 40 years.

Over the course of the past five years, citizens of Damascus have engaged in the planning process to identify important issues and figure out how to plan for them – not just for the transportation system, but for the future of the entire Damascus community. The community has identified primary needs and opportunities in Damascus related to future land use, including a vibrant focal point of the city at the Town Center, several mixed use village areas, and neighborhood commercial nodes. The TSP has been developed to serve these future land use needs as well as the needs of the existing community.

The Transportation System Plan was developed in a multi-step process:

- Reviewing state and regional transportation plans and policies with which the TSP needs to be consistent.
- Assessing the existing transportation and land use system in Damascus, including a detailed inventory of the transportation facilities and input from the community on existing issues and needs.
- Conducting a multi-day charette to identify potential transportation system needs and solutions.
- Working with technical and citizen advisory committees to develop the framing goals and policies for the TSP and as part of a larger process of developing goals and policies for the Comprehensive Plan.
- Gathering input from the community during Town Hall meetings and other meetings throughout the planning process.
- Identifying future transportation system needs over the next 20 to 40 years to be able to accommodate anticipated growth in alignment with the City's goals and vision for the future.
- Evaluating the performance of the proposed future system, based on anticipated growth.
- Identifying strategies for funding the proposed improvements.
- Preparing a plan document for review by the City Council and Planning Commission and to be up for a vote by the citizens of the City of Damascus.

Throughout the process, the significant public engagement activities drove the direction of the TSP. Over the course of planning process, citizens of Damascus identified the following key issues to address in the TSP:

Highway 212

- Address concerns regarding congestion and safety at the intersections of Foster Road, Sunnyside Road, Royer Road, and 22nd Drive intersections along OR 212
- Explore alternative solutions to OR 212 in the Town Center area, potentially increasing parallel street connections or adding a one-way couplet

Walking and Bicycling

- Need safe places to walk and bike in the city
- Need better bicycle connections to Happy Valley and Gresham
- Need safe places for pedestrians to cross OR 212
- Desire for pedestrian and bicycle trails or pathways that are separated from roadways

Transportation Funding

- Identify methods to pay for improvements
- Identify ideas for interim and near-term solutions
- Coordinate transportation improvements with other infrastructure for increased efficiency

Coordination with Nearby Projects

- Coordinate with the Sunrise Corridor Plan
- Connect to the planning and project work related to the SE 172nd Avenue/190th Drive Corridor Management Plan and the future Springwater Interchange Area

REGULATORY CONTEXT

The development of the Transportation System Plan was guided by Oregon Revised Statute (ORS) 197.712 and the Department of Land Conservation and Development (DLCD) administrative rule known as the Transportation Planning Rule (TPR). Through this rule, the State of Oregon requires that the TSP be based on the Comprehensive Plan land uses and that it provide for a transportation system that accommodates the expected growth in population and employment over the next 20 years. The TPR also requires the following elements:

- A road plan for the arterial and collector system, including functional classifications of streets, and standards for the layout of local streets that provide reasonably direct routes for bicycle and pedestrian travel
- A public transportation plan
- A bicycle and pedestrian plan
- An air, rail, water and pipeline transportation plan
- Policies and land use strategies for implementing the plan
- A transportation financing plan

In each of these elements, the TPR requires that the plan consider and incorporate the needs of all users and all travel modes. In addition, the TPR requires that local jurisdictions adopt land use and subdivision ordinance amendments to protect transportation facilities and to provide bicycle and pedestrian facilities between residential, commercial, and employment/institutional areas. Local communities must coordinate their respective plans with the applicable county, regional, and state transportation plans.

TSP ORGANIZATION

This TSP is organized in three main parts: the Executive Summary, Volume 1, and Volume 2.

Executive Summary

The Executive Summary provides explanation, background, and a brief overview of the key recommendations from the TSP. It is designed to be accessible and easy to understand by a wide audience and contains elements of primary interest from Volume 1, including the proposed street network map, the Town Center refinement plan area map, the street cross sections, and bicycle and pedestrian facility planning tools. It also summarizes the costs and potential funding strategies for the transportation plan. It does not include detail on specific policies.

Volume 1: Transportation System Plan

Volume 1 is the "Transportation Plan" for the city, and includes more comprehensive content on the key areas of interest within the Transportation System Plan. It consists of five sections, of which this introduction is the first. Section 2 includes the goals and policies developed by the City to guide the long-range vision of the transportation system and land use plans. Section 3 provides a transportation planning "toolbox" that provides detail on specific planning methods and facilities that can further the city's goals and policies. Section 4 provides the detail on the specific policy guidelines for transportation system development, including design standards, and future multi-modal improvement projects to accommodate future growth. Finally, Section 5 summarizes the existing revenues and expenditures, and provides options for funding the future system improvements.

Volumes 2: Technical Appendices

Volume 2 contains the technical information that was used to develop the policies and recommendations in the TSP, as included in Volume 1.

Section 2

Goals and Policies

GOALS AND POLICIES

Over the course of the planning process, the City of Damascus has developed an overarching community goal for the City's transportation system, as well as a set of 15 policies and implementing strategies that will help frame and prioritize transportation improvements and the development of the system.

COMMUNITY GOAL

"Damascus is to provide a transportation system that is safe, convenient, accessible and economically feasible that incorporates a range of transportation option."

TRANSPORTATION POLICIES

Policy 1:
Maintain and improve the local and regional transportation system for all modes of travel.

Implementation Strategy:

- Adopt a level-of-service standard to assess impacts to the transportation system.
- Adopt Transportation Demand Management (TDM) strategies in the Transportation System Plan (TSP).
- Adopt Transportation System Management (TSM) strategies in the Transportation System Plan (TSP).

Policy 2:
The City's transportation system should minimize impacts to the natural environment and the design should reflect the community's rural character while ensuring efficiency and connectivity.

Policy 3:
Require all new streets and pathways be designed using best management practices to reduce impacts to the environment.

Policy 4:
Preserve, maintain and enhance transportation options through safe, efficient, and cost effective measures for all modes.

Policy 5:
Provide transportation options, including transit, for the City's transit dependent population, seniors, and physically-challenged residents.

Policy 6:
Establish development standards and design guidelines to promote safe, convenient alternative modes of travel including walking and biking.

Policy 7:
Strive to increase the percentage of bicycle and pedestrian users within the City through the maintenance and preservation of safe, convenient, and efficient pedestrian and bicycle systems.

Implementation Strategy:

- Incorporate bike facilities into all multi-family, commercial, institutional and industrial developments, through the Development Code.

Policy 8:
Create transit, pedestrian and bicycle facilities that connect existing and future employment, commercial uses, and neighborhoods.

Implementation Strategy:

- Allow pedestrian and bike paths and lanes to be located both within, adjacent to, or separate from public streets and roadways.

Policy 9:
Establish and employ strategies for using the existing road system and its capacity efficiently before building new roads and all new streets shall be located with consideration to how existing development is impacted, supported, or leveraged for future investment.

Policy 10:
Establish efficient and effective freight transportation infrastructure that is developed and maintained to support local and regional economic needs and plans.

Policy 11:
Establish creative, cost effective and fundable solutions for near and long-term transportation system needs.

Policy 12:
Create strategies that enable new transportation projects to be constructed in phases that can be funded.

Policy 13:
Establish street design standards that are flexible and allow for appropriately-sized streets given the traffic volume, topography, adjacent land uses, social, economic, and environmental considerations.

Policy 14:
Provide flexibility in the transportation infrastructure to accommodate existing land uses and future land use aspirations.

Policy 15:
Minimize the potential for Highway 212 as a barrier to community cohesion while maintaining highway function.

Implementation Strategy:

- Work with regional and State transportation jurisdictions to coordinate planning, construction, and maintenance activities related to highways and roadways.

Section 3

Transportation Planning Toolbox

TRANSPORTATION PLANNING TOOLBOX

Formerly a rural, unincorporated area of Clackamas County, Damascus was brought into Metro's Urban Growth Boundary in 2002 and incorporated as in 2004, serving as the first new city in Oregon in 22 years. The City of Damascus' core values are reflective of the rural character and the strong community vision to maintain the character and values as they transition into a more urban environment over the next 20 – 40 years. The existing low-density patterns of land development are connected primarily by a network of rural, two-lane roads with very limited infrastructure available for pedestrians and bicyclists. Both the land development pattern and the transportation system are shaped by significant topographical constraints, with steep-sloped bluffs in the northern part of the city and a series of creek beds flowing into the Clackamas River to the south.

The long-term community vision is to provide the transportation infrastructure needed to facilitate comfortable, convenient, and safe travel for people using all modes. One of the first steps to achieving this vision is prioritizing improvements that provide for safe walking and cycling between neighborhoods, downtown, and schools, as well as to the neighboring communities of Gresham and Happy Valley.

This section summarizes a range of transportation-related strategies and solutions that can guide the city as it grows and develops. These "tool box" measures fall into the following categories:

- "Active" transportation (i.e., walking, cycling, and transit)
- Connectivity of the transportation network
- Intersection control
- Neighborhood traffic management
- Transportation system management and operations
- Land use

The solutions in this toolbox are intended to help the community to maximize their investment in the existing infrastructure and enhance the quality and availability of the pedestrian and bicycle facilities, as well as to plan for the long-term transportation needs of the community.

INCREASING "ACTIVE" TRANSPORATION

A priority transportation strategy for the city is to provide people the choice to walk or bicycle. This is especially important both as and prior to key roadways being converted from rural two-lane roads to those more urban in nature. The provision of pedestrian and bicycle facilities between key destinations as well as the implementation of other active transportation strategies can enable the community to establish a well-connected system and increase the viability of walking and bicycling.

Pedestrian System

Pedestrian facilities are the elements of the network that enable people to walk safely and efficiently between neighborhoods, retail centers, employment areas and transit stops. These include facilities for pedestrian movement along key roadways (e.g., sidewalks, mixed-use trails) as well as for safe roadway crossing locations (e.g., crosswalks, crossing beacons, pedestrian refuge islands). Each plays a role in developing a comprehensive pedestrian network.

Very few pedestrian facilities are provided today. In the future, as arterials and collector streets are improved to urban standards, most of these streets will include sidewalks and/or multiuse paths alongside the roadway. This system may be complimented by a trail system that will provide for connections between destinations and regional corridors.

As areas of the city become more urban in nature, pedestrian improvements should be prioritized based on their ability to complete connections between places that generate walking trips such as schools and housing; housing and transit stops; and employment areas and future transit stops. Multi-use path projects are discussed in a subsequent section because of their utility for both pedestrians and bicyclists. A trail system is not included in the TSP but will be addressed in the future as part of the City's Parks and Recreation Plan.

Sidewalks

Sidewalks are the fundamental building block to enable people to comfortably, conveniently and safely walk from place to place. They also provide an important means of mobility for people with disabilities and families with strollers, and others who may not be able to travel on an unimproved roadside surface. Sidewalks are usually constructed from concrete and they provide an area separated from the roadway by a curb, landscaping, and/or on-street parking. Sidewalks are widely used in urban and suburban settings.



Sidewalks in a variety of urban and suburban contexts.

Types of Pedestrian Crossings

Crossing facilities enable walkers to safely cross streets, railroad tracks, and other transportation facilities. Planning for appropriate pedestrian crossings requires the community to balance vehicular mobility needs with providing crossing locations that the desired routes of walkers. During the Town Hall meetings, community members highlighted concerns about finding safe places to cross OR 212. They also noted difficulties in crossing other key city roadways, such as Foster Road and 242nd, as well as between neighborhoods located throughout the city.

The state of Oregon considers all roadway intersections to be legal crossing locations for pedestrians regardless of whether a painted crosswalk is provided. At these locations, drivers are required to yield the right of way to pedestrians to allow them to cross. Driver compliance to yielding is often inconsistent and pedestrians often have difficulty crossing higher volume and higher speed roadways. There are several different types of pedestrian crossing treatments that can be used in Damascus; each of these is applicable under a different range of considerations.

A brief description of the various pedestrian crossing types and where they can be applied is provided below.

High Visibility Crosswalk

Clear, reflective roadway markings and accompanying devices are placed at intersections and priority pedestrian crossing where there is sufficient sight distance and reaction time for motorists to yield. Crosswalks can be used at intersections and at mid-block crossings.

Raised Pedestrian Refuge

A raised pedestrian refuge in the median provides a protected area in the middle of a crosswalk for pedestrians to stop while crossing the street. These refuges allow pedestrians to cross one direction of traffic at a time. Pedestrian refuges are often used in areas with high volume traffic volumes and/or at locations with a crash history involving pedestrians.

In-Street Yield

"Yield to Pedestrian" signs can be placed in the middle of crosswalks to increase driver awareness of crossing locations and the legal responsibility to yield right-of-way to pedestrians crossing the street. These signs can be effective in areas that experience high volumes of pedestrians making midblock crossings and/or at locations where there is poor motorist yielding rates.

Rapid Rectangular Flashing Beacon (RRFB)

These crossing treatments include signs that have a pedestrian-activated "strobe-light" flashing pattern to attract motorists' attention and provide awareness of pedestrians that are intending to cross the roadway. RRFBs are often used in areas with high volumes of pedestrians desiring to cross a street at a mid-block location.

Pedestrian Hybrid Beacon (HAWK)

A HAWK is a pedestrian-activated signal, unlit when not in use, that begins with a yellow light alerting drivers to slow, and then a solid red light requiring drivers to stop while pedestrians have the right-of-way to cross the street. HAWKs are often used on wide roadways where mid-block crossings are difficult.

Bicycle System

Bicycle facilities enable cyclists to travel safely and efficiently on the transportation system. Both public infrastructure (bicycle lanes, cycletracks, mixed-use trails, signage and striping) and "on-site" facilities (secure parking, changing rooms and showers at worksites) are important to providing a comprehensive bicycle network.

Many different bicycle facility types are needed to create a complete bicycle network that connects people to their destinations and allows cyclists to feel comfortable and safe while riding. Within the city, only OR 212 has on-street bicycle lanes today. These lanes are not provided along the entire length of the highway and the quality of these facilities is compromised by the generally high motor vehicle volumes and travel speeds. In the future, wider, continuous bike lanes and/or buffers (wider striping, barriers, or medians) separating bicycles from vehicle traffic may be appropriate.

Types of Bicycle Facilities

The types of bicycle facilities that can be used by the City of Damascus in the future are discussed below.

Bike Lanes

Bike lanes are on-street facilities that provide designated spaces for bicycles, separated from vehicles by pavement markings. Bike lanes are generally used on collector and arterial streets with adequate space to accommodate the bike lane width and with vehicular travel volumes and speeds that make it difficult for drivers and cyclists to "share the road." A bike lane can consist of white striping with a bicycle symbol, or it can be filled with a solid paint color, usually green.

Buffered Bike Lanes

Buffered bike lanes are on-street lanes that include a physical separation ("buffer") between the bike lane and the vehicle traffic lane and/or the vehicle parking lane. Buffered bike lanes can be particularly helpful on streets with high vehicle speeds, high vehicle volumes, or relatively frequent parking turnover.

Cycletracks

Cycletracks are exclusive bikeways separated from vehicle travel lanes, parking lanes and sidewalks. In these contexts, vehicular parking is provided adjacent to traffic lanes whereas the bikeway is located adjacent to the curb. They can be one- or two-way in direction and can be even with the street, the sidewalk, or somewhere between. On existing streets, cycletracks can be constructed where there is sufficient roadway width and/or in contexts where the number of vehicular travel lanes can be reduced.

Sharrows

A shared-lane marking, or sharrow, is a pavement marking that can be used where space does not allow for a bike lane and/or where vehicular travel speeds and volumes allow cyclists to comfortably and conveniently "share the road" with motorists. Sharrows remind motorists of the presence of bicycles and indicate to cyclists where to safely ride within the roadway.

Low-Traffic Bikeway

Also known as "bicycle boulevards," streets with low vehicular volumes and speeds can be optimized for bicycle travel by including treatments for traffic calming and traffic reduction, signage and pavement markings, and intersection crossing treatments. Bike boulevards are ideal on local streets that parallel larger, high traffic routes and provide connections to similar destinations.

Wayfinding Signage

Wayfinding signs can direct bicyclists and pedestrians towards key destinations both within the city as well as to neighboring communities. These signs often include the distance to the destination and/or average travel times. Wayfinding signs are generally used on primary bicycle routes and multi-use trails.

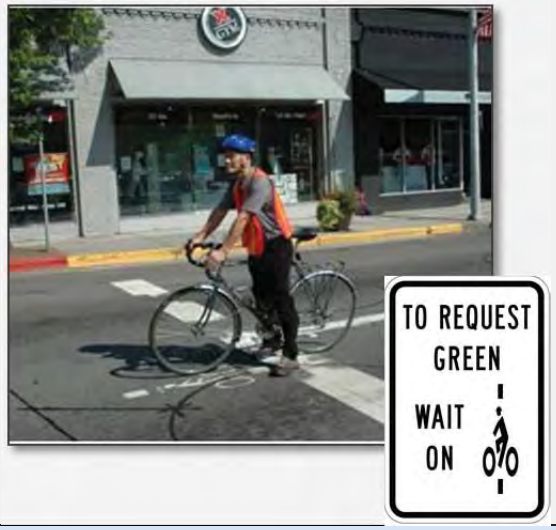
"Share the Road" Signs	
	"Share the Road" signs can be used to remind drivers to watch for bicyclists on roadways without on-street bicycle lanes. However, the signs are not meant as a replacement for using the other facility types listed in this table.

Bicycle Crossings

Bicycle crossing treatments connect bike facilities at high traffic intersections, trailheads, or other bike routes. Frequently used crossing treatments are shown below.

Marked Bicycle Detectors at Traffic Signals

Many traffic signals are "actuated", meaning that a green light is provided to a particular intersection approach only when a vehicle is detected on that approach. However, actuating a signal as a cyclist is difficult if no indication is given of the location of detection equipment. Pavement markings can show cyclists where to stand to actuate a signal. Additionally, the sensitivity of all traffic signal loop detectors should be set to allow for bicycle activation. At intersections where bicyclists wait at an area separated from traffic, specific bicycle detectors can be installed.



Bicycle-only Signal

Bicycle-only signals can be used at intersections to provide a separate signal phase that is dedicated to bicyclists. They are especially useful at roadway intersections with multi-use trails, where there are high volumes of bicyclists crossing, or at intersections where large numbers of right-turning vehicles have the potential to conflict with through bicycles.

Preferential Movement for Bicycles

Some intersections may be designed such that cars cannot make particular movements, but bicyclists can. This type of treatment allows greater connectivity for bicyclists.

Striping Through Intersections

At high-vehicle and/or high-bicycle volume intersections, extending bicycle lane striping through the intersection can alert drivers to look out for bicyclists traveling through the intersection and help bicyclists know where to proceed with crossing.

Bicycles on transit buses

On-Site Facilities

Bicyclists also benefit from facilities that are located on-site within key employment, commercial and institutional locations. These facilities can include indoor and/or outdoor secure bicycle parking, open or covered U-shaped racks, showers/changing rooms, and storage lockers for clothing and gear. The City of Damascus can use incentives to encourage developers to include these types of facilities in new buildings.

As transit service becomes available, allowing bicycles on transit vehicles increases the range of trips possible by both transit and bicycling, and reduces cyclists' fears of being stranded in the event of a mechanical or physical breakdown.

Multi-use Pathways

Paved, bi-directional multi-use pathways can be designed as part of a Park and Recreational System and/or can be constructed adjacent to roadways where the topography, right-of-way, or other issues don't allow for the construction of sidewalks and bike facilities.

Intersections of multi-use paths and roadways require crossing treatments that are well-marked and highly visible to vehicles and trail users. Multi-use pathways can be used to create longer-distance links within and between communities, provide regional connections and play an integral role in recreation, commuting, and accessibility for residents due to their broad appeal to users of all ages and skill levels.

Multi-use paths provide a comfortable space for pedestrians and bicyclists of all ages.

The TSP for Damascus provides for pathways that can be used in lieu of sidewalks and bike facilities, where appropriate. In the future, the City of Damascus will initiate a Parks and Recreation Plan that outlines local and regional trail needs. This plan may include connections to the Springwater Corridor trail to the east and to other multi-use paths in Happy Valley to the west as well as a network of multi-use paths in Damascus.

Public Transit

Public transit can provide important connections to destinations for people that do not drive or bike and can provide an additional option for all transportation system users for certain trips. Public transit links to walking, bicycling, or driving trips: users can walk to and from transit stops and their homes, shopping or work places, people can drive to park & ride locations to access a bus, or people can bring their bikes on transit vehicles and bicycle from a transit stop to their final destination.

Providing transit service in smaller cities is generally led by a local or regional transit agency, and is dependent on having the land use and densities that can support service. The city can plan for transit-supportive land use patterns and support future transit viability by designing and building streets that will comfortably accommodate transit stops and include the right-of-way that could allow for transit stops to be located as close as possible to important destinations in the city. At a minimum, a transit stop should be well-signed and have a comfortable space to wait. Benches and shelter from the weather can improve user comfort, and including bike parking near bus stops allows people the option to leave their bike at one trip-end instead of bring it on the bus. The City's proposed development code generally includes provisions to meet these objectives.

Damascus can support potential future transit service by including easy and safe walking and bicycling network connections between key roadways and neighborhoods.

Public Transit Bus

Bus stop with shelter and seating

CONNECTIVITY

A well connected grid network of streets provides for convenient travel for vehicles, pedestrians and cyclists. Given an equivalent number of roadway lane-miles, a connected system generally has more capacity than a disconnected road network and provides the shortest, most direct routes for all users. A grid network can also lessen the effects of congestion along a single route, due to the number of alternate routes available. A connected system also can create easier and more expedient emergency response and can encourage pedestrians and bicyclists, who benefit greatly from having a direct route due to generally slower travel speeds. Figure 1 shows how someone might travel between their home and school on a well-connected grid network versus one that is a system of cul-de-sacs.

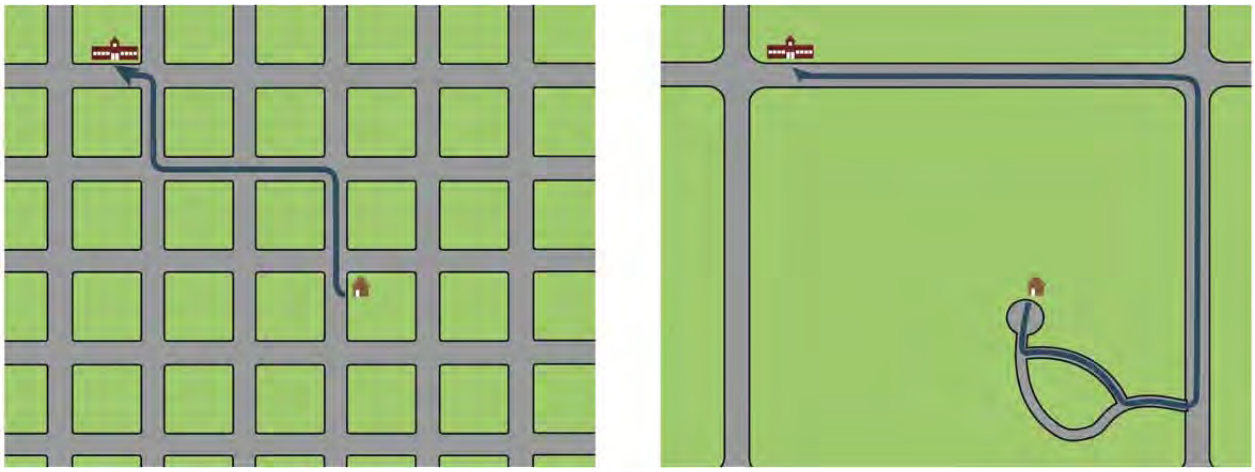


Figure 1: The left illustration is a connected street grid, on the right is a less connected system. Travel distance from home to school is shorter in a connected system.

Topography and natural features can present significant challenges to providing a well-connected street system. Within the City of Damascus, OR 212 currently provides the only east-west connection across the southern portion of the city, which requires it to serve both "through traffic" as well as local travel within the city. Only Foster Road and SE 242nd Avenue provide for continuous north-south travel within the city. The existing street network also has limited connections to Happy Valley to the west, Gresham to the north, and a local street system within the downtown area of Damascus.

Much of the residential neighborhood development in Damascus has been built on a network of cul-de-sacs and dead ends. These streets can be desirable to residents because they can limit traffic speeds and volumes on local streets, but cul-de-sacs and dead ends result in longer trip distances, increased reliance on arterials for local trips, and limited options for people to walk and bike to the places they want to go.

In Damascus, the future street system needs to reflect the balance the benefits of providing a well-connected grid system with the topographical challenges in the city. Incremental improvements to the street system can be planned carefully to provide route choices for motorists, cyclists and pedestrians while accounting for potential neighborhood impacts. In addition, the quality of the transportation system can be improved by making connectivity improvements to the pedestrian and bicycle system separate from street connectivity.

INTERSECTION CONTROL

There are five traffic signals in the City of Damascus: all are on OR 212 and maintained by the Oregon Department of Transportation (ODOT). The rest of the intersections in the city are stop-controlled. The majority of these are two-way stop controlled (TWSC), with the stop sign provided on the lower volume of the two intersecting roadways. In the future, increasing traffic volumes may warrant different intersection options, such as roundabouts, traffic signals, and all-way stop control. The type of intersection control and final design for each intersection will need to consider the desired travel speeds, safety, pedestrian and bicycle needs, topography, anticipated traffic volumes, sight distance, available space and other potential constraints and opportunities.

All-way Stop-control

All-way stop control is often used when the two intersecting roads have similar vehicular volumes and where a traffic signal or roundabout is needed. All-way stop controls are relatively inexpensive and can be implemented more easily than traffic signals and roundabouts.

Roundabout

Roundabouts are circular intersections where entering vehicles yield to vehicles already in the circle. They are designed to slow vehicle speeds to 20 to 30 mph or less before they enter the intersection. As shown in Figure 2, roundabouts have fewer conflict-points and have been shown to reduce the severity of crashes, as compared to signalized intersections. Roundabouts can be more costly to design and install when compared to other intersection control types, but they have a lower operating and maintenance cost than traffic signals. Topography must be carefully evaluated in considering a roundabout, given that slope characteristics at an intersection may render a roundabout infeasible.

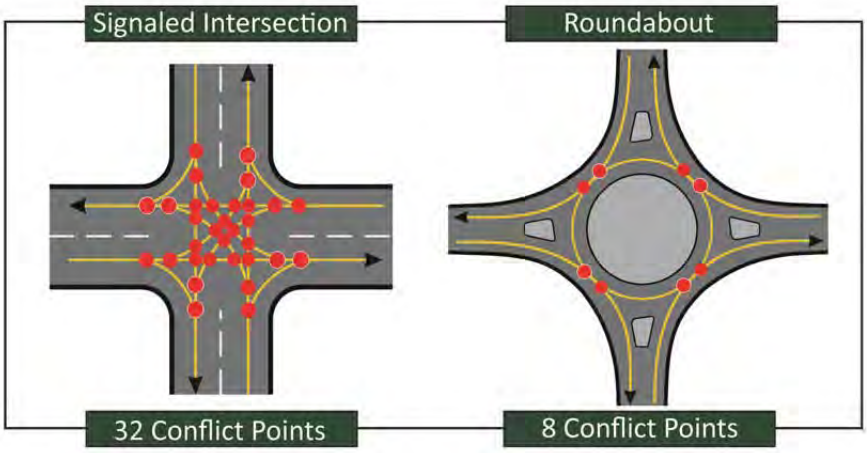


Figure 2: Roundabouts have fewer conflict points than signalized intersections.

Depending on the design, roundabouts can be more land-intensive than other intersection controls. To maintain the flexibility to construct roundabouts at key intersections, the city may want to ensure adequate right-of-way is provided at intersection locations whenever right-of-way dedication or acquisition activities are undertaken. Information contained in Section 4 of the TSP as well as the City's development code and engineering standards can account for this need.

Key intersections of arterial/collector and collector/collector streets may be candidates for roundabout installation in the future. Within Damascus, the majority of these locations could likely be well served by a single lane roundabout. Based on national guidance, the right-of-way dedication at these locations could include a circle with a radius of 85 feet measured from the center of the intersection, to preserve space for a single-lane roundabout, sidewalk, and landscaping in a 170-foot diameter circle. On intersections along key freight routes within the city, a 95-foot radius (190 feet in diameter) circle could be preserved.

Traffic Signals

Traffic signals allow opposing streams of traffic to proceed in an alternating pattern. Both national and state guidance indicates when it is appropriate to install traffic signals at intersections. When used, traffic signals can effectively manage high traffic volumes, and provide for dedicated times in which pedestrians and cyclists can cross roadways. Because they continuously draw from a power source and must be periodically re-timed, signals typically have higher maintenance costs than other types of intersection control. Signals can improve safety at intersections where signal warrants are met, however, signals may result in a shift to higher levels of rear-end crashes compared to alternatives.

NEIGHBORHOOD TRAFFIC MANAGEMENT

Neighborhood Traffic Management (NTM), also known as "traffic calming," describes traffic control devices typically used in residential neighborhoods to slow traffic or possibly reduce the volume of traffic. Below are illustrations and descriptions of neighborhood traffic management strategies that could be applied in Damascus to address traffic issues that arise over time.

Speed Wagon	Pros	Cons
	▪ Inexpensive ▪ Low operating costs ▪ Mobile	▪ Penalties for speeding not enforced ▪ Not permanent ▪ Placement may obstruct bicycle lane or shoulder
Speed Humps	**Pros**	**Cons**
	▪ Permanent ▪ Can be used to provide raised pedestrian crossings ▪ Can be modified to accommodate emergency vehicles	▪ Placement of speed humps can be contentious ▪ Requires maintenance
Traffic Circles	**Pros**	**Cons**
	▪ Can have aesthetic value ▪ Physical barrier encourages lower speeds	▪ Can impede emergency vehicles or freight/delivery truck movement ▪ Increased maintenance costs

Medians	Pros	Cons
	▪ Eliminates potential conflict points ▪ Provides pedestrian refuge ▪ Can benefit access management	▪ Can be more expensive to construct than other NTM measures ▪ Can impede roadway connectivity ▪ Can impact business access

Landscaping	Pros	Cons
	▪ Aesthetic value ▪ Provides buffer for pedestrians ▪ Can have traffic calming effect	▪ Requires additional maintenance, including weed management ▪ Requires additional right-of-way allocation ▪ Can impede sight distance

Curb Extensions	Pros	Cons
	▪ Reduces pedestrian crossing distance ▪ Can have a traffic calming effect	▪ Can be expensive to construct ▪ Can impede freight movements

Choker	Pros	Cons
	▪ Can be used in conjunction with a midblock pedestrian crossing ▪ Can have traffic calming affect	▪ Expensive to construct

Narrow Streets	Pros	Cons
	▪ Reduces pedestrian crossing distance ▪ Can have a traffic calming effect ▪ Less asphalt to maintain	▪ Can impede emergency vehicles ▪ Can limit availability of on-street parking

Photo Radar	Pros	Cons
	▪ Permanent speed enforcement ▪ Strong deterrent for excessive speeds	▪ Expensive initial investment required ▪ Not portable

On-Street Parking	Pros	Cons
	▪ Increases available parking for commercial and/or residential uses ▪ Narrows feel of the street ▪ Potential revenue source when metered	▪ Adequate right-of-way must exist or be created ▪ Can conflict with bicycle lanes ▪ Can create additional conflict points for vehicles ▪ Can reduce sight distance

Selective Enforcement	Pros	Cons
	▪ Mobile ▪ Can target identified problem areas	▪ Requires allocation of enforcement resources ▪ May only result in temporary improvement in motorist compliance with posted speeds

Partial Street Closures	Pros	Cons
	▪ Lack of direct through routes for vehicles can reduce speeds ▪ Maintain connectivity for bicycles and pedestrians	▪ Can create connectivity issues, counter to TSP goals ▪ May increase speeds on alternative routes ▪ May increase volumes on alternative routes

Traffic calming should be considered in an area-wide manner to avoid shifting impacts between neighborhoods and adjacent streets. Typically, traffic calming receives a favorable reception by residents adjacent to streets where vehicles travel at speeds above 30 miles per hour. However, traffic calming can also be contentious because it may be perceived as just moving the problem from one neighborhood to another rather than solving it. Traffic calming may also be perceived as impacting emergency vehicle travel.

TRANSPORTATION SYSTEM MANAGEMENT AND OPERATIONS (TSMO)

Transportation Demand Management (TDM) and Transportation System Management (TSM) strategies are two complementary approaches to managing transportation and maximizing the existing system. Together, these strategies are referred to as Transportation System Management and Operations (TSMO). TDM addresses the *demand* on the system: the number of vehicles traveling on the roadways each day. TDM measures include any method intended to shift travel demand from single occupant vehicles to non-auto modes or carpooling, travel at less congested times of the day, etc. TSM addresses the *supply* of the system: using strategies to improve the system efficiency without increasing roadway widths or building new roads. TSM measures are focused on improving operations by enhancing capacity during peak times, typically with advanced technologies to improve traffic operations.

Metro's Regional TSMO Plan identifies four main areas of investment to improve system performance:

- Multi-modal traffic management (TSM)
- Traffic incident management
- Traveler information
- Transportation demand management (TDM)

The TSMO Plan also identifies specific strategies for 24 mobility corridors in the region. The following strategies are identified for the mobility corridors in the City of Damascus:

- Arterial Corridor Management for 172nd Ave, Sunnyside Ave, and OR 212 into the Damascus Town Center.
- Arterial Corridor Management with transit priority treatment and adaptive signal timing on OR 212 east of Town Center in Damascus.
- Rideshare Park & Ride site (Foster Ave, north of Town Center).

In the TSMO Plan, Arterial Corridor Management (ACM) refers to installing upgraded traffic signal controllers, establishing communications to the central traffic signal system, providing arterial detection (including bicycle detection where appropriate), routinely updating signal timings, upgrading traffic signage, and performing on-going maintenance and parts replacement. In addition, it may include providing real-time and forecast traveler information on arterial roadways including current roadway conditions, congestion information, travel times, incident information, construction work zones, current weather conditions and other events that may affect traffic conditions.

The following section provides an overview of a broad range of TSMO measures that are being implemented and considered in the region and identifies and explains those that are most applicable to the City of Damascus.

TSMO Strategies

Successful implementation of transportation system operations and management (TSMO) strategies relies on the participation of a variety of public and private entities. Strategies can be implemented by a region, a city, a neighborhood, or particular employer. In addition, they can be categorized as policies, programs, or physical infrastructure investments. Table 1 provides a summary of potential measures that can be implemented within the Metro region and which entities are generally in the position to implement each one. As the city urbanizes over the next 20 to 40 years, the applicability of these strategies can be further reviewed. Additional information on potential strategy implementation within Damascus is discussed below.

Table 1: Transportation system management and transportation demand management strategies

TSMO Strategy	TDM or TSM?	Type of Investment	City/ County/ Region	Transportation Management Association[1]	Developers	Transit Provider	Employers	State
Parking management	TSM / TDM	Policy	P		S	S	S	
Limited/flexible parking requirements	TDM	Policy	P		S		S	
Access management	TSM / TDM	Policy / Infrastructure	P					P
Connectivity standards	TSM / TDM	Policy / Infrastructure	P		S			P
Congestion pricing	TSM / TDM	Policy / Infrastructure	P					P
Flexible Work Shifts	TDM	Program / Policy	S				P	
Frequent transit service	TDM	Program	S			P		
Free or subsidized transit passes	TDM	Program	S				P	
Preferential carpool parking	TDM	Program	S				P	
Carpool match services	TDM	Program	S	P			S	
Parking cash out	TDM	Program		S		S	P	
Carsharing program support	TDM	Program	P	S	P	P	P	
Bicycle facilities	TDM	Infrastructure	P		S		S	S
Pedestrian Facilities	TDM	Infrastructure	P		S			
Regional ITS	TSM	Infrastructure	P					
Regional traffic management	TSM	Infrastructure	P					
Advanced signal systems	TSM	Infrastructure	P			S		
Real time traveler data	TSM	Infrastructure	P					P
Arterial corridor management	TSM	Infrastructure	P					

[1]A Transportation Management Association does not currently exist in the City of Damascus
P: Primary role
S: Secondary/Support role
* Primary implementation depends on roadway jurisdiction

Strategies for Damascus

The following section provides more detail on policy, programming and infrastructure strategies that may be effective for managing transportation demand and increasing system efficiency in the City of Damascus, especially within the next 10 to 20 years. Given the current lack of transit access and the rural character, not all of the options listed may receive strong public support or involvement in the near future. As such, care should be taken to implement strategies that are consistent with Damascus core values and lifestyles, while still effectively reducing travel demand.

Programming

Programming solutions can provide effective and low cost options for reducing transportation demand. Some of the most effective programming strategies can be implemented by employers and are aimed at encouraging non-single occupancy vehicle (SOV) commuting. These strategies are discussed below.

Carpool Match Services

Metro coordinates a rideshare/carpool program (see the DriveLessConnect.com website) that regional commuters can use to find other commuters with similar routes to work. The program allows commuters to connect and coordinate with others on locations, departure times, and driving responsibilities. Employers can also play a role in encouraging carpooling by sharing information about the system, providing preferential carpool parking, and allowing employees flexibility in workday schedules.

Collaborative Marketing

Cities, employers, future transit service providers, and developers can collaborate on marketing to get the word out to residents about transportation options that provide an alternative to single-occupancy vehicles.

Policy

Policy solutions can be implemented by cities, counties, regions, or at the statewide level. Regional and state-level policies will affect transportation demand in Damascus, but local policies can also have an impact.

Limited and/or Flexible Parking Requirements

Cities set policies related to parking requirements for new developments. In order to allow developments that encourage multi-modal transportation, cities can set parking maximums and low minimums and/or allow for shared parking between uses. Cities can also provide developers the option to pay in-lieu fees instead of constructing additional parking. This option provides additional flexibility to developers that can increase the likelihood of development, especially on smaller lots where surface parking would cover a high portion of the total property.

Finally, cities can set policies that require provision of parking to the rear of buildings, allowing buildings in commercial areas to directly front the street. This urban form creates a more appealing environment for walking and window-shopping. In-lieu parking fees support this type of development for parcels that do not have rear- or side-access points.

Parking Management

Parking plays a large role in transportation demand management, and effective management of parking resources can encourage use of non-single occupancy vehicle modes. Cities can tailor policies to charge for public parking in certain areas and impose time limits on street parking in retail centers. Cities can also monitor public parking supply and utilization in order to inform future parking strategy.

Access Management

Access management describes a practice of managing the number, placement, and movements of intersections and driveways that provide access to adjacent land uses. Access management policies can be an important tool to improve transportation system efficiency by limiting the number of opportunities for turning movements on to or off of certain streets.

In addition, well deployed access management strategies can help manage travel demand by improving travel conditions for pedestrian and bicycles. Eliminating the number of access points on roadways allows for continuous sidewalk and bicycle facilities and reduces the number of potential interruptions and conflict points between pedestrians, bicyclists, and cars.

Signal Systems Improvements

Signal retiming and optimization offer a relatively low cost option to increase system efficiency. Retiming and optimization refers to updating timing plans to better match prevailing traffic conditions and coordinating signals. Timing optimization can be applied to existing systems or may include upgrading signal technology, such as signal communication infrastructure, signal controllers, or cabinets. Signal retiming can reduce travel times and be especially beneficial to improving travel time reliability. In high pedestrian or desired pedestrian areas, signal retiming can facilitate pedestrian movements through intersections by increasing minimum green times to give pedestrians time to cross during each cycle, eliminating the need to push pedestrian crossing buttons. Signals can also facilitate bicycle movements with the inclusion of bicycle detectors.

Signal upgrades often come at a higher cost and usually require further coordination between jurisdictions. However, upgrading signals provides the opportunity to incorporate advanced signal systems to further improve the efficiency of a transportation network. Strategies include coordinated signal operations across jurisdictions, centralized control of traffic signals, adaptive or active signal control, and transit or freight signal priority. These advanced signal systems can reduce delay, travel time and the number of stops for transit, freight, and other vehicles. In addition, these systems may help reduce vehicle emissions and improve travel time reliability.

Metro's TSMO plan identifies OR 212 as a corridor for an investment in arterial corridor management, including installing upgraded traffic signal controllers, establishing communications to the central traffic signal system, providing arterial detection, and routinely updating signal timing. The plan also includes transit priority treatment and adaptive signal timing.

Transit signal priority systems use sensors to detect approaching transit vehicles and alter signal timings to improve transit performance. This improves travel times for transit, reliability of transit travel time, and overall attractiveness of transit. The City of Portland has the only system of bus priority in the region, which is applied on most of the major arterial corridors throughout the city.

Adaptive or active signal control systems improve the efficiency of signal operations by actively changing the allotment of green time for vehicle movements and reducing the average delay for vehicles. Adaptive or active signal control systems require several vehicle detectors at intersections in order to detect traffic flows adequately, in addition to hardware and software upgrades.

LAND USE

The types and intensities of land uses are closely correlated with travel demand. Land use patterns in many areas of the city are fairly rural and low density, with more moderate densities near OR 212. In the future the city is envisioned to be a mixture of housing densities and areas of mixed use development (i.e., a mix of residential, retail, commercial and/or office uses).

The Comprehensive Plan identifies the potential for a number of "village centers" with higher densities and a mixture of land use types. These are located in the existing Damascus Town Center, north of OR 212 between SE 222nd and SE 242nd Avenues, along Foster Road and in the northern portion of Sunshine Valley. The buildout of these centers are anticipated over the next twenty to forty years and could result in more people living closer to where they shop, work and/or recreate. Locating a mixture of uses in close proximity can shorten auto trips and make walking and biking and/or transit trips more viable for daily activities.

Commercial Nodes in Residential Areas

Commercial nodes in residential areas provide residents with the opportunity to walk or ride their bike for non-work related trips. Neighborhood commercial nodes can include small restaurants, coffee shops, hair salons or other neighborhood retail or personal service uses. The City's zoning map designates five of these nodes in the northern half of the city. The Damascus Development Code allows for a certain percentage of land within residential areas to be developed for non-residential uses to allow for this type of development.

As these nodes develop, the City can encourage individual business to share parking to provide for the more efficient use of land and reduce land, development and maintenance concepts. Nodal development and shared parking allows people to drive, bike, or take transit to one location and then comfortably walk between businesses.

Mixed Use Development

Mixed use developments can reduce automobile trips by supporting higher frequency transit service and promoting pedestrian and bicycle travel. Urban areas with mixed uses and higher densities can be promoted in targeted areas, such as along OR 212 in the existing Damascus Town Center and in the future center north of OR 212 between SE 222nd and SE 242nd Avenues and in the neighborhood commercial or mixed use areas described above. Creating new employment areas near existing and future residential areas in Damascus also can create opportunities for people to live closer to where they work.

Section 4

Transportation Plan

TRANSPORTATION PLAN

STATE AND REGIONAL PLANNING CONTEXT

The Damascus Transportation System Plan (TSP) identifies the transportation-related projects, programs and policies needed over the next 20 to 40 years to serve local, regional and statewide multi-modal travel within the Urban Growth Boundary (UGB). The TSP considers the transportation plans for surrounding cities, the county, and ODOT facilities and is consistent with the requirements of statewide and regional transportation plans and policies.

State and Regional Facilities

OR 212, a statewide highway, is the only continuous east-west roadway within the city. OR 224 passes through the Carver area in southwest Damascus. US 26 passes by the city to the east, although it does not cross city boundaries. Currently, SE 242nd Avenue provides the primary north/south connection between OR 212 and Gresham and other cities to the north. US 26, OR 212, and OR 224 are operated and maintained by the Oregon Department of Transportation (ODOT) and are subject to state requirements. Plans for improvements to the highways and intersections, as well as changes to adjacent land uses and access points must be developed in a manner consistent with ODOT plans, guidelines, and standards.

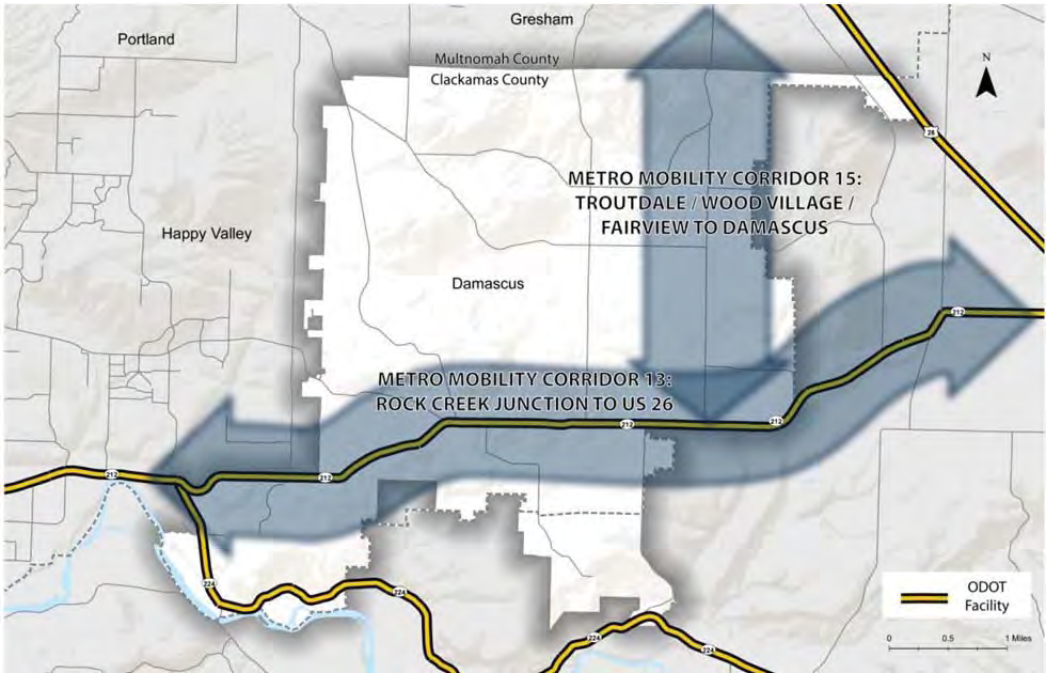


Figure 3: ODOT facilities and Metro's mobility corridors

As shown in Figure 3, OR 212 and SE 242nd Avenue are also part of the Regional Mobility Corridors identified in Metro's 2035 Regional Transportation Plan (RTP). Per Metro's Mobility Corridor Atlas, OR 212 is part of Corridor 13: Rock Creek Junction to US 26. SE 242nd Avenue; SE 242nd Avenue is part of Corridor 15: Connecting Troutdale/Wood Village/Fairview to Damascus via arterial and collector streets, including SE 242nd Avenue. The corridors, while anchored by major roadway facilities, also encompass local streets and multi-modal facilities.

By identifying and managing multi-modal corridors, Metro is shifting transportation planning away from a focus on roadway capacity and instead toward a focus on providing connections using a system of modal options.

Related Plans and Policies

2035 Metro RTP

The Metro Regional Transportation Plan (RTP) is the long range transportation plan for the entire Portland Metro region. The transportation system plans of each city and county within the region should coordinate with the vision in the Metro RTP and rely on it for guidance on specific transportation planning elements. The Metro RTP includes the Regional Transportation System Management and Operations Plan, Regional Freight Plan, and Regional High Capacity Transit System Plan. Metro is also developing a Regional Active Transportation Plan element to the RTP. The RTP is implemented, in large part, through Metro's Regional Transportation Functional Plan (RTFP). The RTFP incorporates a variety of requirements and guidelines that must be addressed in local TSPs and development codes.

Clackamas County Transportation System Plan

Clackamas County is updating their TSP, with a primary focus on the unincorporated areas of the county. The County TSP defers to each city's plan for County facilities within the boundaries of incorporated lands. Although the county currently owns and operates the majority of roadways within the city, the Clackamas County is applying this same policy and deferring plans for all non-state roadways within the Damascus UGB to the city's TSP.

Springwater Interchange Area Management Plan

In January 2011, ODOT completed the US 26: Access to the Springwater Community Interchange Area Management Plan (IAMP) to "address existing and future safety needs, improve access to the existing transportation system, and provide for a future transportation network that will efficiently accommodate the planned development in the Springwater area, while preserving the function of US 26." The plan recommended the ultimate construction of an urban diamond interchange on US 26 with an overcrossing that connects Orient Drive to SE Rugg Road and a new collector that connects SE McNutt Road to the arterial east of US 26. The plan also features an elevated crossing of the multi-use Springwater Corridor Trail. The Springwater IAMP alternative is reflected in the City of Damascus TSP, and transportation network development in the northeast part of the city will occur in coordination with the IAMP recommendations.

Sunrise Corridor Plan

In April 2011, ODOT completed the Rock Creek Junction IAMP in cooperation with the Clackamas County Department of Transportation and Development, the City of Happy Valley, and the City of Damascus, as part of the larger Sunrise Project, I-205 to Rock Creek Junction. The Rock Creek interchange is planned as a single point urban interchange that connects the planned Sunrise Expressway to OR 212 and OR 224 in the southwest part of the City of Damascus. The Damascus TSP recognizes that the development of roadway networks and improvements in this part of the city will need to be done in coordination with the IAMP.

SE 172nd Avenue/190th Drive Corridor Management Plan

In early 2012, Clackamas County completed the SE 172nd Avenue/190th Drive Corridor Management Plan, with the goals to "effectively address the congestion and safety problems, serve future north-south traffic, serve expected population growth in Damascus, Happy Valley, the Pleasant Valley Plan Area and Gresham, and to serve the growing demand for regional travel." The plan proposes a new five-lane connector between SE 172nd and 190th, additional local roadway connectivity, and widening/realignments of existing roadways. This TSP has incorporated the recommendations from the SE 172nd Avenue/192nd Drive Corridor Management Plan, and the City of Damascus will continue to coordinate with the County through the implementation of the plan.

Other Relevant Plans

A variety of other state, regional and local planning documents affect specific aspects of future transportation planning in Damascus. A summary of those documents is included in Volume 2 of the TSP.

Coordination with Plans and Infrastructure

The planning efforts noted above, while led by other jurisdictions, will impact facilities in the City of Damascus. Other future efforts by neighboring jurisdictions may also have an impact on the transportation system in Damascus. In the future, the City of Damascus will coordinate and collaborate with other planning efforts, as appropriate, to ensure integration of any recommended transportation-related projects with the future vision for the city. Coordinating these plans with implementation of other TSP elements can also provide opportunities for additional efficiencies in terms of funding and road system closures due to construction.

To the extent possible, the City of Damascus will coordinate transportation system infrastructure improvements with other types of infrastructure projects within the city (e.g., water, storm drainage, sewer, power, and other utilities) to save costs and minimize disruptions to residents, businesses, and travelers.

POLICY/REGULATORY ELEMENTS

A number of transportation-related policy and regulatory elements will guide development review and project development in Damascus in the future. These elements are discussed in more detail below and include:

- Functional Classification of Roadways
- Street Design Standards
- Transit Service
- Truck Routes
- Intersection Performance Standards
- Access Management Guidelines
- Connectivity Guidelines
- Safety

Functional Classification

Functional classification defines a roadway's primary role in terms of providing mobility and access for all modes of travel. Mobility refers to the actual physical travel that occurs between destinations like home, shopping, and work, whereas access is simply the ability for travelers to access those land uses to meet daily needs. For example, a freeway provides the highest level of mobility (high speeds) with access limited to interchange ramps, that may be a mile apart or more. A neighborhood street is on the opposite end of the spectrum, providing the highest level of access (driveways accessing every property) and with very low mobility (low traffic volumes and speeds).

An individual street's classification directs the design and management of the roadway, including right-of-way needs, the number of travel lanes, the bicycle and pedestrian facilities, on-street parking, and access management guidance.

Figure 4 shows the functional classification for each roadway in Damascus. The City of Damascus functional classification policies include the following designations:

- Arterial
- Collector
- Local Streets

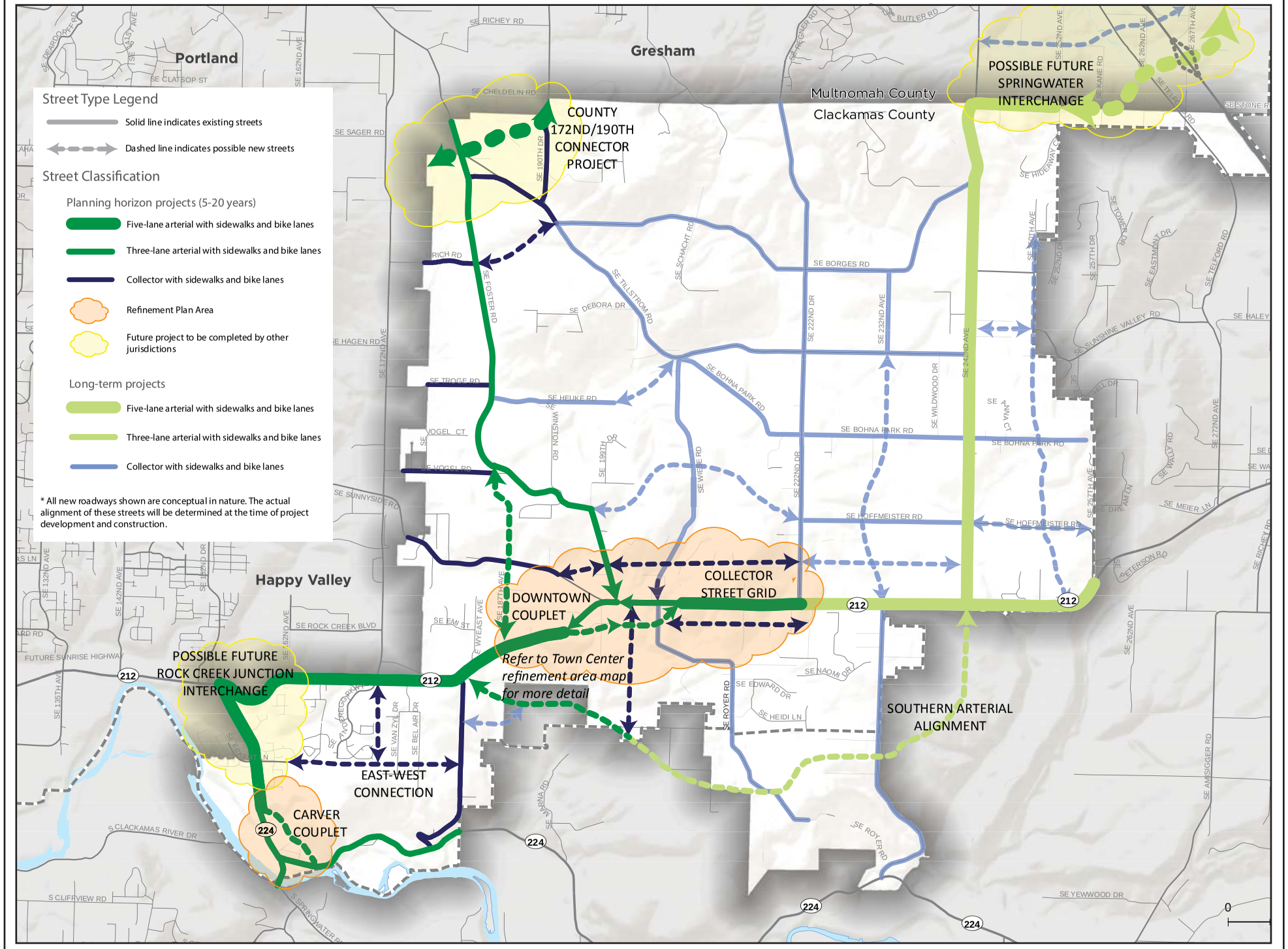


Figure 4: City of Damascus Proposed Street Network

Arterial Streets

Arterial streets can provide for regional and local mobility, access to highways and linkages between major commercial, residential, industrial, and institutional areas. Arterial streets are typically spaced about one mile apart in an urban area, and maintain mobility as a priority. Due to the more rural character and natural features constraints, arterial streets are more widely spaced in the city. The location of arterial streets is in Figure 4.

Collector Streets

Collector streets provide both access and mobility within and between residential and commercial/industrial areas. Collectors differ from arterials in that they provide more of an intra-city circulation function, allow for more access to adjacent lands (compared to arterials), serve residential neighborhoods, and link to the local street system.

Local Streets

Local streets primarily provide access to individual homes and businesses and provide a link to the collector and arterial street system. Local streets are intended for short-distance trips. Through traffic on local streets is discouraged by design. Although many local streets have been constructed as cul-de-sacs or dead-ends, the city should encourage local street system connectivity as part of future development and redevelopment efforts, to the extent possible. When a full street connection is not feasible, a bicycle and/or pedestrian connection should be considered.

Street Design Standards

Over the next 20 – 40 years, streets will be designed and constructed to accommodate a wide variety of users, ranging from children on foot to large vehicles associated with farming and freight movement. Future streets need to be designed to accommodate the needs of people with disabilities, people riding bicycles, people riding transit, and people driving cars, enabling access to destinations for drivers and non-drivers. At the same time, design options for streets need to allow for the preservation of the City's rural character. This street design standards and illustrations of the recommended cross-section street designs are shown in Figures 5 – 8.

Travel Lanes

When arterial and collector roadways are improved to city standards, travel and turn lanes should be 12 feet wide, where feasible. In cases where the right-of-way is constrained by physical features or where desirable to meet urban design objectives, 11 feet can be used on arterials, and 10 feet can be used on collectors. When improved, the minimum width of a local street should be 20 feet although the lanes do not need to be striped. Where used, medians are generally 12 feet wide. The median space can be designed as a two-way left-turn lane, a raised concrete median, a pedestrian crossing refuge, and/or a landscaped median.

Bicycle and Pedestrian Facilities

When improved or when new streets are constructed, all arterials and collectors need to accommodate both pedestrians and bicyclists. Sidewalks are a minimum of 6 feet wide, and must follow Americans with Disabilities Act requirements for design to accommodate all users, including adequate clear widths for people using wheelchairs, sidewalk ramps at all pedestrian crossings, and detectable warnings for the vision-impaired. Bicycle facilities on arterials and collectors can be constructed as bike lanes, buffered bike lanes, shared lanes, or cycle-tracks, depending on the context. The minimum width for a bike lane is six feet. Multi-use paths are another option for pedestrians and bicyclists, especially in more rural areas. These paths should be designed with adequate width to accommodate bi-directional movement and passing, with a minimum width of 12 to 14 feet.

Within the Center, Village and Mixed Use areas, all two-way cycle tracks shall be designed so as to minimize the potential for conflicts with turning motorists that may not expect contraflow cyclists at intersections.

Local Streets

Local streets generally have narrower widths than collectors and arterials, given that their main function is to provide access to homes and/or businesses. Local street designs should encourage slower vehicle speeds. Traffic calming can be used on existing local streets and could incorporate a variety of design treatments such as traffic circles, chokers, or on-street parking. Local streets without on-street parking can be as narrow as 20 feet, which is the minimum width that still allows access for emergency vehicles.

For streets with on-street parking, the width should increase to allow for at least 12 to 14 feet of travel space for vehicles, with 7 feet for parking. Gaps in on-street parking due to driveways or painted curbs can allow oncoming vehicles to pass each other. These gaps must also be long enough to provide space for emergency vehicles to park as needed.

Local streets do not need separate facilities for bicycles; instead, bicycles and vehicles share the travel space. Bicycle sharrows can be used as an indicator to road users of the shared space. Local streets should also include landscaping strips and sidewalks.

Landscaping

In town centers, arterials will have eight-foot landscaping strips with regularly spaced street trees with an appropriate tree canopy. Collectors generally will have tree wells placed in the sidewalks. Both collectors and arterials in the town center have the option of a landscaped median as well. Green street treatments, such as bioswales, may also be used in place of the landscaping strip or tree wells. Bioswales can help slow and filter the flow of stormwater, ensuring that drainage systems are not overwhelmed during heavy rain.

Outside the town centers and village areas, landscaping strips may be replaced with swales that will absorb and filter stormwater runoff.

Context-Sensitive Variation

The street sections in the City of Damascus vary depending on whether they are located in a mixed use/ town center area or in a more rural part of Damascus. Context-specific considerations include:

- Street trees outside the mixed use/town center areas are optional, due to maintenance costs.
- Constrained roadways in more rural areas can be designed with shoulders to accommodate bikes and pedestrians when the right-of-way is limited.
- On-street parking can be provided in the mixed use/town center areas on city streets. On-street parking will not be provided on ODOT facilities. Per the Oregon Highway Plan, on-street parking can only be provided in Special Transportation Areas (STAs); no STAs are designated within Damascus. ODOT policy discourages the creation of additional STAs, especially on freight routes and along ORS 366.215 routes, such as OR 212.
- In mixed use/town center areas, buildings should front directly onto the sidewalk to allow for a lively and enjoyable pedestrian environment.

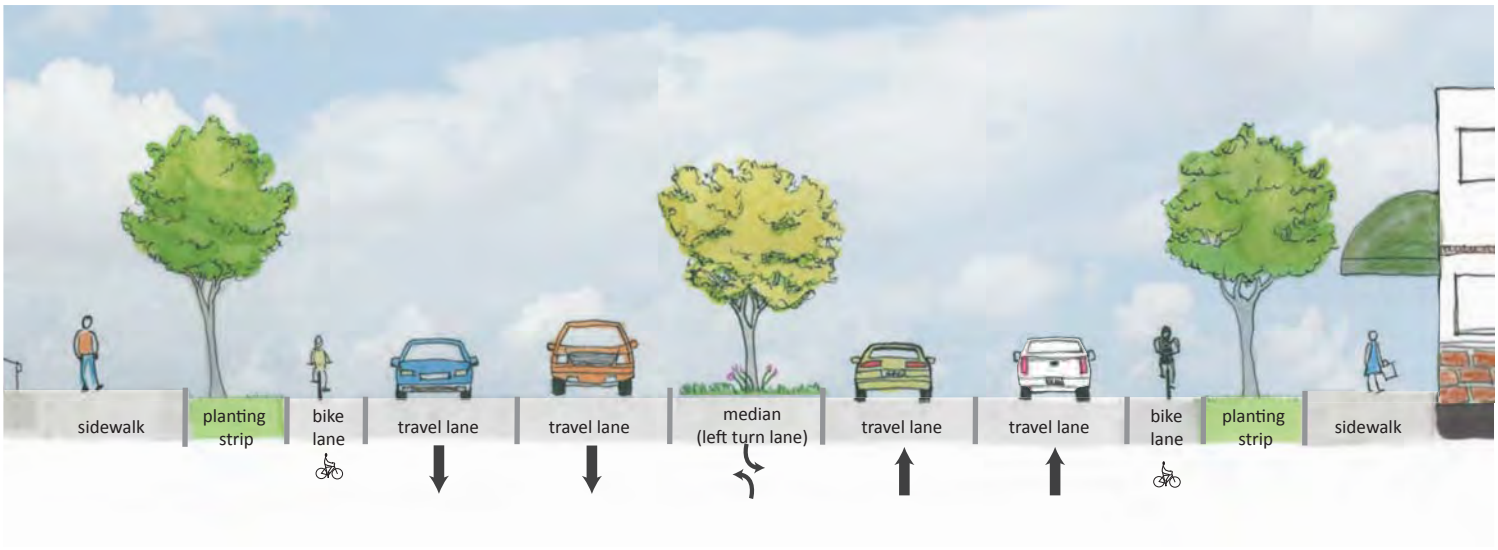
Cross Sections

The City of Damascus street cross sections provide options for arterial and collector streets for mixed use “village center” areas of the City and for areas that remain more rural in nature. Each type of street has three options for each area type. These options provide the city with flexibility to address a number of context-specific considerations, such as topography, other natural resources or issues, character of adjacent development, traffic patterns, and safety.

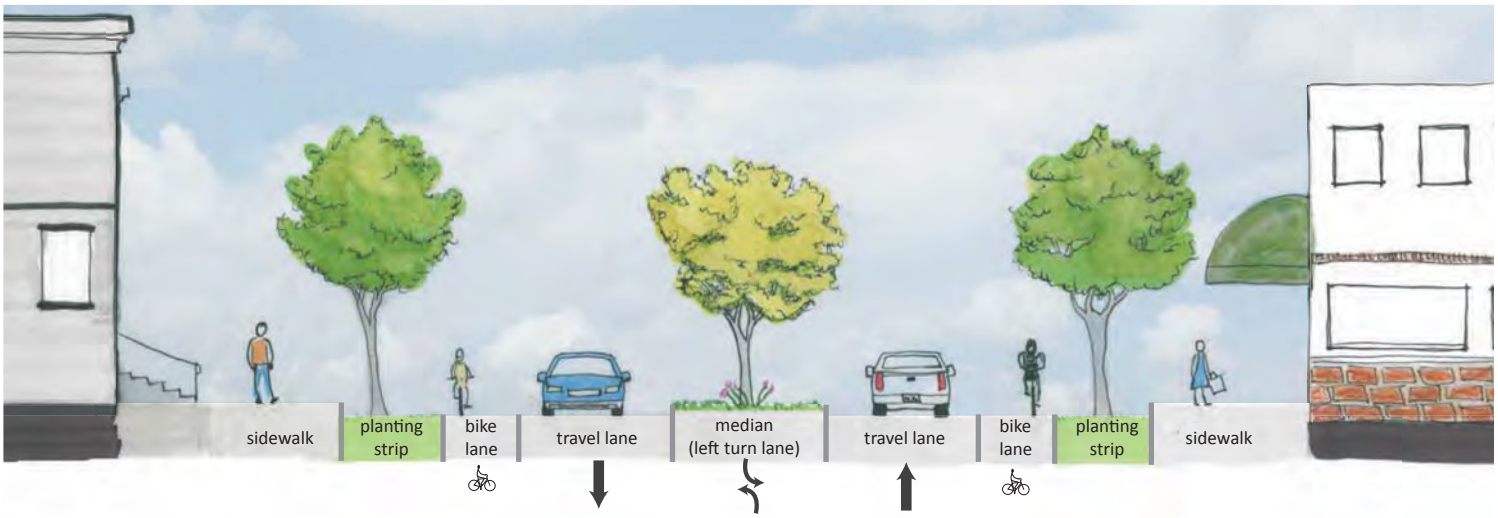
Figure 5: Arterial Street Sections - Center / Village / Mixed Use

Right-of-way width: 74’ - 108’

5-Lane Arterial with Bike Lanes



3-Lane Arterial with Bike Lanes



One-way Arterial with Two-way Cycletrack

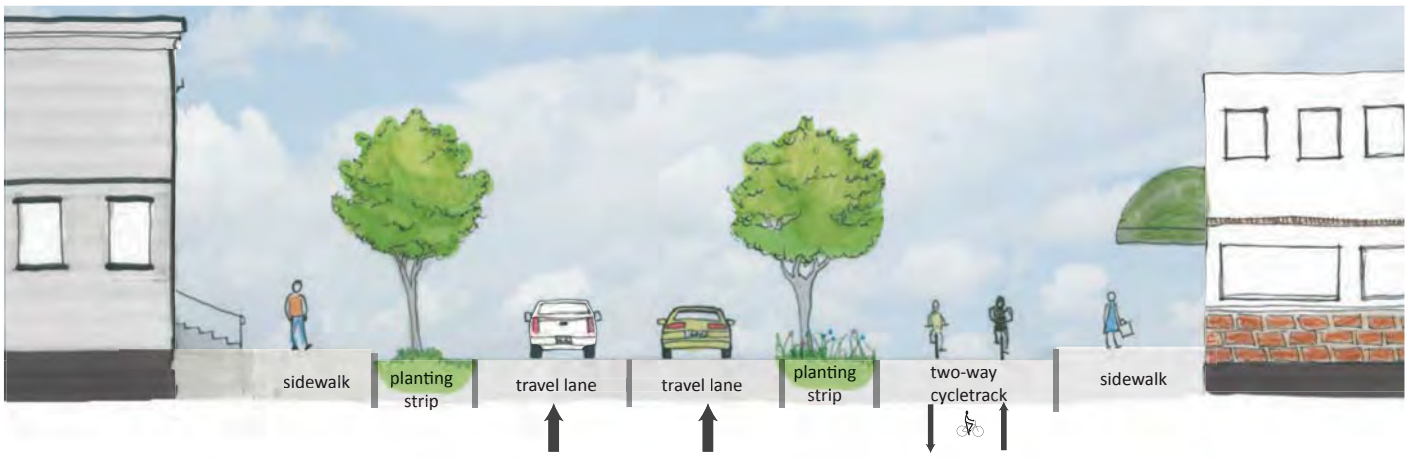
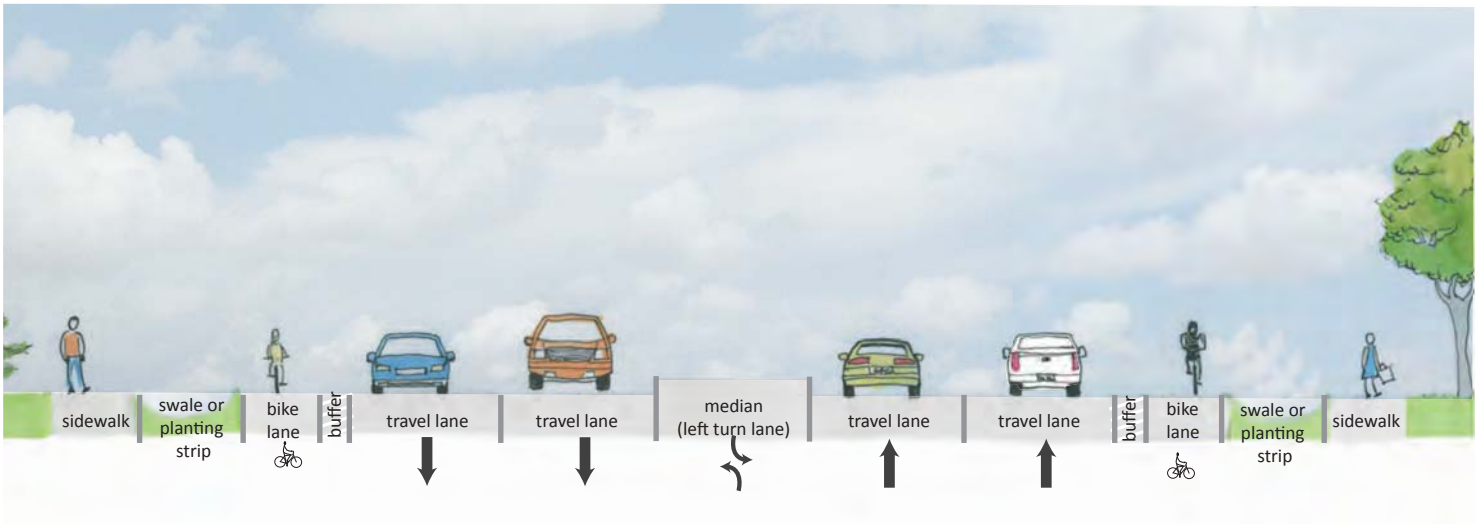


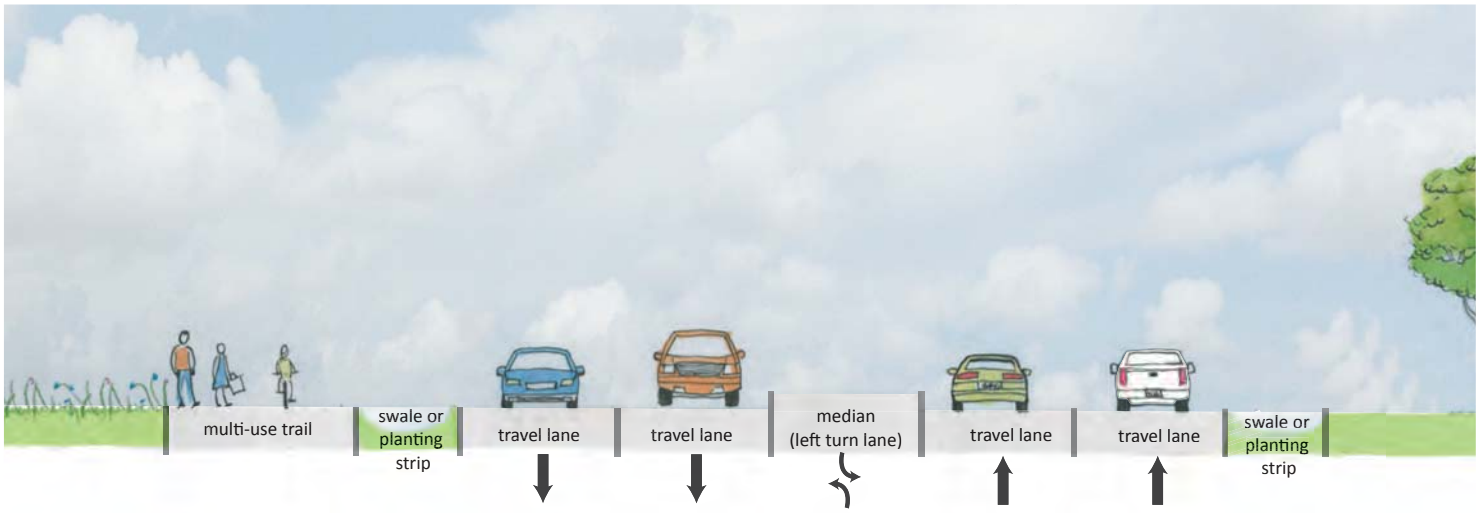
Figure 6: Arterial Street Sections - Other

Right-of-way width: 84’ - 108’

5-Lane Arterial with Bike Lanes



5-Lane Arterial with Multi-Use Path



3-Lane Arterial with Buffered Bike Lanes

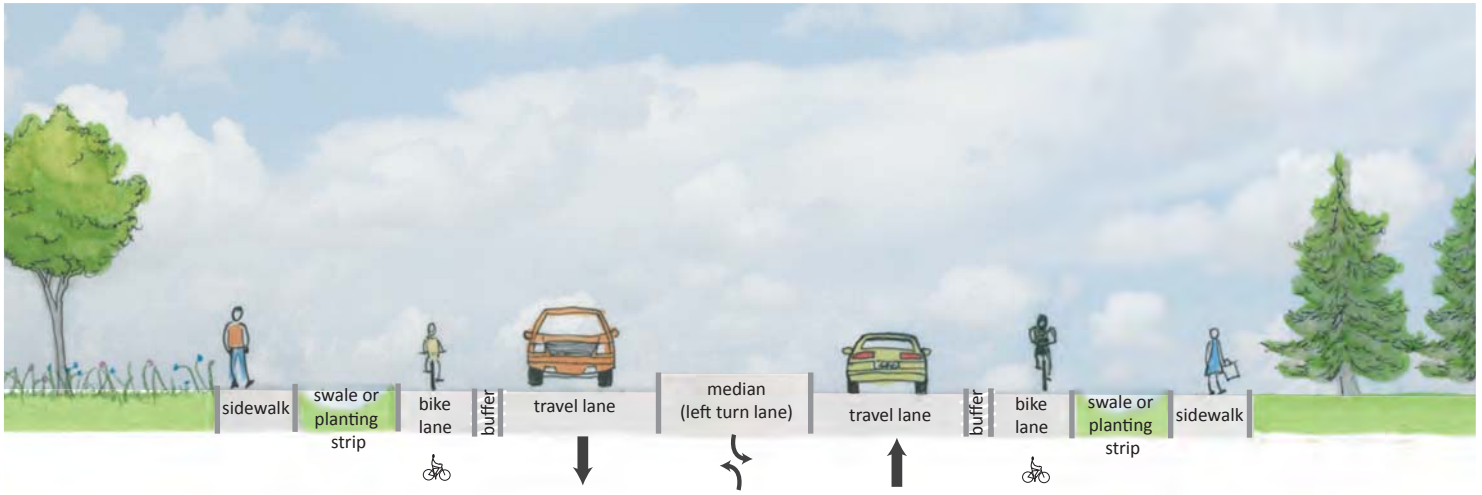
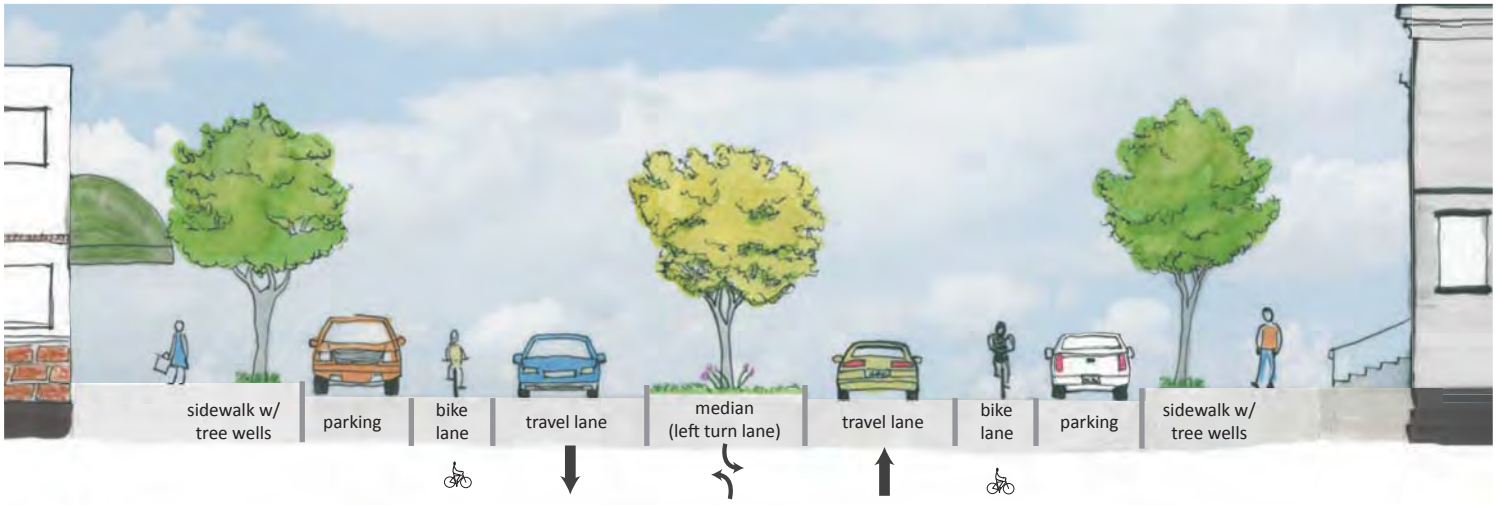


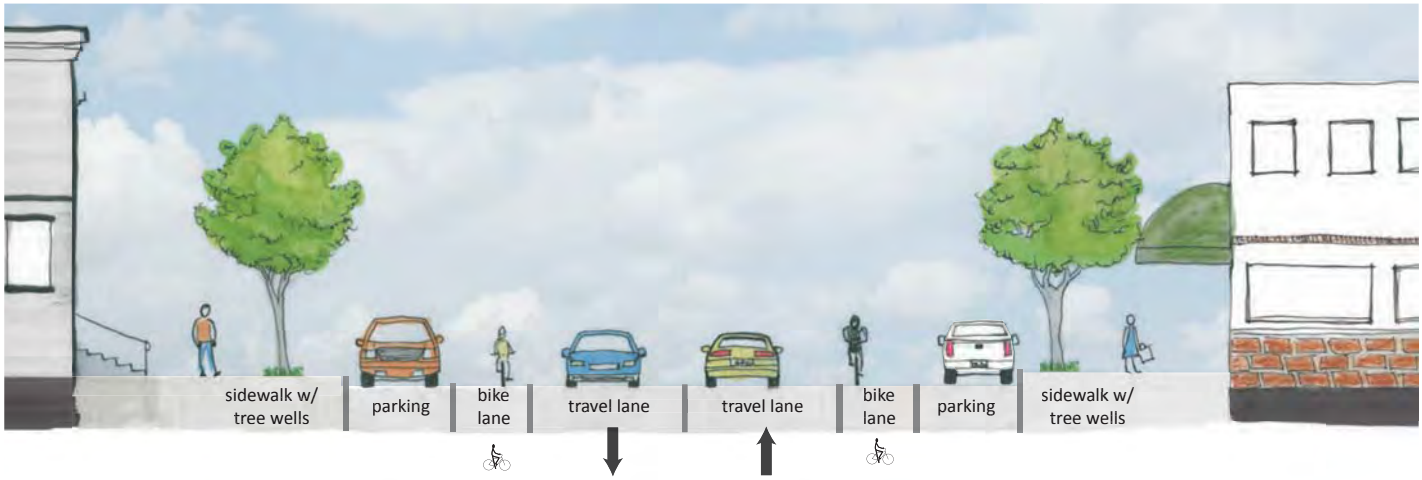
Figure 7: Collector Street Sections - Center / Village / Mixed Use

Right-of-way width: 76’ - 88’

3-Lane Collector with Bike Lanes and Parking



2-Lane Collector with Bike Lanes and Parking



2-Lane with Parking and Two-way Cycletrack

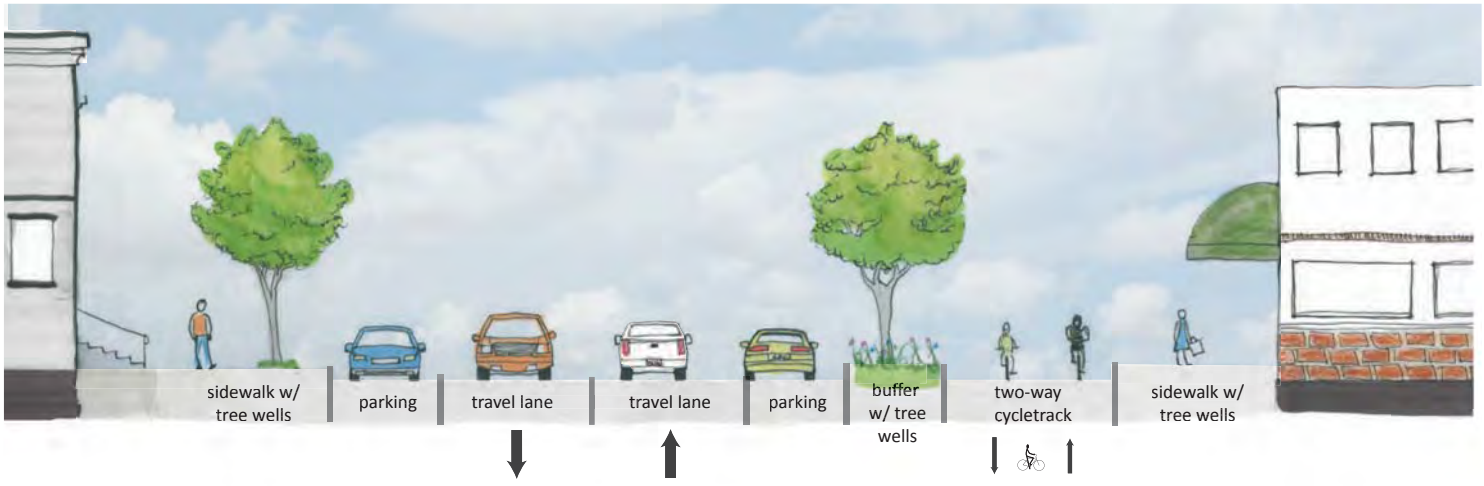
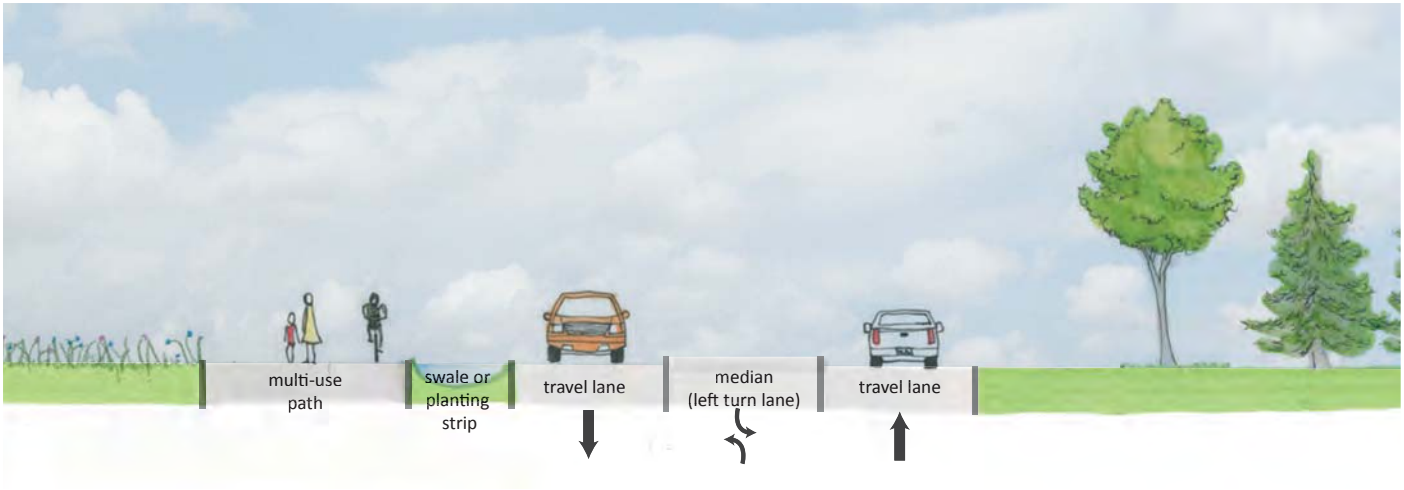


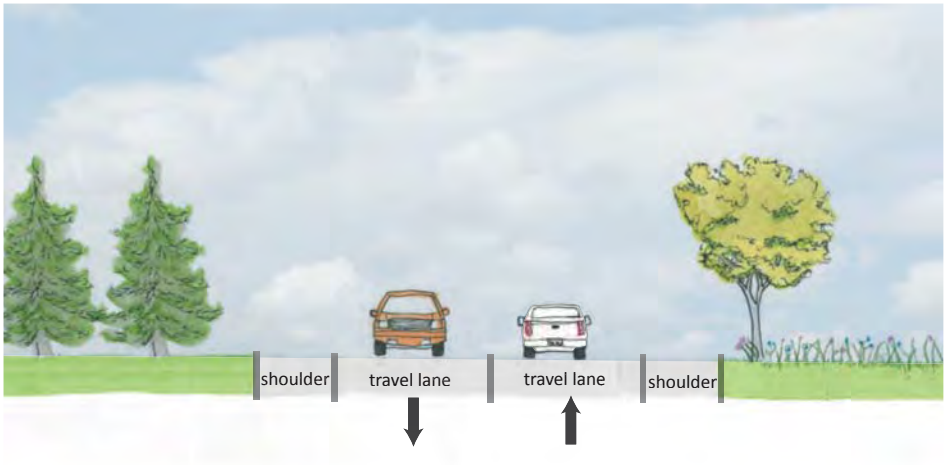
Figure 8: Collector Street Sections - Other

Right-of-way width: 40’ - 64’

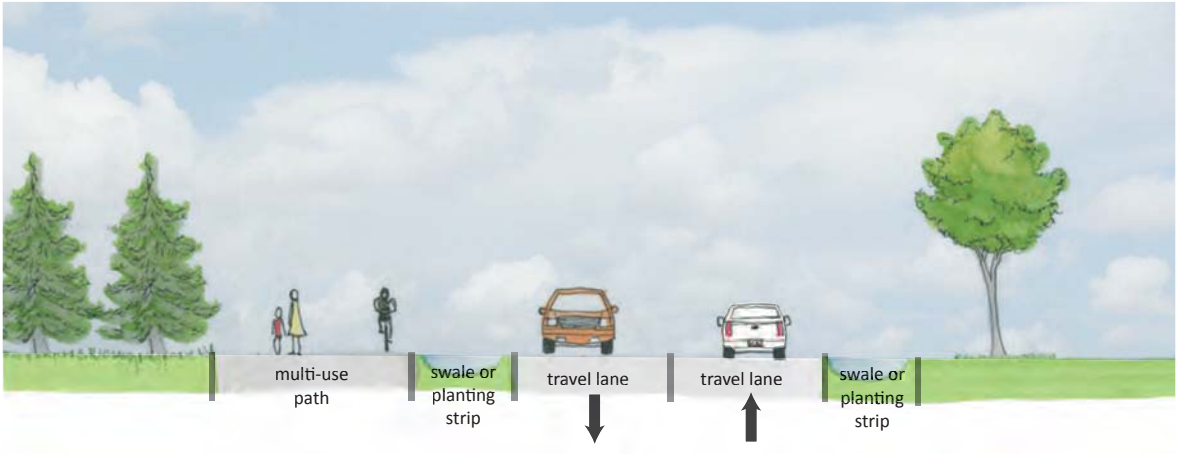
3-Lane Collector with Multi-Use Path



2-Lane Collector with Shoulder for Pedestrians and Cyclists



2-Lane Collector with Multi-Use Path



Transit Service

In the future, transit can play an important role in providing a balanced transportation system within the city. Transit can provide an alternative to private automobile travel for distances too far to walk or bike, people seeking options to single occupancy vehicle travel, and/or for transportation-disadvantaged travelers. Today, existing transit service in the city is limited to Trimet's line 30, which runs from the Clackamas Town Center to Estacada, traveling via OR 224 through Damascus. Trimet's line 155 provides a nearby connection, running from the Clackamas Town Center into Happy Valley.

In the future, the city can work with Trimet and/or other transit service providers to identify corridors that may be suitable for transit as development and land use densities create a demand. Potential corridors for future transit service may include:

- Foster Road from Damascus into Portland
- SE 242nd Avenue from Damascus into Gresham
- OR 212 connecting Damascus to the east and west
- Extending line 155 from Clackamas Town Center to downtown Damascus via Sunnyside

To support convenient transit service, the design of potential transit corridors needs to consider transit-supportive land-use, connectivity, and streetscape features, such as:

- Residential density of at least 4-5 dwelling units per acre is typically needed to provide enough ridership to support local transit service; densities of about 15 units per acre can typically support a frequent transit network.
- Commercial activity nodes with a mix of uses can provide access to multiple amenities within walking distance of a single transit stop.
- A well connected grid network can enable people to easily access transit stops on foot or by bicycle.
- Streetscaping designs can include comfortable space for people on foot, bicycle, and waiting at transit stop locations, including wide sidewalks, bike lanes or cycletracks, street trees, and benches or shelters.

Truck Routes

A majority of freight traffic within Clackamas County occurs by truck along designated freight truck routes. The truck routes include interstate highways, statewide highways, and regional highways, as well as County arterial and collector roadways that support the ODOT system. These routes provide interstate and intrastate connections to ports, intermodal facilities, and urban areas. The Oregon Highway Plan (OHP) and Clackamas County TSP identify the designated freight truck routes. Per these plans, OR 212 is a Statewide Freight Route whereas OR 212, SE 172nd Avenue, and OR 224 are County Freight Routes. In the RTP, Metro designates SE 172nd Avenue, OR 212, and SE 242nd Avenue as freight routes. Figure 9 shows each of these routes.

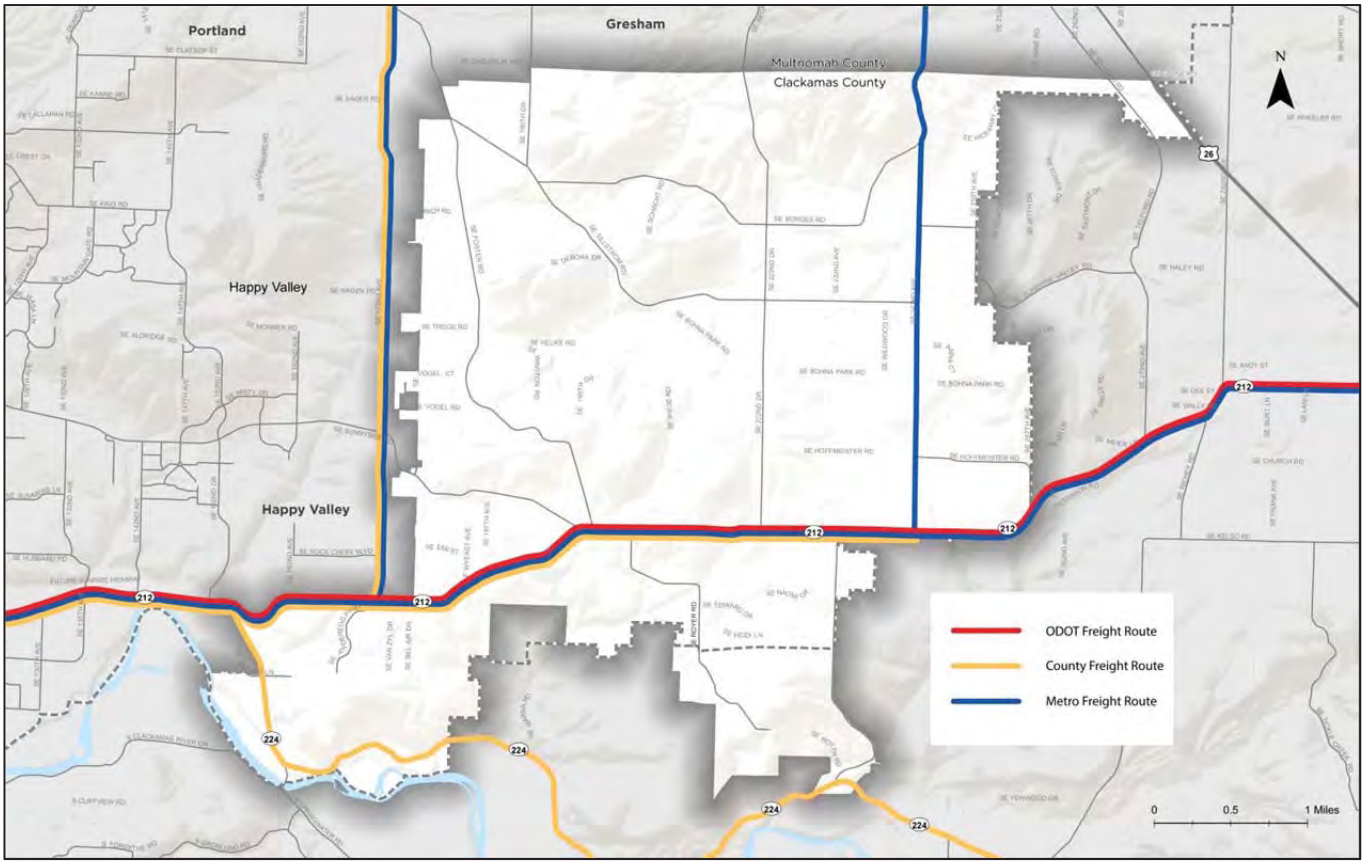


Figure 9: Freight routes

Intersection Performance Standards

Intersection performance standards indicate desirable operating levels for intersections. Clackamas County has adopted intersection performance standards for each facility type, based on its location inside or outside the Metro urban growth boundary, drawing on the interim performance measures set by the 2035 Metro Regional Transportation Plan (RTP). The interim performance standards are based on the volume-to-capacity ratio associated with vehicular traffic. The interim standards do not define the desirable operations of non-vehicular modes of travel nor do they account for financial, environmental, and community impacts. Metro, ODOT, and other regional partners are working to update the standards in order to guide investment decisions to align with these broader goals.

Performance standards for intersections within the city will follow those adopted by Clackamas County.

- Volume-to-capacity ratio of 0.99 for signalized intersections, unsignalized intersections, and roundabouts during the peak one-hour period in residential neighborhoods, employment areas, and rural areas.
- Volume-to-capacity ratio of 1.10 for signalized intersections, unsignalized intersections, and roundabouts within the Damascus Town Center.

When Clackamas County updates its performance measures, the City of Damascus can evaluate the potential to adopt these standards to reflect the goals and needs of the city.

Access Management Guidelines

Access management guides the construction, operations and maintenance of the locations, spacing, design, and operations of driveways, median openings, and local/collector street connections. These guidelines are considered in context with the traffic flow, safety, capacity, and speed on the surrounding road system. Within developed areas, the implementation access management guidance could include shared or consolidated access points, restrictions on specific movements at access points through medians or channelization, or closing access points. Access management provides several potential benefits, such as reducing crashes and crash rates and increasing roadway capacity by maintaining consistent vehicle flows and speeds.

Access management techniques and strategies help preserve long-term investments in the transportation system, provide appropriate access to homes and businesses, and can help provide for safe and efficient movement of vehicles, bicycles, and pedestrians.

Access management guidance generally becomes more stringent as the functional classification level of roadways increases and the corresponding emphasis on mobility increases. The city's access management guidance aligns with that of Clackamas County.

Table 2 identifies the access spacing guidance for city roadways. Driveway access spacing is measured from center of each driveway to the center of the upstream or downstream driveway or intersection on one side of the roadway. The guidance reflected in Table 2 can be difficult to achieve on existing roadways once properties have been developed.

Table 2: Access Management Guidelines

Function Classification	Minimum Signal Spacing	Minimum Intersection Spacing	Minimum Driveway Access Spacing	Residential Uses	Commercial/Industrial Uses
Major (5-lane) arterials	1000 feet	400 feet	400 feet from intersections	No direct access	Shared access encouraged Left-turn lanes determined through review
Minor (3-lane) arterials	600 feet	300 feet	300 feet from intersections	No direct access	Shared access encouraged Left-turn lanes determined through review
Collector	300 feet	150 feet	100 feet for driveways, 150 feet for development access?	Shared access encouraged New development to access local streets	Shared access encouraged Left-turn lanes determined through review
Local	N/A	100	25 feet from the right-of-way lines at an intersection	Allowed	Curb cut minimum 50 feet to curb return

ODOT maintains jurisdiction over OR 212 and OR 224. ODOT's access spacing guidelines reflect a specific highway's level of importance (i.e. statewide, regional, or district), the average annual daily traffic, and whether the highway inside or outside an UGB. In Damascus, OR 212 is a statewide highway and OR 224 is a district highway. Both carry more than 5,000 vehicles per day on average over the course of a year (>5,000 AADT). Table 3 summarizes ODOT's spacing guidelines for unsignalized intersections on statewide and regional urban highways with AADT greater than 5,000.

Table 3: ODOT Access Spacing Guidelines for Unsignalized Approaches (Urban highways with AADT > 5000)

	Minimum Space Required (feet)	
Posted Speed Limit	Statewide (OR 212)	District (OR 224)
≤ 25 mph	350	250
30 mph and 35 mph	500	350
40 mph and 45 mph	800	500
50 mph	1,100	550
≥ 55 mph	1,320	700

Access Management Policies

Adopting a common set of guidelines will enable new access locations to adhere to access management strategies. The city recognizes that many existing access locations do not meet the recommended spacing guidelines today. When redevelopment occurs, the city will consider the consolidation of accesses where spacing is too dense, as feasible and appropriate.

The city will implement the following policies as part of future land use actions, to maintain and/or improve traffic operations and safety along the arterial and collector roadways. Access decisions should be based upon the review of an approved traffic study prepared according to the County's Transportation Impact Study Requirements in Section 295 of the *Clackamas County Roadway Standards.*

- Developments with frontage on two roadways should locate their driveways on the lower functional classified roadway.
- Access driveways should be located to align with opposing driveways.
- Multiple driveways may be permitted so long as they meet the driveway access spacing guidelines.
- If spacing guidelines cannot be met, effort should be made to consolidate access points with neighboring properties.
- Where guidelines cannot be met and joint access is not feasible, temporary conditional access can be granted with the provision of crossover easements on compatible parcels (considering topography, access, and land use) to facilitate future access between adjoining parcels.
- Right-of-way dedications may be provided to facilitate the future planned roadway system in the vicinity of proposed developments, thus creating additional off-street access locations.

- Half-street improvements (sidewalks, curb and gutter, bike lanes/paths, and/or travel lanes) shall be provided along site frontages that do not meet applicable roadway cross-sections standards at the time of development unless otherwise directed by the public works director.
- Shared or consolidated access, along with cross-over easements for adjacent parking areas, should be implemented as part of future development or redevelopment in the Damascus Town Center or other mixed use or commercial areas adjacent to OR 212.

Figure 10 and the explanation in Table 4 provide more detail the on the application of cross-over easements and conditional access permits that can be implemented over time to achieve the desired access management objectives.

Figure 10: Example of cross-over easement / access consolidation process

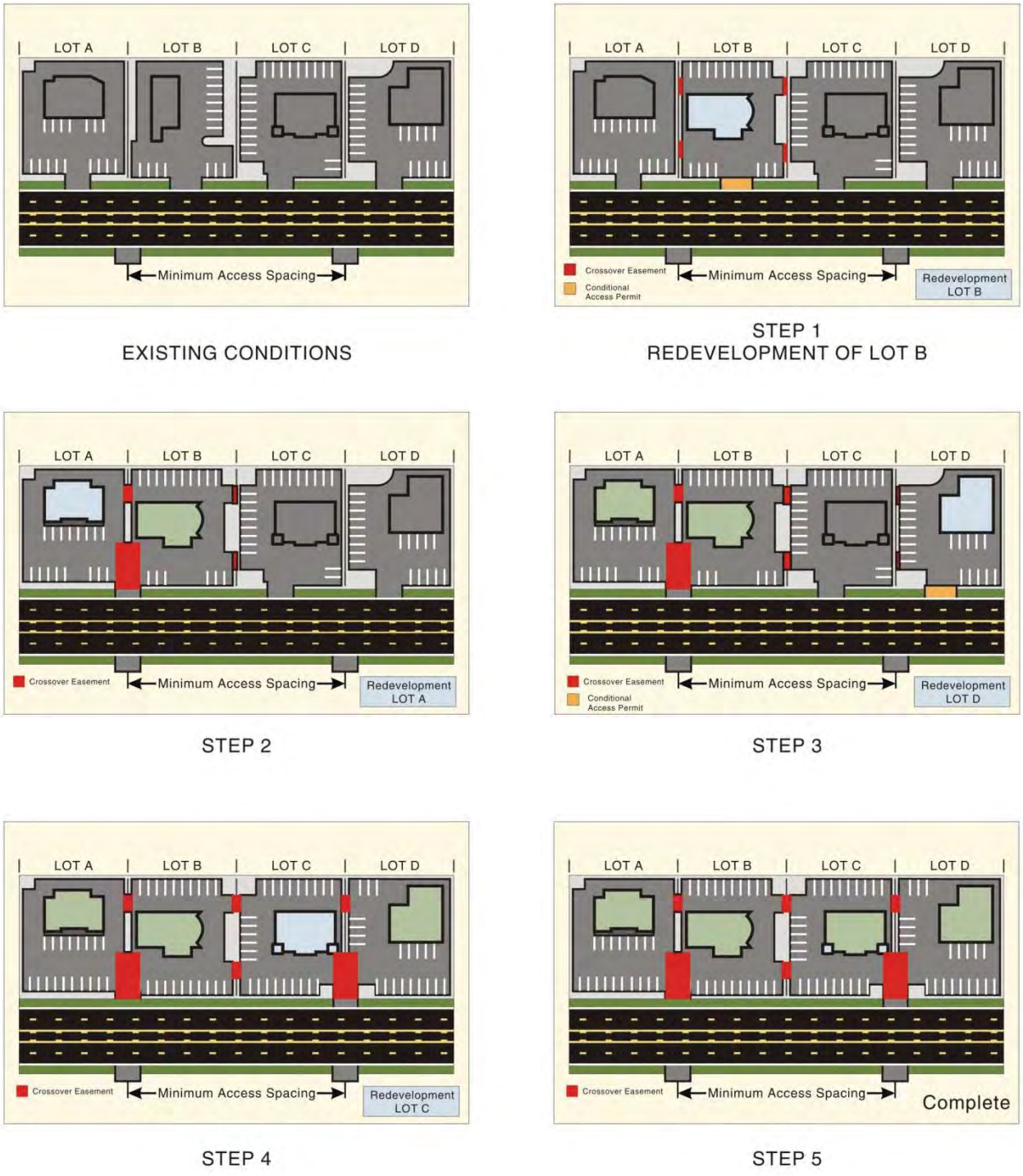


Table 4: Cross-over easement/access consolidation process explanation

Step	Process
1	EXISTING – Currently Lots A, B, C, and D have site-access driveways that neither meet the access spacing criteria of 300 feet nor align with driveways or access points on the opposite side of the roadway. Under these conditions motorists are into situations of potential conflict (conflicting left turns) with opposing traffic. Additionally, the number of side-street (or site-access driveway) intersections decreases the operation and safety of the roadway.
2	REDEVELOPMENT OF LOT B – At the time that Lot B redevelops, the City or County would review the proposed site plan and make recommendations to ensure that the site could promote future crossover or consolidated access. Next, the City/County/ODOT would issue conditional permits for the development to provide crossover easements with Lots A and C, and City/County/ODOT would grant a conditional access permit to the lot. After evaluating the land use action, the City/County/ODOT would determine that LOT B does not have either alternative access, nor can an access point be aligned with an opposing access point, nor can the available lot frontage provide an access point that meets the access spacing criteria set forth for segment of roadway.
3	REDEVELOPMENT OF LOT A – At the time Lot A redevelops, the City/County/ODOT would undertake the same review process as with the redevelopment of LOT B (see Step 2); however, under this scenario the City/County/ODOT would use the previously obtained cross-over easement at Lot B consolidate the access points of Lots A and B. City/County/ODOT would then relocate the conditional access of Lot B to align with the opposing access point and provide and efficient access to both Lots A and B. The consolidation of site-access driveways for Lots A and B will not only reduce the number of driveways accessing the roadway, but will also eliminate the conflicting left-turn movements the roadway by the alignment with the opposing access point.
4	REDEVELOPMENT OF LOT D – The redevelopment of Lot D will be handled in same manner as the redevelopment of Lot B (see Step 2)
5	REDEVELOPMENT OF LOT C – The redevelopment of Lot C will be reviewed once again to ensure that the site will accommodate crossover and/or consolidated access. Using the crossover agreements with Lots B and D, Lot C would share a consolidated access point with Lot D and will also have alternative frontage access the shared site-access driveway of Lots A and B. By using the crossover agreement and conditional access permit process, the City/County/ODOT is able to eliminate another access point and provide the alignment with the opposing access points.
6	COMPLETE – After Lots A, B, C, and D redevelop over time, the number of access points will be reduced and aligned, and the remaining access points will meet the access spacing standard.

Connectivity Guidelines

The TSP and the city's development code include provisions to promote the development of a well-connected transportation network, while maintaining desirable neighborhood characteristics. As part of new development and redevelopment, the city can implement the following strategies to achieve connectivity and neighborhood objectives.

- Where feasible, new developments should include a highly connected network of local streets to provide direct access to local destinations, such as schools, parks, and neighborhood amenities.
- The use of cul-de-sacs and dead-end streets should be limited in new developments, except where topographical and/or natural features constraints do not allow for connections.
- New developments should connect to the stub streets of prior developments to provide continuous streets, and include stub streets for connection with future development.
- Block size in new developments can be designed to maximize connectivity. Smaller block sizes (i.e., 250-500 feet) can provide better access for all modes.

Increased connectivity in existing areas can occur over a period of time. The following strategies can be implemented in order to enhance connectivity in existing developed areas:

- In creating refinement plans in downtown Damascus and the Carver area, consider local street connectivity as a primary goal in the development of the street network. The connectivity objectives need to be balanced with access management guidance OR 212 and OR 224.

- Multi-use paths and sidewalk connections can provide additional connectivity for pedestrians and bicyclists.
- Where needed and appropriate, apply traffic calming strategies in existing residential areas to minimize traffic impacts.
- In existing neighborhoods with cul-de-sacs or dead end streets, work with property owners to establish right-of-way easements for pedestrian and bicycle connections, prioritizing completion of pedestrian and bicycle routes to destinations.

Parking

Cities set policies related to parking requirements for new developments; these policies can provide for parking maximums instead of minimums and/or allow for shared parking between uses to encourage multimodal travel options. In the Portland metropolitan area, Metro has established regional guidelines for minimum and maximum parking ratios. The Damascus Development Code ("Code") standards are consistent with those standards and also allow developers or business owners to include the supply of adjacent on-street parking in meeting off-street parking requirements. The Code also includes provisions for establishing shared parking agreements among adjacent property owners, and that allow buildings in commercial areas to directly front the street. The Code includes requirements for bicycle parking, consistent with regional standards.

The Code also includes provisions to ensure that large parking lots include adequate pedestrian facilities to provide safe, attractive connections to buildings and adjacent sidewalks. Finally, the code includes provisions regarding allowed location of off-street loading areas to minimize conflicts between trucks and other types of vehicles, bicycles and pedestrians.

Parking plays a large role in transportation demand management, and effective management of parking resources can encourage use of non-single occupancy vehicle modes. Cities can tailor policies to charge for public parking in certain areas and impose time limits on street parking in retail centers. Cities can also monitor public parking supply and utilization in order to inform future parking strategy. At this stage in the City's development, many of these strategies are not yet ripe for implementation. As development intensifies, the City may consider additional parking management strategies which would be consistent with transportation and land use management policies in its Comprehensive Plan.

Safety

The ability to move safely throughout the city of Damascus on foot, by bike, and in a vehicle is critical to providing a well-planned and designed transportation system for the future of Damascus.

In the RTP, Metro identifies three regional needs related to safety in Mobility Corridor 13, from Rock Creek Junction along OR 212 to US 26:

- Stretches of OR 212 rank on the ODOT SPIS list as Category 3 and 4.
- Need to address safety problems on SE Tong Rd
- Need for safety improvements to the Carver Bridge.

In 2012, ODOT designated a section of OR 212 from MP 7.96-8.28 as a top 5% SPIS section, just west of the intersection of OR 212 and OR 224.

In addition to these issues previously identified, analysis of recent crash history at key collector/arterial intersections within Damascus helped to identify potential improvement projects for the Transportation System Plan. The City of Damascus will continue to monitor the safety of the system and will plan and prioritize transportation system improvements with safety as a priority.

MULTIMODAL IMPROVEMENT PROJECTS

Projects identified as key improvements for the future transportation system in Damascus are discussed below. Each is intended to provide multi-modal options to residents and to serve projected vehicle, pedestrian, and bicycle traffic. The identified improvements will be able to accommodate future transit service in the City of Damascus, as applicable.

The identified list includes those projects anticipated within the next twenty years as well as those that may be needed in the 20 – 40 year future as the city further develops.

20-Year Needs

Projects in the 20-Year Needs category are those needed to support the growth in households and jobs expected over the next twenty years (as documented in the Comprehensive Plan) as well as the growth in regional “through” traffic. Many of these projects focus on prioritizing the addition of pedestrian and bicycle facilities to existing rural roads.

These projects and the planning-level cost estimates of each are listed in Table 5. They are also shown in Figure 4. The projects included in Table 5 are not listed in a priority order; the city will determine priorities as part of their Capital Improvements Program. Further, all projects listed as “urban upgrades” in Table 5 include the addition of pedestrian and bicycle facilities, landscaping/swales, on-street parking (as applicable), and vehicular travel lanes consistent with the roadway’s cross-section requirements. All new roadways are assumed to be constructed to standard cross-sections with full accommodations for all modes.

Table 5: Damascus TSP 20-year needs projects

20-Year Needs Projects	Project Length (mi)	Cost Estimate	Right-of-way Acquisition Cost
SE Tillstrom urban upgrades in 172nd/190th Corridor *(City of Damascus/City of Happy Valley/County Project)*	0.63	$3,660,000	$1,240,000
SE 190th urban upgrades *(City of Damascus/City of Happy Valley/County Project)*	0.50	$2,900,000	$560,000
New arterial connection between SE 190th and SE 172nd *(City of Damascus/City of Happy Valley/County Project)*	0.90	$11,380,000	$5,460,000
Town Center Refinement Plan (with possible one-way couplet, additional east-west collector connections, additional north-south local connections)	-	$200,000 + $40,700,000* (Refinement Plan + Implementation)	$18,270,000
Carver Area Refinement Plan (with possible one-way couplet)	-	$150,000 + $12,520,000* (Refinement Plan + Implementation)	$5,480,000
SE 172nd extension and urban upgrades south to east-west collector	0.61	$5,550,000	$2,430,000
New east-west collector connection between Carver and OR 212	1.04	$11,700,000	$5,120,000
SE Weise Road realignment at the southern end to meet SE Royer	0.18	$1,960,000	$890,000
SE 187th Ave arterial urban upgrades and extension north to Foster/Vogel	1.12	$12,470,000	$5,400,000
Foster Road widening and urban upgrades	2.15	$22,020,000	$4,690,000
OR 224 urban upgrades from south of Carver to UGB (east of Tong Road)	1.00	$10,210,000	$2,170,000
New southern arterial from OR 212/Tong to SE 202nd	1.10	$11,200,000	$5,280,000
SE 202nd urban upgrades	0.53	$5,830,000	$1,260,000
SE Tong Road urban upgrades	0.93	$10,290,000	$2,230,000
SE 202nd extension south to new arterial	0.27	$3,010,000	$1,370,000
SE Vogel Road urban upgrades	0.44	$1,780,000	$0
SE Hemrich Road extension east to Tillstrom	0.56	$3,230,000	$2,090,000
SE Hemrich Road urban upgrades	0.27	$1,090,000	$0
SE Troge Road urban upgrades	0.51	$2,060,000	$0
SE Sunnyside Road urban upgrades	1.08	$6,270,000	$1,210,000
OR 212 widening to 5 lanes and urban upgrades between OR 224 (Rock Creek Junction) and SE 222nd Ave (Town Center cross-section to be determined)	2.91	$37,480,000	$10,030,000
OR 224 widening to 5 lanes and urban upgrades between OR 212 (Rock Creek Junction) and the north side of Carver	0.82	$10,550,000	$2,830,000

* Refinement Plan costs are based on one possible option for the refinement areas. This cost will vary based on the conclusions of the Refinement Plan.

Due to limited funding, the city will prioritize this list to support economic development. In addition, projects will be prioritized according to whether they address safety and/or operations deficiencies.

Intersection Improvements

As the city grows, and traffic volumes also grow, intersections throughout the city may need turn lanes, a change in traffic control (i.e. installing signals, roundabouts, all-way stops), and/or pedestrian and bicycle facilities. The timing of improvements is directly tied to growth in demand. All-way stop control measures can offer a transitional configuration, especially for collector-collector intersections. As demand grows further, some intersections will ultimately need to be converted to signal or roundabouts. During the next 20 years, the following city intersections may need improvements (based on how development occurs):

- Foster Road/172nd-190th Connector
- Foster Road/Vogel Road
- Hemrich Road/Foster Road
- Hueke Road/Foster Road
- Bohna Park Road/Tillstrom Road/Weise Road

The City will reserve the right-of-way needed to accommodate a single-lane roundabout at collector-collector and collector-arterial intersections, except where topography would not allow a roundabout to be constructed. Based on national guidance, the right-of-way dedication at these locations should include a circle with a radius of 85 feet measured from the center of the intersection, to preserve space for a single-lane roundabout, sidewalk, and landscaping in a 170-foot diameter circle. On intersections along key city freight routes (non-ODOT facilities), a 95-foot radius (190 feet in diameter) circle should be preserved. Where a roundabout is not feasible, right-of-way needs and dedication will be governed by the applicable street cross section standards.

Intersection improvements may also be needed at the following ODOT intersections:

- 187th Avenue/OR 212
- Tong Road/OR 212
- Weise Road/OR 212
- Royer Road/Town Center Couplet
- 222nd Drive/OR 212
- Eckert Lane/OR 224

For the most part, improvement of the state intersections will likely include the installation of new traffic signals and/or modification of existing traffic signals. The design and construction of any roundabouts on state facilities will need to be completed in close coordination with ODOT and with careful consideration given to state design standards, multimodal safety and freight needs.

Long-term

Long-term projects can serve growth anticipated 20 – 40 years in the future and are primarily located in areas designated in the Comprehensive Plan as "Future Growth Areas". The timing of these long-term projects depends on the pace and location of development in the city and the surrounding areas. The long-term projects are identified in Figure 4 and listed below.

- SE Borges Road urban upgrades
- SE Tillstrom Road urban upgrades
- SE Heuke Road urban upgrades and extension east to Tillstrom
- SE Bohna Park Road urban upgrades
- SE Weise Road urban upgrades
- SE Royer Road urban upgrades
- SE Hoffmeister Road urban upgrades and extension west to Foster
- SE 222nd Drive urban upgrades
- SE 232nd Ave urban upgrades and connection between Tillstrom and Hwy 212
- OR 212 widening to 5 lanes and urban upgrades east of SE 222nd Drive
- SE 242nd Ave widening to 5 lanes and urban upgrades
- New southern arterial from SE 202nd to SE 242nd
- New north-south collector connection east of SE 242nd
- New east-west collector between Sunshine Valley Road and SE 242nd

SPECIAL AREAS FOR REFINED ANALYSIS

(After TSP adoption)

The TSP identifies two areas in need of further refinement plans: the Carver area and downtown Damascus, including future alignment of Foster Road and Sunnyside Road. At least three other adopted plans just outside the city boundaries will impact the development of Damascus' transportation system and need to be considered for future coordination. These plans include the County's SE 172nd Avenue/190th Drive Corridor Management Plan, the Springwater Interchange on US 26, and the Rock Creek Junction Interchange (part of the Sunrise Corridor Plan).

Carver Area

The Carver area is in the southwest corner of Damascus, lying along the north bank of the Clackamas River. Neighborhoods have been built to the north along OR 224, and the City's Comprehensive Plan envisions the Carver area to the north as a mixed-use village, where residential development is blended with neighborhood retail and commercial uses. This type of development can give people the choice to make various trips by walking and bicycling, as residential and commercial uses are close together.

Future transportation projects can support development and increased activity in the area and create a safe and pedestrian-friendly environment while allowing projected growth in traffic volumes to travel along OR 224.

The future street network could include a one-way couplet, which can offer several advantages for the Carver area. Splitting OR 224 into two one-way streets in this area allows for street widths to be narrower, making them more pedestrian-friendly due to the shorter crossing distances. One-way couplets can improve vehicle flow by reducing turning movement conflicts. If a couplet is constructed, future southbound traffic would travel on the existing OR 224, while north/westbound traffic would travel on a future roadway just to the north of the existing Carver Village area.

Implementation of one-way couplet system would be determined by a refinement plan that considers the existing conditions and future development and needs of the area. Figure 11 shows an option for the one-way couplet in Carver.

Figure 11: Carver refinement plan area

Damascus Town Center

The Damascus Town Center also will require a refinement plan to determine the recommended alternative for a network of streets within the vicinity of downtown.

Context

Damascus' Town Center is located along OR 212, where Foster Road and Sunnyside Road connect to the highway. This area currently contains the majority of the retail, commercial, and service establishments in the city. Several churches also are located in the Town Center. OR 212, a three-lane statewide highway, runs through the middle of this area. In the future, the Damascus Town Center is envisioned to be the commercial and civic core for the city, with mixed-use development, a variety of commercial and office uses, and high density residential development. As land develops and improvements to the transportation system progress, destinations in the Town Center need to be accessible via all transportation modes.

Town Center Issues and Needs

At Town Hall Meetings conducted for the TSP and Comprehensive planning efforts and at a variety of public engagement venues, the residents of Damascus identified a number of issues and needs related to the Town Center; these are summarized below.

Safety: The community has expressed a desire for increasing safety along OR 212, especially in the town center area. The intersections of Foster/OR 212 and Sunnyside/OR 212 have the second and third highest number of crashes within the city, respectively.

Congestion: OR 212 experiences vehicle congestion during peak times, particularly in the town center area, where vehicles making turning movements in and out of commercial areas can create additional delay to through movements.

Pedestrian crossing difficulties: OR 212 presents a barrier for pedestrians trying to access destinations on opposite sides of the highway. Currently, the only painted crosswalks and signalized crossing in the town center area are located at the Foster Road/OR 212 intersection. The community identified the need for safe and more frequent crossing opportunities for pedestrians.

High vehicle speeds: High vehicle speeds can contribute to difficult pedestrian crossing conditions and are generally not consistent with a Town Center area. National research indicates that people in slower-moving vehicles are more inclined to notice a shopping opportunity and stop, contributing to the liveliness and economic vitality of the Town Center.

Need for parallel street connections: Currently, OR 212 is the only east-west connection through the Damascus Town Center, and as such, it serves not only regional and statewide trips, but also shorter local trips. The existing lack of east-west parallel routes contributes to congestion on OR 212.

Transportation Improvement Options

The Town Hall meetings identified three general options for the Damascus Town Center including:

- One-way couplet of OR 212 in Town Center
- Addition of parallel streets in the Town Center
- Widening of OR 212 to five lanes in the Town Center

Based on feedback from the community, the following elements merit consideration in the Town Center area. These elements provide the basis for a more detailed refinement plan that will determine the alignments of the specific roadway and are illustrated in Figure 12.

- Create a one-way couplet in downtown Damascus, with westbound traffic flowing on the existing OR 212 and east bound traffic flowing on a parallel roadway to the south (starting on Chitwood and extending to the east, as shown in Figure 12).
- Realign Weise Road to meet up with Royer Road at OR 212.
- Realign Foster Road to meet up with SE Anderson Rd.
- Realign Sunnyside Road to join Foster Road north of OR 212.
- Add local streets parallel to OR 212 to increase connectivity and provide alternate routes for local traffic.
- Include safe and protected spaces for bicyclists and pedestrians on all new or improved facilities in the Town Center.

Within two to five years of adoption of the TSP, the City can initiate a Refinement Plan to evaluate the potential options and feasibility of implementation.

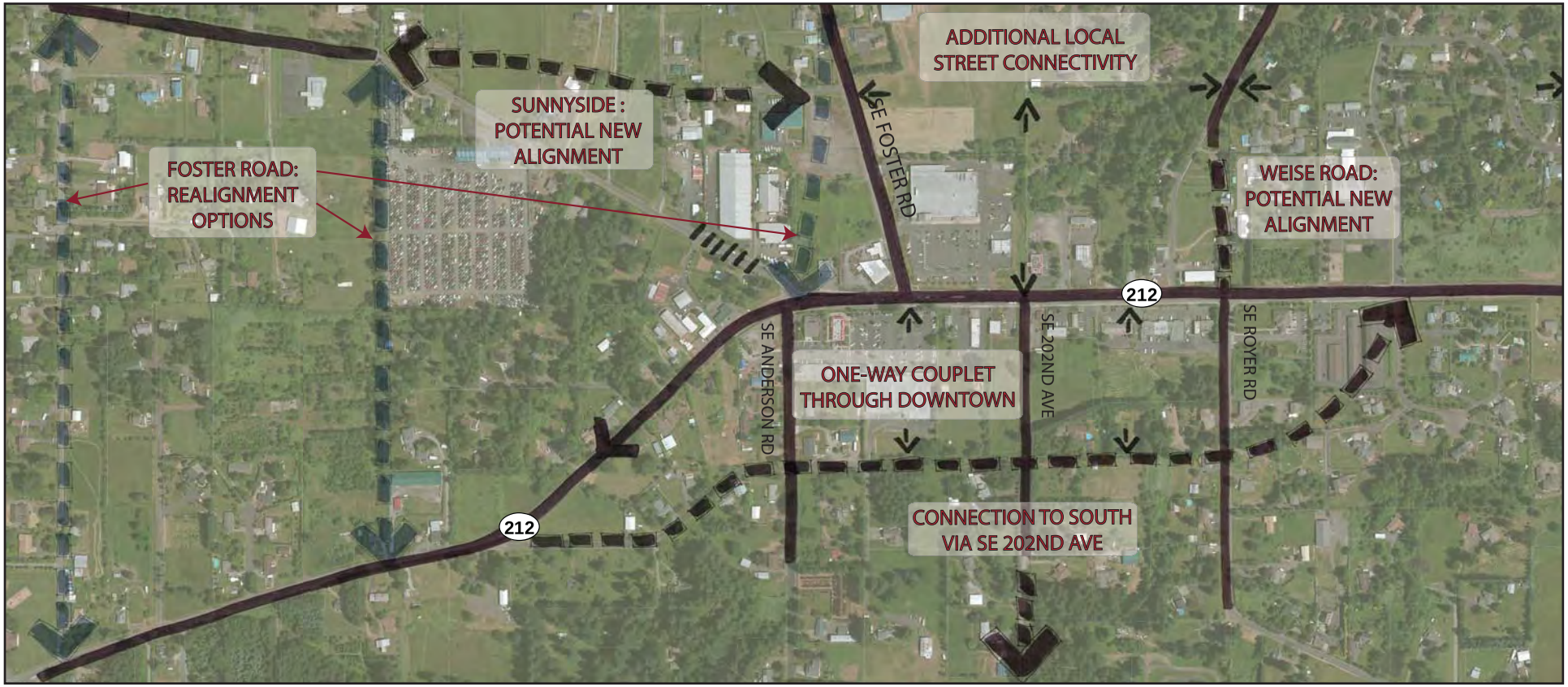


Figure 12: Damascus Town Center Refinement Area Plan

OTHER TRAVEL MODES

This following addresses the rail, air, pipeline, and surface water networks in the City of Damascus. No future projects have been identified as part of the TSP for these modes as the service is provided by other entities.

Rail Service

Clackamas County has passenger and freight rail service; however, neither are located within the city. Passenger service is provided by Amtrak with the closest station to Damascus located in Oregon City. Clackamas County is connected to the regional rail system through the rail lines in the northwestern portion of the county, which are considered part of the Portland Area rail corridor. This rail corridor is the densest in the state and carries the highest quantity of rail tonnage. It is considered the hub of most rail operations in the state. Clackamas County's close proximity to the rail hubs in Portland provides connections to the Salem, Eugene, Southern, North Central, and East regions.

Air Service

Damascus is served by the Portland International Airport, located in Northeast Portland on the Columbia River. The Portland International Airport is a major air transportation and freight facility, which serves Oregon and Southwest Washington. It provides a base for over twenty commercial airlines and air freight operations. Ground access to Portland International Airport from Damascus is available by automobile, taxi and shuttle. Light rail and bus service also run to the airport from many origins in the Portland region, but these modes do not currently provide a direct connection from Damascus to the airport.

There are over 30 airports, airparks, and airfields located throughout Clackamas County that provide a variety of air transportation services to local residents as well as people traveling through. The majority of the airports are private, five are open to the general public, including Valley View Airport, Lenhardt Airpark, Portland-Mulino Airport, County Squire Airpark, and Sandy River Airport. No private or public airports exist or are expected within the City in the future. Therefore, no policies or recommendations in this area of transportation are provided for Damascus.

Pipeline Service

As shown in Figure 13, several pipelines pass through Damascus with sections that run east-west north of OR 212, north-south along SE 242nd Avenue, and north-south, south of OR 212 near SE 172nd Avenue to the city limits.

NW Natural provides natural gas to homes and businesses through Clackamas County. NW Natural gets its gas from the Northwest Pipeline. The Northwest Pipeline is a 4,000 mile bi-directional transmission system that crosses the states of Washington, Oregon, Idaho, Wyoming, Utah, and Colorado. The Northwest Pipeline is owned, operated, and maintained by Williams. Williams operates over 15,000 miles of interstate pipelines across the United States. Williams has no identified major infrastructure improvement projects identified within the City of Damascus.

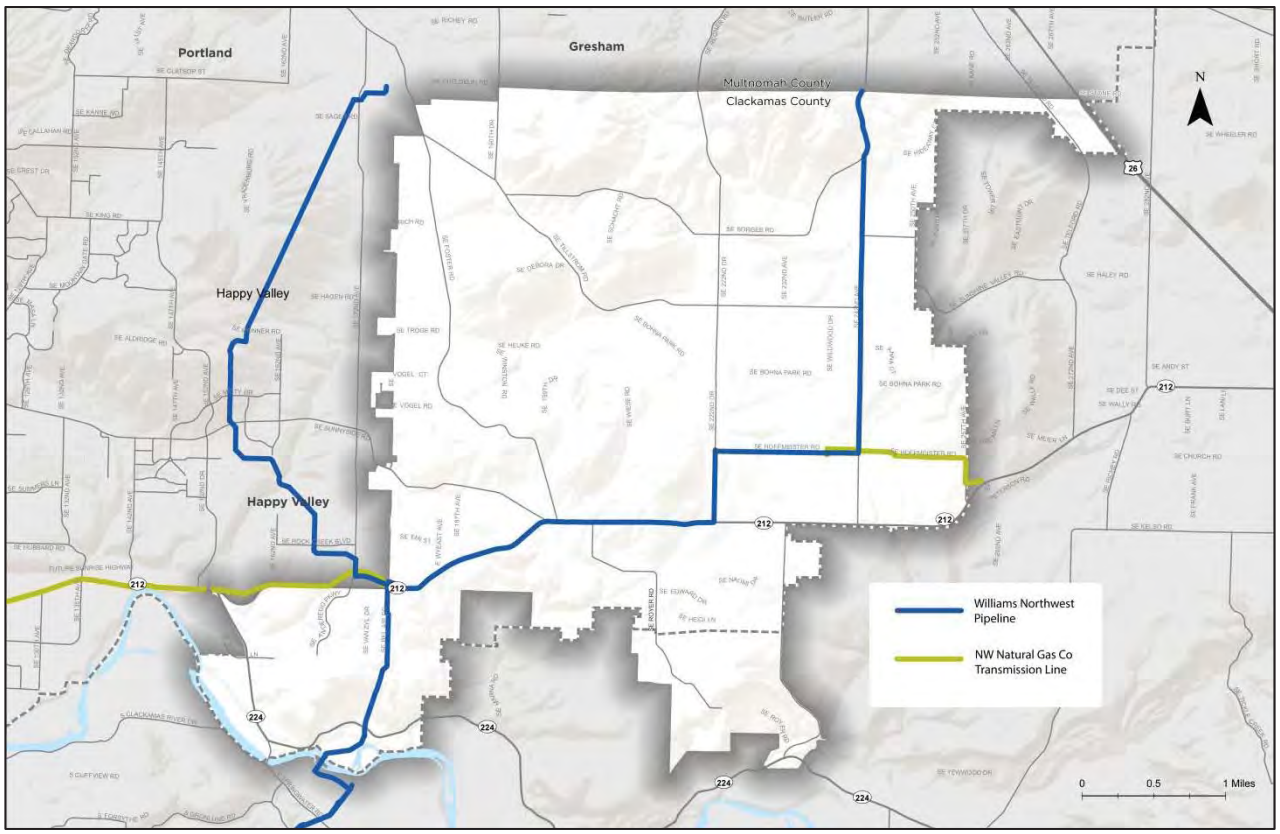


Figure 13: Pipelines in the City of Damascus

Surface Water Transportation

The Clackamas River is the only navigable waterway within Damascus; however, the only transportation function it serves is recreational. The Clackamas River flows into the Willamette River, which flows through the northwest corner of the county to meet the Columbia River. The Willamette River carries both recreational and commercial vessels. The Willamette River caters to commercial operations by providing a waterborne through route for commercial vessels from the Willamette Valley to the Columbia River and the Port of Portland.

Section 5

Funding and Implementation

FUNDING AND IMPLEMENTATION

The existing transportation facilities in the City of Damascus fall under the jurisdiction of the City, the County, or ODOT. OR 212 and OR 224 are ODOT facilities, with the remainder of the collectors and arterials under County jurisdiction. Funding for the projects in the Transportation System Plan will come from a combination of sources, including state, county, city, and private funds. This section outlines the existing revenue stream for transportation funding in the City of Damascus, estimates the costs of the 20-Year Needs projects, and identifies potential funding sources to complete the plan.

20-YEAR ESTIMATED REVENUE STREAM

Over the past eight years, the City of Damascus has received annual revenues from the gas tax, as shown in Table 6. In 2007 and 2008, the city also received some revenues from franchise fees, which are paid into the transportation fund by other public utility funds like water, wastewater, or electricity. The existing revenue sources have primarily been used for small capital projects and minor maintenance of the system. Table 7 shows the expenditures and completed improvements from 2008 to 2012. Clackamas County currently performs the majority of maintenance for the roadways in the city.

Table 6: City of Damascus Transportation Fund Annual Revenues

Year	Gas Tax	Franchise Fees	Total
2005	$41,000	0	$41,000
2006	$577,000	0	$577,000
2007	$433,000	$1,000	$434,000
2008	$407,000	$165,709	$572,709
2009	$377,000	0	$377,000
2010	$441,000	0	$441,000
2011	$550,000	0	$550,000
2012	$579,000	0	$579,000

Table 7: City of Damascus Transportation Related Expenditures

Year	Location	Improvements Completed	Cost
2008	Miscellaneous pavement repairs	Grading, drainage, patching	$515,000
2009	Miscellaneous slurry seals	Slurry seal all paved surfaces	$207,000
2010	199th Street overlay	2" overlay	$57,000
2010	Anderson Road	Reconstruct 660 linear feet	$446,000
2011	OR 212 sidewalk	Construct retaining wall and sidewalk	$68,000
2012	Royer Road	Grade and pave emergency access	$427,000

The City of Damascus has collected an average of $504,387 annually since the first full revenue-year in 2006. Based on this average amount, and an assumed annual growth rate of 2% due to increasing population in the city, Damascus can expect about $12.3 million (in 2013 dollars) in revenues in total over the next 20 years.

COST OF 20-YEAR NEEDS

Table 8 summarizes the cost estimates for the capital improvement projects in the 20-year needs category in this TSP, including roadway widenings, urban upgrades (including sewer, sidewalks, landscaping and bike facilities), and intersection improvements. This list does not include costs for projects within the refinement plan areas, nor does it include costs for improvements associated with the other ongoing projects in the city (the 172nd/190th Corridor Plan, the Sunrise Corridor Plan, or the Springwater/OR-26 IAMPS). It also does not include the costs of future multi-use paths to be determined in the parks and recreation plan.

Table 8: City of Damascus 20-year Needs Projects Costs

Priority	Refinement Plans	Roadway (including bike and pedestrian facilities)	Intersection Improvements	Right-of-way Acquisition Costs	Total
Key 20-Year Needs projects	$350,000	$227,890,000	$2,000,000	$78,020,000	$308,260,000

The key 20-year needs projects in this plan cost, in aggregate, about $308 million, including refinement plans, roadway and intersection improvements, and right-of-way costs. The cost of these projects exceeds the projected revenue over the next 20 years by $296 million. The following identifies funding sources that may enable the City of Damascus to move forward with planned projects.

POTENTIAL FUNDING SOURCES

Since Damascus' incorporation as a city, the Oregon State gas tax has provided the primary source of funding for transportation-related projects in the city, with a portion of funds in 2007-2008 coming from franchise fees. To supplement these sources, the city will need to develop a strategy to fund the TSP improvements. Possible elements of this strategy are outlined below.

Local funding mechanisms

At the local level, the City can draw on a number potential funding mechanisms to help finance the TSP.

As properties with road frontage develop, developers can be required to build the road frontage along their property consistent with the city standards. This allows the transportation system to be developed incrementally at the same time as land develops. Property owners are only required to pay the portion of the improvement that is proportionate to the development's impact on the transportation system. This equates to only a portion of the cost of collectors and arterials.

Table 9 outlines other potential funding sources at the local level that could be implemented in the future in the City of Damascus. In general, local funding sources are more flexible than funding obtained from state or federal grant sources. Per the City Charter in Damascus, implementation of any new fees, including systems development charges, require voter approval. Increases in annual spending also are limited by the City's charter, with further increases requiring voter approval. These charter elements may limit the potential for local funding mechanisms and slow the implementation of transportation system improvements.

Table 9: Potential Local Funding Mechanisms

Funding Source	Description	Potential Application in Damascus
User Fee	Fees tacked on to a monthly utility bill or tied to the annual registration of a vehicle to pay for improvements, expansion, and maintenance on the street system.	Preliminary street improvements
Street Utility Fees/Road Maintenance Fee	The fee is based on the number of trips a particular land use generates and is usually collected through a regular utility bill.	System-wide transportation facilities including streets, sidewalks, bike lanes, and trails
Systems Development Charges (SDCs)	Sometimes referred to as a transportation impact fee, SDCs are fees assessed on development for impacts created to public infrastructure. All revenue is dedicated to transportation capital improvements designed to accommodate growth.	System-wide transportation facilities including streets, sidewalks, bike lanes, and trails

Funding Source	Description	Potential Application in Damascus
	The City can also offer SDC credits to developers that provide public improvements beyond the required street frontage, including those that can be constructed by the private sector at a lower cost. For example, an SDC credit might be given for providing end-of-trip bike facilities within the new development.	
Stormwater SDCs, Grants, and Loans	Systems Development Charges, Grants, and Loans obtained for the purposes of making improvements to stormwater management facilities.	Primarily street improvements
Local Gas Tax	A local tax assessed on the purchase of gas within the City. This tax is added to the cost of gasoline at the pump, along with the state and federal gas taxes.	System-wide transportation facilities including streets, sidewalks, bike lanes, and trails
Optional Tax	A tax that can be used to fund improvements, and gives the taxpayer the option to pay. Generally paid at the same time other taxes are collected, optional taxes are usually less controversial and easily collected since they give the taxpayer a choice whether or not to pay the additional tax.	System-wide transportation facilities including streets, sidewalks, bike lanes, trails, and transit
Parking In-lieu Fees	Fees that are assessed to developers that cannot or do not want to provide the parking for development.	System-wide transportation facilities including streets, sidewalks, bike lanes, trails, and transit
Incentives	An enticement such as bonus densities and flexibility in design in exchange for a public benefit. Examples might include a Commute Trip Reduction (CTR) program, or transit facilities in exchange for bonus densities.	System-wide transportation facilities including streets, sidewalks, bike lanes, trails, and transit
Public/Private Partnerships	Public/private partnerships have been used in several places around the country to provide public transportation amenities within the public right-of-way in exchange for operational revenue from the facilities. These partnerships could be used to provide services such as charging stations, public parking lots, bicycle lockers, or carshare facilities.	System-wide transportation facilities including streets, sidewalks, bike lanes, trails, and transit
Tax Increment Financing (TIF)	A tool cities use to create special districts (tax increment areas) where public improvements are made in order to generate private-sector development. During a defined period, the tax base is frozen at the pre-development level. Property taxes for that period can be waived or paid, but taxes derived from increases in assessed values (the tax increment) resulting from new development can go into a special fund created to retire bonds issued to originate the development or leverage future improvements. A number of small-to-medium sized communities in Oregon have implemented, or are considering implementing, urban renewal districts that will result in a TIF revenue stream.	System-wide transportation facilities including streets, sidewalks, bike lanes, trails, and transit
Local Improvement Districts (LID)	A local improvement district is a geographic area where local property owners are assessed a fee to cover the cost of a public improvement in that area.	Improvements to the transportation system in a local area where local property owners will benefit from the improvement.

State and Federal Grants

In addition to local funding sources, the City of Damascus can seek to leverage opportunities for funding from grants at the State and Federal levels for specific projects. The current Federal transportation bill, MAP-21, expires in September of 2014, and funding opportunities may change after that date. Table 10 outlines those sources and their potential applications.

Potential state funding sources are extremely limited with significant competition for these limited funds. Any future improvements that rely on state funding will require City and regional consensus that these improvements take precedent over transportation needs elsewhere in the region and the state. It will likely be necessary to utilize multiple funding sources so dollars can be combined for a single improvement projects (e.g., combining state, regional or City bicycle and pedestrian funds to pay for new bike lanes and sidewalks).

Table 10: Potential State and Federal Grants

Funding Source	Description	Potential Application in Damascus
Statewide Transportation Improvement Program (STIP)	STIP is the State of Oregon's four-year transportation capital improvement program. Local agencies apply in advance for projects to be funded in each four-year cycle. Capital projects are prioritized based on benefit categories, including (in the 2015-2018 STIP) benefits to state-owned facilities, mobility, accessibility, economic vitality, environmental stewardship, land use and growth management, livability, safety and security, equity, and funding and finance.	Projects on any facility that meet the benefit categories of the STIP.
Transportation and Growth Management Grants (TGM)	TGM Grants are administered by ODOT and awarded on an annual basis. The TGM grants are generally awarded to projects that will lead to more livable, economically vital, transportation efficient, sustainable, pedestrian-friendly communities. The grants are awarded in two categories: transportation system planning and integrated land use & transportation planning.	Refinement area plans for the Damascus Town Center or Carver area; multi-use trails planning.
Transportation Alternatives Program (TAP)	TAP is a federal program that provides funding for pedestrian and bicycle facilities, projects for improving public transit access, safe routes to schools, and recreational trails. Local governments, regional transportation authorities, transit agencies, school districts or schools, natural resource or public land agencies, and tribal governments are all eligible to receive TAP funds.	Bicycle and pedestrian facilities, multi-use trails.
Highway Safety Improvement Program (HSIP)	HSIP is a federal program that provides funding to infrastructure and non-infrastructure projects that improve safety on all public roads. HSIP requires a data-driven approach and prioritizes projects in demonstrated problem areas.	Areas of safety concerns within the city, consistent with Oregon's Transportation Safety Action Plan.

Funding Source	Description	Potential Application in Damascus
Congestion Mitigation and Air Quality (CMAQ)	CMAQ is a federal program, administered through the state, and funds projects that help reduce emissions and meet national air quality standards, such as transportation demand management programs, bicycle and pedestrian improvements, transit projects, diesel retrofits, and vehicle emissions reductions programs.	Projects that demonstrate the potential to reduce emissions: bicycle and pedestrian facilities, transportation demand management.

Section 6

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