MEMORANDUM #4: EVALUATION OF THE DAMASCUS MOBILITY PLAN AREA TRANSPORTATION SYSTEM

Date:	September 10, 2021
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Project:	Damascus Mobility Plan
Subject:	Evaluation of the Damascus Mobility Plan Area Transportation System

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Overview

This memorandum provides an overview of existing traffic conditions in the Damascus area. It includes a technical operations analysis of 11 study intersections to identify existing traffic operations issues due to inadequate capacity or safety performance.

This effort focuses on vehicular and freight improvements and refers to the recently-completed Clackamas County Transit Development Plan for transit components and ongoing Clackamas County Bike and Walk Plan for active transportation components for pedestrian and bicycle components.

Roadway System

Figure 1 shows the existing roadway system in Damascus, identifying functional class and freight routes.

Of the two state highways that intersect the Damascus Mobility Plan study area, Highway 212 is classified as statewide highway in the Oregon Highway Plan (OHP) and Highway 224 is classified as a District Highway.

There are three major arterials that are present in the Damascus Mobility Plan study area: SE 242nd Avenue, SE Sunnyside Road, and a segment of SE 190th Drive. In addition, there are three minor arterials: SE Foster Road, SE Tillstrom Road, and SE 232nd Drive. Table 1 shows the characteristics for each functional classification type.

Table 1. Functional Classification Characteristics

Roadway	Functional Classification	Speed Limit	Number of Lanes	Sidewalks	Bike Lanes
OR 212	Principal Arterial / State Highway	35 – 55 MPH	2 - 3[1]	Partial[2]	Partial[2]
OR 224	Principal Arterial / State Highway	45 MPH	3	No	No
SE 190th Dr	Major Arterial	40 MPH	2	No	No
SE 242nd Ave	Major Arterial	45 MPH	2	No	No
SE Sunnyside Rd	Major Arterial	40 MPH	2	No	No
SE 232nd Dr	Minor Arterial	45 MPH	2	No	No
SE Foster Rd	Minor Arterial	45 MPH	2	No	No
SE Tillstrom Rd	Minor Arterial	40 MPH	2	No	No
SE 190th Dr	Collector	45 MPH	2	No	No
SE 222nd Dr	Collector	45 MPH	2	No	No
SE 257th Ave	Collector	45 MPH	2	No	No
SE Borges Rd	Collector	40 MPH	2	No	No
SE Hoffmeister Rd	Collector	45 MPH	2	No	No
SE Royer Rd	Collector	25 MPH	2	No	No
SE Sunshine Valley Rd	Collector	40 MPH	2	No	No
SE Telford Rd	Collector	45 MPH	2	No	No

[1] The three-lane cross-section of OR 212 extends from SE Sunnyside Road to SE Old Barn Lane, and again from SE 215th Court to SE Hollyview Terrace.

[2] Sidewalks and marked bike lanes extend from OR 212/SE Sunnyside Road and OR 212/SE Old Barn Lane. East of SE Old Barn Lane, the shoulders remain wide enough (6+ feet wide on either side) for bicycles to ride with low levels of traffic stress.

Freight System

Highway 212 is identified as a freight route in the OHP (shown in Figure 1), stretching across the length of the Damascus Mobility Plan study area, from US 26 at its eastern end to I-205 at its western end. At a national level, Highway 212 is a National Highway Freight Route from I-205 to the SE Foster Road/Highway 212 intersection within the Damascus Mobility Plan study area.

Study Intersections

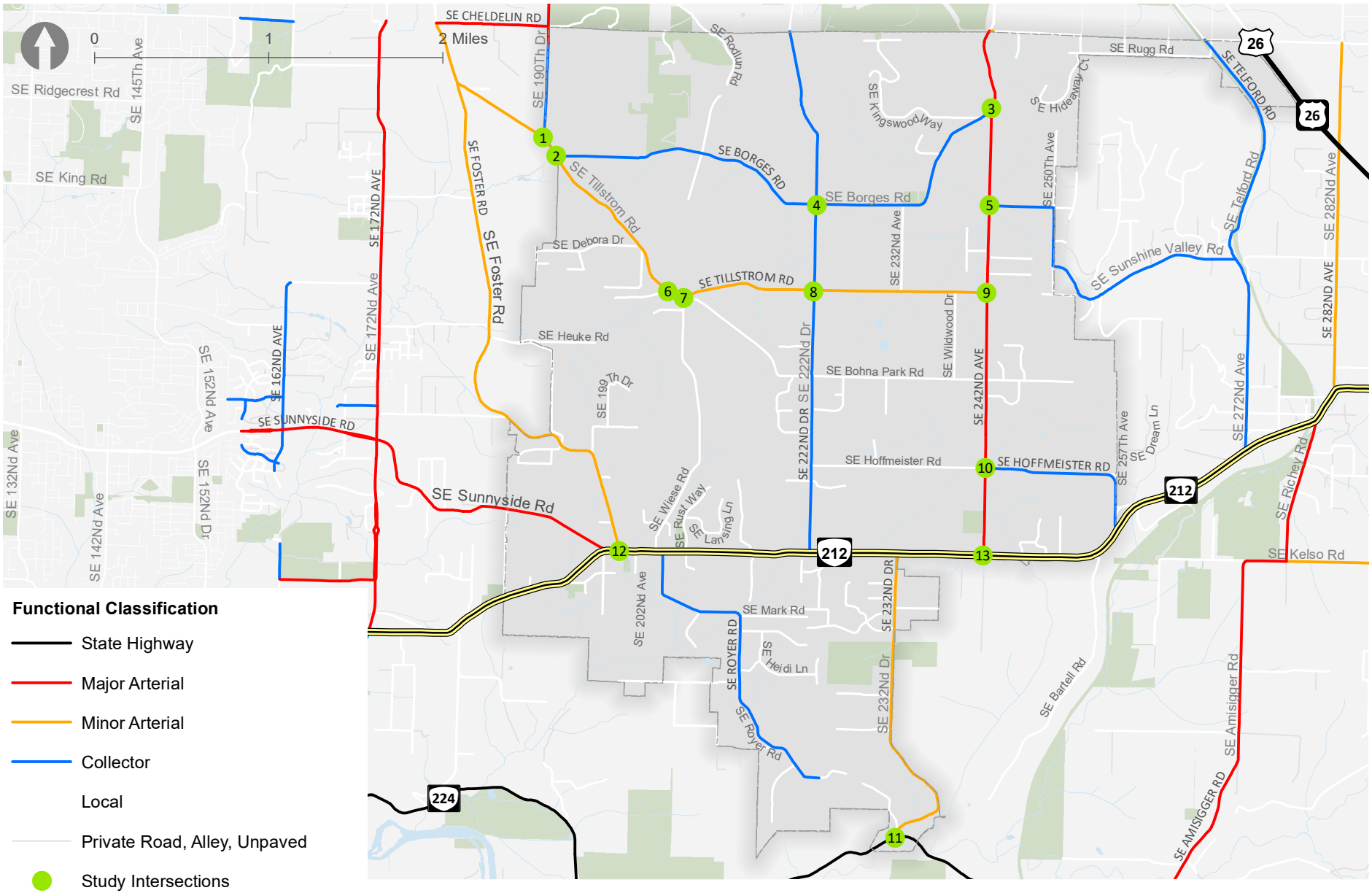
Figure 2 shows the 11 traffic study intersections analyzed in this memorandum as well as their lane configurations and traffic control devices. Of the 11 study intersections within the Damascus Mobility Plan study area, 10 are two-way stop-control intersections, and one (SE 222nd Drive/SE Tillstrom Road) is an all-way stop control intersection. The *Sunnyside-Foster and 242nd Intersection Refinement Memorandum* details the intersection operations for intersections along Highway 212.

Turning movement counts were collected at all study intersections in April 2019 and grown at a one percent annual growth rate to reach base year 2021 volumes. Figure 3 shows the base year 2021 traffic counts and operations results.

Level-of-service (LOS) is a commonly used performance measure. LOS uses an "A" to "F" ranking based on the average control delay experienced by motorists. LOS "A" conditions have very low vehicles delay times (10 seconds or less), while LOS "F" conditions have high delay times (over 50 seconds on average per vehicle at an unsignalized intersection) that are considered unacceptable to most drivers. According to the Clackamas County Transportation System Plan, the LOS threshold for unsignalized intersections in rural areas of the county is LOS E during both the AM and PM peak hours.

One study intersection is located along OR 224, a District Highway managed by ODOT. As outlined in the OHP, a District Highway outside of an urban growth boundary on rural lands has a volume-to-capacity (V/C) ratio target of 0.75 during peak hour operating conditions.

As shown, all intersections operate at LOS C or better. The majority of critical movements for the study intersections operate at LOS C or better. In addition, the SE 232nd Drive/OR 224 intersection operates with a V/C ratio of 0.59, below the 0.75 V/C ratio threshold.



Functional Classification

- State Highway
- Major Arterial
- Minor Arterial
- Collector
- Local
- Private Road, Alley, Unpaved
- Study Intersections
- OHP Freight Routes
- Damascus Mobility Plan Study Area

Roadway System and Freight Classification Clackamas County, Oregon

Figure **1**

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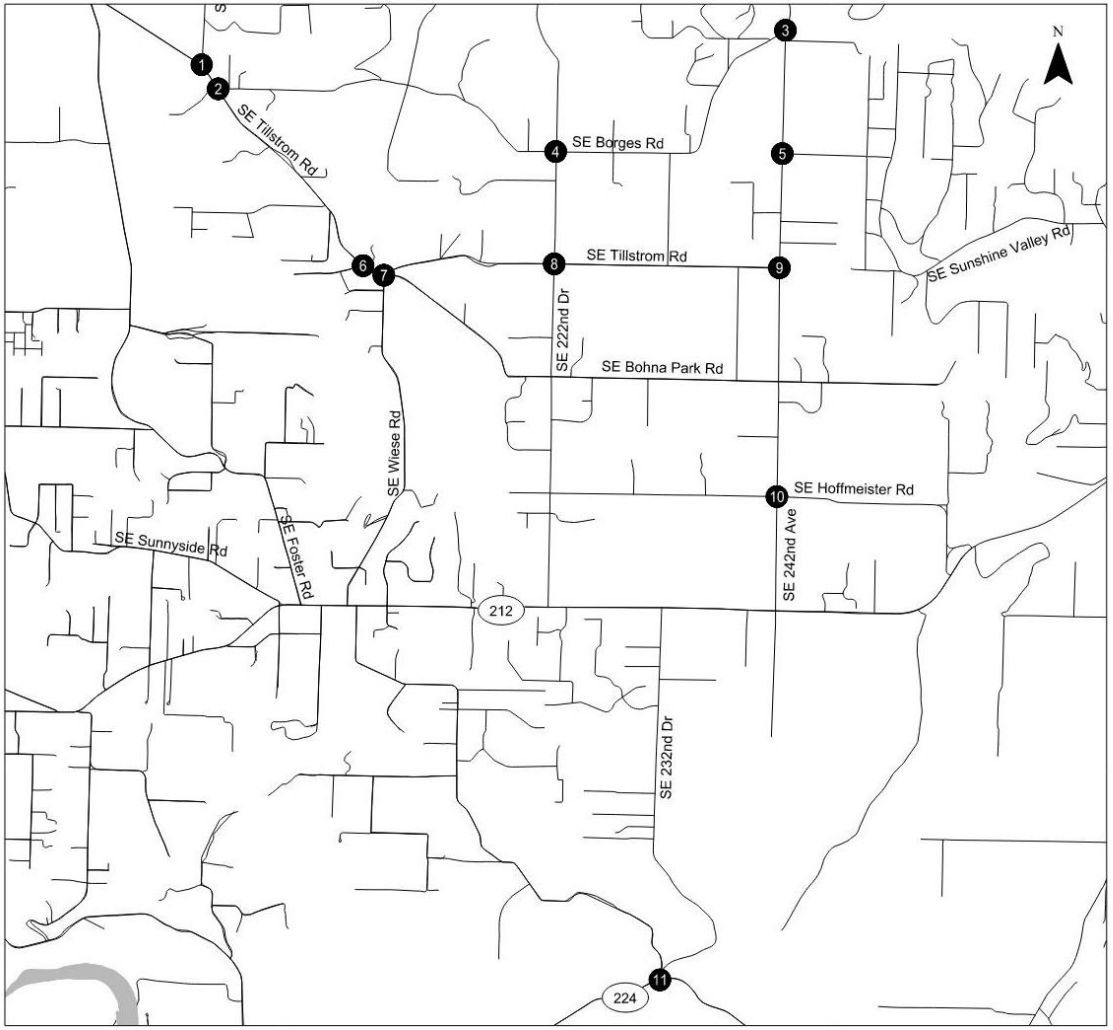
Coordinate System: NAD 1983 2011 StatePlane Oregon North FIPS 3601 Ft Intl
Data Source: Metro RLIS, Oregon Department of Transportation

Figure 2. Lane Configurations and Traffic Control at Study Intersections



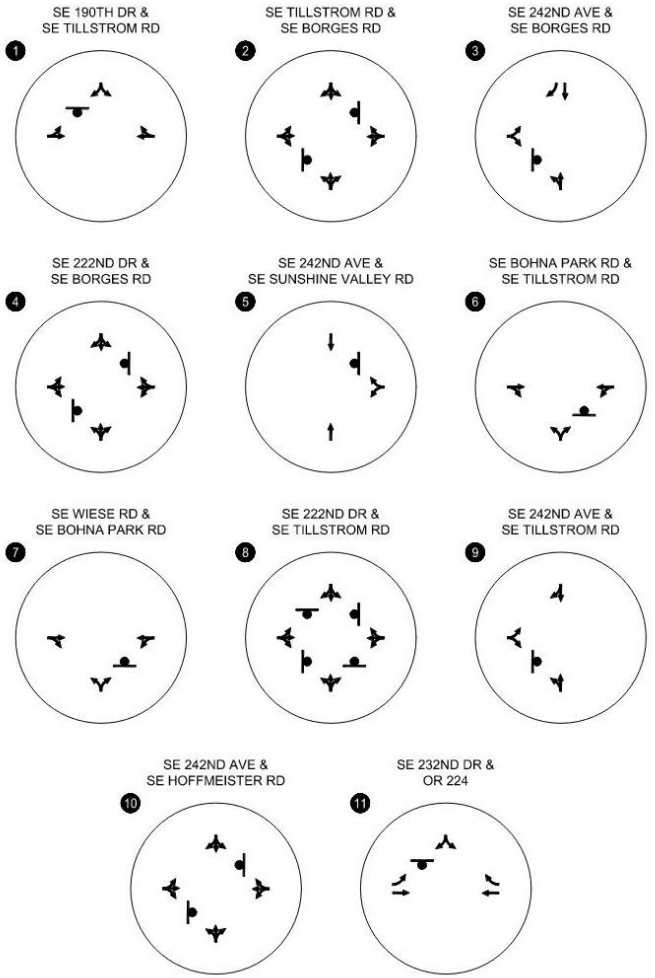


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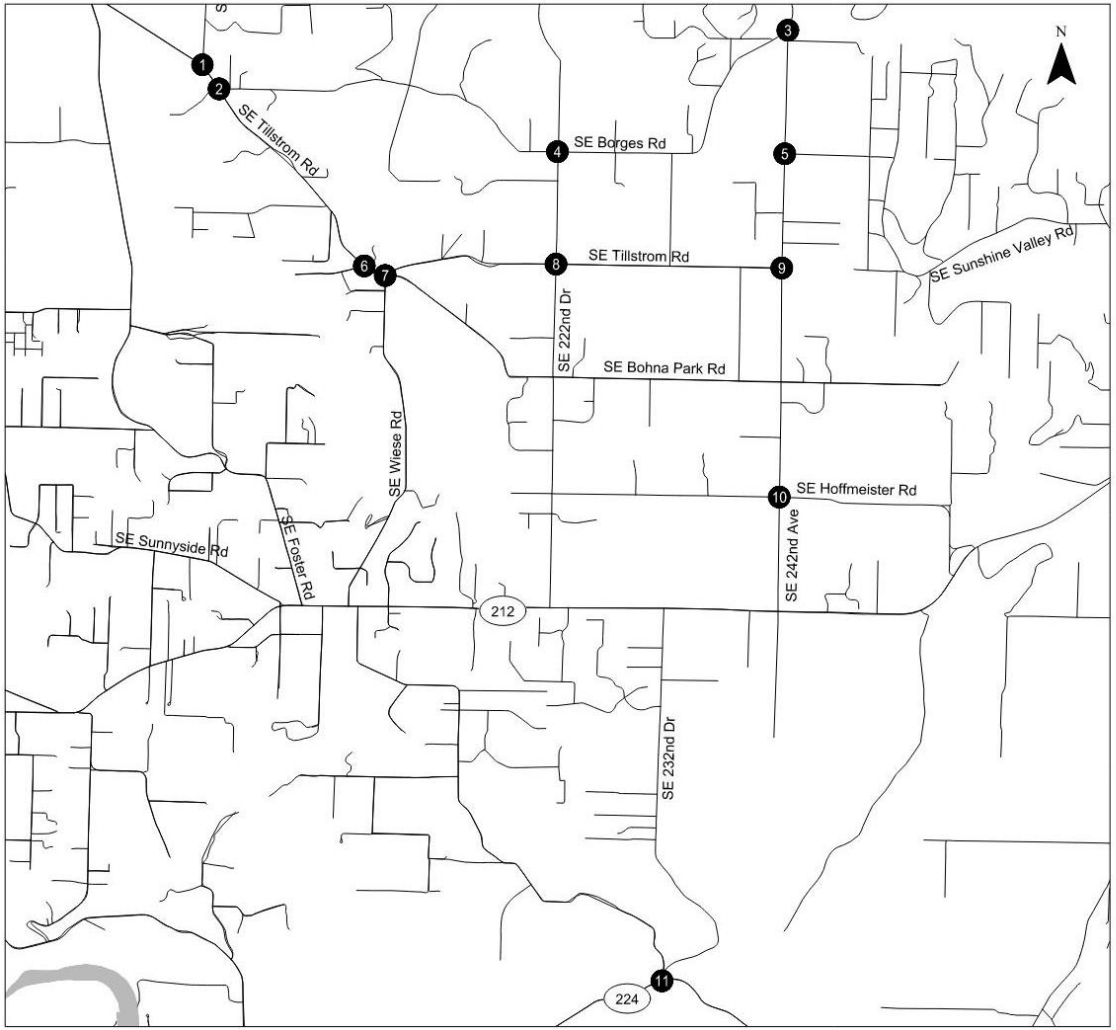
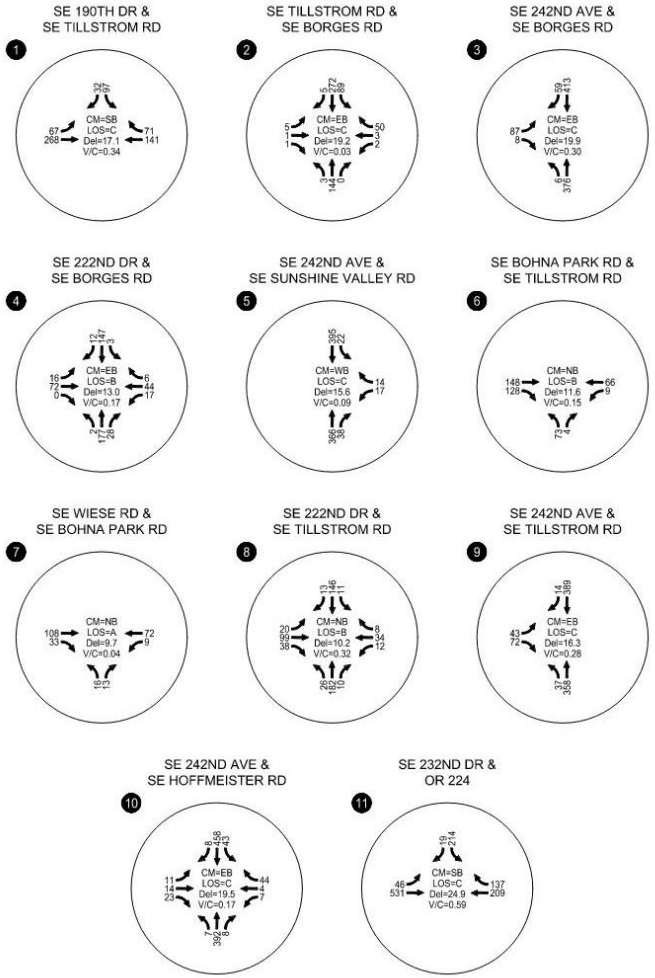
Figure 3. Base Year 2021 Traffic Volumes and Operations





CM = CRITICAL MOVEMENT (UNSIGNALIZED)
LOS = LEVEL OF SERVICE (SIGNALIZED)/
CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALIZED)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED)/
CRITICAL MOVEMENT CONTROL DELAY (UNSIGNALIZED)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

Safety Performance

Crash data for the Damascus Mobility Plan study area was collected for the five most recent years with complete data, 2015 through 2019. There were 537 reported crashes within the Damascus Mobility Plan study area between January 1, 2015 and December 31, 2019. Figure 4 shows the location and the crash type for all of these crashes.

There are three crash types that account for the majority of reported crashes within the Damascus Mobility Plan study area: Rear-end (220 crashes), turning movement (112 crashes), and fixed object (109 crashes). As shown in Table 2, these three crash types account for 82 percent of reported crashes within the Damascus Mobility Plan study area; rear end crashes account for nearly 41 percent of all reported crashes.

Table 2. Crash Type within the Damascus Mobility Plan Study Area

Crash Type	Number of Crashes	Number of Fatal Crashes	Number of Suspected Serious Injury Crashes
Rear-End	220	0	2
Turning	112	0	3
Fixed Object	109	2	5
Angle	39	1	5
Sideswipe	36	0	1
Head-On	8	2	3
Other	7	0	0
Backing	4	0	0
Pedestrian	2	1	0
TOTAL	**537**	**6**	**19**

Different crash types were reported in various places across the Damascus Mobility Plan study area. Of the 220 rear-end crashes, 164 were reported along OR 212, representing nearly three-quarters of all reported rear-end crashes. Fixed object crashes were more distributed across the study area, with 19 reported crashes along OR 212, 16 reported crashes along 242nd Avenue, and 15 reported crashes along 222nd Drive. Note that the Sunnyside-Foster and 242nd Avenue intersections with OR 212 are being examined as a separate ongoing project.

Angle crashes were primarily located at intersections. The six intersections listed in Table 3 below account for 33 of the 39 reported angle crashes (nearly 85 percent) within the Damascus Mobility Plan study area. Three of these six intersections are located on SE 222nd Drive.

Table 3. Intersections with the Most Reported Angle Crashes

Intersection	Number of Crashes
SE 222nd Drive & SE Tillstrom Road	7
SE 267th Avenue & SE Telford Road	7
SE Sunnyside Road & OR 212	5
SE 222nd Drive & SE Bohna Park Road	5
SE 222nd Drive & SE Borges Road	5
SE 242nd Avenue & SE Hoffmeister Road	4

Table 2 also includes information on the number of fatal and suspected serious injury crashes by crash type. Overall, there were six reported fatal injury crashes and 19 reported suspected serious injury crashes within the Damascus Mobility Plan study area between 2015 and 2019. Figure 5 shows crashes by severity type.

There were six reported crashes that resulted in eight fatalities within the Damascus Mobility Plan study area between 2015 and 2019. Details on these crashes are shown in Table 3 below.

Table 4. Reported Fatal Crashes in the Damascus Mobility Plan Study Area, 2015-2019

Date	Location	Number of Fatalities	Crash Type	Crash Cause
2/18/2017	SE Wiese Rd north of SE Dogwood Ln	3	Fixed Object	Driving in excess of posted speed
1/14/2018	OR 212 east of SE Regner Ter	1	Pedestrian	Non-motorist illegally in roadway
8/7/2018	SE 222nd Dr and OR 212	1	Fixed Object	Driving in excess of posted speed
9/26/2018	SE 232nd Dr and Ondo Rivera Dr	1	Angle	Inattention
11/4/2018	OR 212 east of SE 187th Ave	1	Head-On	Drove left of center on two-way road
8/2/2019	SE 232nd Dr south of SE Weatherly Ln	1	Head-On	Speed too fast for conditions (not exceeding limit)

There are specific trends that apply both to crash types and locations. Three of the fatal crashes were on OR 212, and two of the fatal crashes were on SE 232nd Drive. Both head-on crashes were in slick conditions, with the November 4, 2018 crash taking place on a snowy road. Three of the six fatal crashes involved speeding, either above the posted speed limit or greater than the conditions allowed.

One of the crashes on OR 212 involved a pedestrian that was fatally struck by a vehicle. The crash occurred at midnight on January 14, 2018, and an eastbound vehicle struck the pedestrian in the road at a location where there was no legal crossing. The second reported pedestrian crash, located at the SE Foster Road and OR 212 signalized intersection, took place at 6 AM on October 18, 2019. The vehicle, which was a northbound left turn at the intersection, failed to yield the right-of-way to the pedestrian, causing a suspected minor injury to the pedestrian.

Figure 6 shows the location of these two reported pedestrian crashes in the Damascus Mobility Plan study area. There were no reported crashes involving bicycles within the study area from 2015 through 2019.

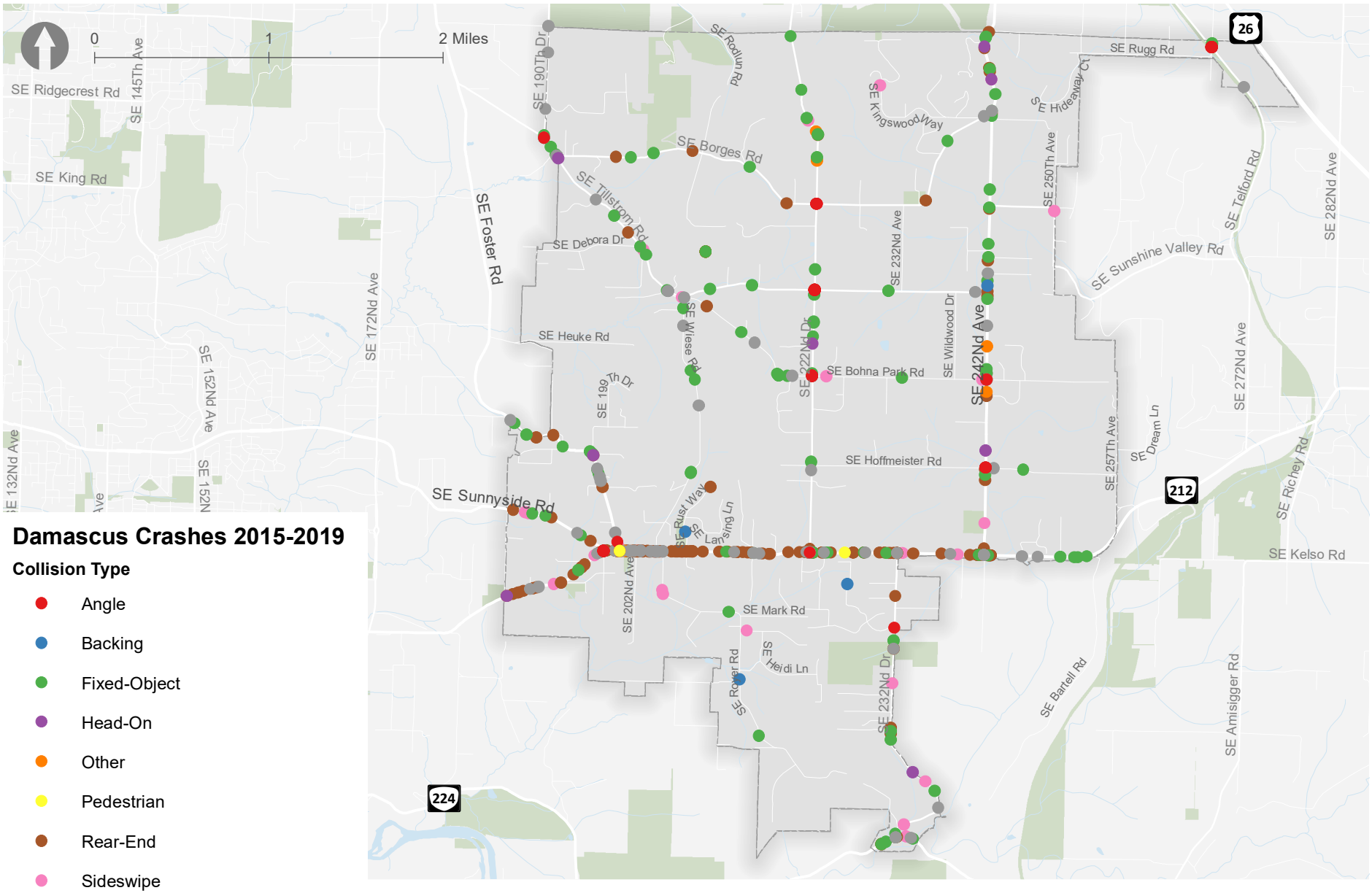
Table 5 shows the total number of reported crashes at the study intersections during the 2015 to 2019 time period and compares the intersection crash rate to the ODOT 90th percentile crash rate as identified in the Analysis Procedures Manual (APM).

As shown in Table 5, all intersections have a crash rate that is below the statewide 90th percentile crash rate, except for the SE Bohna Park Road & SE Wiese Road intersection. The intersection crash rate is a function of three reported crashes measured against a low intersection ADT – only 252 vehicles were counted at this intersection during the weekday PM peak hour, the lowest of any of the study intersections in Table 5. All three crashes involved a northbound left-turning vehicle colliding with a vehicle heading either eastbound or westbound on Bohna Park Road.

Table 5. Intersection Crash Analysis

Intersection	Total Crashes	90th Percentile Rate[1]	Intersection Crash Rate[2]	Does Intersection Rate Exceed 90th Rate?
SE 190th Dr & SE Tillstrom Rd	5	0.475	0.40	No
SE Tillstrom Rd & SE Borges Rd	6	1.08	0.57	No
SE 242nd Ave & SE Borges Rd	3	0.475	0.17	No
SE 222nd Dr & SE Borges Rd	5	1.08	0.52	No
SE 242nd Ave & Sunshine Valley Rd	0	0.475	0.00	No
SE Bohna Park Rd & SE Tillstrom Rd	3	0.475	0.38	No
SE Wiese Rd & SE Bohna Park Rd	3	0.475	0.65	***Yes***
SE 222nd Dr & Tillstrom Rd	11	1.08	1.01	No
SE 242nd Ave & Tillstrom Rd	0	0.475	0.00	No
SE 242nd Ave & SE Hoffmeister Rd	7	1.08	0.38	No
SE 232nd Dr & OR 224	7	0.475	0.33	No

[1] Calculated using Exhibit 4-1 from the ODOT APM.
[2] Calculated using the equation for intersection crash rate per million entering vehicles from the ODOT APM. Average Annual Daily Traffic was estimated based on weekday PM peak hour traffic volumes



Damascus Crashes 2015-2019

Collision Type

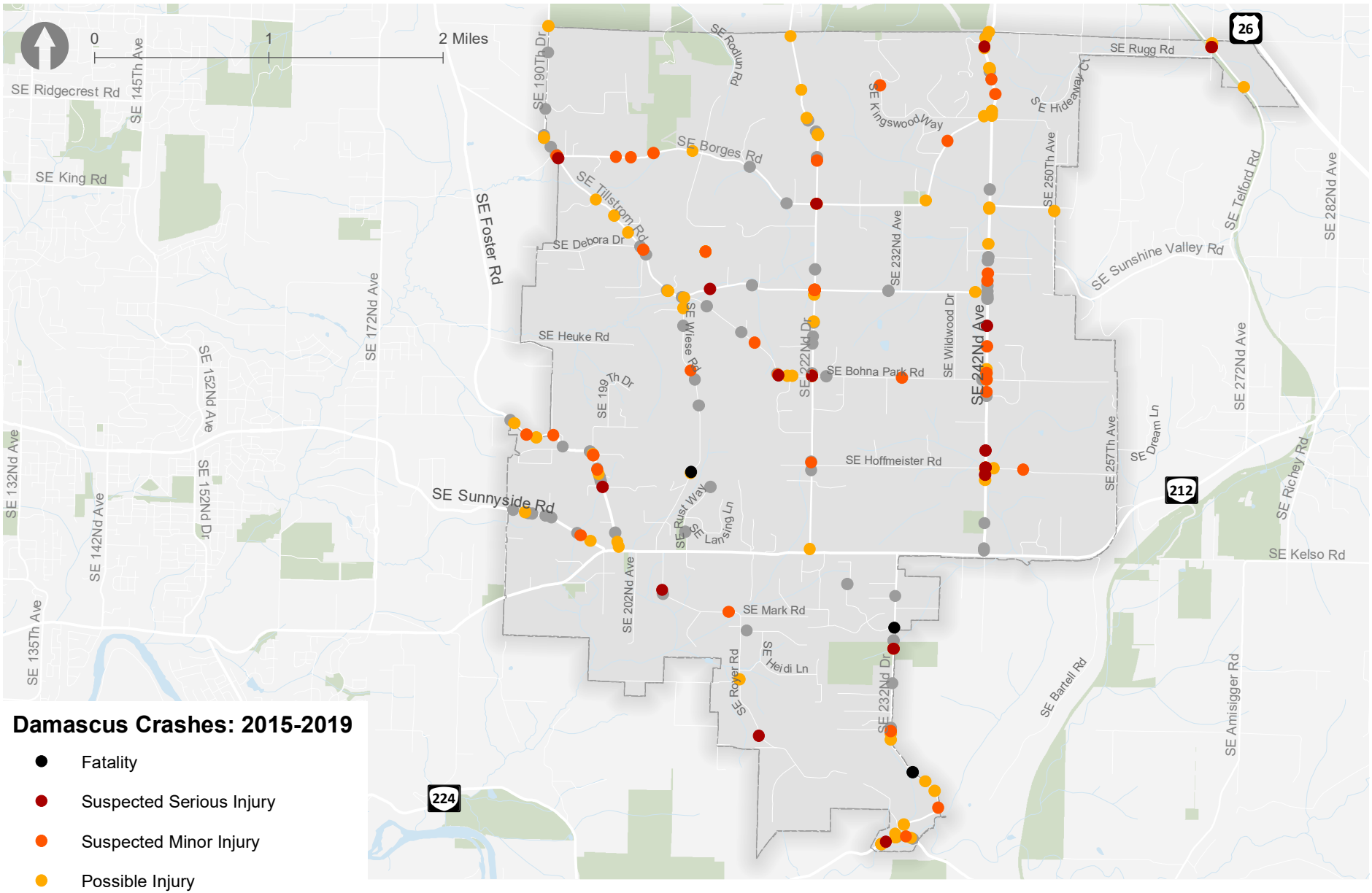
- Angle
- Backing
- Fixed-Object
- Head-On
- Other
- Pedestrian
- Rear-End
- Sideswipe
- Turning Movement
- Damascus Mobility Plan Study Area

Reported Crashes by Crash Type and Frequency (2015 - 2019) Clackamas County, Oregon

Figure **4**

KITTELSON & ASSOCIATES

Coordinate System: NAD 1983 2011 StatePlane Oregon North FIPS 3601 Ft Intl
Data Source: Metro RLIS, Oregon Department of Transportation



Damascus Crashes: 2015-2019

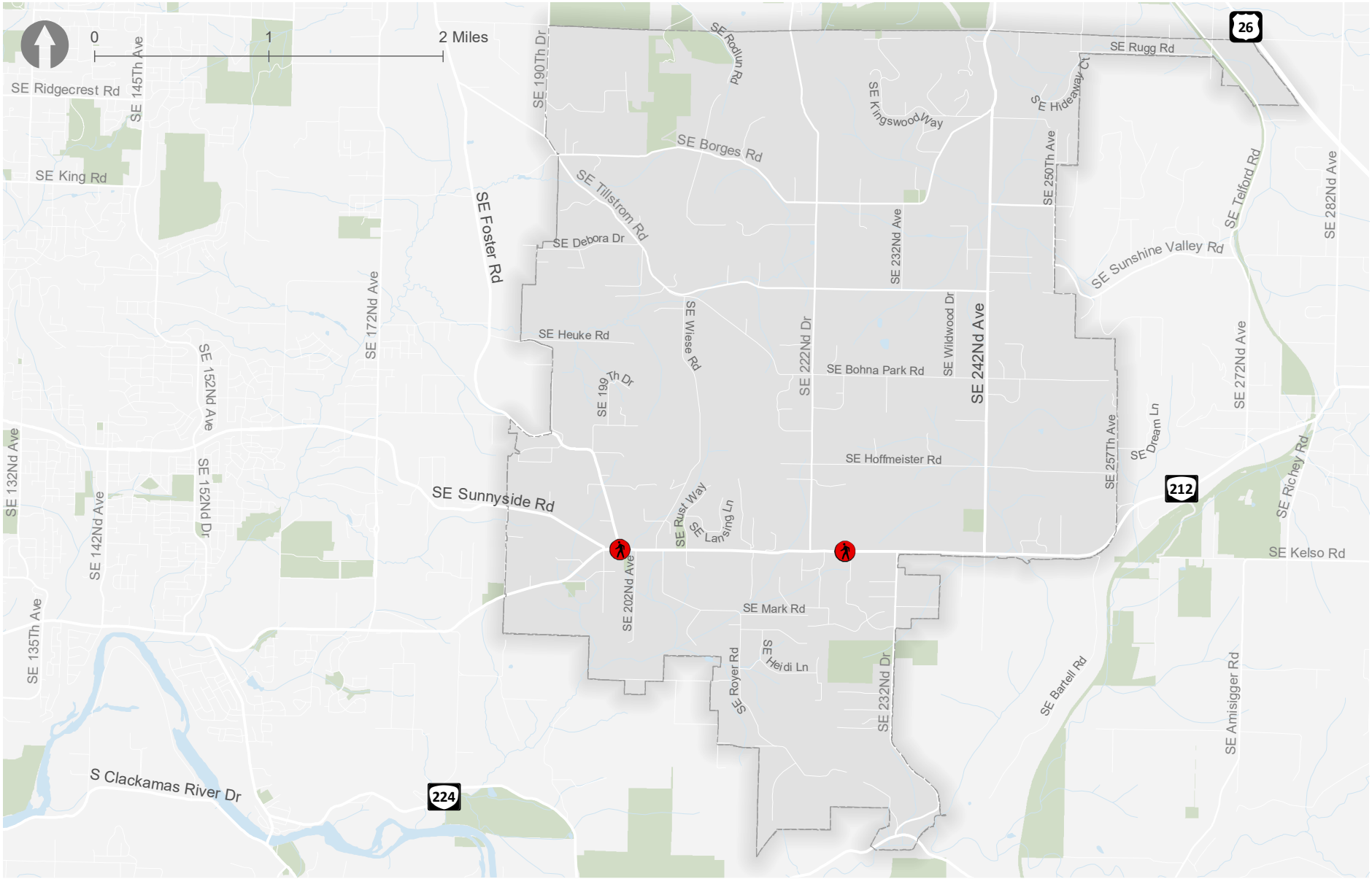
- Fatality
- Suspected Serious Injury
- Suspected Minor Injury
- Possible Injury
- No Apparent Injury
- Damascus Mobility Plan Study Area

Reported Crashes by Severity Type (2015 - 2019) Clackamas County, Oregon

Figure **5**

KITTELSON & ASSOCIATES

Coordinate System: NAD 1983 2011 StatePlane Oregon North FIPS 3601 Ft Intl
Data Source: Metro RLIS, Oregon Department of Transportation



Pedestrian Crashes

Damascus Mobility Plan Study Area

Reported Crashes Involving Pedestrians and Bicyclists Clackamas County, Oregon

Figure **6**

KITTELSON & ASSOCIATES

Coordinate System: NAD 1983 2011 StatePlane Oregon North FIPS 3601 Ft Intl
Data Source: Metro RLIS, Oregon Department of Transportation

Transit System

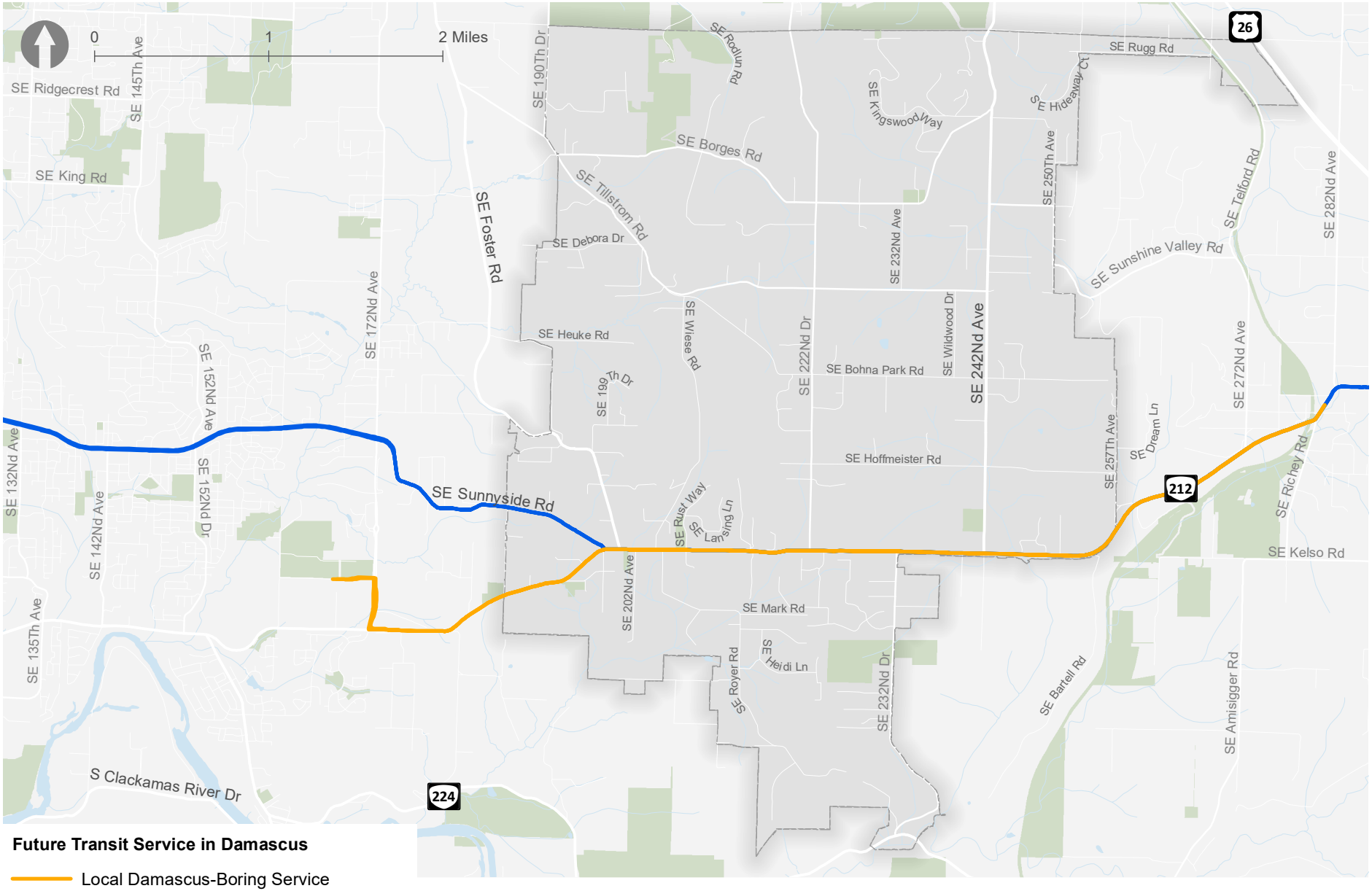
Currently, there is no fixed-route transit service within the Damascus Mobility Plan study area. In addition, Damascus is located outside of the TriMet service boundary, which means that there is no paratransit service, either.

The recently completed Clackamas County Transit Development Plan (TDP) outlines two future routes within the Damascus Mobility Plan study area. One local route (MT-9 in the TDP) would serve Damascus and Boring along Highway 212, turning around near SE Rock Creek Boulevard and SE 172nd Avenue. One regional route (MT-11 in the TDP) would run between the Sandy Transit Center and Clackamas Town Center, likely to be operated by Sandy Area Metro. The planned route would run along Highway 212, and then turn onto SE Sunnyside Road within the Damascus Mobility Plan study area. Additional services are available near the Damascus Mobility Plan study area, such as Sandy Area Metro's Sandy – Gresham service, but do not enter the study area boundary.

The long-term horizon for the TDP adds additional runs to these two routes. The TDP does not provide a timeline for the introduction of "medium-term" or "long-term" service. Figure 7 shows these two planned routes within the Damascus Mobility Plan service area. The exact stop locations were not determined as part of this countywide TDP and would be identified as service implementation gets underway.

Next Steps

This memorandum will be used to inform *TM #5: Future Damascus Mobility Plan Area Transportation System Conditions*.



Future Transit Service in Damascus

- Local Damascus-Boring Service
- Sandy to Clackamas Town Center Service
- Damascus Mobility Plan Study Area

Fixed-Route Transit Services Clackamas County, Oregon

Figure **7**

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Coordinate System: NAD 1983 2011 StatePlane Oregon North FIPS 3601 Ft Intl
Data Source: Metro RLIS, Oregon Department of Transportation