2018 Cornelius Transportation System Plan: Volume I

Adopted February 5, 2018

Cornelius
Transportation System Plan

Prepared for:

City of Cornelius

Oregon Department of Transportation

Prepared by:

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Glossary

Access Management: Access management is a broad set of techniques that balance the need to provide for efficient, safe, and timely travel with the ability to allow access to individual destinations. Measures include restrictions on the type and amount of access to roadways, and use of physical controls such as raised medians, to reduce impacts of approach traffic on the main facility.

Level of Service (LOS): LOS is a "report card" rating (A through F) based on the average delay experienced by vehicles at the intersection. LOS A, B, and C indicate conditions where traffic moves without significant delays over periods of peak hour travel demand. LOS D and E are progressively worse operating conditions. LOS F represents conditions where average vehicle delay is excessive and demand exceeds capacity, typically resulting in long queues and delays.

Mobility Targets: The level of congestion the corresponding jurisdiction has defined as acceptable. Mobility targets are in the form of LOS or v/c ratios.

Peak Period or Peak Hour: The period of the day with the highest number of travelers. This is normally between 4-6 p.m. on weekdays.

Safety Priority Index System (SPIS): An indexing system used by Oregon Department of Transportation to prioritize safety improvements based on crash frequency and severity on state facilities.

Transportation Demand Management (TDM): A policy tool as well as any action that removes single occupant vehicle trips from the roadway network during peak travel demand periods.

Transportation System Management (TSM): Management strategies such as signal improvements, traffic signal coordination, traffic calming, access management, local street connectivity, and intelligent transportation systems.

Transportation System Management and Operations (TSMO): Strategies and policies that work towards improving mobility through cost-effective methods, and can be categorized as transportation system management or transportation demand management.

Transportation System Plan (TSP): Is a comprehensive plan that is developed to provide a coordinated, seamless integration of continuity between modes at the local level as well as integration with the regional transportation system.

Urban Growth Boundary (UGB): The regional boundary that encompasses zoning designations in an urban area.

Volume-to-capacity (v/c) ratio: A v/c ratio is a decimal representation (between 0.00 and 1.00) of the proportion of capacity that is being used at a turn movement, approach leg, or intersection. The ratio is the peak hour traffic volume divided by the hourly capacity of a given intersection or movement. A lower ratio indicates smooth operations and minimal delays. A ratio approaching 1.00 indicates increased congestion and reduced performance.

1. Summary

The previous Cornelius Transportation System Plan (TSP) was adopted in 2005. The primary purpose of the 2018 update is to ensure the recommended system plan can adequately serve planned growth areas, including the recently approved expansion of the urban growth boundary, and to confirm consistency with the current regional and statewide planning policies.

The TSP details specific transportation needs to guide future transportation investment in the City and outlines transportation solutions that place more value on investments in smaller cost-effective solutions rather than larger, more costly ones. This chapter provides on overview of the public involvement plan that guided this update, the transportation plans for each mode, and the funding needed to build and maintain the system.

Public Involvement Plan

Cornelius recognized that citizen involvement was necessary in making wise and legitimate decisions through its Comprehensive Plan. The TSP was developed in close coordination with Cornelius city staff, citizen representatives and key representatives from the surrounding communities. Specific public outreach included:

Project Advisory Committee (PAC) – The primary function of the PAC was to provide recommendations for the project, acting as community and technical representatives. The PAC included representatives of affected agencies and service providers; Washington County, City of Hillsboro, City of Forest Grove, Metro, ODOT, TriMet, school districts, community businesses and residents. The PAC met three times during the TSP planning process.

Community On-line Surveys - Two online surveys were conducted to gain community input on existing transportation issues and opportunities in Cornelius and support or priorities for the recommended transportation solutions. Survey questions were provided in English and Spanish.

Community Meeting – A community meeting was held to gather feedback on the recommended TSP solutions. The City made the presentation in English and Spanish and provided a bilingual graphic, easy to understand handouts, displays and maps.

Community Presentations - The City conducted presentations with four community groups to provide additional opportunities for citizens to participate in the planning process, without having to attend a separate project-specific meeting (such as the Community Meeting).

Transportation Plans

The Cornelius TSP identifies projects and programs needed to support the City and regional goals and to serve planned growth over the next 20 years. This document presents the recommended investments and priorities for the Pedestrian, Bicycle, Transit, Motor Vehicle and Other Modes systems. For each travel mode, a Financially Constrained Plan Financially provides solutions reasonably expected to be funded by 2040 and a Strategic Plan with transportation solutions not reasonably expected to be funded by 2040 based on currently anticipated funding streams.

The approach to developing transportation solutions for this update placed more value on investments in smaller cost-effective solutions for the transportation system rather than larger, more costly ones (see TSP Appendix - Technical Memorandum #6). The approach enabled more cost-effective solutions to increase transportation system capacity and helped to encourage multiple travel options, increase street connectivity and promote a more sustainable transportation system. Taking the network approach to transportation system improvements, the 100 projects in this plan fall within one of the categories below.

- **Walking** projects for sidewalks, shared paths and street crossings providing seamless connections for pedestrians throughout the City. Cornelius identified 50 walking projects that will cost an estimated $30.5 million to complete. The Pedestrian Plan is provided in Chapter 5.

- **Biking** projects including an integrated network of bicycle lanes and marked on-street routes that facilitates convenient travel citywide. Cornelius identified 23 biking projects that will cost an estimated $5.1 million to complete. The Bicycle Plan is provided in Chapter 6.

- **Transit** projects to enhance the quality and convenience for bus passengers. Cornelius identified 4 transit projects that will cost an estimated $2.2 million to complete. The Transit Plan is provided in Chapter 7.

- **Driving** projects to improve connectivity, safety and capacity throughout the City. Cornelius identified 23 driving projects that will cost an estimated $33.7 million to complete. The Motor Vehicle Plan is provided in Chapter 8.

Funding

The City of Cornelius currently utilizes several sources to fund construction and maintenance of its transportation infrastructure. Each source collects revenue each year that is used to repair street facilities or construct new streets, with some restrictions on the type and location of projects. Under current funding programs, the City of Cornelius will collect approximately $29.4 million from Washington County TDT and $27.4 million from the remaining sources, totaling $56.9 million (see Table 10-2).

The cost estimates outlined in the TSP to implement the financially constrained project list for motor vehicles, transit, bicycles and pedestrians total $28.9 million of city funds, and the recommended transportation operations and maintenance programs would add $24.7 million for a total cost of $53.6 million through 2040. Refer to Chapter 4 through 9 for details on the individual projects by travel mode. Note that several additional projects are listed on the financially constrained project lists that are expected to be funded by other sources (Metro, TriMet, development, etc.). These non-city project costs have not been included in the estimates in Table 10-4, but are identified in the financially constrained plans for each mode.

The estimated $24.7 million need for roadway maintenance will not be adequately funded by the forecasted transportation revenue. Potential new funding sources to cover the future roadway maintenance needs and funding shortfall are discussed in the next section.

2. Goals and Project Development

This chapter presents the transportation-related goals and objectives used to guide the TSP update and the approach to developing TSP projects. The goals and objectives reflect the vision of the community and support regional transportation plans and regulations (see TSP Appendix - Technical Memorandum #2). The TSP project development emphasized improved system efficiency and management over adding capacity, consistent with regional transportation guidelines.

Setting Direction for Transportation Planning

Goals and objectives were developed to reflect Cornelius's values and to guide the TSP update and its implementation. Goals are somewhat general in nature and challenging, but not unreasonable, to achieve. Each goal is supported by more well-defined objectives. In contrast to goals, objectives are specific and measurable. The prior local transportation goals were reorganized and updated to reflect modern policy needs. Feedback from the Project Management Team and Project Advisory Committee were incorporated into the goals and objectives to help ensure coordination and plan consistency. The goals and objectives are presented in the following sections.

Goal 1: Safety

Develop a transportation system that maintains and improves individual health and safety by maximizing pedestrian and bicycle transportation options, public safety and service access, and safe and smooth connections.

Goal 1 Objectives

A. Provide safe connections for walking, biking and driving trips
B. Identify locations in the city where enhanced street crossings for walking and biking users are needed
C. Monitor safety data and implement improvements to address high-collision locations
D. Install amenities (e.g., directional ramps) at marked pedestrian crossings to improve safety of underserved and vulnerable populations when warranted
E. Identify programs that encourage safe walking and bicycling, and educate good traffic behavior and consideration for all users
F. Increase the transportation system's ability to support emergency response

Goal 2: Transportation System Management

Emphasize effective and efficient management of the transportation system for all users.

Goal 2 Objectives

A. Identify opportunities to improve vehicle travel reliability and safety with system management operation strategies (e.g. signal timing, driver feedback signs)
B. Seek to shift vehicular travel to off-peak periods
C. Strive to meet City's mobility standards
D. Promote and implement transportation demand management programs, such as carpool/vanpool programs, aimed at reducing commuter vehicular travel demand
E. Reduce single-occupant vehicle trips by supporting travel options
F. Support alternative vehicle types by identifying potential electric vehicle plug-in stations and developing implementing code provisions
G. Support new technologies and/or trends related to new mobility options (e.g. car-sharing, connected and autonomous vehicles, etc.)

Goal 3: Travel Choices and Livability

Develop and maintain a well-connected transportation system that offers convenient and available pedestrian, bicycle and transit trips, facilitates access to daily needs and services, and enhances livability.

Goal 3 Objectives

A. Provide safe, comfortable and convenient transportation options
B. Incorporate amenities in the system such as street lighting, bike parking, bus shelters that better meet the needs of the walking, biking and transit user
C. Improve walking and biking connections to community destinations and continue to address deficiencies and gaps in the pedestrian and bicycle systems
D. Enhance wayfinding signage for those walking and biking, directing them to bus stops, trails, and key routes and destinations
E. Support efforts and cooperate with regional partners to develop trails
F. Work with TriMet to establish and maintain transit stops in locations that are safe and convenient for users and that are consistent with the TriMet Transit Investment Plan[1]
G. Coordinate with TriMet (and other transit providers) to improve the coverage, quality and frequency of services as needed in areas where existing and planned land uses support transit services
H. Enhance transportation connections between community destinations and neighborhoods by implementing the City's local street connectivity plan as opportunities arise

[1] TriMet Transit Investment Plan, FY 2012.

Goal 4: Economic Vitality

Support the development and revitalization efforts of the City, Region, and State economies and ensure the efficient movement of people and goods.

Goal 4 Objectives

A. Improve the freight system's efficiency, access, safety and travel reliability
B. Manage parking demands efficiently and provide access to community destinations such as businesses and scenic/recreation areas
C. Balance local access with the need to serve regional traffic on Highway 8
D. Enhance the vitality of the downtown area by incorporating roadway design elements for all modes
E. Designate truck-freight corridors on current and future truck-trip demand and the need to maintain connectivity between land uses that generate or receive significant truck trips, and the state's strategic freight corridors.

Goal 5: Fiscal Responsibility

Sustain an economically viable transportation system for existing and future users that protects and improves existing transportation assets while cost-effectively enhancing the total system.

Goal 5 Objectives

A. Plan for an economically viable and cost-effective transportation system
B. Identify and develop diverse and stable funding sources to implement recommended projects in a timely fashion and ensure sustained funding for transportation projects and maintenance
C. Make maintenance of the transportation system a priority
D. Maintain existing facilities to preserve their intended function and useful life
E. Consider costs (construction and maintenance) and benefits when identifying project solutions and prioritizing public investments
F. Prioritize funding of projects that are most effective at meeting the goals and objectives of the Transportation System Plan
G. Implement street cross-sections with narrow pavement widths to reduce future maintenance costs

Goal 6: Equitable Transportation System

Provide a transportation system that is accessible to all users regardless of age, income, and health.

Goal 6 Objectives

A. Ensure that the transportation system provides equitable access to underserved and vulnerable populations
B. Ensure that the transportation system supports users with a range of age, income and health

C. Provide facilities for all modes that meet applicable Americans with Disabilities Act (ADA) standards

Approach to Developing Projects

Transportation funding is limited in Cornelius, a fact that highlights the need to be fiscally responsible when enhancing the transportation system. In the past, a typical response to congestion was to expand streets, creating significant barriers to walking and biking and detracting from the livability, health, safety and fiscal well-being of the community.

Cornelius' approach to developing a list of TSP projects to address the needs of the future transportation system emphasized improved system efficiency and management over adding capacity. The approach, as required by the Metro RTFP and shown in Figure 2-1, considered five categories of solutions from top to bottom that included:

- **Manage** the performance of congested locations with strategies that reduce traffic conflicts, increase safety, and encourage more efficient usage of the transportation system.
- **Reduce** the driving demand at congested locations by improving walking, biking and transit options.
- **Revisit** land uses and congestion thresholds to encourage shorter driving trips or modified travel decisions.
- **Extend** streets to create parallel routes for all users that will reduce the driving demand on the congested facility.
- **Expand** existing streets or intersections to increase the driving capacity of the facility.

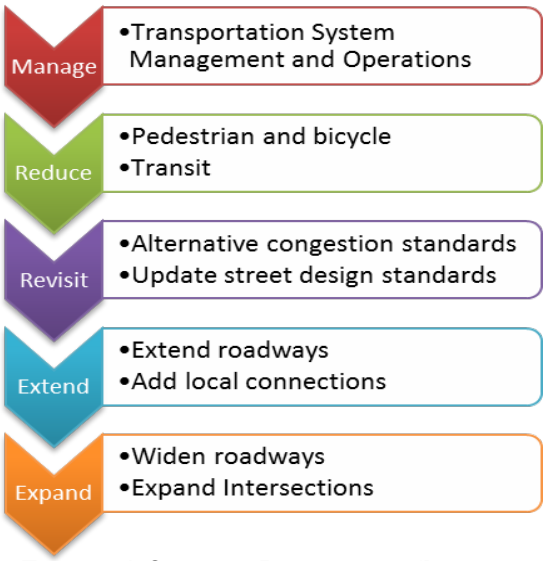


Figure 2-1: Solutions Identification Process

The project team recommended higher category solution types to address identified needs unless a lower category solution was clearly more cost-effective or better supported the goals and objectives of the city. This process allowed the city to maximize use of available funds, minimize impacts to the natural and built environments, and balance investments across all modes of travel.

Measurable evaluation criteria based on the goals and objectives were used to screen and prioritize transportation solutions (see TSP Appendix - Technical Memorandum #3). Projects deemed to contribute more towards achieving the transportation goals of Cornelius ranked higher, and the plan assigned higher priority to their implementation. Consequently, the TSP project lists in Chapters 5 through 9 are ensured to be consistent with the established goals and objectives.

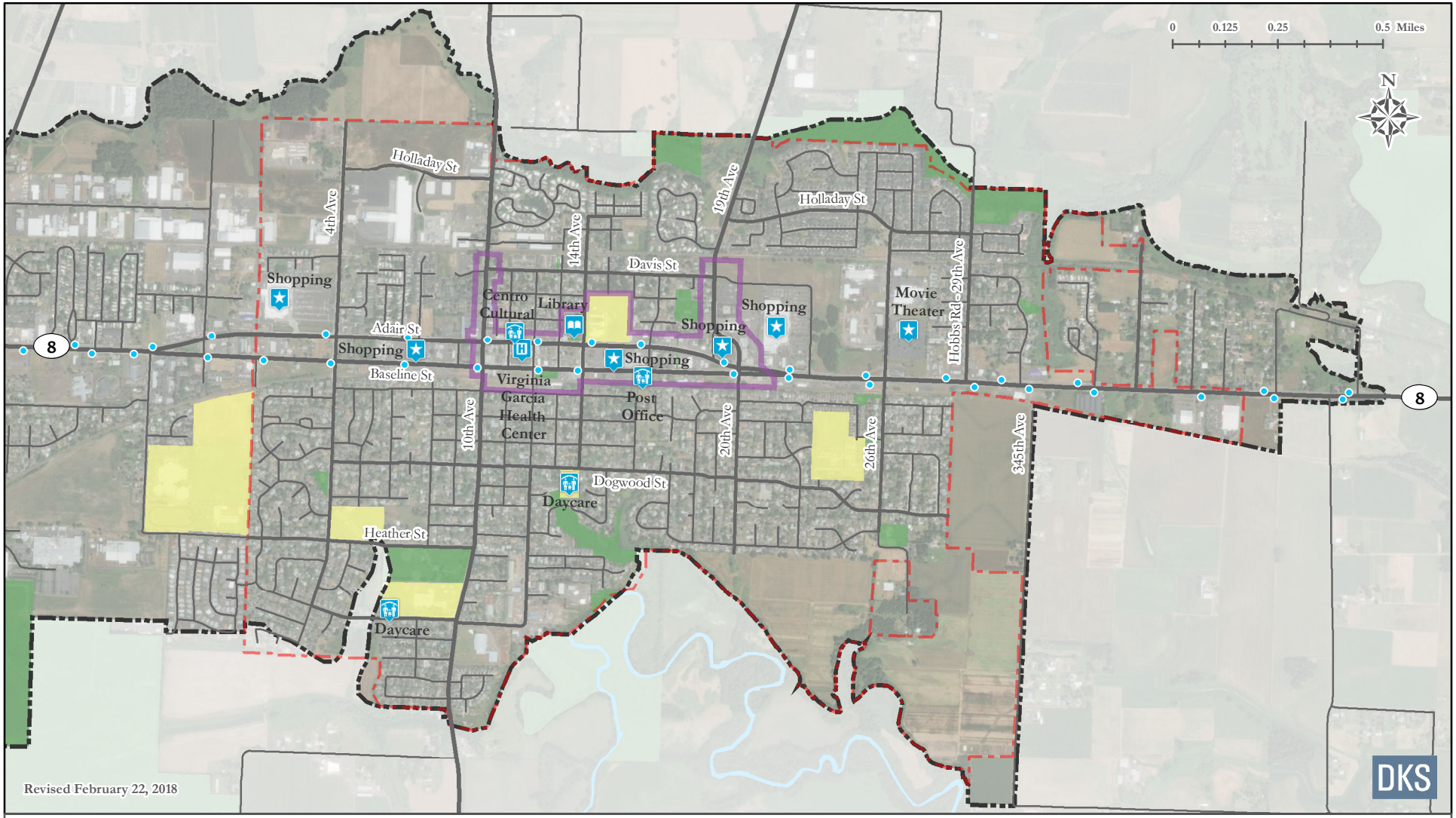
3. Existing Conditions

Existing transportation conditions were evaluated as part of the City of Cornelius TSP Update. An analysis of current conditions provides an understanding of facility development, service and performance. This chapter summarizes existing transportation operation in the City for all travel modes including pedestrians, bicycles, transit, motor vehicles, freight, water and air. To understand existing travel patterns and conditions, multiple aspects of the city's transportation system were considered. An inventory was conducted in fall and winter of 2016 to establish base year conditions for the TSP. Much of this data provides a basis of comparison for future assessment of transportation performance in Cornelius relative to desired policies. The City conducted an online survey[1] to gather community views on the current state of the transportation system and identify issues that are most important. Highlights from the survey responses are provided throughout this chapter.

The study area includes the City of Cornelius and the surrounding area transportation system network within the urban growth boundary. The study area for the TSP is shown in Figure 3-1. This figure also shows key destinations and the Cornelius Main Street District to highlight locations that generate demand on the transportation system. Fifteen intersections within the study area were selected for traffic operational and safety analysis. The following sections review the existing transportation systems including pedestrian, bicycle, transit, motor vehicle and other modes (such as rail, marine, etc.) and their performance in the City of Cornelius. Based on the existing conditions and input provided by the community, the TSP plans for each mode (Chapters 5 through 9), presenting recommendations to address system deficiencies and needs.

[1] Cornelius TSP Community Survey #1, online November 28 to December 23, 2016.

3-1 Activity Generators



Legend:

Major Activity Generators:

- Shopping
- Health Center
- Library
- Other Community Amenity

- Bus Stop
- Parks and/or Natural Areas
- School

Main Street District

- Cornelius Main Street District

- Urban Growth Boundary
- Cornelius City Limit
- Arterial or Collector Street

Pedestrian System

In Cornelius, walking plays a key role in the transportation network. Planning for pedestrians not only helps the city provide a complete, multi-modal transportation system, it supports healthy lifestyles and ensures that the young, the elderly, and those not financially able to afford motorized transport have access to goods, services, employment, parks, and transit. Continuous sidewalk connections between all activity generators and arterial/collector roadways are desirable to allow for safe and attractive non-motorized travel options.

Existing Pedestrian Infrastructure

Although sidewalks are the basic infrastructure of the citywide pedestrian network, various other connections and trails provide vital layers of infrastructure that allow efficient pedestrian movement. The walking network is composed of sidewalks, roadway shoulders, trails and marked pedestrian crossings. Existing pedestrian facilities are shown in Figure 3-2.

Sidewalks are located along roadways, often separated from the roadway with a curb and/or planting strip, and have a hard, smooth surface, such as concrete. In general, most arterial and collector streets in Cornelius have sidewalks on at least one side of the street. There are several locations within the downtown area and the neighborhoods and on rural sections of OR 8 where sidewalks are not well connected. Sidewalks on Baseline Street and N Adair Street (OR 8) between N 10th and 20th Avenue and the connecting avenues are at least eight feet wide. Sidewalks outside the downtown area are typically four to five feet wide, some sections with poor surface quality.

Roadway shoulders serve as pedestrian routes in some rural areas of Cornelius. On roadways with low traffic volumes (i.e., less than 3,000 vehicles per day) and speeds, shoulders may be adequate for pedestrian travel. These shoulders must be wide enough so that both pedestrians and bicyclists can use them, usually six feet or wider. OR 8 east of East Lane (private) provides roadway shoulders for walking that are also used by cyclists.

Multi-use paths serve recreational and daily trip needs for residents in Cornelius. There are several multi-use paths within the City providing connections to neighborhoods and through parks. Key multi-use paths include the Council Creek HOA Trail and pathways in Harleman Park and Arboretum Park.

Marked pedestrian crossings provide critical linkages that connect downtown Cornelius, commercial areas, neighborhoods and bus stops separated by OR 8. There are numerous enhancements that can be provided to increase driver awareness and pedestrian visibility in these locations. The effectiveness of crossing treatments can be influenced by factors such as the number of lanes being crossed, number of pedestrians wanting to cross, features that aid mobility-impaired, and vehicle speeds.

Marked and signalized pedestrian crosswalks are provided at traffic signals on Baseline Street and N Adair Street (OR 8) at N 4th, 10th and 14th Avenue and on Baseline Street (OR 8) at N 20th Avenue, Fred Meyer Access, and N 26th Avenue. The traffic signals provide crossing locations for pedestrians traveling between the north and south portions of Cornelius. The traffic signals improve pedestrian access to the library, schools, Walmart, Fred Meyer and downtown businesses.

There are a few marked (non-signalized) locations on city arterial and collector streets. Crosswalk pavement markings (no signs) are provided at the N 14th Avenue/N Barlow Street intersection to serve the Cornelius Elementary School main entrance. S Heather Street provides a crosswalk (pavement markings and signs) at the west entrance to Harleman Park which connects to Echo Shaw Elementary School. Crosswalks are provided on all legs of the S 4th Avenue/S Heather Street intersection to serve demand from the Swallowtail Waldorf School.

The downtown area has the highest density of major activity generators. The signalized pedestrian crosswalks at N 10th and 14th Avenue on Baseline Street and N Adair Street (OR 8) are about 1,200 feet apart, a distance which may encourage people to cross at N 11th, 12th and 13th Avenues. Each of these intersections has recently been improved to provide curb extensions, ADA ramps, stop bars on the side streets and pedestrian level lighting. These crossing average 26 feet wide and require a pedestrian to cross two vehicle lanes (both same direction) and a bike lane. Enhancements, such as marked and signed crosswalks, can be considered to increase driver awareness of potential pedestrian. Typically, enhanced crosswalks are not warranted until pedestrian crossing volumes reach moderate to high levels or a safety deficiency is identified. A review of available crash data for these segments did not reveal a pedestrian safety issue. Further enhancements on Baseline Street and N Adair Street (OR 8) at N 11th, 12th and 13th Avenues require detailed analysis and approval by ODOT.

Pedestrian Volumes

Pedestrian counts were conducted during the PM peak hour at the study intersections. These counts represent a sample of the existing pedestrian activity based on data collected on weekdays in 2010 through 2016. Pedestrian activity is influenced by several factors such as time of year and weather. Variations in pedestrian activity at the study intersections would be expected with data collection over extended periods of time. The pedestrian crossing volumes are shown on Figure 3-2.

The most significant pedestrian movements for study intersections occur at Baseline Street and N Adair Street (OR 8) at the N 10th, 14th and 20th Avenue signals. These pedestrian trips are likely generated by adjacent retail and school land uses and close proximity to bus stops. S Dogwood Street at S 10th, 14th and 20th Avenue and N Davis Street at N 19th Avenue experienced moderate pedestrian volumes.

Qualitative Pedestrian Assessment

The method for assessing pedestrian network conditions at a citywide planning level relies on a qualitative analysis of walkways based on the ODOT Multimodal Analysis Methodology[2]. The quality and availability of various characteristics are rated system-wide as "Excellent," "Good," "Fair," or "Poor." For the pedestrian network evaluation, consideration is given to the presence of a sidewalk or path, a buffer zone (i.e., bike lane, shoulder, landscape strip, or on-street parking) and street lighting, and traffic volumes, number of travel lanes and travel speeds along the adjacent roadway. The intent of the analysis is to show the extent to which the pedestrian network provides a level of comfort and

[2] Analysis Procedures Manual Version 2, Oregon Department of Transportation, March 2016.

safety for users. The analysis will be used to inform, create and confirm recommendations for pedestrian projects.

In Cornelius, an "Excellent" rating requires sidewalks on both sides of the roadway, along with a desirable buffer zone given the roadway characteristics. A "Good" rating requires sidewalks on both sides of the roadway and a buffer zone, but without the desirable features or widths given the roadway characteristics. A "Fair" rating is given to a roadway with sidewalks on both sides, but without an adequate buffer zone, or a low volume, low speed roadway with a sidewalk on one side. A "Poor" rating denotes gaps within the sidewalks along that corridor.

Figure 3-3 summarizes the pedestrian network conditions in Cornelius. Overall, the network rates relatively high in the downtown area east of N 10th Avenue and poor towards the edges of the city.

Community Survey

The TSP Community Survey found citizens are interested in improving the pedestrian network. Specific responses were related to lack of sidewalks and trails, concerns about sidewalk conditions (lifting causing tripping hazard), and better street lighting.

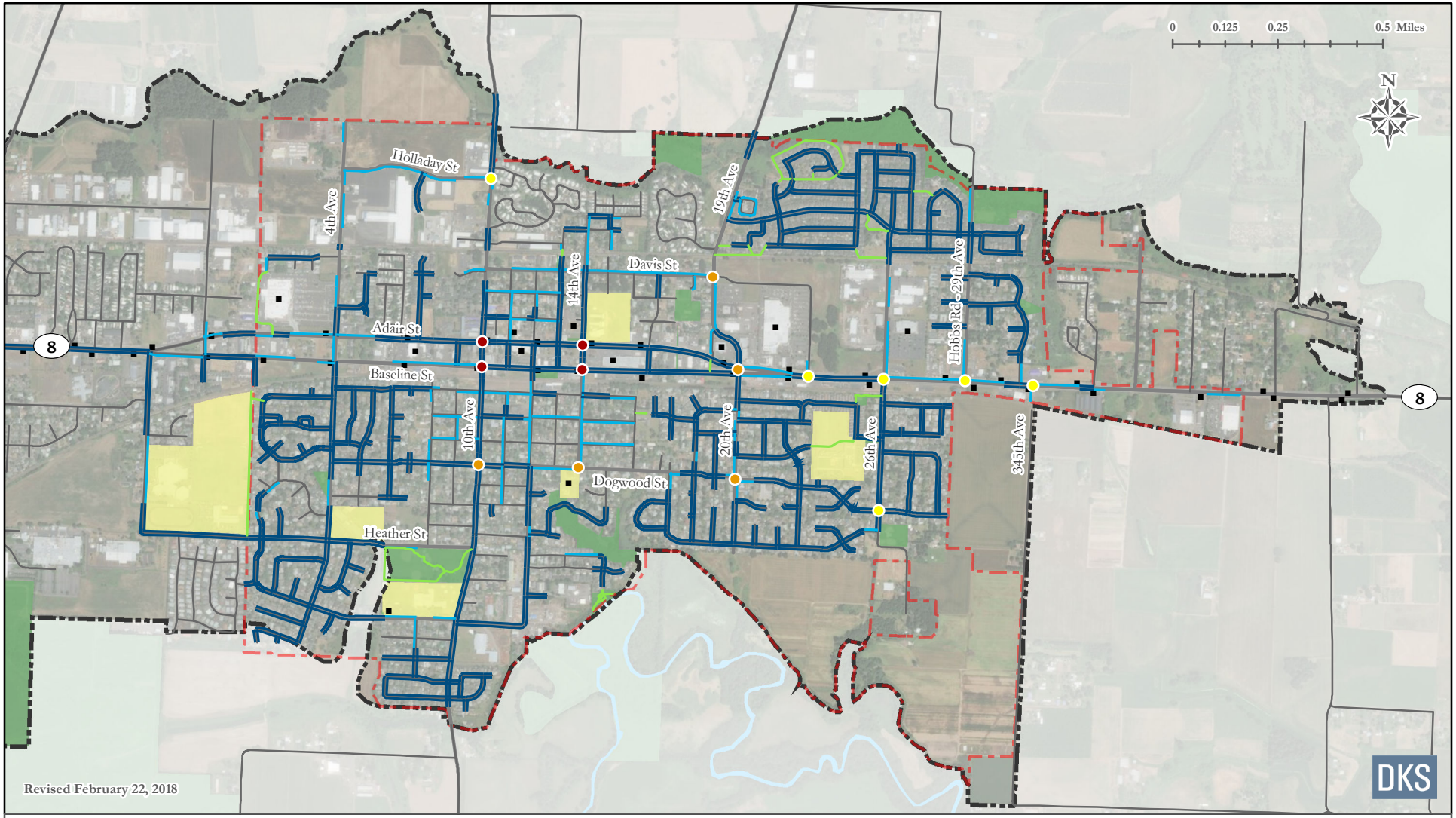
Deficiencies in the Pedestrian System

The pedestrian system has several deficiencies, which make walking difficult and potentially unsafe. One of the most pressing mobility issues facing Cornelius is the need to expand sidewalk coverage on arterials and provide opportunities to safely cross OR 8 at key locations. While some improvements are requirements, such as infill of sidewalks gaps to meet Metro guidelines, others such as pedestrian crossings, can be helpful in improving the overall connectivity of the system.

Sidewalk gaps along OR 8: Cornelius has a relatively well-built out sidewalk network along OR 8 in the developed portion of the city. There are several priority locations for sidewalk infill needs based on the Qualitative Pedestrian Assessment ("Poor" segments shown in Figure 3-3):

- East of East Lane (private) is absent of sidewalks on both sides of the highway requiring pedestrians to walk in the shoulder area. This highway segment connects to rural single family neighborhoods. Highway traffic volumes are over 33,000 vehicles per day.
- OR 8 between N 26th Avenue and East Lane (private) has no sidewalks on the south side. Walking trips on this highway segment are likely related to nearby bus stops.
- Baseline Street (OR 8) west of 10th Avenue and N Adair Street (OR 8) near N 4th Avenue have large sidewalk gaps.

3-2 Existing Pedestrian Facilities



Legend:

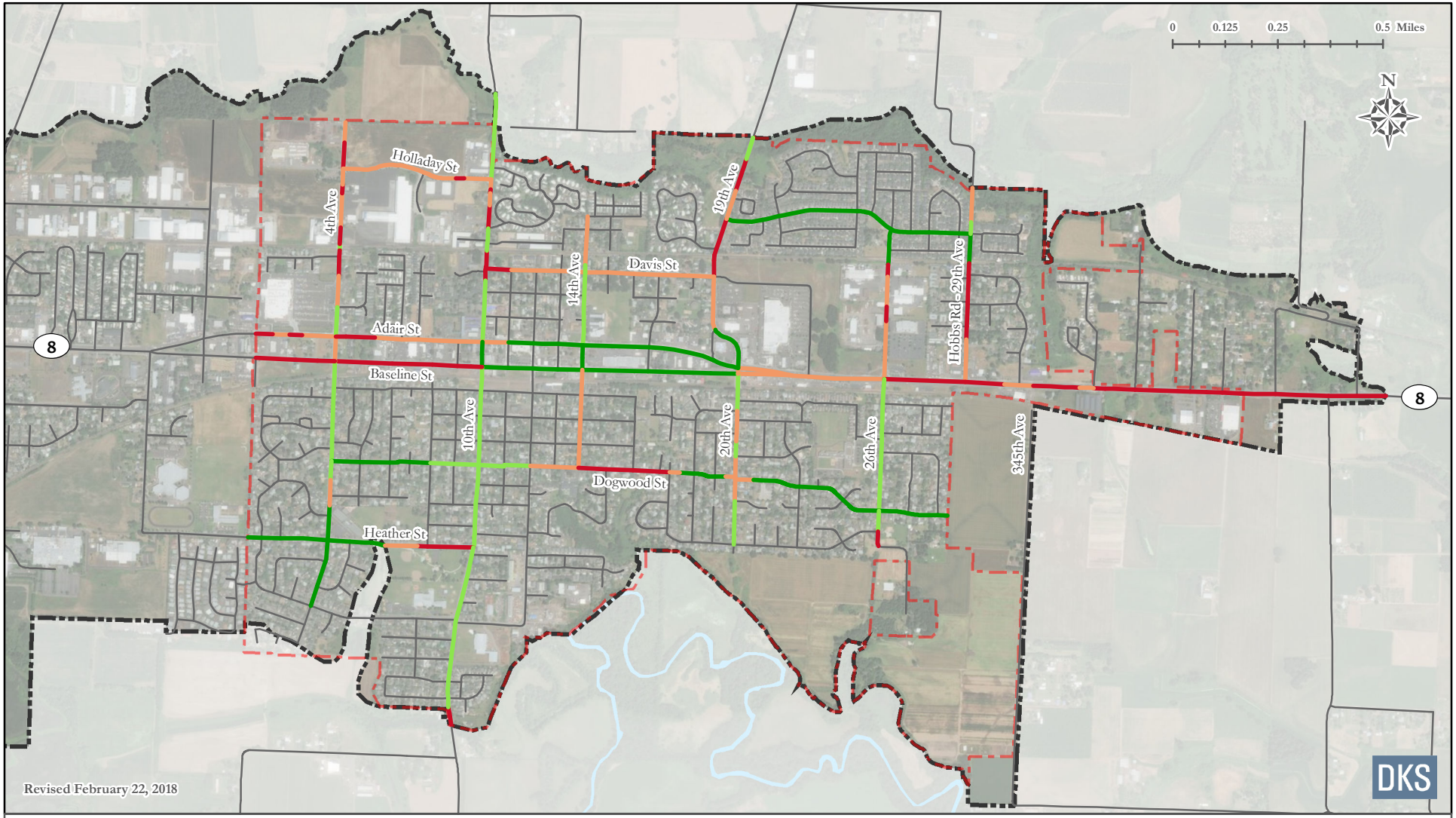
Pedestrian Facilities
- Sidewalk on Both Sides
- Sidewalk on One Side
- Trails

Pedestrian Volumes (PM Peak):
- 0 - 10 Pedestrians
- 11 - 20 Pedestrians
- 21 - 35 Pedestrians

Activity Generators
- Parks and/or Natural Areas
- School
- Other Major Activity Generator (see Figure 3-1)

- Urban Growth Boundary
- Cornelius City Limit

3-3 Qualitative Pedestrian Assessment



Legend:

Qualitative Pedestrian Assessment:

- Excellent
- Good
- Fair
- Poor

Note:
Rating is based on a combination of sidewalk presence, speed limit, presence of buffers, roadway volume, number of lanes, shoulder widths and presence of lighting. Rating calculated on Collectors and Arterials.

- Urban Growth Boundary
- Cornelius City Limit

Sidewalk gaps along city streets: Priority locations for sidewalk infill needs on the arterial and collector network from the Qualitative Pedestrian Assessment ("Poor" segments shown in Figure 3-3) include:

- S Heather Street along Harleman Park, west of S 10th Avenue
- S Dogwood Street between S 14th and 18th Avenue
- N 4th Avenue north of N Davis Street, includes at railroad crossing
- N 10th Avenue north of N Davis Street, includes at railroad crossing
- N 19th Avenue north of N Davis Street, includes at railroad crossing
- N Davis Street east of N 10th Avenue
- Sections of N 26th and 29th Avenue north of OR 8

While Figure 3-2 does not include an inventory of existing pedestrian facilities for local streets, an examination of the system reveals that only a small portion of the local streets have sidewalks.

Pedestrian crossings along OR 8: The number of marked crossings can be improved in the downtown area with N 11th, 12th and 13th Avenue as primary candidates for further evaluation. Other key locations for highway crossings to support bus stops are identified in the Deficiencies in the Transit System section of this chapter.

Pedestrian needs in the Cornelius Main Street District: Improvements to support walking trips in this area are important to complete the grid system and connect to retail centers, Cornelius Elementary School, Veterans Memorial Park, public library and other key destinations. Priority needs include:

- Sidewalk gap on west side of S 14th Avenue south of Baseline Street
- Sidewalk gaps on west side of N 11th Avenue near Centro Cultural
- Sidewalk gaps on both sides of N 17th Avenue north of N Adair Street
- Crosswalks at the N 14th Avenue/N Barlow Street intersection lack pedestrian crossing signs

Substandard facilities: Existing non-ADA (American Disabilities Act) compliant curb ramps and pedestrian throughway obstacles (e.g., shrubbery, utilities poles) present barriers to those with visual or mobility impairments, and are present throughout the existing sidewalk system.

Bicycle System

The bicycle system provides a non-motorized travel option for trips that are longer than a comfortable walking distance. A well-developed bicycle system promotes a healthy and active lifestyle for its residents, and promotes activity for its visitors.

Existing Bicycle Infrastructure

The bicycling network, shown in Figure 3-4, consists of bike lanes, shared bike routes (designated Metro bicycle friendly street) and trails. Bicycle parking is a fundamental component of a bicycle network.

Bike lanes are portions of the roadway designated specifically for bicycle travel by a striped lane and pavement stencils. Bike lanes are not required, and are often not appropriate, on local streets. OR 8 provides bike lanes along the entire corridor. The south side of Baseline Street and the north side of N Adair Street along the couplet provide bike lanes that are primarily located against on-street parking. Baseline Street from N 9th to 10th Avenue is currently under construction; improvements include filling in the bike lane gap and removing the separate eastbound right turn lane at N 10th Avenue.

The majority of the collector routes in Cornelius do not provide bike lanes. There are several Metro designated bike friendly routes in the City which do not provide standard striped bike lanes but are low volume and low speed routes for cyclists to use. In addition, the lack of bicycle connectivity via major roadways such as NW Susbauer Road and NW Cornelius-Schefflin Road, and limits options to travel by bicycle outside of the city.

Shoulder bikeways exist when paved roadways have striped shoulders wide enough for bicycle travel. ODOT recommends a six-foot paved shoulder to adequately provide for bicyclists, and a four-foot minimum width in constrained areas. Some shoulder bikeways are signed to alert motorists to expect bicycle travel along the roadway. OR 8 east of N 331st Avenue provides unsigned wide shoulders (five feet or more) on both sides that can be used by cyclists.

Shared bike routes include roadways on which bicyclists and motorists share the same travel lane. The most suitable roadways for shared bicycle use are those with low speeds (25 mph or less) and low traffic volumes (3,000 vehicles or fewer per day). Shared roadways are often signed as bicycle routes, serve to provide continuity to other bicycle facilities (e.g., bicycle lanes) or can be designated as a preferred route through the community. Shared roadways can have signs that highlight a special route or provide directional information in bicycle minutes or distance. Most local roadways in the city are considered shared roadways, but do not have signs or pavement markings. Metro designated Bicycle Friendly Streets, shown in Figure 3-4, are considered to operate as shared roads, however no signage or pavement markings are provided.

Bicycle parking provides essential end-of-trip facilities. Lack of safe and secure facilities for either short-term or long-term parking can be an obstacle to promoting bicycle riding. Short-term parking accommodates visitors, customers, and messengers. It requires a standard rack, appropriate location and placement, and weather protection. Long-term parking accommodates employees, residents, commuters, and others who park for long periods. This parking requires a secure, weather-protected

location. Bike racks are provided at upgraded bus stops on Baseline Street at N 12th and 14th Avenue.
Bicycle Volumes

Bicycle counts were conducted during the PM peak hour at the study intersections. The bicycle volumes observed are summarized in Figure 3-4. The highest bicycle volumes were observed on N 10th Avenue and the Baseline Street/N Adair Street couplet (OR 8). These counts represent a sample of the bicycle activity based on evening peak hour data collected on weekdays in 2010 through 2016. The level of bicycle ridership is influenced by several factors such as time of year and weather. Variations in bicycle activity is expected with data collected over extended periods of time.

Qualitative Bicycle Assessment

The method for assessing bicycle network conditions at a citywide planning level relies on a qualitative analysis of bikeways based on the ODOT Multimodal Analysis Methodology[3]. The quality and availability of various characteristics are rated system-wide as "Excellent", "Good", "Fair", or "Poor". Consideration is given to the presence and width of bike facilities (i.e., bike lane, shoulder, path, shared lane markings), grade and pavement conditions of the roadway, and the number of travel lanes, vehicle volumes, and travel speeds along the adjacent roadway. The analysis shows the extent to which the bicycle network provides a level of comfort and safety for users. The analysis was used to inform, create, and confirm recommendations for projects.

An "Excellent" rating requires separated bicycle facilities on high volume or high speed roads, or adequate bike facilities given the segment characteristics on a low volume and low speed road. A "Good" rating is given to a high volume or high speed road with adequate bicycle facilities and width, or a low volume and low speed road without the preferred facility type or widths given the roadway characteristics. A "Fair" rating is given to a high volume or high speed road with bicycle facilities, but without the preferred facility type or width, or a low volume and low speed road without bicycle facilities. A "Poor" rating denotes gaps within the bike network along that corridor.

Figure 3-5 summarizes the bicycle network conditions in Cornelius. Overall, the network rates relatively high near downtown, as well as on most collectors but poor on OR 8 outside downtown.

Community Survey

The TSP Community Survey found citizens are interested in more bike lanes and trails in natural areas.

Deficiencies in the Bicycle System

The bicycle system has several deficiencies, below are recommended improvements to meet system needs and encourage use.

[3] Analysis Procedures Manual Version 2, Oregon Department of Transportation, March 2016.

Bicycle facilities along OR 8: There are complete bike facilities on OR 8 through Cornelius. The shoulder bikeways on OR 8, east of N 331st Avenue, would benefit from signs to alert drivers to expect bicycle travel along the roadway.

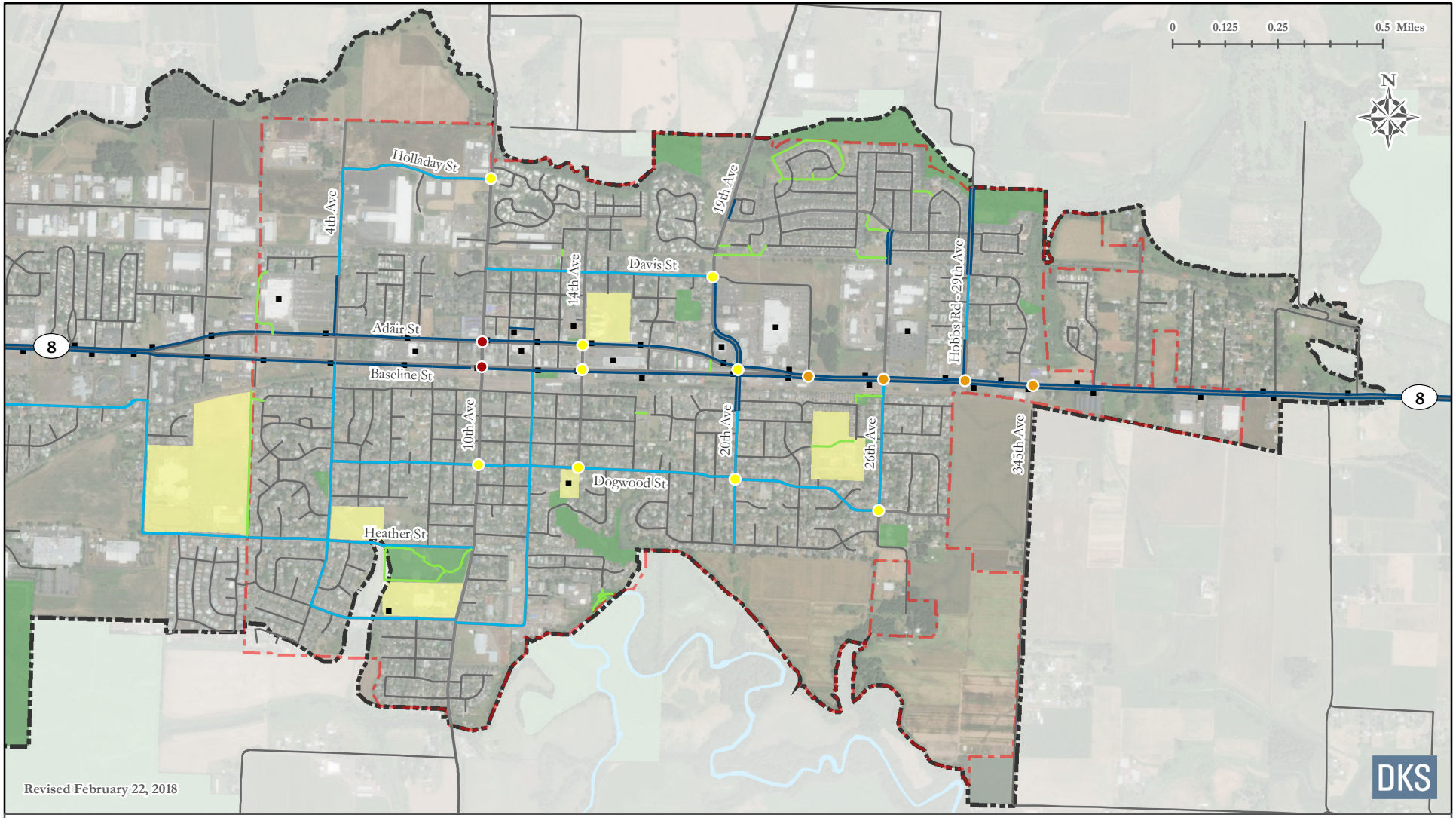
Bicycle facilities along City roadways: There are several priority locations for bicycle facility needs based on the Qualitative Bicycle Assessment ("Poor" and "Fair" segments shown in Figure 3-5):

- N 19th Avenue north of Baseline Street (OR 8) and N/S 10th Avenue through the City.
- N 4th Avenue between Baseline and N Adair Street (OR 8)
- N 10th Avenue between Baseline and N Adair Street (OR 8) (improvements planned in 2018)

Bike lane gaps on collector facilities were rated as "Good" condition based on lower traffic volumes and speeds suggesting no improvements are needed.

Bicycle parking: Available bicycle parking in Cornelius is quite low. Increased bicycle parking is needed to support and promote bicycling as a mode of transportation. Priority locations for bike parking in the Cornelius Main Street District include Cornelius Elementary School, parks and larger commercial and office buildings.

3-4 Existing Bicycle Facilities



Legend:

Bicycle Facilities

- Bike Lane
- Metro Bicycle Friendly Street
- Trails

Bicycle Volumes (PM Peak):

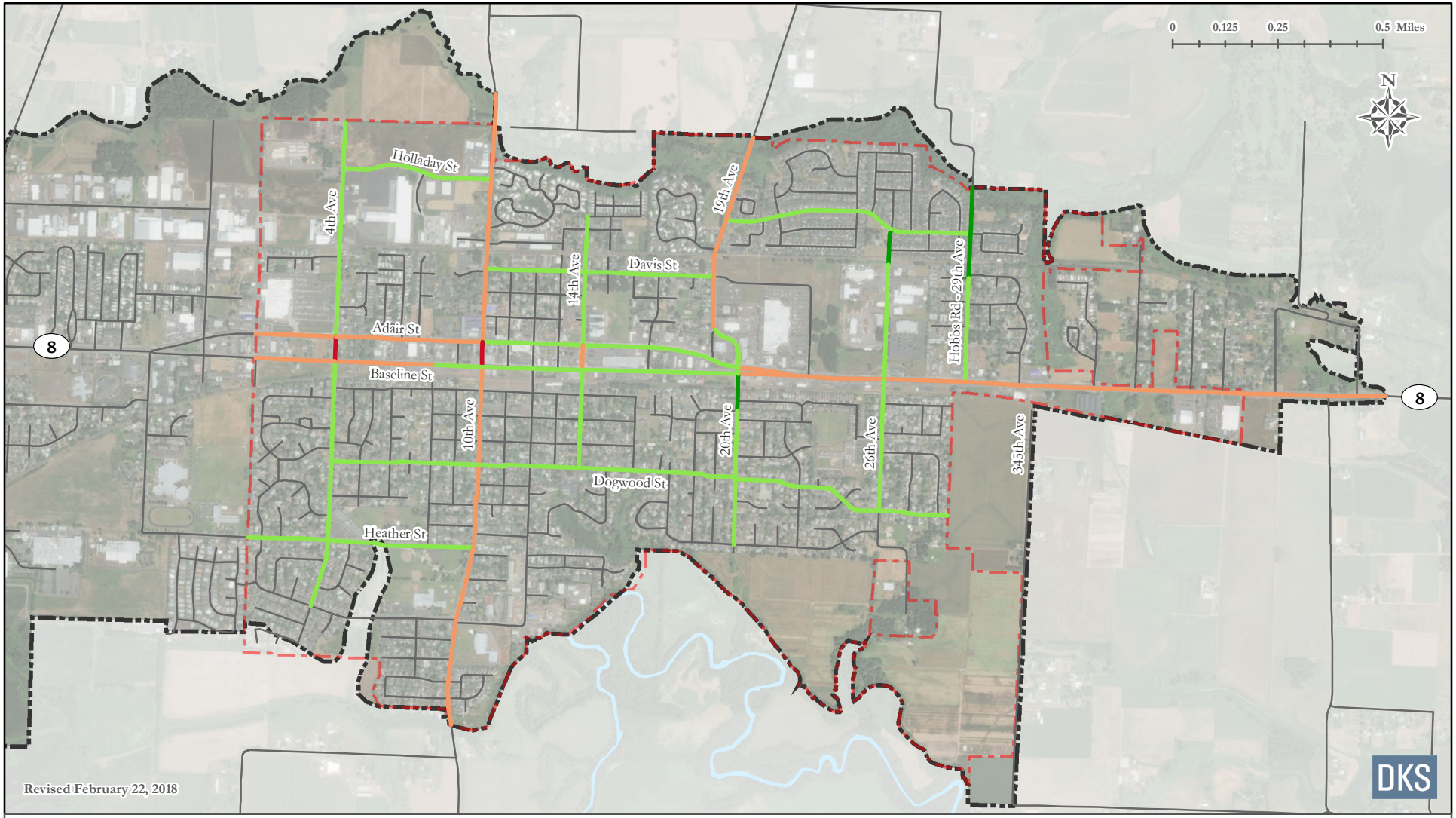
- 0 - 2 Bicyclists
- 3 - 5 Bicyclists
- 6 - 7 Bicyclists

Activity Generators

- Parks and/or Natural Areas
- School
- Other Major Activity Generator (see Figure 3-1)

- Urban Growth Boundary
- Cornelius City Limit

3-5 Qualitative Bicycle Assessment



Legend:

Qualitative Bicycle Assessment:

- Excellent
- Good
- Fair
- Poor

Note:
Rating is based on a combination of speed limit, presence of bicycle facilities, presence of buffers, on-street parking, access, grade and pavement conditions of the roadway and other street characteristics. Rating calculated on Collectors and Arterials.

- Urban Growth Boundary
- Cornelius City Limit

Transit System

The transit system provides an important travel option for the young, the elderly, and those not financially able to afford motorized transport. It also provides an alternative travel option for those who own motorized transport but choose not to drive or pay for parking. Public transportation is critical to the region's transportation system and is essential to the economic and social quality of life of Cornelius citizens.

Service

The transit system provides a public travel option for trips that are longer than a comfortable walking or biking distance. Transit service is provided in Cornelius by TriMet. Bus route 57 connects Cornelius, Forest Grove, Hillsboro and Aloha to the Beaverton Transit Center. Bus route 57 provides frequent service with buses at stops every 15-minutes or better during the day (weekdays, weekends and holidays). During off peak periods, bus service frequency is reduced to every 20 to 60-minutes. Bus services is not provided from 3 AM to 5 AM. No designated park and ride lots are provided along bus route 57 in Cornelius.

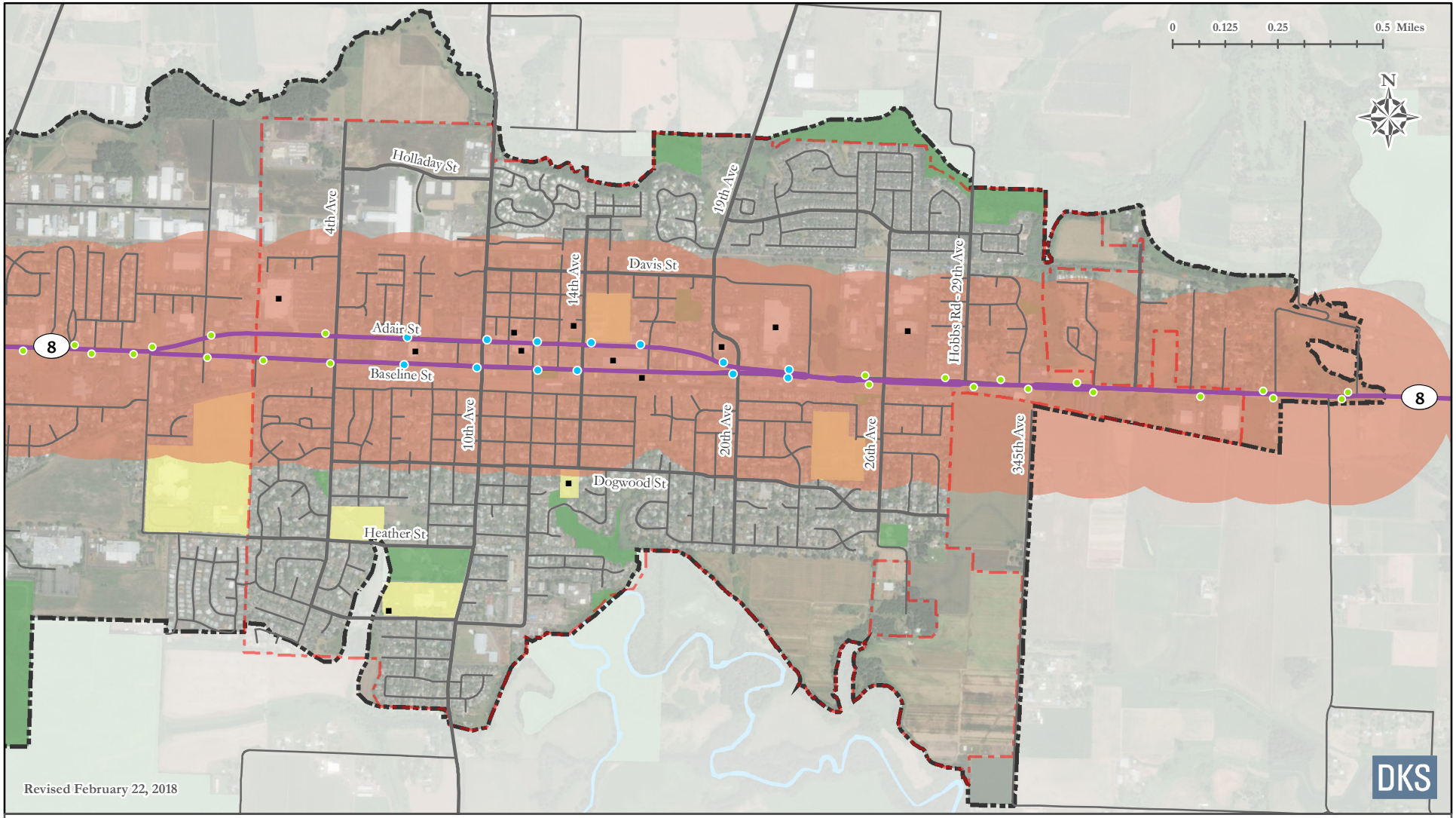
Figure 3-6 shows bus route 57 and stop locations serving Cornelius and the adjacent areas. Bus stops are categorized in the Portland Metro region to help define the appropriate improvement requirements. As shown in Figure 3-6, Major Bus Stops are located within the Cornelius Town Center, which is planned for higher population and employment densities, and Minor Bus Stops are the remaining stops.

The 2016 weekday ridership volumes for bus stops within Cornelius are summarized in Table 3-1. This data represents the number of passengers that get on and get off at each bus stop during an average weekday (24-hour period). The N 4th Avenue and Fred Meyer bus stops serve the highest number of riders. The downtown area, Cornelius Public Library, Virginia Garcia Health Center and Centro Cultural are also transit trip generators.

Table 3-1: TriMet Bus Route 57 Weekday Ridership (Fall 2016)

Bus Stop	Direction	Ons	Offs	Total
331st Avenue/OR 8	Westbound	1	2	3
331st Avenue/OR 8	Eastbound	3	2	5
334th Avenue/OR 8	Westbound	4	9	13
334th Avenue/OR 8	Eastbound	5	2	7
338th Avenue/OR 8	Eastbound	3	4	7
Valley View/OR 8	Westbound	3	14	17
Valley View/OR 8	Eastbound	8	2	10
31st Avenue/OR 8	Westbound	2	6	8
345th Avenue/OR 8	Eastbound	11	5	16
29th Avenue/OR 8	Westbound	7	18	25
29th Avenue/OR 8	Eastbound	13	5	18
26th Avenue/OR 8	Westbound	7	36	43
26th Avenue/OR 8	Eastbound	45	13	58
Fred Meyer Access/OR 8	Westbound	51	85	136
Fred Meyer Access/OR 8	Eastbound	54	29	83
19th Avenue/Adair Street	Westbound	22	41	63
19th Avenue/Baseline Street	Eastbound	55	36	91
17th Avenue/Adair Street	Westbound	8	15	23
14th Avenue/Adair Street (Public Library)	Westbound	24	48	72
14th Avenue/Baseline Street (Public Library)	Eastbound	43	29	72
12th Avenue/Adair Street (Hispanic Centro Cultural)	Westbound	17	49	66
12th Avenue/Baseline Street	Eastbound	64	25	89
10th Avenue/Adair Street	Westbound	32	65	97
10th Avenue/Baseline Street	Eastbound	70	30	100
7th Avenue/Adair Street	Westbound	4	20	24
7th Avenue/Baseline Street	Eastbound	14	4	18
4th Avenue/Adair Street	Westbound	51	138	189
4th Avenue/Baseline Street	Eastbound	109	33	142
West City Limits/Adair Street	Westbound	21	95	116
1st Avenue/Baseline Street	Eastbound	17	17	34
Total		**768**	**877**	**1,645**

3-6 Existing Transit Facilities



Legend:

Transit Facilities
- Major Bus Stop
- Minor Bus Stop
- TriMet Route 57

Transit Buffer
- Within 0.25 mile of Transit Stop

Activity Generators
- Parks and/or Natural Areas
- School
- Other Major Activity Generator (see Figure 3-1)

- Urban Growth Boundary
- Cornelius City Limit
- Arterial or Collector Street

Table 3-2 summarizes the average route headways (time increment between buses at a stop) and corresponding level of service (based on the Highway Capacity Manual methodology[4]) for bus route 57 in Cornelius. The performance of the service is rated as LOS C throughout the day which corresponds to existing headways of 15 minutes or better.

Table 3-2: TriMet Service Routes and Weekday Peak Period Level of Service

	Average Headways (minutes)			Level of Service		
Route	AM	Midday	PM	AM	Midday	PM
#57 OR 8/Forest Grove	15	15	15	C	C	C

Note: AM Period = 06:00-08:30, Midday Period = 08:30-16:00, PM Period = 16:00-18:00
Level of Service for transit service based on headway: less than 10 minutes = LOS A; 10-14 minutes = LOS B; 14-19 minutes = LOS C; 20-29 minutes = LOS D; 30-60 minutes = LOS E; and greater than 60 minutes = LOS F.

TriMet's LIFT Program is a shared-ride public transportation service provided for people who are unable to use buses or MAX due to a disability or disabling health condition. The LIFT service area boundary is three-fourths of a mile beyond the outermost portions of TriMet's Bus and MAX lines, which includes all of Cornelius. LIFT service operates during the same hours as bus and MAX services. All rides are by advance reservation only.

Ride Connection is a private, non-profit organization based on Portland, Oregon that provides rides for medical, shopping, social and recreation, and other purposes in Washington, Clackamas and Multnomah counties. Ride Connection is made up of agencies who offer a variety of transportation options to older adults and people with disabilities. Services include door-to-door rides, transit travel training and regional transportation option information. Reservations must be made at least four days in advance. No fee is charged but a donation is suggested. .

Access and Amenities

Access to transit should be a comfortable experience for passengers and those considering riding transit. Lack of sidewalk coverage and crosswalk facilities can create uncomfortable conditions for transit passengers seeking to access their bus stop or final destination. Conditions can also be a deterrent for some potential transit users, including elderly users and persons with disabilities. In addition, during winter months when the sun sets earlier, some passengers may not feel comfortable returning home from the bus due to the lack of lighting at bus stops.

Pedestrian access to several bus stops is difficult due to the lack of sidewalks and street connectivity. The east and west ends of OR 8 in the rural areas provide limited sidewalks. Many roadways connecting to OR 8 also lack sidewalks for riders to access bus stops. Existing sidewalks and bus stop locations are shown in Figure 3-2. Neighborhoods south of OR 8 require long walking distances to bus stops due to poor street connectivity. There are large blocks south of OR 8, between S 4th and

[4] *2000 Highway Capacity Manual*, Transportation Research Board, 2000, Chapter 27.

10th Avenue, S 14th and 20th Avenue and S 20th and 26th Avenue, created by infrequent rail line crossings.

Attractive stops with clear signage, user information and amenities help promote transit as an easy, comfortable way to get around. Rider amenities are provided at many bus stops in Cornelius. All bus stops that serve a moderate number of boardings (greater than 35 per day, see Table 3-1) provide a bus shelter, except the Baseline Street/19th Avenue stop (provides a bench) and Baseline Street/14th Avenue stop (provides sign only). The Baseline Street and Adair Street (OR 8) intersections between 11th and 20th Avenue provide curb extensions at crosswalks and pedestrian level street lighting to support access to transit stops. Street lighting is also provided along OR 8 between the west city limits and N 11th Avenue, between N 20th Avenue and 26th Avenue and at the N 29th and 31st Avenue intersections.

Transit level of service can also be analyzed based on the area of service coverage and route reliability. Transit service coverage is typically measured as a quarter-mile walking distance buffer around transit stops. As shown in Figure 3-6, about half of the neighborhoods are outside the coverage area requiring more than a quarter-mile walk to a bus stop. Transit service reliability is primarily measured by the ability for buses to maintain schedules along corridors. On-time performance data specifically for bus route 57 is not available, however TriMet reports that system-wide bus service was about 80 percent in 2016.

Community Survey

The TSP Community Survey found citizens are interested in improvement of transit facilities. Specific responses requested extending bus routes off highway, more bus shelters, better walking connections to bus stops, street lighting and extending MAX light rail service from Hillsboro.

Deficiencies in the Transit System

The transit system has several deficiencies, below are needs and recommendations to encourage potential riders.

Transit Access: Near bus stops on OR 8, west of N 10th Avenue and east of N 26th Avenue, the streets lack sidewalk coverage, bus stop pads and crosswalk facilities. A review of recent ridership data (see Table 3-1) identified the need for sidewalk infill to improve bus stop access at key locations:

- South side of Baseline Street between N 1st and 10th Avenue
- South side of OR 8 between N 26th and 345th Avenue

High use bus stops on OR 8 that would benefit from a marked pedestrian crossing include:

- West city limit and N 1st Avenue bus stops
- N 12th Avenue bus stops
- N 29th Avenue bus stops

Transit Amenities: TriMet bus shelters are needed at the Baseline Street/19th Avenue and Baseline Street/14th Avenue bus stops based on the number of daily boardings.

Park and Ride Lots: The addition of a Park and Ride Lot along OR 8 is recommended to serve potential bus riders that are not well connected to bus route 57 due to either distance or ability to walk or bike to bus stop.

Motor Vehicle System

In Cornelius, driving a personal automobile is the primary mode within the transportation network. Planning for motor vehicles supports future needs to efficiently and safely move people and goods to destinations.

City Functional Classification

To manage the roadway network, the City classifies roadways based on a hierarchy according to the intended purpose of each road. The functional classifications from the 2005 TSP are shown in Figure 3-7. From highest to lowest intended usage, the classifications are arterials, collectors, neighborhood routes and local streets. Roadways with a higher intended usage generally provide more efficient traffic movement (or mobility) through the City, while roadways with lower intended usage provide greater access for shorter trips to local destinations such as businesses or residences. City Public Works Standards[5] further categorizes facilities into "street types" for specific design and cross section guidelines.

State and Regional Classifications

Within Cornelius, several streets have regional and state designations for their role in the transportation system, as shown in Figure 3-7. These designations are used to guide future planning and design decisions and ultimately inform the adopted standards, regulations, and policies that apply to the multi-modal transportation system in Cornelius. A complete summary of planning documents, designations, policies, and regulations that are applicable to the Cornelius TSP is provided in the appendix (see Technical Memo #2).

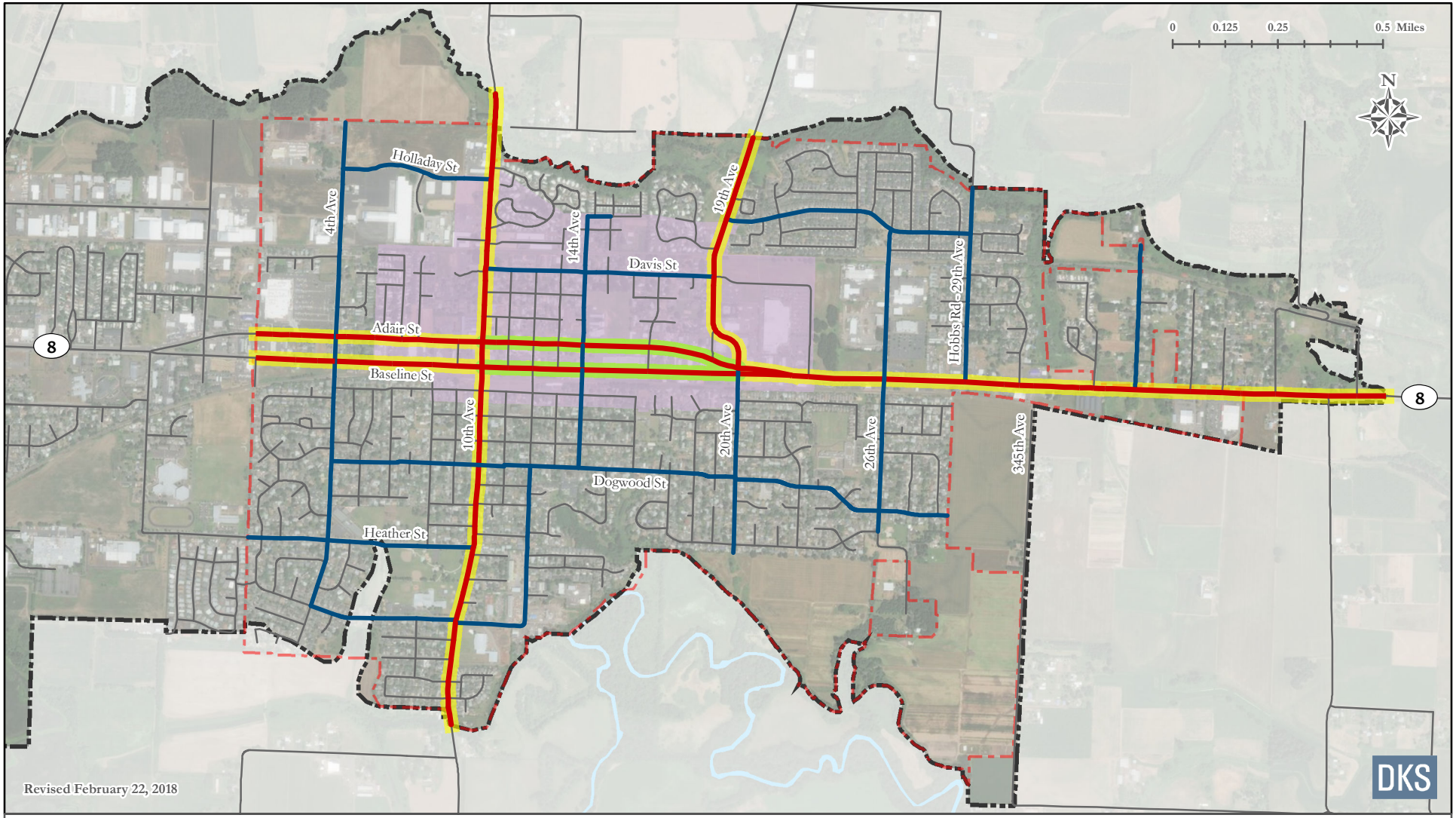
Statewide Highway

OR 8 is designated as a Statewide Highway in the Oregon Highway Plan (OHP)[6]. From the OHP, Statewide Highways typically provide inter-urban and inter-regional mobility and provide connections to larger urban areas, ports, and major recreation areas. A secondary function is to provide connections for intra-urban and intra-regional trips. The management objective is to provide safe and efficient, high-speed, continuous-flow operation. In constrained and urban areas, interruptions to flow should be minimal. Inside Special Transportation Areas (see Special Designations below), local access may be a priority.

[5] City of Cornelius Public Works Standards, March 17, 2017.

[6] Oregon Highway Plan, ODOT, State Highway Classification System map.

3-7 2005 Functional Classification



Legend:

Functional Classification:

- Arterial
- Collector
- Neighborhood Route
- Local Streets

Special Designation

- Regional Arterial and Throughway Network
- Special Transportation Area
- Regional Town Center

- Urban Growth Boundary
- Cornelius City Limit

Special Transportation Area

The Adair Street-Baseline Street couplet (OR 8) from N 10th Avenue to 20th Avenue is designated as a Special Transportation Area (STA). The primary objective of a STA is to provide access to and circulation amongst community activities, businesses, and residences and to accommodate pedestrian, bicycle, and transit movement along and across the highway. While traffic moves through an STA and automobiles may play an important role in accessing an STA, convenience of movement within an STA is focused upon pedestrian, bicycle, and transit modes. STAs look like traditional "Main Streets" and are generally located on both sides of a state highway. Direct street connections and shared on-street parking are encouraged. Local auto, pedestrian, bicycle, and transit movements to the area are generally as important as the through movement of traffic. Because of this, ODOT's mobility targets and design standards in STA's are intended to allow for lower speed operations.

State Highway Freight System

OR 8 is classified as part of the NHS (National Highway System) in the OHP[7]. This designation indicates a need to balance the movement of goods and services with other uses and states that the timeliness of freight movements should be considered when developing and implementing plans and projects on freight routes.

Reduction Review Routes

OR 8 is classified as a Reduction Review Route[8] in Cornelius which requires review of all potential actions that will alter, relocate, change or realign a Reduction Review Route that could result in permanent reductions in vehicle-carrying capacity. Reduction of vehicle-carrying capacity means a permanent reduction in the horizontal or vertical clearance of a highway section, by a permanent physical obstruction to motor vehicles located on useable right-of-way subject to Commission jurisdiction, unless such changes are supported by the Stakeholder Forum.

Regional Transportation Plan

OR 8 is designated as a Major Arterial, and N 10th Avenue and N 19th Avenue are designated as Minor Arterials on the Regional Transportation Plan (RTP) Arterial and Throughway Network. The Metro Regional Transportation Plan Arterial and Throughway Network designates streets of regional significance for vehicular circulation as either Throughways or Arterials. Within Cornelius, only the Arterial classification applies. Arterial Streets are intended to serve as primary links to the principal arterial system. Major Arterial streets accommodate longer distance through trips and serve more of a regional traffic function. Minor arterial streets serve shorter trips that are localized within a community. As a result, major arterial streets usually carry more traffic than minor arterial streets.

[7] Oregon Highway Plan, ODOT, State Highway Freight System**,** Goal 1, Policy 1C.

[8] Administrative Rule ORS 366.215

Metro's 2040 Growth Concept[9] in the RTP applies land use designations to the Portland region. The 2040 Growth Concept is the region's long range plan for managing growth by integrating land use and transportation. The concept concentrates mixed use and higher density development in areas of the region designated as "Centers", "Station Communities", and "Main Streets". The 2040 Growth Concept land uses are arranged in a hierarchy, with the primary and secondary land uses, referred to as 2040 Target Areas, as the focus of RTP investments. The hierarchy also serves as a framework for prioritizing RTP investments.

There are no Primary land uses in Cornelius. Secondary land uses in Cornelius include:

- The "Cornelius Town Center" which generally includes the area bounded by Holladay Street to the north, Alpine Street to the south, 20th Avenue to the east and 5th Avenue to the west.
- The Adair Street "Main Street" from 20th Avenue to 10th Avenue.
- The 10th Avenue "Main Street" from Davis Street to Cherry Street.
- The 19th Avenue-20th Avenue "Main Street" from Davis Street to OR 8.
- The OR 8 "Corridor" from 20th Avenue to 341st Avenue.
- The Adair Street-Baseline Street "Corridor" from 10th Avenue to the west end of the City.
- The "Employment Land" in the northwest portion of Cornelius.

The remaining areas of Cornelius are designated as Neighborhood land uses. These areas have the lowest priority for RTP investments.

The RTP identifies Mobility Corridor #24 – Beaverton to Forest Grove[10] as part of a coordinated network of planned transportation facilities. The corridor extends from OR 217 west to Forest Grove and Farmington Road south to Baseline Street to the north. A Corridor Refinement Plan has been developed for the Beaverton to Hillsboro segment with recommended strategies ranging from a variety of capacity and transit improvements, updated street design classifications, and transportation system management. Future corridor improvements to the west may improve overall mobility for trips to and from Cornelius.

Connectivity

The existing street network within Cornelius is made up of a grid configuration for several blocks north and south of OR 8 (N Adair Street and Baseline Street) between N 10th Avenue and 14th Avenue. The remaining street network is made up of small developed areas that are not adequately linked to each other. There are a number of locations in Cornelius where, due to the lack of alternative routes, the majority of neighborhood traffic is funneled onto a single street. This type of street network results in an imbalance of traffic volumes that impacts residential neighborhoods and out-of-direction travel for motorists, bicycles and pedestrians.

[9] Metro 2040 Growth Concept: http://www.oregonmetro.gov/index.cfm/go/by.web/id=29882

[10] Metro Regional Transportation Plan, Section 5.3.1.5, adopted July 17, 2014.

Future roadway connections will be constrained by the rail lines passing through Cornelius one-half block south of OR 8 and five blocks north of OR 8. Street connectivity needs to be coordinated with public rail crossings. The multi-modal connectivity needs are shown in Figure 3-8.

Arterial and Collector Connectivity

The functional classifications of streets in Cornelius were reviewed to determine the appropriateness of the local classification and connectivity. The Metro Regional Transportation Functional Plan requires that, to the extent possible, arterials be spaced at one-mile intervals and collectors to be spaced at half-mile intervals[11]. Overall, most areas in Cornelius comply with the spacing standards to the extent possible. Existing development, environmental areas, the Urban Growth Boundary, and rail lines each pose a significant constraint in further improving the arterial and collector connectivity in Cornelius. The functional classifications of several roadways throughout the City may need to be modified to address the connectivity gaps identified in Figure 3-8 and summarized below.

Arterial Connectivity gaps were identified in the following areas (see Figure 3-8):

1. A north to south gap at the east end of the City, near N 338th Avenue. Connectivity improvements in this area are hindered by existing development and limited railroad crossing opportunities.

East to west Arterial gaps also exist at the north and south end of the City. However, these alignments would be outside of the urban growth boundary (UGB).

Collector Connectivity gaps were identified in the following areas (see Figure 3-8):

2. An east to west gap west of N 4th Avenue, near N Holladay Street. Connectivity could be improved by extending N Holladay Street to the west.
3. An east to west gap between N 10th Avenue and N 19th Avenue. Connectivity improvements in this area are hindered by existing development, and environmental areas.
4. An east to west gap at the east end of the City, north of OR 8. Connectivity improvements in this area are hindered by existing development, environmental areas and alignment outside the UGB.
5. An east to west gap between S Dogwood Street and S 345th Avenue. Connectivity could be improved by extending S Dogwood Street to the east.
6. A north to south gap at the east end of the City, south of OR 8. Consideration should be given to designating N 345th Avenue as a Collector to help satisfy the regional connectivity requirements.

[11] Metro Regional Transportation Functional Plan, Section 3.08.110 Street System Design Requirements

Local Street and Trail Connectivity

The aggregate effect of local street design impacts the effectiveness of the regional system when local travel is restricted by a lack of connecting routes, and local trips are forced onto the regional network. Therefore, streets should be designed to keep through motor vehicle trips on arterial streets and provide local trips with alternative routes. Street system connectivity is critical because roadway networks provide the backbone for bicycle and pedestrian travel in the region. Metro's local street connectivity principle encourages communities to develop a connected network of local streets to provide a high level of access, comfort, and convenience for bicyclists and walkers that travel to and among centers.

Connectivity of the existing transportation system was reviewed to identify current deficiencies. These locations will be further addressed in the pedestrian, bicycle and motor vehicle plans. Topography, environmental constraints, railroads and existing development may be limiting the connectivity in areas of Cornelius. These factors may not stop the possible connections from being made in the noted areas lacking connectivity, but will affect what modes could be accommodated and the financial viability. The major areas lacking connectivity include:

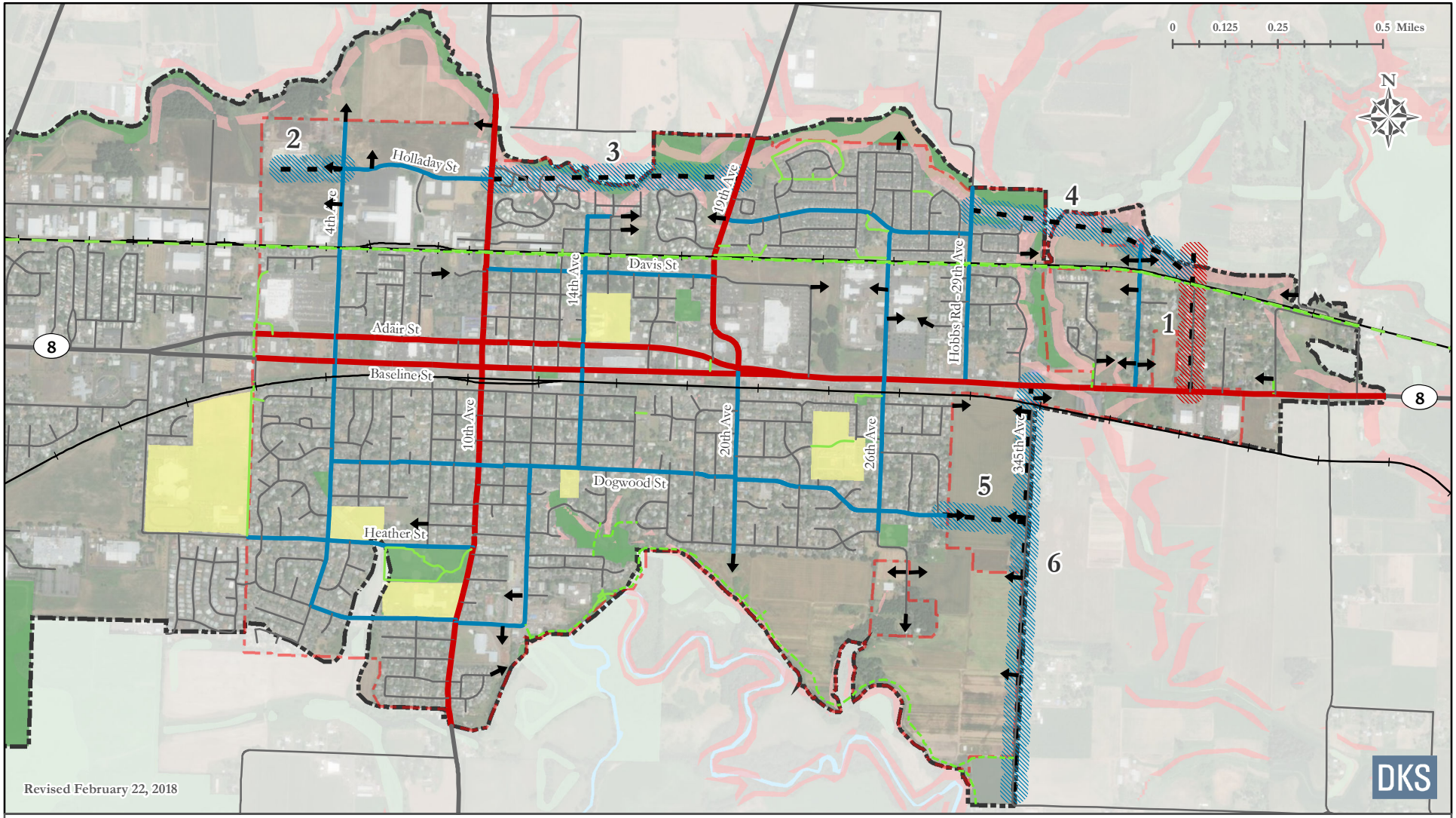
- East to west connectivity between local streets at the east end of the City, north of OR 8.
- East to west connectivity between N 19th Avenue and N 29th Avenue, between OR 8 and the railroad track.
- East to west connectivity between S Dogwood Street and S 345th Avenue.

A multi-modal connectivity plan for Cornelius is shown in Figure 3-8. It specifies the general location where new streets or shared-use paths could potentially be installed as nearby areas are developed or as the opportunity arises. The planned regional Council Creek Trail alignment is shown along the railroad right-of-way north of OR 8. The purpose of the plan is to ensure that new developments accommodate circulation between adjacent neighborhoods to improve connectivity for all modes of transportation. The criteria used for providing connections are as follows (as required in the Metro Regional Transportation Functional Plan):

- Provide a full local street connection at least every 530 feet (or 1/10 of a mile), if possible
- Provide a pedestrian and bicycle connection every 330 feet if a full-street connection is not possible

Final street spacing shall be determined by the adopted Cornelius Public Works Standards and through approval by the City Engineer.

3-8 Multi-Modal Connectivity



Legend:

Existing Arterial and Collector Streets:

- Arterial
- Collector

Arterial and Collector Connectivity Gaps:

- Arterial Gap of over 1 mile
- Collector Gap of over 1/2 mile
- # Connectivity Gap Reference Number (See Chapter 3)

Local Street and Trail Connectivity:

- Existing Local Streets
- Potential Local Street or Trail Extension
- Existing Trails
- Planned Shared-Use Path (Conceptual Alignment)

- Urban Growth Boundary
- Cornelius City Limit
- Parks and/or Natural Areas
- School

Roadway Characteristics

Field inventories were conducted to determine characteristics of major roadways in the study area. Data collected included roadway jurisdiction, posted speed limits, roadway cross-section, intersection geometry and controls and access spacing. These characteristics define roadway capacity and operating speeds through the street system, which affects travel path choices for drivers in Cornelius.

Roadway Jurisdiction

Roadway ownership and maintenance responsibilities of the various roads in the City of Cornelius are identified in Figure 3-9. OR 8 and the Baseline Street-Adair Street couplet are under state jurisdiction. The remaining roadways are owned and operated by the City of Cornelius. Washington County does not have jurisdiction over any roads in Cornelius with the exception of S Webb Road (south of Dogwood Park), which is planned to vacate with the installation of new roads in Laurel Woods.

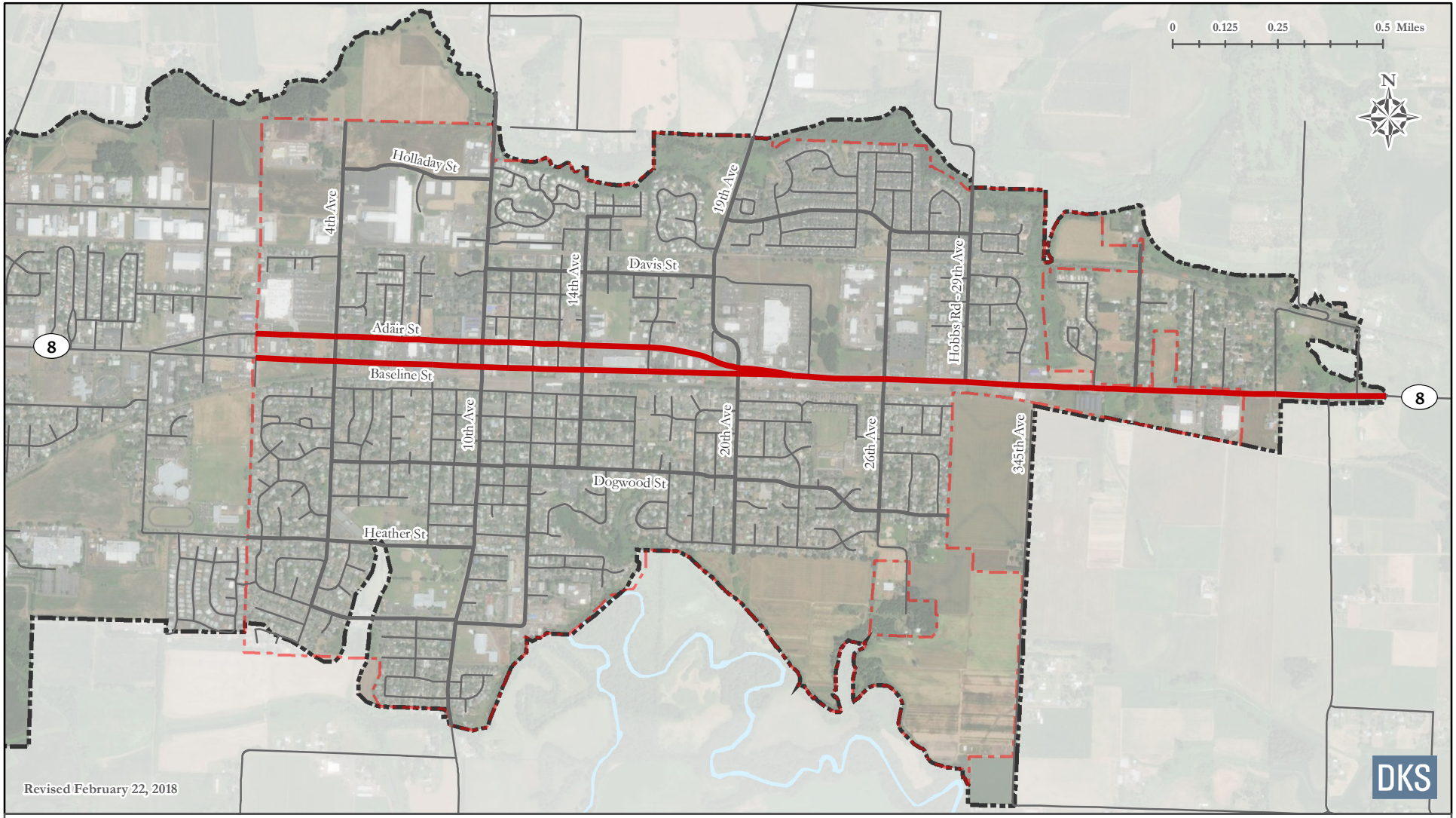
Vehicle Speed Limits

Speed limit zones are set by the Oregon Department of Transportation and the local road authority. ODOT has the responsibility to investigate roads for establishing new speed zones or changing posted speeds of existing speed zones based on many factors such as roadway width, surface, lanes, shoulders, signals, intersections, roadside development, parking, accidents and 85th percentile speed. The 85th percentile speed is commonly used to establish the reasonable and prudent speed for a roadway. Figure 3-10 shows a select inventory of the posted speeds in Cornelius. N Adair Street and Baseline Street (OR 8) are posted at 30 miles per hour (mph) on the couplet, 40 mph west and east of the couplet and 50 mph east of N 345th Avenue. In general, local, neighborhood route and collector roadways are posted (or statutory) at 25 miles per hour.

Average Daily Traffic Volumes

Average daily traffic volumes (ADTs) on select roadways are shown in Figure 3-10. These ADT volumes are estimated based on the PM peak hour count data at study intersections and available ODOT volume data for OR 8. As shown, daily volumes on OR 8 reach almost 34,000 vehicles east of the city limits and 31,000 vehicles west of N 10th Avenue (N Adair Street and Baseline Street combined). Daily volumes on N 10th and 19th Avenue are similar with about 4,700 vehicles north of OR 8.

3-9 Roadway Jurisdiction



Legend:

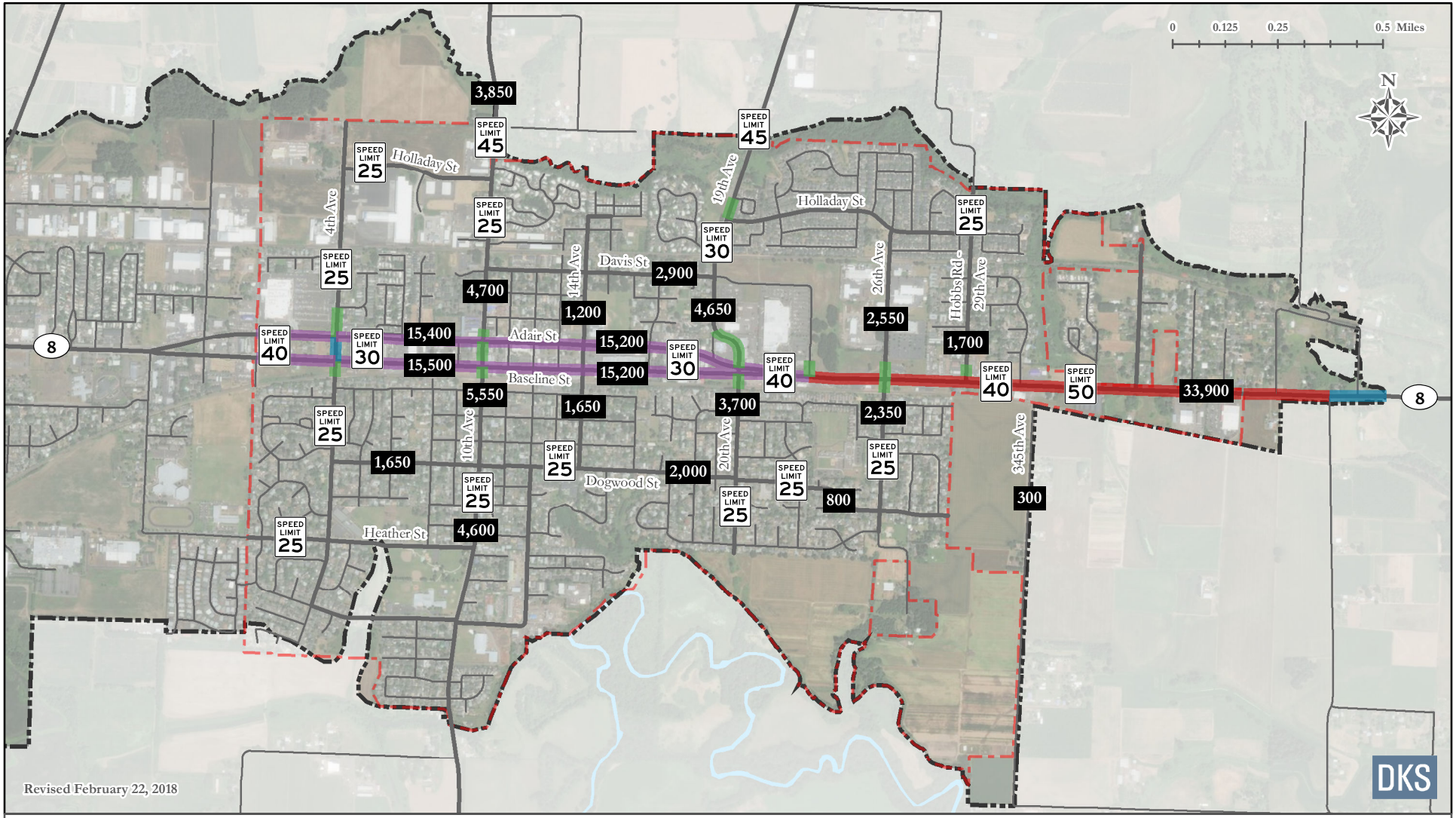
Roadway Jurisdiction:

- State of Oregon
- City of Cornelius

- Urban Growth Boundary
- Cornelius City Limit
- Arterial or Collector Street

3-10

Travel Lanes, Speed Limits and Average Daily Traffic Volumes



Legend:

Travel Lanes:

- 1 travel lane in each direction (2 lanes)
- 2 travel lanes (one-way)
- 1 travel lane in each direction, with a turn lane/median (3 lanes)
- 2 travel lanes in each direction (4 lanes)
- 2 travel lanes in each direction, with a center turn lane/median (5 lanes)

Traffic Volumes:

- # Average Daily Traffic Volumes

- Urban Growth Boundary
- Cornelius City Limit

Roadway Cross-section

The existing number of lanes on each major roadway in Cornelius is also shown in Figure 3-10. OR 8 outside of the couplet operates as a four to five lane roadway. The remaining roads in the City of Cornelius operate as two to three lane roadways. A facility designated with a three and/or five lane roadway width indicates the presence of a center median or two-way left-turn lane. The major roadways in Cornelius were measured to determine typical cross-section widths and right-of-way available. Table 3-3 summarizes the findings.

Table 3-3: Study Roadway Cross-sections

Roadway	Location	Roadway Width*	Right of Way Width**
10th Avenue	south of Holladay Street	33’	40’
10th Avenue/Golf Course Rd	south of Linden Street	40’	56’
Dogwood Street	west of 16th Avenue	34’	40’
Holladay Street	west of 10th Avenue	38’	60’
19th Avenue	north of Davis Street	32’	50’
Adair Street (OR 8)	east of 4th Avenue	45’	60’
Baseline Street (OR 8)	east of 4th Avenue	44’	60’
Adair Street (OR 8)	east of 17th Avenue	40’	60’
Baseline Street (OR 8)	east of 17th Avenue	40’	100’
345th Avenue	north of railroad tracks south of railroad tracks	29’ 20’	50’
336th Avenue	north of OR 8	20’	40’

* Roadway width measured curb to curb or from edge of pavement.

** Right of way width measured between tax lots.

Access Spacing

Access management is a broad set of techniques that balance the need to provide efficient, safe, and timely travel with the ability to allow access to individual destinations. Appropriate access spacing standards and techniques will reduce congestion and accident rates, and may lessen the need for constructing additional roadway capacity. ODOT aims to balance the safety and mobility needs of travelers along state highways with the access needs of property and business owners.

An access inventory was conducted for OR 8 (Baseline Street) on the east side of Cornelius, comparing the number of driveways against ODOT spacing standards[12]. The standards, shown in Table 3-4, are based on state highway classification, volume and speed. The purpose of this inventory is to document deficient locations so when a property elects to redevelop, alternative access options will be explored.

[12] Oregon Highway Plan Goal 3, Policy 3A and OAR 734-051

Table 3-4: Highway Access Spacing Standards (>5,000 AADT)

Highway (Segment)	Posted Speed Limit	Minimum Intersection Spacing
OR 8 (from the east UGB to 345th Avenue)	50 mph	1,100 feet
OR 8 (from 345th Avenue to just west of 20th Avenue)	40 mph	800 feet
OR 8 (from just west of 20th Avenue to just west of 4th Avenue) (14th to 13th is 20 mph School Zone)	30 mph	500 feet
OR 8 (from just west of 4th Avenue to the west City Limits/Mountain View Lane)	40 mph	800 feet

The north side of OR 8 from west of East Lane (private) to the east UGB covers about 3,300 feet which would allow three access points based on the standard. In this section, there are six public street intersections and eight private driveways. The south side of OR 8 from west of N 26th Avenue to the east UGB covers about 5,800 feet which would allow six access points (two between N 26th and 345th Avenue, four further east) based on the standard. In this section, there are three public intersections and 14 private driveways. Several parcels have multiple driveways which could be consolidated.

Broader access management strategies should be considered on OR 8 in the east side of Cornelius to work towards meeting ODOT spacing standard. Improvements may include developing the local street network to allow driveway closure, consolidation of multiple driveways or restricting access with a raised center median and local street access closure (i.e., frontage road).

The city and ODOT recently conducted an extensive access management study of N Adair Street and Baseline Street (OR 8) from N 10th to 20th Avenue. The outcome was the closure and consolidation of several accesses onto the highway as part of the construction of the roadway improvement project.

Motor Vehicle Volumes

An inventory of evening peak hour traffic conditions was performed in the fall of 2016 as part of the Cornelius TSP update. The traffic turn movement counts provide the basis for analyzing existing problem areas as well as establishing a base condition for future monitoring. Study intersections were chosen in coordination with city staff in order to address major roadways and noted areas of concern.

Turn movement counts were conducted at 15 intersections during the weekday evening peak period (4 – 6 PM) to determine existing operating conditions. The intersection counts used for the analysis were a mix of new 2016 data and available data from prior traffic studies. Older count data was factored based on calculated annual growth rates and traffic volumes between study intersections were balanced. The PM peak hour in Cornelius occurs before 6:00 PM, therefore the peak period for the data collection was appropriate to capture the evening commute peak.

The study intersection PM peak hour volumes, lane configurations and existing intersection controls are shown in Figures 3-11a and 11b. Traffic signals are located along OR 8 (Baseline Street and Adair Street) and are under ODOT jurisdiction. The remaining study intersections are stop sign controlled.

Traffic Levels of Service

The TSP compares intersections in Cornelius to mobility targets and standards intended to maintain a minimum level of efficiency for motor vehicle travel. Two methods to gauge intersection operations include volume-to-capacity (v/c) ratios and level of service (LOS).

- **Volume-to-capacity (v/c) ratio:** A decimal representation (between 0.00 and 1.00) of the proportion of occupied capacity (capacity defined as the theoretical maximum vehicle throughput in a given time frame) at a turn movement, approach leg, or intersection. It is the peak hour traffic volume divided by the hourly capacity of a given intersection or movement. A lower ratio indicates smooth operations and minimal delays. A ratio approaching 1.00 indicates increased congestion and reduced performance. A ratio greater than 1.00 indicates the turn movement, approach leg, or intersection is oversaturated, which usually results in excessive queues and long delays.

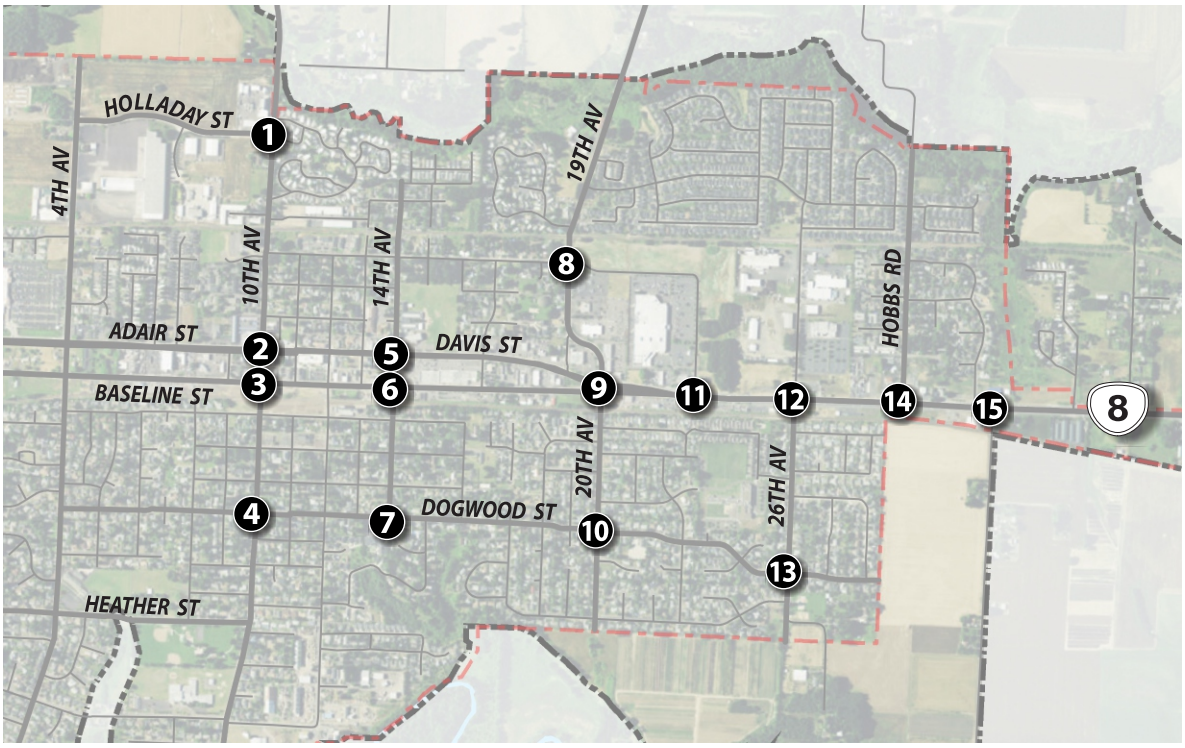
- **Level of service (LOS):** A "report card" rating (A through F) based on the average delay experienced by vehicles at the intersection. LOS A, B, and C indicate conditions where traffic moves without significant delays over periods of peak hour travel demand. LOS D and E are progressively worse operating conditions. LOS F represents conditions where average vehicle delay has become excessive and traffic is highly congested.

Intersection mobility targets vary by jurisdiction of the roadways. All intersections under state jurisdiction in Cornelius must comply with the v/c ratios in the Oregon Highway Plan (OHP). The ODOT v/c targets are based on highway classification and posted speeds shown in Table 3-5. These operating standards apply to all study intersections located on OR 8 (N Adair Street and Baseline Street). LOS D is the minimum performance standard during the peak-hour operations at intersections under City jurisdiction.

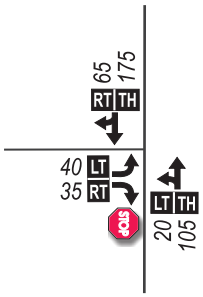
Table 3-5: Highway Intersection Mobility Targets

Highway (Segment)	Posted Speed / Metro Designation	Highway Signalized Intersections	Unsignalized Intersections	
			Highway Approaches	Side Street Approaches
OR 8 (west UGB to 345th Ave)	50 mph/Corridor	0.99 / 0.99	0.99 / 0.99	0.99 / 0.99
OR 8 (345th Ave to 29th Ave)	40 mph Corridor	0.99 / 0.99	0.99 / 0.99	0.99 / 0.99
OR 8 (29th Ave to 20th Ave)	40 mph/TC	1.1 / 0.99	1.1 / 0.99	0.99 / 0.99
OR 8 (20th Ave to 10th Ave)	30 mph/STA, TC	1.1 / 0.99	1.1 / 0.99	0.99 / 0.99
OR 8 (10th Ave to 7th Ave)	30 mph/Corridor	1.1 / 0.99	1.1 / 0.99	0.99 / 0.99
OR 8 (7th Ave to 4th Ave)	30 mph/Corridor	0.99 / 0.99	0.99 / 0.99	0.99 / 0.99
OR 8 (4th Ave to west city limits/Mountain View Ln)	40 mph/Corridor	0.99 / 0.99	0.99 / 0.99	0.99 / 0.99

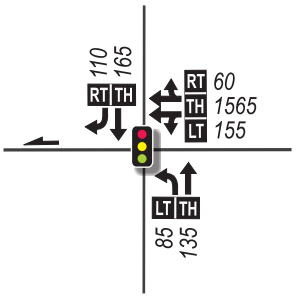
Notes: STA – Special Transportation Area, TC – Town Center



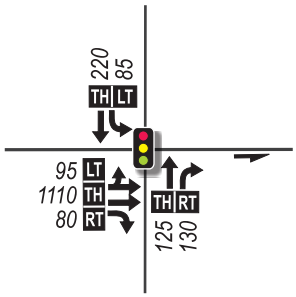
1. Holladay St. @ 10th Ave.



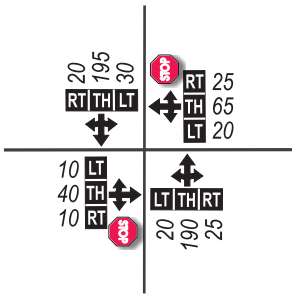
2. Adair St. @ 10th Ave.



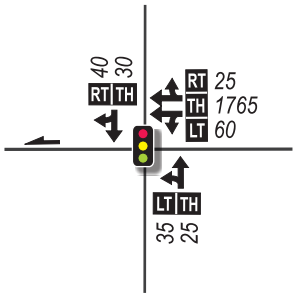
3. Baseline St. @ 10th Ave.



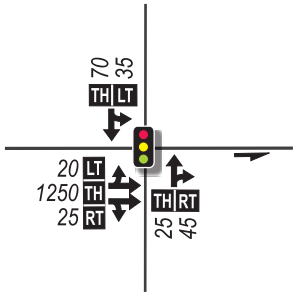
4. Dogwood St. @ 10th Ave.



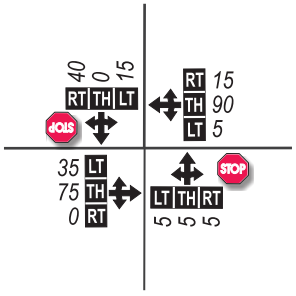
5. Adair St. @ 14th Ave.



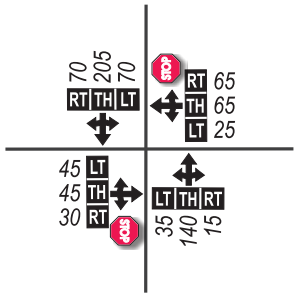
6. Baseline St. @ 14th Ave.



7. Dogwood St. @ 14th Ave.



8. Davis St. @ 19th Ave.



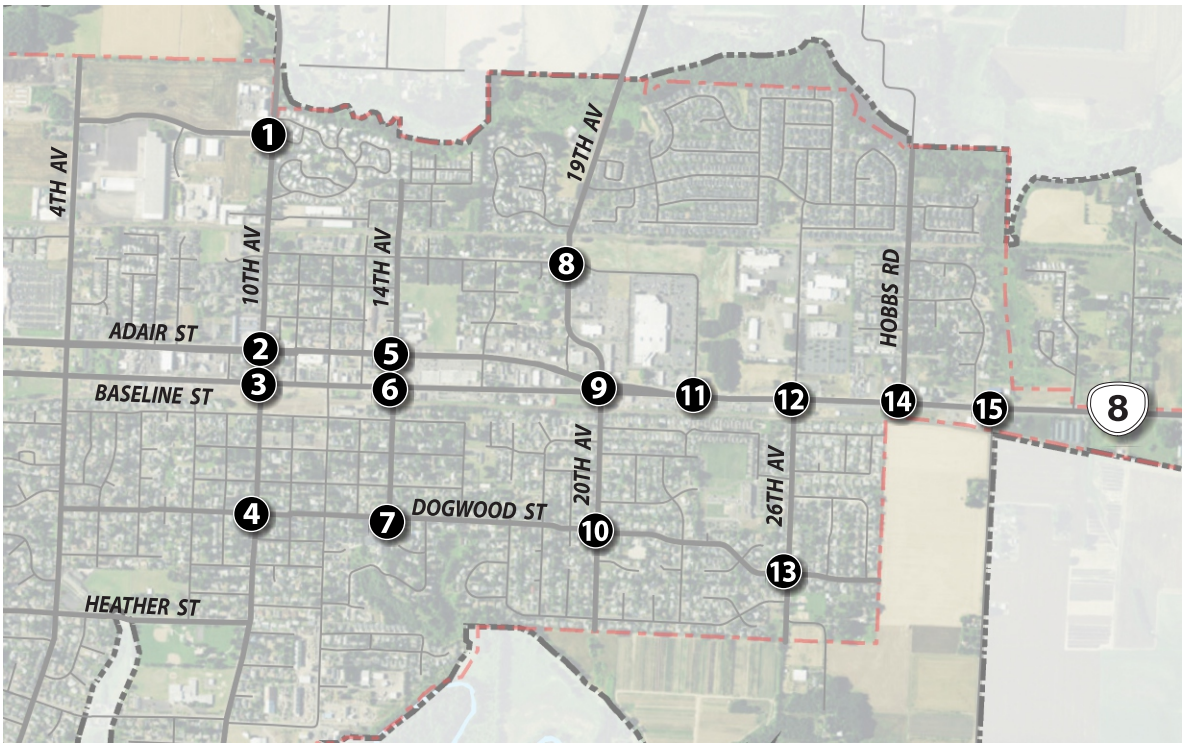
LEGEND

- # - Study Intersection
- STOP - Stop Sign
- Traffic Signal
- Lane Configuration
- 000 - PM Peak Hour Traffic Volume
- LT TH RT - Volume Turn Movement (Left•Thru•Right)

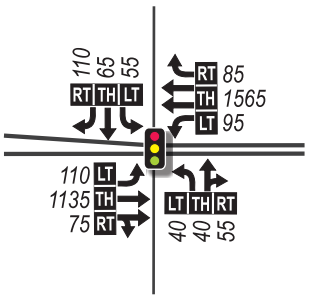
No Scale

Figure **3-11a**

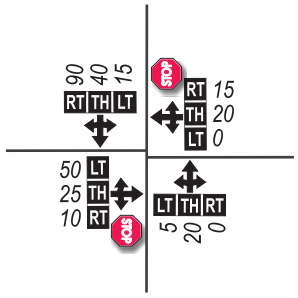
Existing PM Peak Hour Traffic Volumes & Intersection Control



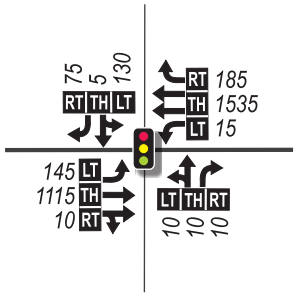
9. *OR 8 (Adair St./Baseline St.) @ 20th Ave.*



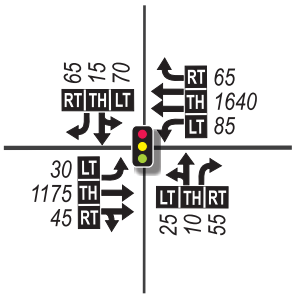
10. *Dogwood St. @ 20th Ave.*



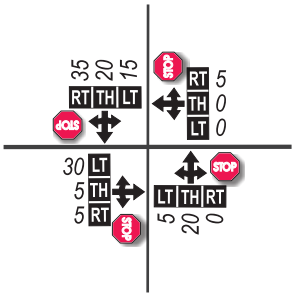
11. *OR 8 (TV Highway) @ Fred Meyer Dwy.*



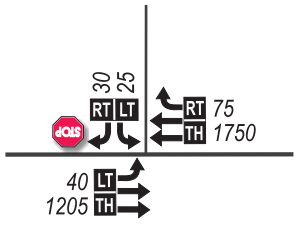
12. *OR 8 (TV Highway) @ 26th Ave.*



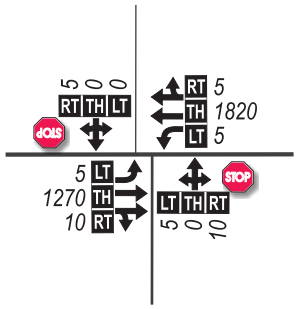
13. *Dogwood St. @ 26th Ave.*



14. *OR 8 (TV Highway) @ 29th Ave.*



15. *OR 8 (TV Highway) @ 345th Ave.*



LEGEND

- # - Study Intersection
- STOP - Stop Sign
- Traffic Signal
- ← - Lane Configuration
- 000 - PM Peak Hour Traffic Volume
- LT TH RT - Volume Turn Movement (Left•Thru•Right)

No Scale

Figure **3-11b**

Existing PM Peak Hour Traffic Volumes & Intersection Control

The PM peak hour intersection counts were used to determine the existing level of service based on the 2000 and 2010 Highway Capacity Manual methodology[13]. Traffic counts and level of service calculation sheets will be provided in the TSP appendix. Table 3-6 summarizes the existing weekday PM peak hour study intersection operation conditions.

The signalized study intersections (all located on OR 8) meet the ODOT minimum performance standard during the PM peak hour. Several unsignalized study intersection operate with significant minor street delay, however they are located on OR 8 and meet ODOT minimum performance standards.

Table 3-6: Existing Weekday Intersection Level of Service (PM Peak Hour)

Intersection	Level of Service	Delay	Volume/ Capacity
Unsignalized Intersections			
Dogwood Street/10th Avenue	A/C	16	0.27
Dogwood Street/14th Avenue	A/B	10.5	0.08
Dogwood Street/ 20th Avenue	A/B	10.6	0.13
Dogwood Street/26th Avenue	A/A	7.4	0.08
Holladay Street/10th Avenue	A/B	11.6	0.08
Davis Street/19th Avenue	A/C	24.9	0.43
OR 8/29th Avenue	C/F	62	0.29
OR 8/345th Avenue	C/F	172.4	0.46
Signalized Intersections			
Adair Street/10th Avenue	C	21.0	0.66
Baseline Street/10th Avenue	B	15.0	0.56
Adair Street/14th Avenue	A	7.2	0.68
Baseline Street/14th Avenue	A	6.5	0.52
OR 8/20 Avenue	D	51.7	0.76
OR 8/Fred Meyer Access	B	15.3	0.71
OR 8/26th Avenue	B	16.1	0.71

Signalized intersections:
LOS = Level of Service of Intersection
V/C = Volume-to-Capacity Ratio of Intersection
Delay = Average Delay of Intersection

Stop controlled intersections:
LOS = Level of Service of Major Street/Minor Street
V/C = Volume-to-Capacity Ratio of Worst Movement
Delay = Delay of Worst Movement

[13] *2000 Highway Capacity Manual*, Transportation Research Board, 2000 and *2010 Highway Capacity Manual*, Transportation Research Board, 2010.

Community Survey

The TSP Community Survey found citizens are interested in improving the vehicle network. Specific responses requested alternative east and west travel options north and south of the highway and more street connections to improve through traffic.

The TSP Community Survey also found citizens are interested in improving traffic operations. A specific response requested fixing bottlenecks at intersections.

Motor Vehicle System Deficiencies

The motor vehicle system has several deficiencies that contribute to a poorly connected street system and congested driving conditions.

Connectivity: Consideration should be given the following street extensions to help satisfy regional connectivity guidelines (shown in Figure 3-8):

- Designate S 345th Avenue south of OR 8 as Collector facility. Extend S Dogwood Street east of S 345th Avenue as a Collector Facility.
- Extend N Holladay Street west of N 4th Avenue and east of N 10th Avenue as a Collector facility.

Access Spacing: OR 8 on the east side of Cornelius has a significant number of public street intersections and private driveways not compliant with ODOT spacing standards. There is a need for alternative access options and management strategies along the highway.

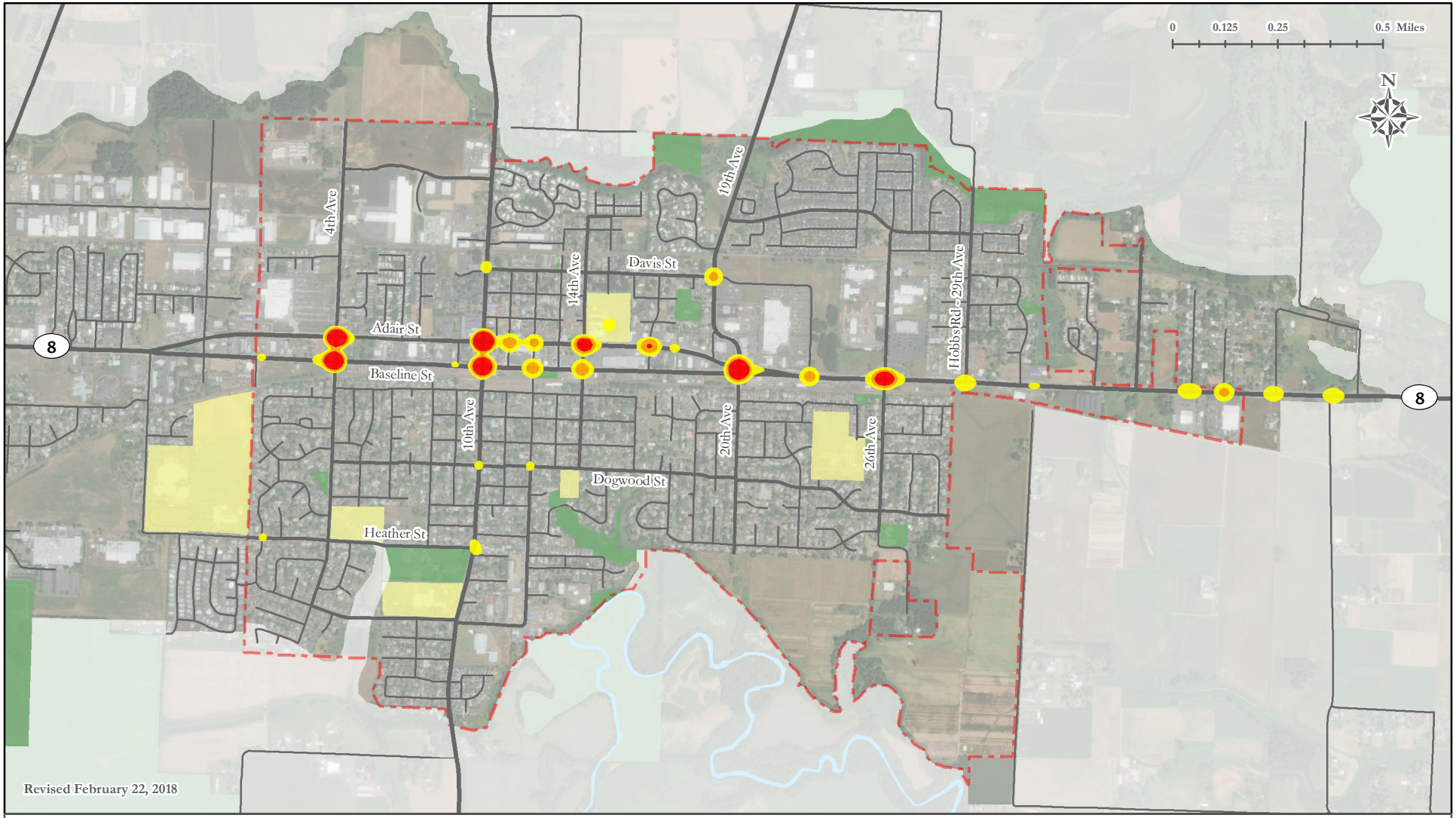
Intersection Operations: The OR 8/345th Avenue and OR 8/29th Avenue intersections operate below standard at LOS F with significant minor street delay experienced by a low volume of traffic. These operational deficiencies may warrant capacity or access management improvements to meet performance standards.

Safety

A review of motor vehicle, pedestrian, and bicyclist reported crashes was conducted based on ODOT data[14] from January 2010 through December 2014 (the most recent five years of available data) within the TSP study area. Data collected for the entire TSP study area showed a total of 498 crashes (an average of about 100 crashes a year). A summary of the high crash locations from low to high frequency is shown in Figure 3-12. The high collision locations cluster around intersections which experience increased vehicle conflicts, and primarily along the OR 8 corridor which serves higher vehicle volumes.

[14] ODOT crash data includes crashes with pedestrians and bicyclists, but only if a motor vehicle was involved. Crash reports are the responsibility of individual drivers, and are only required in the event of death, bodily injury, or damage exceeding $1,500. As such, low-severity crashes are generally underreported.

3-12 High Crash Locations



Legend:

Crash Density

- Low
- High

Parks and Schools

- Parks and/or Natural Areas
- School

- Urban Growth Boundary
- Cornelius City Limit
- Arterial or Collector Street

For the TSP study area, there were eight pedestrian-involved crashes over the past five years. They occurred most frequently along OR 8 between N 10th Avenue and 20th Avenue (six crashes involving a pedestrian). There were 14 bicycle-involved crashes over the past five years. The majority of the bicycle-involved crashes occurred at intersections along OR 8 between N 4th Avenue and 20th Avenue (12 crashes involving a bike on the segment).

Study Intersection Safety Analysis

Collision data specific for the study intersections is summarized in Table 3-7. There were no fatal crashes and 19 serious injury crashes during this period. The high-severity crashes are a small portion of all crashes, making up only four percent of all reported crashes. However, the overall severity of crashes in Cornelius over the past five years is generally low, with 85 percent involving only property damage (no injuries) or minor injuries.

Table 3-7: Intersection Collision Severity and Type (2010 – 2014)

Intersection	Total Collisions	Collision Severity			Collision Type				
		Fatality	Injury	Personal Damage Only	Angle	Rear-end	Turn	Bike	Ped
Dogwood St/10th Ave	4	0	2	2	2	2	-	-	-
Dogwood St/14th Ave	1	0	0	1	-	-	-	-	-
Dogwood St/20th Ave	1	0	0	1	-	-	1	-	-
Dogwood St/26th Ave	1	0	0	1	-	-	-	-	-
Holiday St/10th Ave	2	0	0	2	-	-	1	-	-
Davis St/19th Ave	8	0	2	6	4	-	1	-	-
Adair St/10th Ave	31	0	18	13	14	10	5	2	-
Baseline St/10th Ave	26	0	16	10	5	11	6	1	3
Adair St/14th Ave*	20	0	12	8	3	12	1	-	-
Baseline St/14th Ave*	12	0	6	6	1	6	5	-	-
OR 8/20th Ave	42	0	20	22	5	20	10	2	1
OR 8/Fred Meyer	9	0	3	6	-	8	1	-	-
OR 8/26th Ave	26	0	14	12	2	17	1	-	-
OR 8/29th Ave	13	0	9	4	-	7	4	-	-
OR 8/345th Ave	8	0	3	5	-	7	-	-	-

* Baseline and Adair Street at 14th Avenue underwent a major construction project during the five-year analysis period (2010-2014) which may have contributed to the number and type of collisions. The construction project was completed in 2014.

Crash rates provide an additional perspective on intersection safety and identify locations where people have a higher risk of being involved in a crash. Crash frequencies (the number of crashes in a period of time) tend to increase with higher vehicle traffic. With more exposure to vehicles, there are more opportunities for crashes to occur. Crash rates consider the amount of crashes relative to the traffic volume at the intersection, and are expressed in units of crashes per million entering vehicles. Study intersections are divided into groups of similar intersections for this analysis, called "Intersection Populations."

Crash rates for the study intersections were calculated and evaluated using two methods: the critical crash rate method from the Highway Safety Manual; and by comparison to statewide 90th percentile crash rates published by ODOT. The critical crash rate method compares an intersection's crash history to that of other similar intersections in Cornelius, adjusting for volume at the intersection. The 90th percentile crash rate compares an intersection's crash history to that of other similar intersections across Oregon. Where an intersection's crash rate is greater than either of these two thresholds, it is an indication that a problem might exist and that further study is warranted.

The Excess Proportion of Specific Crash Types method from the Highway Safety Manual was used as an additional analysis at locations with high crash rates. This method identifies the types of crashes that are over-represented at an intersection, when compared to other similar intersections.

There were four intersections with high crash rates that exceeded either the critical crash rate or 90th percentile crash rate as shown in Table 3-8. These intersections are identified as high crash locations.

Table 3-8: Intersection Crash Rates (2010 – 2014)

Intersection	Total Crashes	Observed Crash Rate (per MEV)	Critical Crash Rate (per MEV)	Over Critical Crash Rate?	90th Percentile Rate (per MEV)	Over 90th Percentile Rate	Excess Proportion Crash Types*
Dogwood St/10th Ave	4	0.34	0.51	Under	0.41	Under	-
Dogwood St/14th Ave	1	0.19	0.68	Under	0.41	Under	-
Dogwood St/20th Ave	1	0.19	0.68	Under	0.41	Under	-
Dogwood St/26th Ave	1	0.39	0.93	Under	0.41	Under	-
Holiday St/10th Ave	2	0.25	0.40	Under	0.29	Under	-
Davis St/19th Ave	8	0.54	0.48	Over	0.41	Over	None
Adair St/10th Ave	31	0.75	0.71	Over	0.86	Under	Angle
Baseline St/10th Ave	26	0.77	0.74	Over	0.86	Under	Turn
Adair St/14th Ave	20	0.55	0.73	Under	0.86	Under	-
Baseline St/14th Ave	12	0.45	0.77	Under	0.86	Under	-
OR 8/20th Ave	42	0.67	0.68	Under	0.86	Under	-
OR 8/Fred Meyer	9	0.15	0.68	Under	0.86	Under	-
OR 8/26th Ave	26	0.43	0.68	Under	0.86	Under	-
OR 8/29th Ave	13	0.23	0.22	Over	0.29	Under	N/A
OR 8/345th Ave	8	0.14	0.35	Under	0.41	Under	-

Per MEV = Crashes per million entering vehicles
* Excess Proportion analysis presented for high crash rate locations only. Parameters used: 90% minimum probability, 10% minimum excess proportion.

Each intersection with a high crash rate is discussed below.

- **Davis St/19th Ave (stop controlled):** This four-leg intersection with stop control on Davis Street, had eight collisions. The crash rate exceeds both the critical crash rate and the 90th percentile statewide rate. Of the eight collisions, four were angle collisions and three involved a fixed-object. The majority of the crashes resulted in property damages only (6 of 8). There was not a specific crash type identified in excess proportion analysis.

- **Adair St/10th Ave (signalized):** Angle crashes (14 of 31) were the most prominent here. Disregarding traffic controls was the most common cause of crashes. The majority of the crashes resulted in injuries (18 of 31).

- **Baseline St/10th Ave (signalized):** Rear-end crashes were the most common collision types observed at this site. Following too closely was the major cause of rear-end crashes. Turning crashes were identified in the excess proportion analysis. Failing to yield right-of-way and making improper turn were the major causes to turning crashes. More than half of the collisions resulted in injuries (16 of 26). A major construction project was completed on Baseline Street between 10th and 19th Avenue from 2013 to 2015 and may have contributed to the number and type of collisions.

- **OR 8/29th Ave (stop controlled):** This three-leg intersection with stop control on 29th Avenue, had thirteen collisions over the past five years. Rear-end crashes were the most prominent at this intersection, largely due to following too closely.

Safety Priority Index System (SPIS) Assessment

The Safety Priority Index System (SPIS) is a method developed by ODOT for identifying hazardous locations on and off state highways. The score for each 0.10-mile segment of highway is based on three years of crash data, considering crash frequency, rate, and severity. SPIS ranks all segments throughout the state by score and identifies the top 5 percent and top 10 percent segments. According to the ODOT 2015 SPIS ratings (data reported between 2012 and 2014), several locations in the Cornelius TSP study area rank among the top most hazardous sections of highways in Oregon. The identified locations are listed and discussed below.

- **OR 8 around the 336th Avenue intersection (top five percent segment):** 13 crashes occurred from 2012 to 2014, the majority of the crashes (8 of 13) were injury crashes including two resulting in serious injury. The majority of the crashes were rear-end crashes, and following too closely was the prominent cause. The close spacing of intersections in this segment possibly contributes to the high crash rate.

- **OR 8 around the 14th Avenue intersection (top five percent segment):** 18 crashes occurred here from 2012 to 2014, more than half of which were injury crashes including three resulting in serious injury. Rear-end crashes were most common, and following too close was a prominent cause. A major construction project at this location was completed in 2014 and may have contributed to the number and type of collisions.

- **OR 8 between 9th Avenue and 11th Avenue (top five percent segment; high crash rate intersection):** see prior section discussion of Adair Street/10th Avenue and Baseline Street/10th Avenue

- **OR 8 around 29th Avenue intersection (top 10 percent segment; high crash rate intersection):** see prior section discussion of OR 8/29th Avenue

- **OR 8 between 9th Avenue and 11th Avenue (top 10 percent segment; high crash rate intersection):** see prior section discussion of Adair Street/10th Avenue and Baseline Street/10th Avenue

- **OR 8 around the 4th Avenue intersection (top 10 percent segment):** 16 crashes occurred from 2012 to 2014, more than half of the crashes resulted in injuries including one serious injury. Rear-end and turning crashes were the most common at this site. A prominent cause of the crashes was inattention.

Safety Deficiencies

Potential needs and recommendations from the safety analysis include:

- The collision data indicated that actions focusing on motorist behaviors (inattention and following too closely) may be effective, including targeted enforcement and education.

- The most common cause of crashes at Adair Street/10th Avenue was disregarding traffic controls. Improvements to increase compliance may include reflective tape on signal backplates, larger stop signs, and photo-enforced red-light running cameras.

- The most common type and cause of crashes on OR 8 near N 14th Avenue, 29th Avenue, and 336th Avenue were rear-end crashes from following too close. Improvements may include police enforcement of safe following distances.

- Baseline Street and N Adair Street at N 14th Avenue should be monitored to determine if the identified safety issue continues after construction was complete in 2014.

- Baseline Street at N 10th Avenue should be evaluated after construction of the 2017 planned improvements to determine if the identified safety issues remain.

Truck Freight System

Efficient truck movement plays a vital role in the economical movements of raw materials and finished products. The designation of through truck routes provides for this efficient movement while at the same time maintaining neighborhood livability, public safety, and minimizing maintenance costs of the roadway system. Washington County identifies OR 8, Baseline Street and N Adair Street through Cornelius as an Over-Dimensional Truck Route and N 10th Avenue as a Truck Route. Metro has designated OR 8, Baseline Street and N Adair Street as a Reginal Freight Road Connector defined as a road that connects freight facilities and freight generation areas to the main roadway route. OR 8 is not a designated State Freight Route.

ODOT reports bridge conditions on major routes. The bridge on N 29th Avenue-Hobbs Road over Council Creek is identified as functionally obsolete due to its narrow width and posted weight restriction. Freight access to the area is provided by N Hobbs Road via N 19th Avenue-NW Susbauer Road. Current freight routes and bridge conditions are shown in Figure 3-13.

The N Adair Street and Baseline Street at N 10th Avenue do not provide adequate turning radius for heavy vehicles. Freight traffic has a difficult time traveling through the intersections and remaining in the appropriate travel lane. Improvements are planned for these intersections in 2017 that will allow adequate movements for freight.

Truck Freight Deficiencies

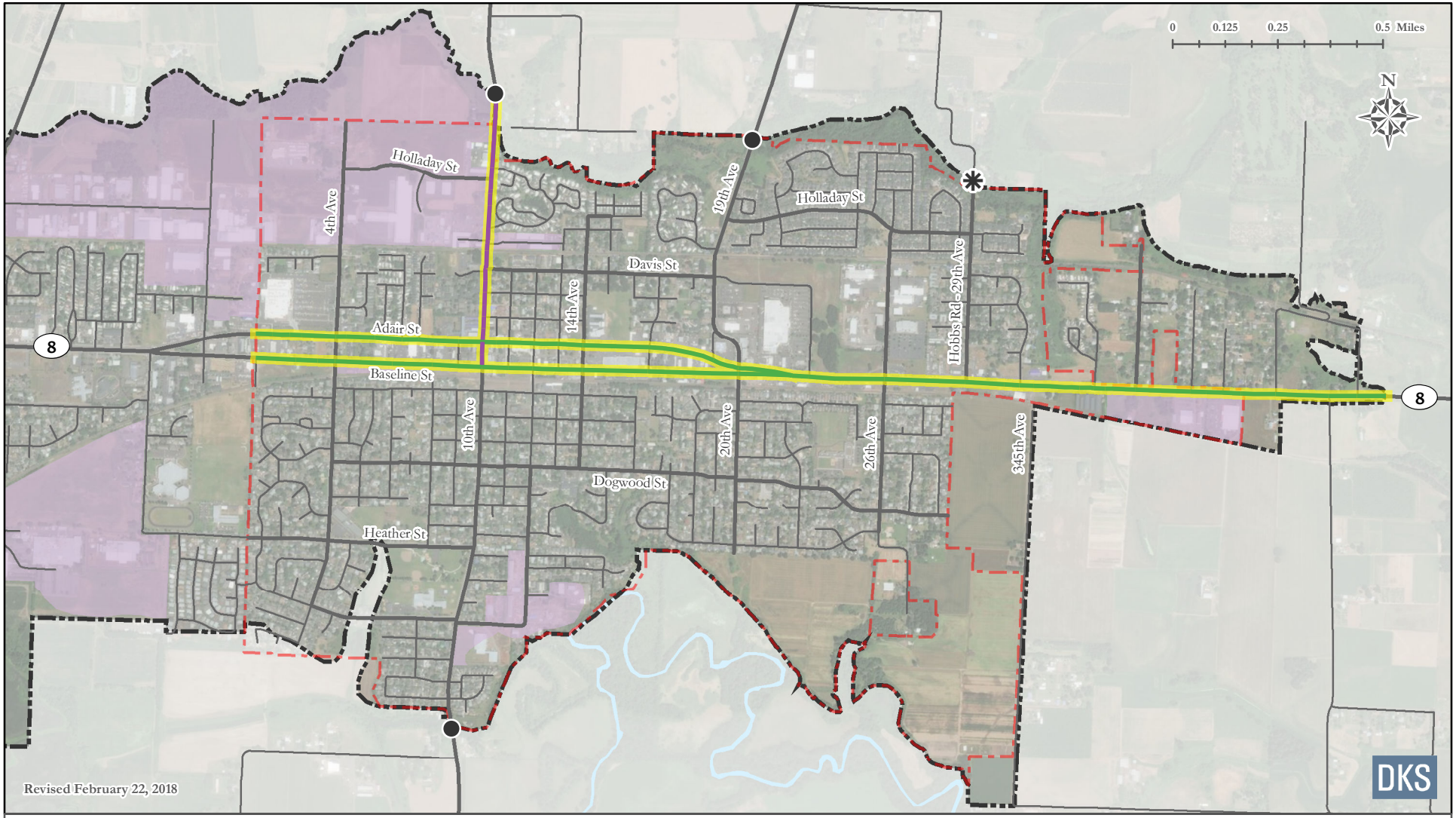
The truck freight system has several deficiencies:

Bridges: The N 29th Avenue-Hobbs Road bridge over Council Creek is identified as functionally obsolete due to its narrow width and posted weight restriction.

Geometrics: N Adair Street and Baseline Street at N 10th Avenue do not provide adequate turning radius for heavy vehicles. Planned improvements will remove this deficiency.

3-13

Freight and Trucking Routes With Bridge Condition



Legend:

Bridge Condition:

- Not Deficient
- Functionally Obsolete

Freight Routes

- Washington County Over-Dimensional Truck Route
- Washington County Truck Route
- Regional Freight Road Connector

Land Use

- Employment Land

- Urban Growth Boundary
- Cornelius City Limit
- Arterial or Collector Street

Rail Freight System

Portland & Western Railroad (PNWR) has two freight lines that pass through Cornelius, the Seghers District (the FAA Line) and Forest Grove District (the 3F line). The FAA line passes through Cornelius one-half block south of OR 8. The 3F line passes through Cornelius approximately five blocks north of OR 8 and one block north of N Davis Street.

The FAA line is owned by Union Pacific Railroad and is operated and maintained by PNWR under lease. The 3F line track and appurtenances are owned by PNWR but the land beneath the railroad is owned by the State of Oregon and administered by the Department of Transportation, Rail and Public Transit Division. There are one to two trains a day at maximum speed of 25 mph on the FAA Line, and less than one train a day at 5 mph on the 3F Line. Within the study area, the FAA Line has seven at-grade crossings and the 3F Line has eight at-grade crossings. There are no passenger trains running through Cornelius at this time. PNWR handles less than 1 million gross tons of freight through Cornelius annually. Figure 3-14 shows the existing rail freight lines and type of control at each crossing. The S 11th and 12th Avenue crossings on the FAA Line were recently closed to motor vehicles, the S 12th Avenue crossing was replaced with a pedestrian and bicycle only crossing. The FAA Line crossings from S 4th to 26th Avenue are equipped with flashing lights, bells and gate arms that lower when a train approaches.

Public crossing incident data from 1965 to the present was obtained from the Federal Railroad Association for both rail lines in the study area. Nine public crossing incidents have occurred over the last 50 years with one total injury and no fatalities. The public crossing incident data is shown in Table 3-9.

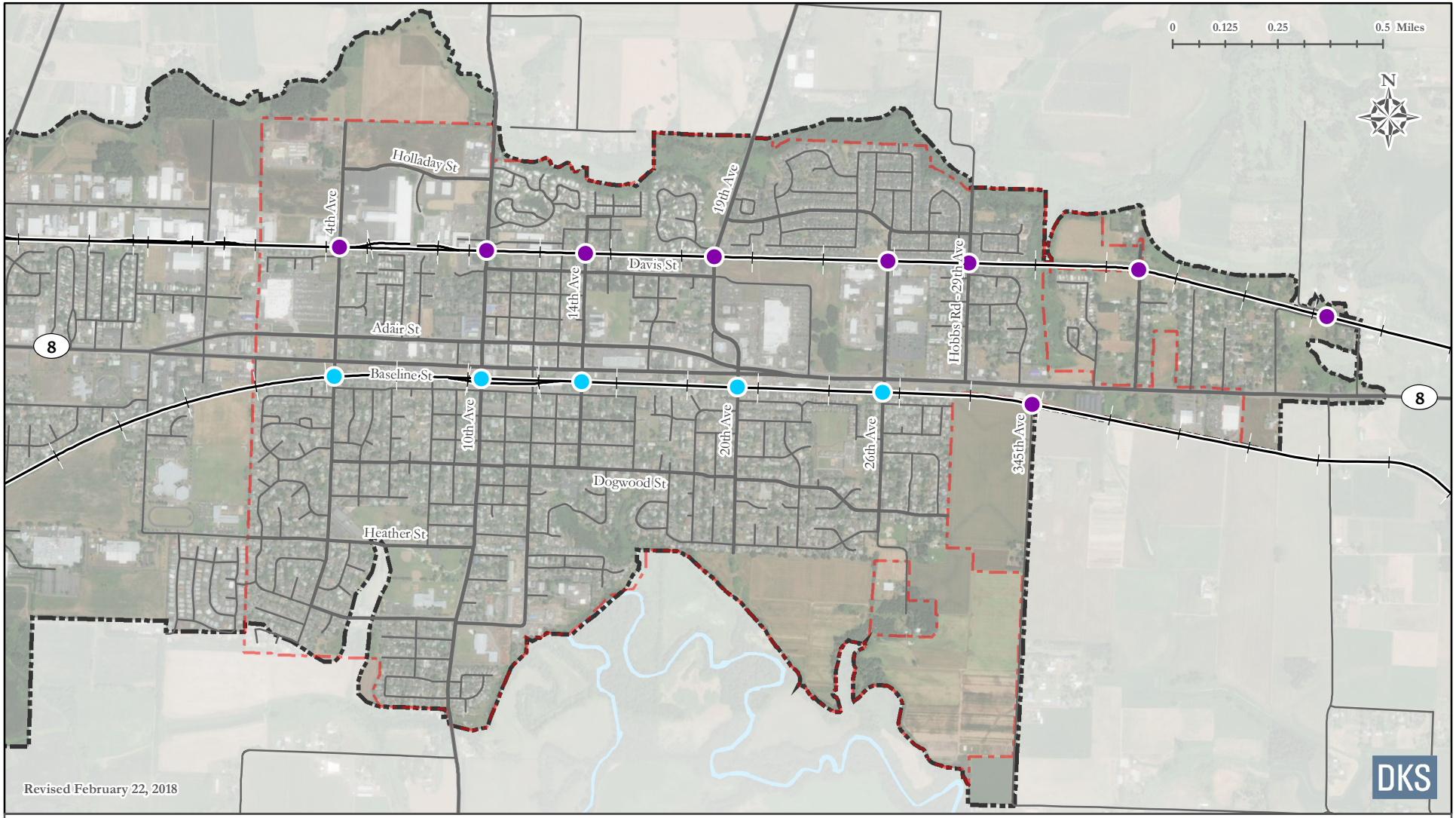
Table 3-9: Public Rail Crossing Incident Data (1965 to Present)

Public Crossing Location	Number of Incidents	Injuries	Fatalities
N 4th Avenue	1	0	0
N 14th Avenue	1	0	0
N 19th Avenue (Susbauer Road)	1	0	0
S 12th Avenue	3	0	0
S 26th Avenue (Webb Road)	3	1	0

Rail Freight Deficiencies

At-Grade Crossings: The at-grade rail crossings on the FAA Line east of S 26th Avenue provide signage only, no gates or flashing lights. Safety controls may be warranted as vehicle, bicycle and pedestrian volumes increase with urban development.

3-14 Rail Lines and Crossings



Legend:

Rail:

- At-Grade Crossing, gated
- At-Grade Crossing, ungated
- Railroad

- Urban Growth Boundary
- Cornelius City Limit
- Arterial or Collector Street

4. Future Demand and Land Use

The Cornelius TSP addresses existing system needs and additional facilities that are required to serve future growth. Metro's urban area transportation forecast model was used to determine future traffic volumes in Cornelius. This forecast model translates assumed land uses into person travel, selects travel modes and assigns motor vehicles to the roadway network. These traffic volume projections form the basis for identifying potential roadway deficiencies and for evaluating alternative circulation improvements. This section describes the forecasting process including key assumptions and the land use scenario developed from the existing Comprehensive Plan designations and allowed densities.

Projected Land Use Growth

Land use is a key factor in developing a functional transportation system. The amount of land that is planned to be developed, the type of land uses, and how the land uses are mixed together have a direct relationship to expected demands on the transportation system. Understanding the amount and type of land use is critical to taking actions to maintain or enhance transportation system operation. The City's Zoning and Comprehensive Plan land use designations are shown in Figures 4-1 and 4-2.

Projected land uses were developed for the study area and reflect the Comprehensive Plan and Metro's land use assumptions for the year 2040. The future land use projections were deemed acceptable as part of the City's recent urban growth boundary expansion. Complete land use data sets were developed for the following conditions.

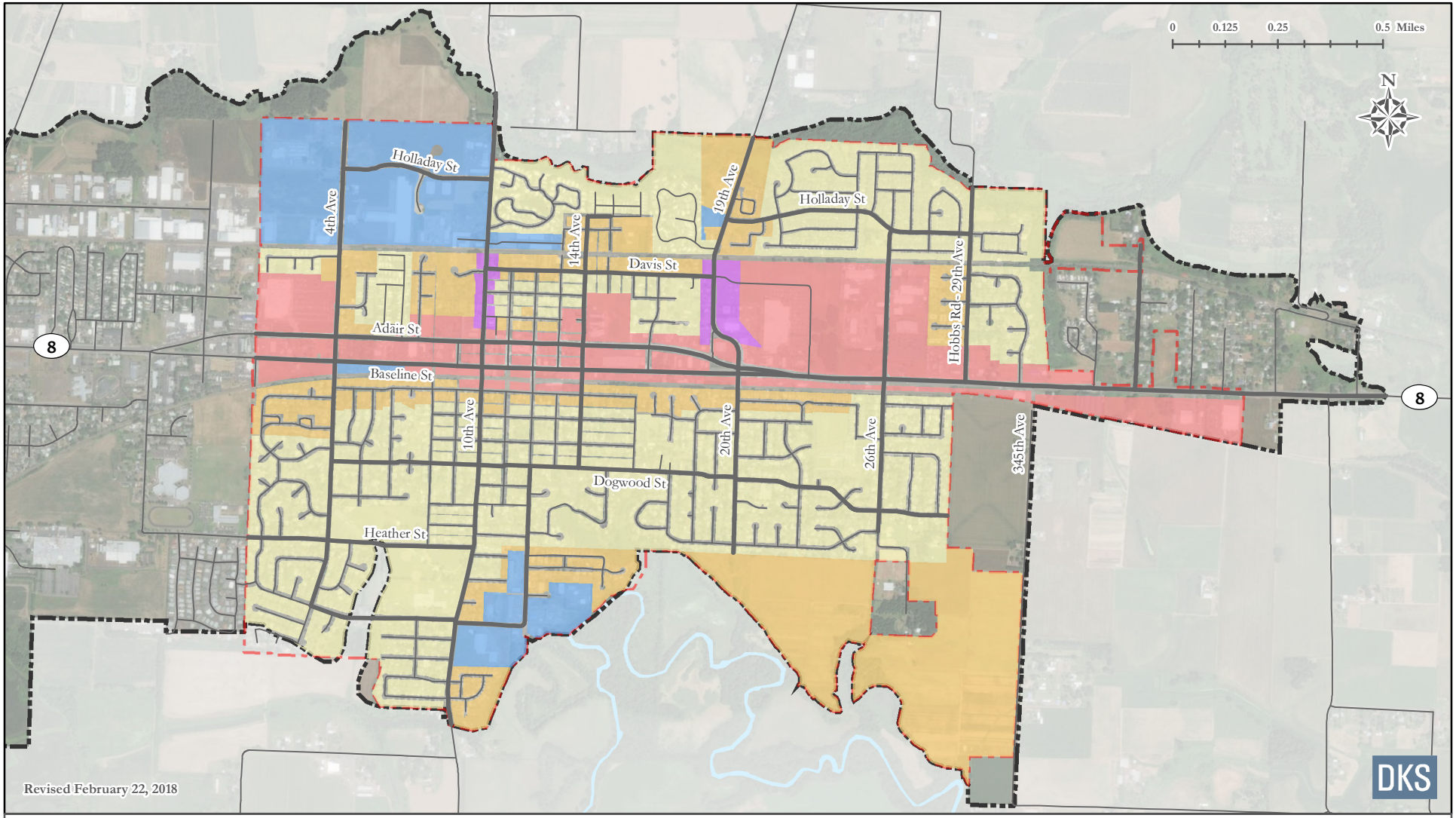
- Existing 2010 Conditions (base travel forecast for the region)
- Future 2040 Conditions

The following sections summarize the forecasted growth that will influence travel within Cornelius.

Growth within Cornelius

For this study effort, the available base model provided by Metro was for 2010. This land use database includes the number of dwelling units, retail employees and other employees. Table 4-1 summarizes the population and land uses for the 2010 base and future 2040 scenarios within the Cornelius TSP Update study area. These land use projections are significantly higher than the previous 2025 forecasts, reflecting the development potential of the urban growth boundary expansion area. A detailed summary of the uses for each Transportation Analysis Zone (TAZ) within the Cornelius study area is provided in the technical appendix.

4-1 Zoning Designations



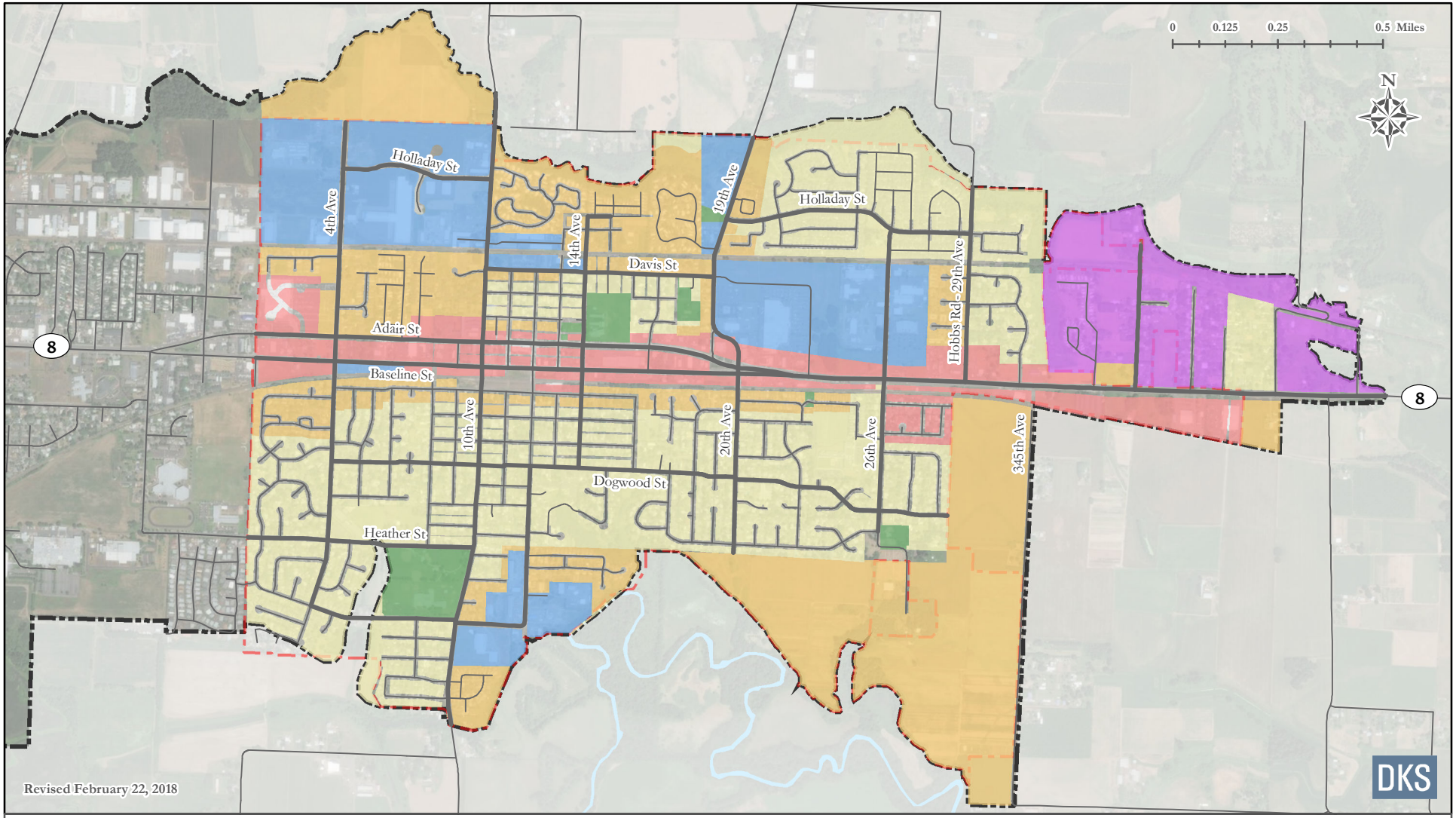
Legend:

Cornelius Zoning Designations

- Commercial
- Mixed-Use
- Industrial
- Single-Family Residential
- Multi-Family Residential

- Urban Growth Boundary
- Cornelius City Limit
- Arterial or Collector Street

4-2 Comprehensive Plan Designations



Legend:

Cornelius Zoning Designations

- Commercial
- Mixed-Use
- Industrial
- Single-Family Residential
- Multi-Family Residential

- Urban Growth Boundary
- Cornelius City Limit
- Arterial or Collector Street

Table 4-1: Cornelius TSP Study Area Land Use Summary

Land Use	Year 2010	Year 2040	30-year Growth	Percent Increase
Population	11,875	17,407	5,532	47%
Households	3,518	5,805	2,287	65%
Retail Employees	693	1,767	1,074	155%
Service Employees	712	2,086	1,374	194%
Other Employees	1,679	4,958	3,279	395%

Year 2010 population estimate from Portland State University, Population Research Center
Year 2040 population estimate and growth from Cornelius Economic Opportunities Analysis[1]
Land use data from Metro 2010 and 2040 Gamma travel demand models

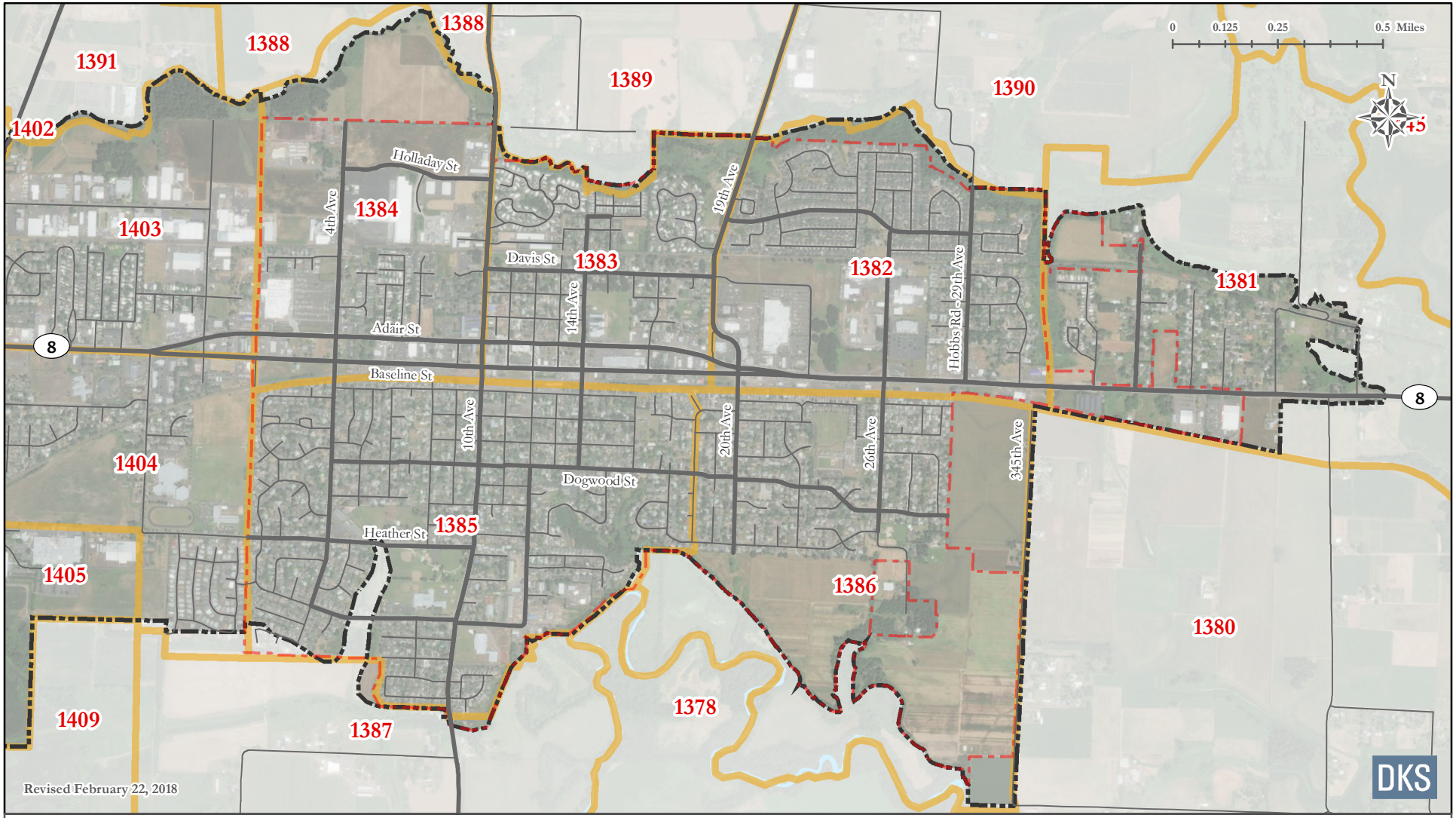
At the existing level of land development, the transportation system generally operates without significant deficiencies in the study area. As land uses change in proportion to each other (i.e. there is a significant increase in employment relative to household growth), there will be a shift in the overall operation of the transportation system. Retail land uses generate higher amounts of trips per acre of land than households do and other land uses. The location and design of retail land uses in a community can greatly affect transportation system operation. Additionally, if a community is homogeneous in land use character (i.e. all employment or residential), the transportation system must support significant trips coming to or from the community rather than within the community. Typically, there should be a mix of residential, commercial, and employment type land uses so that some residents may work and shop locally, reducing the need for residents to travel long distances.

Table 4-1 indicates that significant employment growth (about 4,700 jobs) is expected in Cornelius in the coming decades. The transportation system should be monitored to make sure that land uses in the plan are balanced with transportation system capacity. This TSP balances needs with the forecasted 2040 land uses.

For transportation forecasting, the land use data is separated into geographical areas called transportation analysis zones (TAZs), which represent the sources of vehicle trip generation. There are approximately six Metro TAZs within the Cornelius TSP Update study area. The TAZ boundaries are shown in Figure 4-2. The projected growth for each land use category (households, retail employees and other employees) within each TAZ is shown in Figures 4-4 through 4-6.

[1] DRAFT Economic Opportunities Analysis, City of Cornelius, PNW Economics LLC, October 20, 2016.

4-3 Transportation Analysis Zones

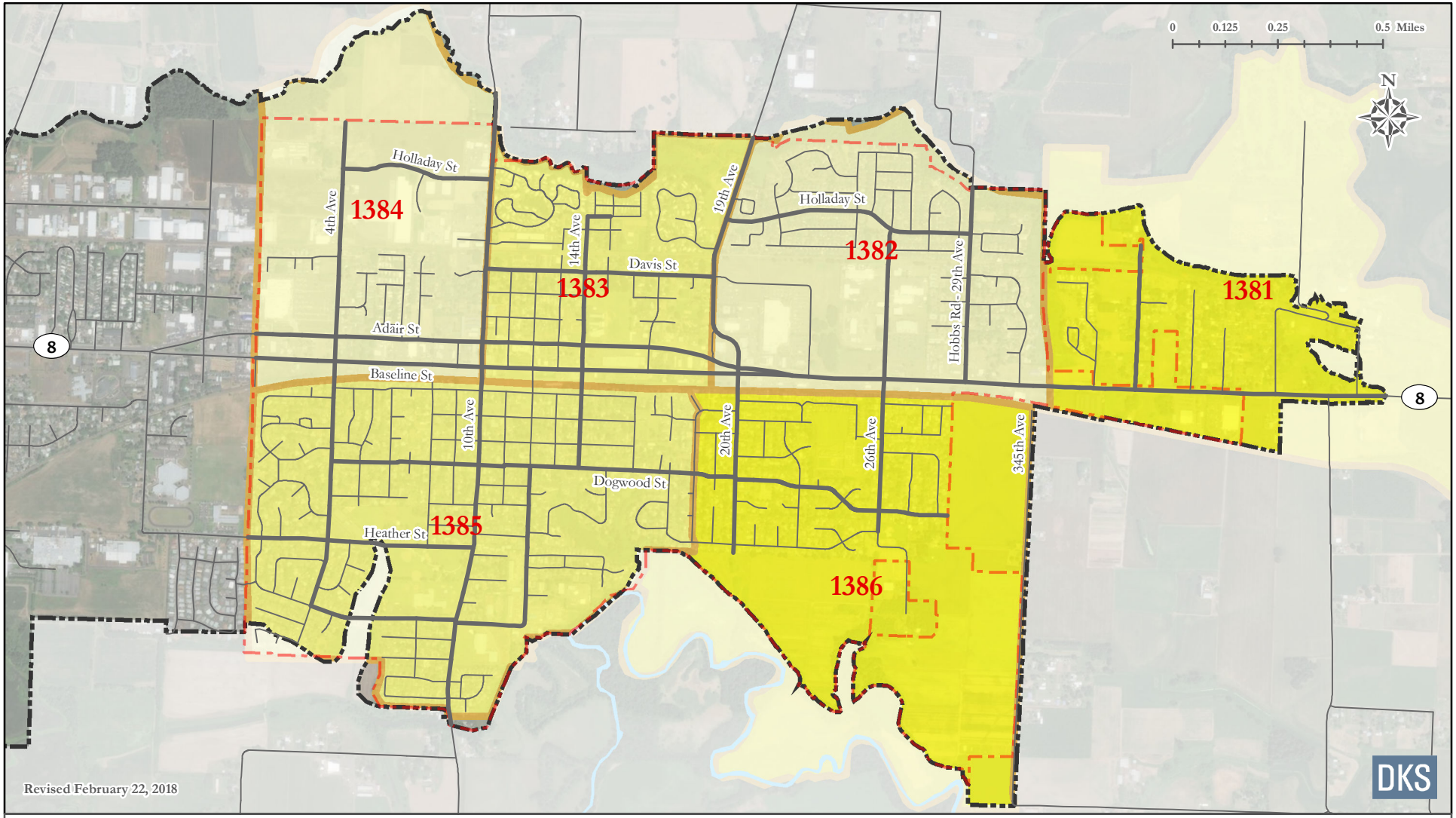


Legend:

Transportation Analysis Zones

- Transportation Analysis Zone (TAZ)
- # TAZ Number
- Urban Growth Boundary
- Cornelius City Limit
- Arterial or Collector Street

4-4 Projected Growth by TAZ – Households



Legend:

Projected Household Growth by TAZ between 2010 and 2040

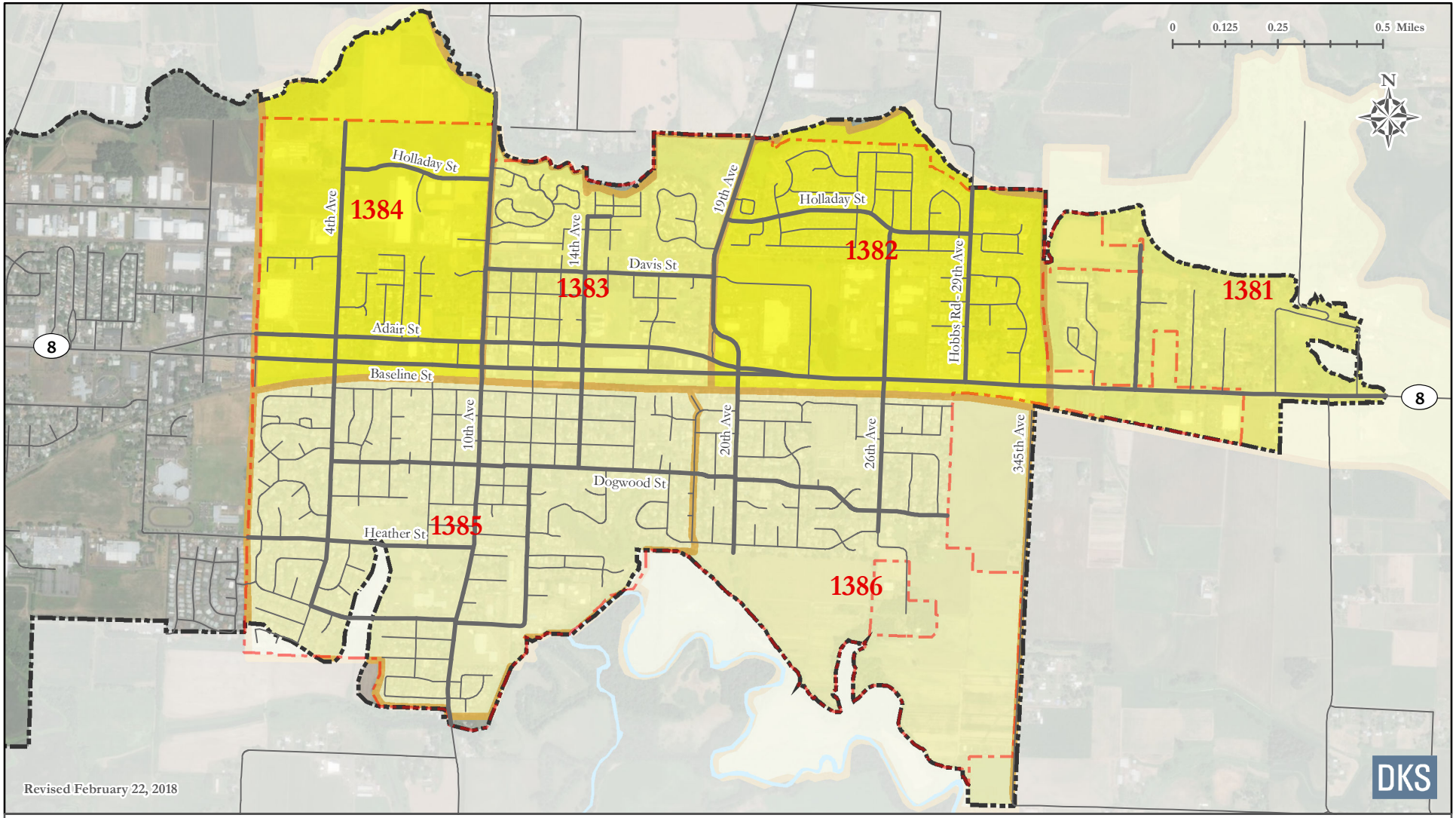
- Less than 55 Households
- 55 to 300 Households
- More than 300 Households

Transportation Analysis Zones

- Transportation Analysis Zone (TAZ)
- # TAZ Number

- Urban Growth Boundary
- Cornelius City Limit
- Arterial or Collector Street

4-5 Projected Growth by TAZ – Retail Employment



Legend:

Projected Retail Employment Growth by TAZ between 2010 and 2040

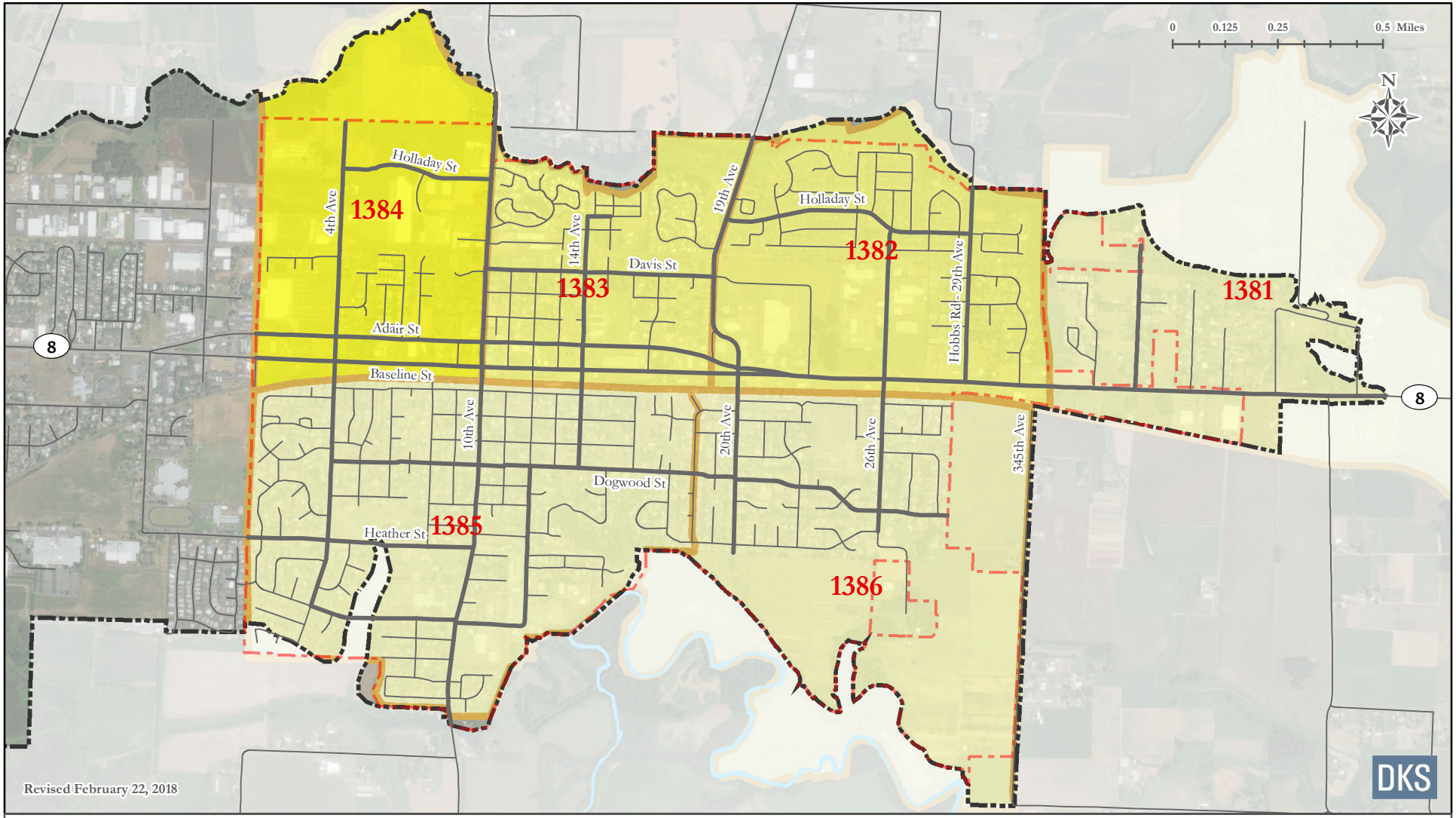
- Less than 75 Employees
- 75 to 200 Employees
- More than 200 Employees

Transportation Analysis Zones

- Transportation Analysis Zone (TAZ)
- # TAZ Number

- Urban Growth Boundary
- Cornelius City Limit
- Arterial or Collector Street

4-6 Projected Growth by TAZ – Service and Other Employment



Legend:

Projected Service and Other Employment Growth by TAZ between 2010 and 2040

- Less than 350 Employees
- 350 to 850 Employees
- More than 850 Employees

Transportation Analysis Zones

- Transportation Analysis Zone (TAZ)
- # TAZ Number

- Urban Growth Boundary
- Cornelius City Limit
- Arterial or Collector Street

Metro Area Transportation Model

A determination of future traffic system needs in Cornelius requires the ability to accurately forecast travel demand resulting from estimates of future population and employment for the City. The objective of the transportation planning process is to provide the information necessary for making decisions on when and where improvements should be made to the transportation system to meet travel demand as developed in an urban area travel demand model as part of the Regional Transportation Plan update process. Metro uses Visum, a computer based program for transportation planning, to process the large amounts of data for the Portland Metropolitan area. For the Cornelius TSP Update, the regional 2040 model used for the 2014 RTP update was used to develop future forecasts.

Traffic forecasting can be divided into several distinct but integrated components that represent the logical sequence of travel behavior (see Figure 4-7). These components and their general order in the traffic forecasting process are as follows:

- Trip Generation
- Trip Distribution
- Mode Choice
- Traffic Assignment

The initial roadway network used in the traffic model was the existing streets and roadways. Future 2040 land use scenarios were tested and roadway improvements were added to mitigate the impacts of motor vehicle traffic growth, using the RTP Priority System as a starting basis. Improvements in the RTP were validated in the study process. Forecasts of PM peak period traffic flows were produced for every major roadway segment within Cornelius. Traffic volumes were projected on all arterials and collector streets. Some local streets were included in the model, but many are represented by centroid connectors in the model process.

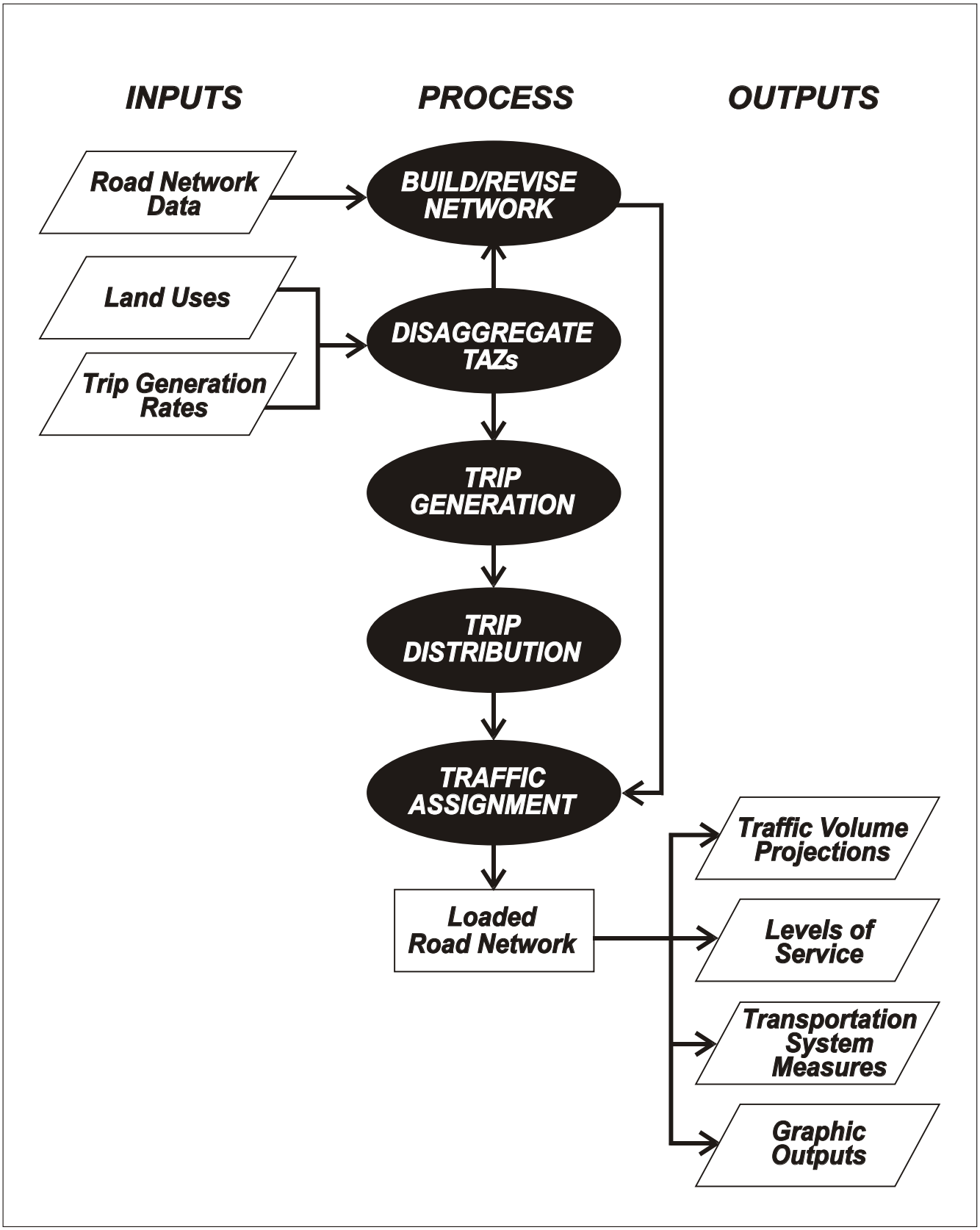


Figure 4-7
MODEL PROCESS

Trip Generation

The trip generation process translates land use quantities (number of dwelling units, retail, and other employment) into vehicle trip ends (number of vehicles entering or leaving a TAZ or sub-TAZ) using trip generation rates established during the model verification process. The Metro trip generation process is complex, entailing detailed trip characteristics for various types of housing, retail employment, non-retail employment, and special activities, as well as time of day, mode choice, and distribution parameters. Typically, most traffic impact studies rely on the Institute of Transportation Engineers (ITE) research for analysis[2]. The model process is tailored to variations in travel characteristics and activities in the region. For reference purposes only, Table 4-2 provides a summary of the approximate average evening peak hour trip rates resulting from the Metro model process. These are averaged over a broad area and thus, are different than driveway counts represented by ITE. This data provides a reference for the trip generation process used in the model.

Table 4-2: Approximate Average PM Peak Period Trip Rates from the Metro Model

	Average Trip Rate/Unit		
Unit	**In**	**Out**	**Total**
Household (HH)	0.40	0.20	0.60
Retail Employee (RET)	0.56	0.76	1.32
Other Employee (OTH)	0.09	0.28	0.38

Source: DKS Associates/Metro

Table 4-3 summarizes the estimated growth in vehicle trips generated within the Cornelius study area during the PM peak period (2-hr peak) between 2010 and 2040. It indicates that vehicle trips in Cornelius would grow by approximately 93 percent between 2010 and 2040 if the land develops according to Metro's 2040 land use assumptions. Assuming a 30-year horizon to the 2040 scenario, this represents annualized growth rate of approximately 3.1 percent per year.

[2] *Trip Generation Manual*, 7th Edition, Institute of Transportation Engineers, 2003.

Table 4-3: Cornelius Vehicle Trip Generation (2-Hour PM Peak Period)

	2010 Trips	2040 Trips	Percent Increase
Cornelius TSP Update Study Area	4,764	9,175	93%

Trip Distribution

This step estimates how many trips travel from one zone in the model to any other zone. Distribution is based on the number of trip ends generated in each zone pair and on factors that relate the likelihood of travel between any two zones to the travel time between zones. In projecting long-range future traffic volumes, it is important to consider potential changes in regional travel patterns. Although the locations and amounts of traffic generation in Cornelius are essentially a function of future land use in the city, the distribution of trips is influenced by regional growth, particularly in neighboring areas such as Hillsboro and Forest Grove as well as the unincorporated Washington County areas. External trips (trips that have either an origin and not a destination in Cornelius or have a destination but not an origin in Cornelius) and through trips (trips that pass through Cornelius and have neither an origin nor a destination in Cornelius) were projected using trip distribution patterns based upon census data and traffic counts performed at gateways into the Metro Urban Growth Boundary (UGB) calibration.

Mode Choice

This step determined how many trips will be by various modes (single-occupant vehicle, transit, carpool, pedestrian, bicycle, etc.). The 2010 mode splits are incorporated into the base model and adjustments to that mode split may be made for the future scenario, depending on any expected changes in transit or carpool use. These considerations are built into the forecasts used for 2040.

Based upon analysis of the forecasted mode choice in 2040, an analysis was performed to determine the level of non-single occupant vehicle (SOV) mode share. The travel model provides estimates of the various modes of travel that can be generally assessed at the transportation analysis zone (TAZ) level. Figure 4-8 summarizes the level of non-SOV mode share estimated for 2040 using the regional travel demand forecast model in comparison to the modal targets established in Table 3.08-1 of the Regional Transportation Functional Plan (RTFP). Generally, the areas served by bus service have the highest levels of non-SOV mode use.

Traffic Assignment

In this process, trips from one zone to another are assigned to specific travel routes in the network, and resulting trip volumes are accumulated on links of the network until all trips are assigned.

Network travel times are updated to reflect the congestion effects of the traffic assigned through an equilibrium process. Congested travel times are estimated using what are called "volume-delay functions" in Visum. There are different forms of volume/delay functions, all of which attempt to simulate the impact of congestion on travel times (greater delay) as traffic volume increases. The volume-delay functions take into account the specific characteristics of each roadway link, such as capacity, speed and facility type. This allows the model to reflect conditions somewhat similar to driver

behavior.

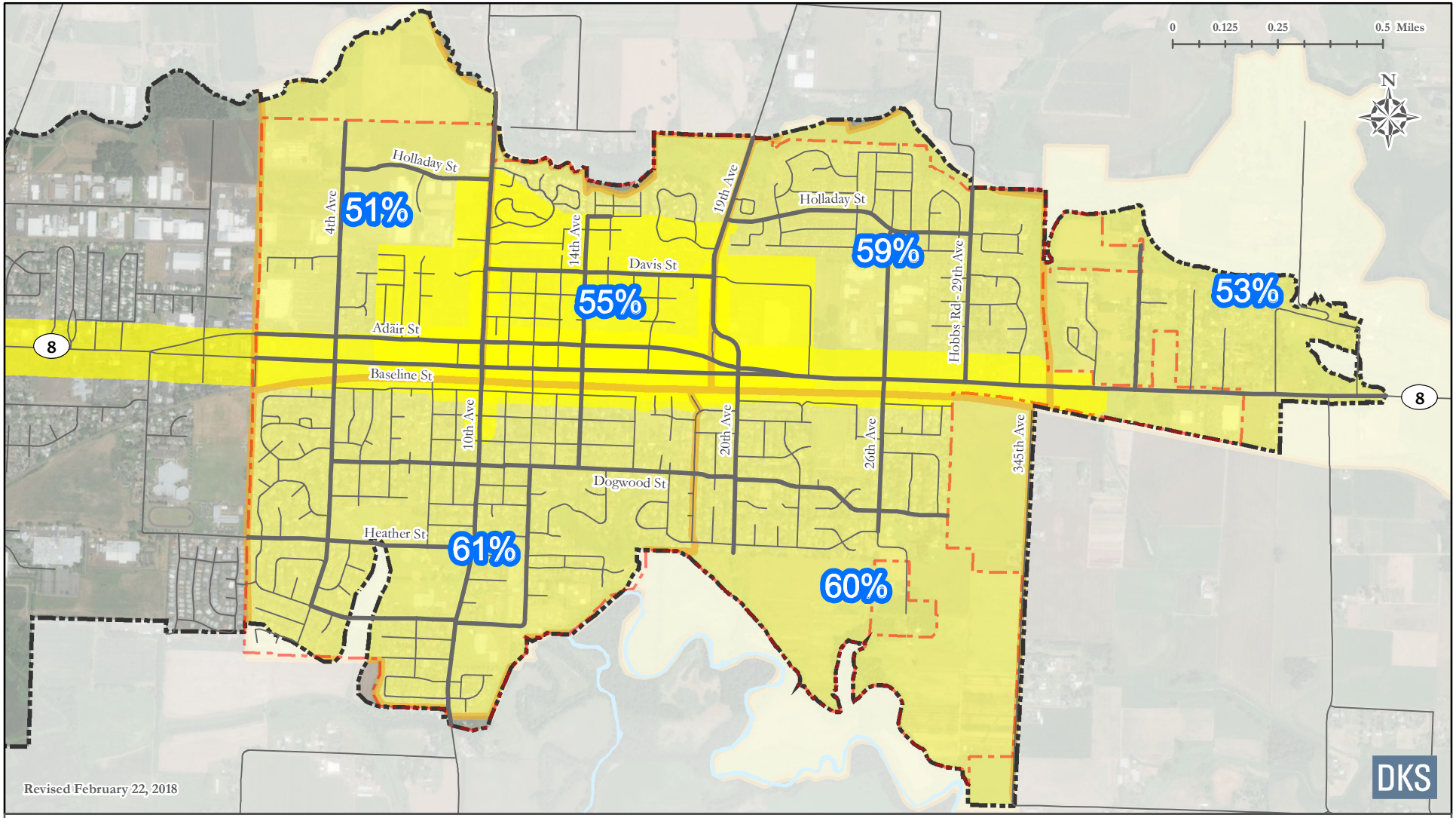
Model Verification

The base 2010 modeled traffic volumes were compared against actual traffic volume counts across screenlines, on key arterials and at key intersections. Most arterial traffic volumes met screenline tolerances for forecast adequacy. Based on this performance, the model was used for future forecasting and assessment of circulation change.

Model Application to Cornelius

Intersection turn movements were extracted from the model at key intersections for both the base year 2010 and forecast year 2040 scenarios. These intersection turn movements were not used directly, but a portion of the increment of the year 2040 turn movements over the 2010 turn movements was applied (added) to existing (actual 2016) turn movement counts in Cornelius. A post processing technique was utilized to refine model travel forecasts to the volume forecasts utilized for 2040 intersection analysis. The turn movement volumes used for future year intersection analysis can be found in the technical appendix.

4-8 2040 Non-Single Occupancy Vehicle Analysis



Legend:

Regional Non-SOV Mode Share Targets

- Non-SOV Target 40-45% (Employment Areas, Neighborhoods)
- Non-SOV Target 45-55% (Town Centers, Corridors)

Transportation Analysis Zones

- Transportation Analysis Zone (TAZ)
- XX% 2040 Non-SOV Mode Share Percentage

- Urban Growth Boundary
- Cornelius City Limit
- Arterial or Collector Street

5. Pedestrian Plan

This chapter summarizes the pedestrian needs in the City of Cornelius and presents the Pedestrian Financially Constrained Plan and Strategic Plan. The goals and project development approach used to identify pedestrian needs and prioritize solutions are provided in Chapter 2. A detailed description of the existing transportation system and needs is provided in Chapter 3.

Development of Walking Solutions

The 2005 Cornelius TSP identified a connected network of routes to facilitate walking trips throughout the city, including routes to key destinations such as commercial activity, schools, parks and transit. Some of the 2005 pedestrian network has been constructed, with sidewalks and pedestrian crossings added as a part of roadway projects, residential or commercial development projects and stand-alone pedestrian improvement projects. The evaluation of the pedestrian system revealed that the following needs still remain:

- Gaps in the sidewalk network in the Main Street District
- Lack of sidewalks connecting neighborhoods to downtown
- Lack of pedestrian crossings across major roadways (e.g. rural portion of OR 8)
- Lack of pedestrian facilities at existing railroad crossings
- Lack of sidewalks/crossings along portions of transit routes (e.g. rural portion of OR 8)
- Lack of transit service to neighborhoods

To address these gaps, the evaluation criteria emphasize completing gaps to key pedestrian attractors such as schools, parks, transit stops and commercial areas. Additional walking routes and crossing improvements (including near transit stops) were added to the pedestrian network.

Several other types of deficiencies were identified during the review of the pedestrian network. These deficiencies are summarized below:

- Difficulties for pedestrians with mobility impairments – An ADA/Curb Ramp Upgrade Program would promote universal access.

- Lack of pedestrian crossings on major roadways – Pedestrian crossing improvements on major roadways are addressed through projects on OR 8.
- Limited street connectivity in some areas – Need for more direct walking routes.

Pedestrian Plan

The approach to developing transportation solutions for this TSP focused on more cost-effective solutions which includes encouraging multiple travel options and promoting a more sustainable transportation system. The full development of pedestrian projects and programs is provided in the Technical Appendix - Technical Memorandum #6. Transportation system facilities and programs needed to meet TSP goals and objectives for pedestrians include:

- **Sidewalks**: Sidewalks are located along roadways, are separated from the roadway with a curb and/or planting strip, and have a hard, smooth surface, such as concrete. The unobstructed travel way for pedestrians should be clear of utility poles, sign posts, fire hydrants, vegetation and other site furnishings. Cornelius identified 33 walking projects that will cost an estimated $15.9 million to complete.
- **Shared-Use Paths**: Shared-use paths are used by a variety of non-motorized users, including pedestrians, cyclists, skaters, and joggers. Shared-use paths can create both efficient commuter routes and recreational opportunities for walking and bicycling users. The Cornelius Parks Master Plan[1] and Council Creek Regional Trail Master Plan[2] provide additional shared-use path projects to be incorporated in the TSP. The citywide shared-use path plan includes 14 projects totaling an estimated $14 million.
- **Street Crossing Improvements**: Solutions include incorporating marked crosswalks, high visibility crossings and curb extensions to improve the safety and convenience of street crossings. Three crossing projects were identified, totaling an estimated $200,000.
- **ADA/Curb Ramp Improvements:** Solutions include developing a program to identify and fund upgrades to deficient facilities. The pedestrian plan includes a program estimated to cost $500,000.

Improvements to the pedestrian network include sidewalk infill along key arterial and collector street corridors. Construction of new roadways identified in Chapter 8 - Motor Vehicle Plan are not included in the Pedestrian Plan, but, as a matter of policy, will include construction of sidewalks or pedestrian facilities appropriate to the functional classification of the new roadway.

[1] City of Cornelius Parks Master Plan, October 2009.

[2] Council Creek Trail Master Plan, Parametrix, August 2015.

Financially Constrained System

The Pedestrian Financially Constrained Plan identifies the transportation solutions reasonably expected to be funded by 2040, as summarized in Table 5-1 and illustrated in Figure 5-1. The projects numbered on Figure 5-1 correspond with the project numbers in Table 5-1. The financially constrained projects were selected based on several factors and added to the list until the combined project costs exhausted the estimated available funding. The financially constrained project list for pedestrians includes projects with high and some medium evaluation scores, projects in areas where development is expected and projects identified as funded in other plans. Projects identified as financially constrained in the Draft Metro Regional Transportation Plan Project List (dated July 24, 2017) are noted with the corresponding RTP project number. The project numbers are denoted as pedestrian ("P"), shared-use path ("S"), or street crossing ("C"). Policies and programmatic solutions are denoted with letters. Several projects have dedicated funds (including projects that are development conditions of approval) but have not been constructed (shown with gray highlighting). Planning level cost estimates used to determine the likeliness of funding are also included in Table 5-1.

Table 5-1: Pedestrian Financially Constrained System

Project ID	Project Description	Project Elements	Estimated Cost (2017 Dollars)	Primary Funding Source	Priority
A	ADA/Curb Ramp Upgrade Program	Upgrade curb ramps and eliminate gaps in ADA access along pedestrian routes near key destinations.	$500,000	City	High
P3	4th Avenue Pedestrian Improvements between Adair Street and Baseline Street	Add pedestrian improvements to 4th Ave between Adair St and Baseline St (e.g., complete pedestrian facility gaps on east side, includes rail crossing).	$95,000	TDT	High
P4	Adair Street Pedestrian Improvements between 1st Avenue and 7th Avenue	Add pedestrian improvements to Adair Street between 1st Avenue and 7th Avenue (e.g., complete pedestrian facility gaps on both sides).	$635,000	TDT & City Urban Renewal	Medium
P6a	Baseline Street Pedestrian Improvements between 4th Avenue and 10th Avenue	Add pedestrian improvements to Baseline Street between 4th Avenue and 10th Avenue (e.g., complete pedestrian facility gaps on the north side).	$978,000	City Urban Renewal & TDT (RTP #10805)	High
P7	10th Avenue Pedestrian Improvements between Clark Street and Holladay Street	Add pedestrian improvements to 10th Ave between Clark St and Holladay St (e.g., complete pedestrian facility gaps on both sides, includes rail crossing).	Funded		

Project ID	Project Description	Project Elements	Estimated Cost (2017 Dollars)	Primary Funding Source	Priority
P9	Davis Street Pedestrian Improvements between 10th Avenue and 14th Avenue	Add pedestrian improvements to Davis Street between 10th Avenue and 14th Avenue (e.g., complete pedestrian facility gap on the south side).	$455,000	TDT (RTP #11245)	Low
P10	Davis Street Pedestrian Improvements between 14th Avenue and 19th Avenue	Add pedestrian improvements to Davis Street between 14th Avenue and 19th Avenue (e.g., complete pedestrian facility gap on the south side).	$470,000	TDT (RTP #11245)	Low
P11	19th Avenue Pedestrian Improvements between 20th Avenue and Davis Street	Add pedestrian improvements to 19th Avenue between 20th Avenue and Davis Street (e.g., complete pedestrian facility gap on the west side).	$195,000	TDT	High
P12	19th Avenue Pedestrian Improvements between Davis Street and Council Creek	Add pedestrian improvements to 19th Avenue between Davis Street and Council Creek (e.g., complete pedestrian facility gaps on both sides).	$630,000	TDT (RTP #11249)	High
P13b	26th Avenue Pedestrian Improvements between Baseline Street and Fremont Street	Add pedestrian improvements to 26th Avenue between Baseline Street and Fremont Street (e.g., complete pedestrian facility gap on the east side).	Funded		
P14	Hobbs Road-29th Avenue Pedestrian Improvements between Baseline Street and the north Urban Growth Boundary	Add pedestrian improvements to Hobbs Road-29th Avenue between Baseline Street and the north Urban Growth Boundary (e.g., complete pedestrian facility gaps on both sides).	$830,000	TDT	High
P15	Baseline Street Pedestrian Improvements between 26th Avenue and East Lane	Add pedestrian improvements to Baseline Street between 26th Avenue and East Lane (e.g., complete pedestrian facility gap on the south side).	$1,035,000	City Urban Renewal & Development	Low
P16a	Baseline Street Pedestrian Improvements between East Lane and the east UGB	Add pedestrian improvements to north side of Baseline Street between East Lane and the east Urban Growth Boundary	$1,779,000	TDT (RTP #10805)	High
P17	4th Avenue Pedestrian Improvements near Fawn Street	Add pedestrian improvements to 4th Avenue near Fawn Street (e.g., complete pedestrian facility gap on the east side).	$95,000	TDT	Medium
P19	Dogwood Street Pedestrian Improvements between 12th Avenue and 18th Avenue	Add pedestrian improvements to Dogwood Street between 12th Avenue and 18th Avenue (e.g., complete pedestrian facility gaps on the south side).	Funded		

Project ID	Project Description	Project Elements	Estimated Cost (2017 Dollars)	Primary Funding Source	Priority
P20	20th Avenue Pedestrian Improvements between Alpine Street and Elder Lane	Add pedestrian improvements to 20th Avenue between Alpine Street and Elder Lane (e.g., complete pedestrian facility gaps on both sides).	$280,000	TDT	High
P21	Dogwood Street Pedestrian Improvements between 19th Place and 21st Avenue	Add pedestrian improvements to Dogwood Street between 19th Place and 21st Avenue (e.g., complete pedestrian facility gaps on both sides).	Funded		
P22b	Heather Street Pedestrian Improvements between 6th Avenue and 10th Avenue	Add pedestrian improvements to Heather Street between 6th Avenue and 10th Avenue (e.g., complete pedestrian facility gap on the south side).	Funded		
P24	341st Avenue Improvements between Baseline Street and the northern terminus of the street	Improve 341st Avenue between Baseline Street and the northern terminus of the street. This street will be improved as a Collector, with a sidewalk on the east side and shared-use path on the west side. Improve the existing rail crossing to Collector standard (pending ODOT Rail crossing order).	$525,000	TDT & Development	Medium
P25	Fred Meyer Roadway Improvements	Add frontage improvements to the Fred Meyer roadway between OR 8 and Davis Street Extension (e.g., complete sidewalks, landscaping buffer).	$1,100,000	City Urban Renewal & Development	Medium
P26	Ginger Street Pedestrian Improvements between 10th Avenue and 12th Avenue	Add pedestrian improvements to one side of Ginger Street between 10th and 12th Avenue (e.g., complete sidewalks).	$180,000	City	Medium
P27	Downtown Alleyway Improvements	Reconstruct downtown alleyways between Adair Street and Baseline Street with pedestrian amenities and decorative features	$300,000	City Urban Renewal	High
S1	Council Creek Trail connection between the west city limits and 4th Avenue	Create a shared-use path connection between the west city limits and 4th Avenue (e.g., Council Creek Trail).	$805,000	Metro (RTP #10806 & #11479)	Medium
S2	Council Creek Trail connection between 4th Avenue and 10th Avenue	Create a shared-use path connection between 4th Avenue and 10th Avenue (e.g., Council Creek Trail).	$1,500,000	Metro (RTP #10806 & #11479)	Medium
S3	Council Creek Trail connection between 10th Avenue and 19th Avenue	Create a shared-use path connection between 10th Avenue and 19th Avenue (e.g., Council Creek Trail).	$2,135,000	Metro (RTP #10806 & #11479)	Medium

Project ID	Project Description	Project Elements	Estimated Cost (2017 Dollars)	Primary Funding Source	Priority
S4	Council Creek Trail connection between 19th Avenue and Hobbs Road-29th Avenue	Create a shared-use path connection between 19th Ave and Hobbs Road-29th Avenue (e.g., Council Creek Trail).	$2,570,000	Metro (RTP #10806 & #11479)	Medium
S5	Council Creek Trail connection between Hobbs Road-29th Ave and the east Urban Growth Boundary	Create a shared-use path connection between Hobbs Road-29th Avenue and the east Urban Growth Boundary (e.g., Council Creek Trail).	$3,995,000	Metro (RTP #10806 & #11479)	Medium
S7	Shared-use path between Heather St and 15th Ave, and Emerald Loop	Create a shared-use path connection between Heather Street and 15th Avenue, and Emerald Loop.	Funded		
S10	Shared-use path between south of 19th Avenue and 25th Avenue	Create a shared-use path connection between south of 19th Avenue and 25th Avenue.	Funded		
S11	Shared-use path between 25th Avenue and 27th Avenue	Create a shared-use path connection between 25th Avenue and 27th Avenue.	$205,000	TDT	Medium
S12	Shared-use path between 27th Avenue and 29th Boulevard	Create a shared-use path connection between 27th Avenue and 29th Boulevard.	Funded		
C1	Adair-Baseline Street Crossing Study	Study to identify shared-use path alignment between Adair St and Baseline St, and highway crossing needs between Walmart and 1st Avenue at the west end of city.	$100,000	City Urban Renewal	High
C2	Baseline Street Crossing Study	Study for crossing enhancements along Baseline Street at the east end of the city (e.g., near transit stops).	$100,000	City	High
C3	10th Avenue Crossing Improvements	Add flashers and ADA ramps at marked pedestrian crossing	Funded		

Note: RTP projects shown reflect Draft Regional Transportation Plan Project List dated July 24, 2017
TDT is the Washington County Transportation Development Tax
Projects on ODOT facilities will require approval from the State Traffic Engineer. Inclusion of highway projects on this table does not obligate or imply ODOT funds for any project.

Strategic System

The Pedestrian Strategic Transportation Plan identifies those transportation solutions that are not reasonably expected to be funded by 2040 based on currently anticipated funding streams, but many of which are critically important to the transportation system. Some of the projects will require funding and resources beyond what is known or available in the time frame of this plan. Others are contingent upon redevelopment that makes it possible to provide the missing infrastructure, such as street connections.

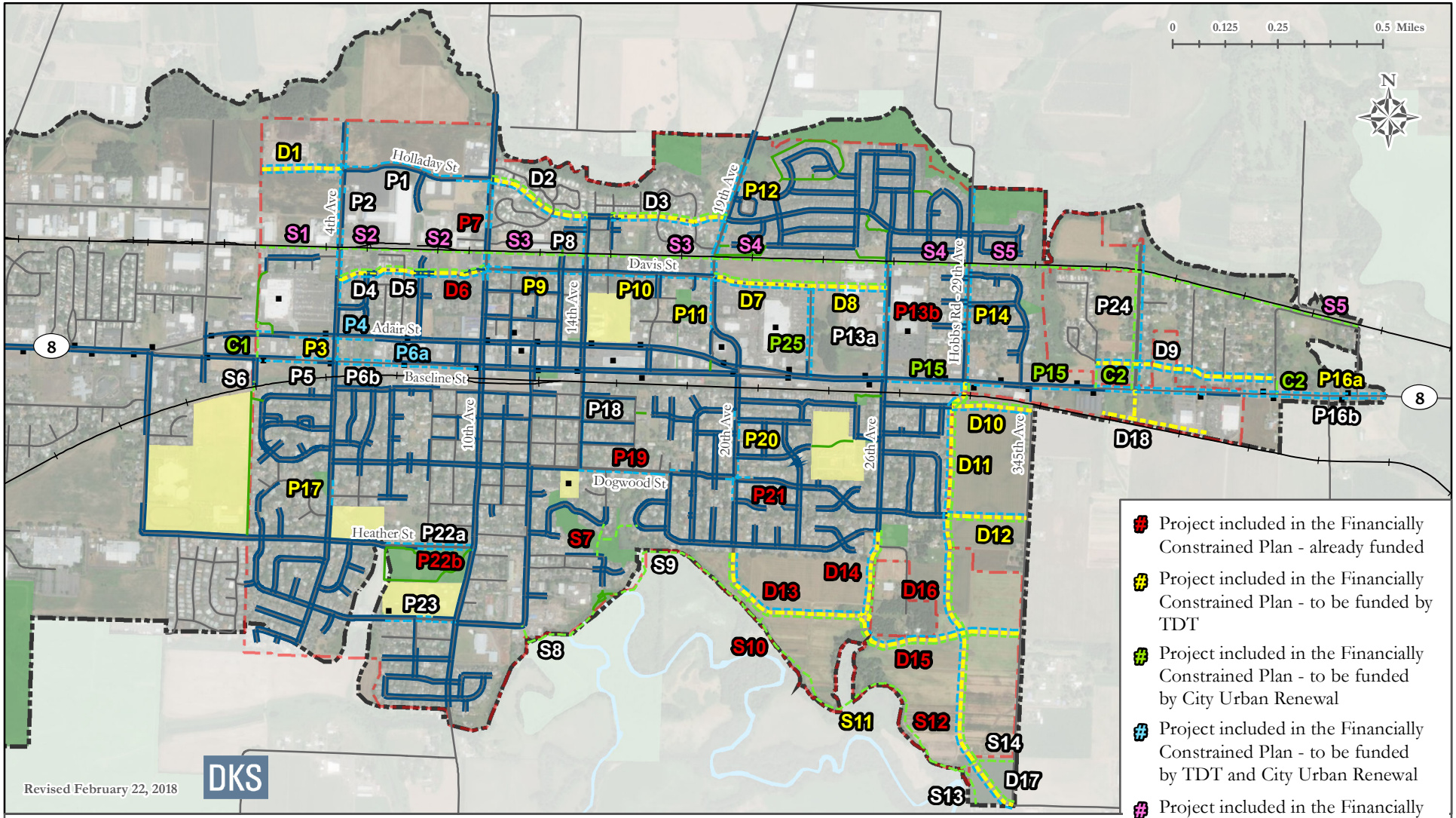
Pedestrian Strategic Transportation Plan solutions are summarized in Table 5-2 and illustrated in Figure 5-1. The projects numbered on Figure 5-1 correspond with the project numbers in Table 5-2. Planning level cost estimates used to determine the likeliness of funding are also included in Table 5-1.

Table 5-2: Pedestrian Strategic System

Project ID	Project Description	Project Elements	Estimated Cost (2017 Dollars)	Priority
P1	Holladay Street Pedestrian Improvements between 4th Avenue and 10th Avenue	Add pedestrian improvements to Holladay Street between 4th Avenue and 10th Avenue (e.g., complete pedestrian facility gaps on both sides).	$580,000	Low
P2	4th Avenue Pedestrian Improvements between Barlow Court and the northern terminus of the street	Add pedestrian improvements to 4th Avenue between Barlow Court and the northern terminus of the street (e.g., complete pedestrian facility gaps on both sides).	$925,000	Low
P5	Baseline Street Pedestrian Improvements between 1st Avenue and 4th Avenue	Add pedestrian improvements to Baseline Street between 1st Avenue and 4th Avenue (e.g., complete pedestrian facility gaps on both sides).	$625,000	Low
P6b	Baseline Street Pedestrian Improvements between 4th Avenue and 10th Avenue	Add pedestrian improvements to Baseline Street between 4th Avenue and 10th Avenue (e.g., complete pedestrian facility gaps on the south side).	$355,000	Low
P8	14th Avenue Pedestrian Improvements between Davis Street and Gray Street	Add pedestrian improvements to 14th Avenue between Davis Street and Gray Street (e.g., complete pedestrian facility gap on the west side, includes rail crossing).	$180,000	Low
P13a	26th Avenue Pedestrian Improvements between Baseline Street and Fremont Street	Add pedestrian improvements to 26th Avenue between Baseline Street and Fremont Street (e.g., complete pedestrian facility gap on the west side).	$420,000	Low
P16b	Baseline Street Pedestrian Improvements between East Lane and the east Urban Growth Boundary	Add pedestrian improvements to Baseline Street between East Lane and the east Urban Growth Boundary (e.g., complete pedestrian facility gap on the south side).	$1,655,000	Low
P18	14th Avenue Pedestrian Improvements between Baseline Street and Dogwood Street	Add pedestrian improvements to 14th Avenue between Baseline Street and Dogwood Street (e.g., widen the existing sidewalk on the east side).	$250,000	Low
P22a	Heather Street Pedestrian Improvements between 6th Avenue and 10th Avenue	Add pedestrian improvements to Heather Street between 6th Avenue and 10th Avenue (e.g., complete pedestrian facility gaps on both sides).	$265,000	Low
P23	Linden Street Pedestrian Improvements between 5th Circle and 10th Avenue	Add pedestrian improvements to Linden Street between 5th Circle and 10th Avenue (e.g., complete pedestrian facility gaps on both sides).	$320,000	Medium

Note: Projects on ODOT facilities will require approval from the State Traffic Engineer.

5-1 Pedestrian Master Plan



Legend:

Pedestrian Facilities

Existing	Planned	
———	- - - -	Sidewalk
———	- - - -	Shared-Use Path

Roadway Facilities with Pedestrian Projects

- - - - Planned Street Extension (Conceptual Alignment)

Activity Generators

- Parks and/or Natural Areas
- School
- ▪ Other Major Activity Generator

- # Project included in the Financially Constrained Plan - already funded
- # Project included in the Financially Constrained Plan - to be funded by TDT
- # Project included in the Financially Constrained Plan - to be funded by City Urban Renewal
- # Project included in the Financially Constrained Plan - to be funded by TDT and City Urban Renewal
- # Project included in the Financially Constrained Plan - to be funded by Metro
- # Project included in the Strategic Plan
- Urban Growth Boundary
- Cornelius City Limit

6. Bicycle Plan

This chapter summarizes existing and future bicycle needs in the City of Cornelius and presents the Bicycle Financially Constrained Plan and Strategic Plan. The goals and project development approach used to identify bicycle needs and prioritize solutions are provided in Chapter 2. A detailed description of the existing bicycle transportation system and needs is provided in Chapter 3.

Development of Biking Solutions

Several deficiencies, summarized below, were identified during the review of the bicycle network. Solutions are aimed to provide a connected network to facilitate bicycling trips throughout the city, including routes to key destinations such as commercial activity, schools, parks and transit stops.

- Gaps in the bicycle route network through the city
- Lack of designated bike facilities on city arterial and collector streets
- Lack of bicycle parking in public areas

Bicycle Plan

Similar to the Pedestrian Plan in Chapter 5, the approach to developing transportation solutions for this TSP update enabled more cost-effective solutions to encourage multiple travel options, increase street connectivity and promote a more sustainable transportation system. The full development of bicycle projects and programs is provided in the Technical Appendix - Technical Memorandum #6.

The TSP Bicycle Plan includes an integrated network of bicycle lanes and marked on-street routes to facilitate safe and convenient travel citywide and bike programs to support bicycling. Other improvement projects that would benefit the bicycle system are included in the Pedestrian Plan, such as multi-use paths, and intersection and crossing improvements.

Improvements to the bicycle network include bike facilities along key arterial and collector street corridors. Construction of new roadways identified in Chapter 8 - Motor Vehicle Plan are not included in the Bicycle Plan, but, as a matter of policy, will include construction of bicycle facilities appropriate to the functional classification of the new roadway.

Financially Constrained System

The Bicycle Financially Constrained Plan identifies the transportation solutions reasonably expected to be funded by 2040, as summarized in Table 6-1 and illustrated in Figure 6-1. The projects numbered on Figure 6-1 correspond with the project numbers in Table 6-1. The financially constrained projects for bicycling were selected based on several factors and added to the list until the combined project costs exhausted the estimated available funding. The financially constrained project list includes projects with high evaluation scores and projects that have dedicated funds but have not been constructed (shown with gray highlighting). The project numbers are denoted as biking ("B"). Policies and programmatic solutions are denoted with letters. Planning level cost estimates used to determine the likeliness of funding are also included in Table 6-1.

Table 6-1: Bicycle Financially Constrained System

Project ID	Project Description	Project Elements	Estimated Cost (2017 Dollars)	Primary Funding Source	Priority
B	Bike Parking Program	Install new bike parking throughout the city.	$20,000	City Urban Renewal	High
C	Bicycle/Pedestrian Connections to Transit	Coordinate infrastructure upgrades on streets connecting to OR 8, near transit stops (estimate $10,000 per year).	$230,000	City	High
B3	10th Avenue Bicycle Improvements between Adair Street and the north Urban Growth Boundary	Add bicycle improvements to 10th Avenue between Adair Street and the north Urban Growth Boundary (e.g., bike lanes).	Funded		
B5	10th Avenue Bicycle Improvements between Adair Street and Baseline Street	Add bicycle improvements to 10th Avenue between Adair Street and Baseline Street (e.g., bike lanes).	Funded		
B8	19th Avenue Bicycle Improvements between 20th Avenue and the north Urban Growth Boundary	Add bicycle improvements to 19th Avenue between 20th Avenue and the north Urban Growth Boundary (e.g., bike lanes).	$1,150,000	TDT	High
B16	10th Avenue Bicycle Improvements between Baseline Street and the south Urban Growth Boundary	Add bicycle improvements to 10th Avenue between Baseline Street and the south Urban Growth Boundary (e.g., restripe with bike lanes).	$60,000	TDT	High
B18	20th Avenue Bicycle Improvements between Alpine Street and the southern terminus of the street	Add bicycle improvements to 20th Avenue between Alpine Street and the southern terminus of the street (e.g., restripe with bike lanes).	$25,000	TDT	High

Note: TDT is the Washington County Transportation Development Tax

Strategic System

The Bicycle Strategic Transportation Plan identifies those transportation solutions that are not reasonably expected to be funded by 2040 based on currently anticipated funding streams, but many of which are critically important to the transportation system. Some of the projects will require funding and resources beyond what is known or available in the time frame of this plan. Others are contingent upon redevelopment that makes it possible to provide the missing infrastructure, such as street connections.

Bicycle Strategic Transportation Plan solutions are summarized in Table 6-2 and illustrated in Figure 6-1. The projects numbered on Figure 6-1 correspond with the project numbers in Table 6-2. Planning level cost estimates used to determine the likeliness of funding are also included in Table 6-1.

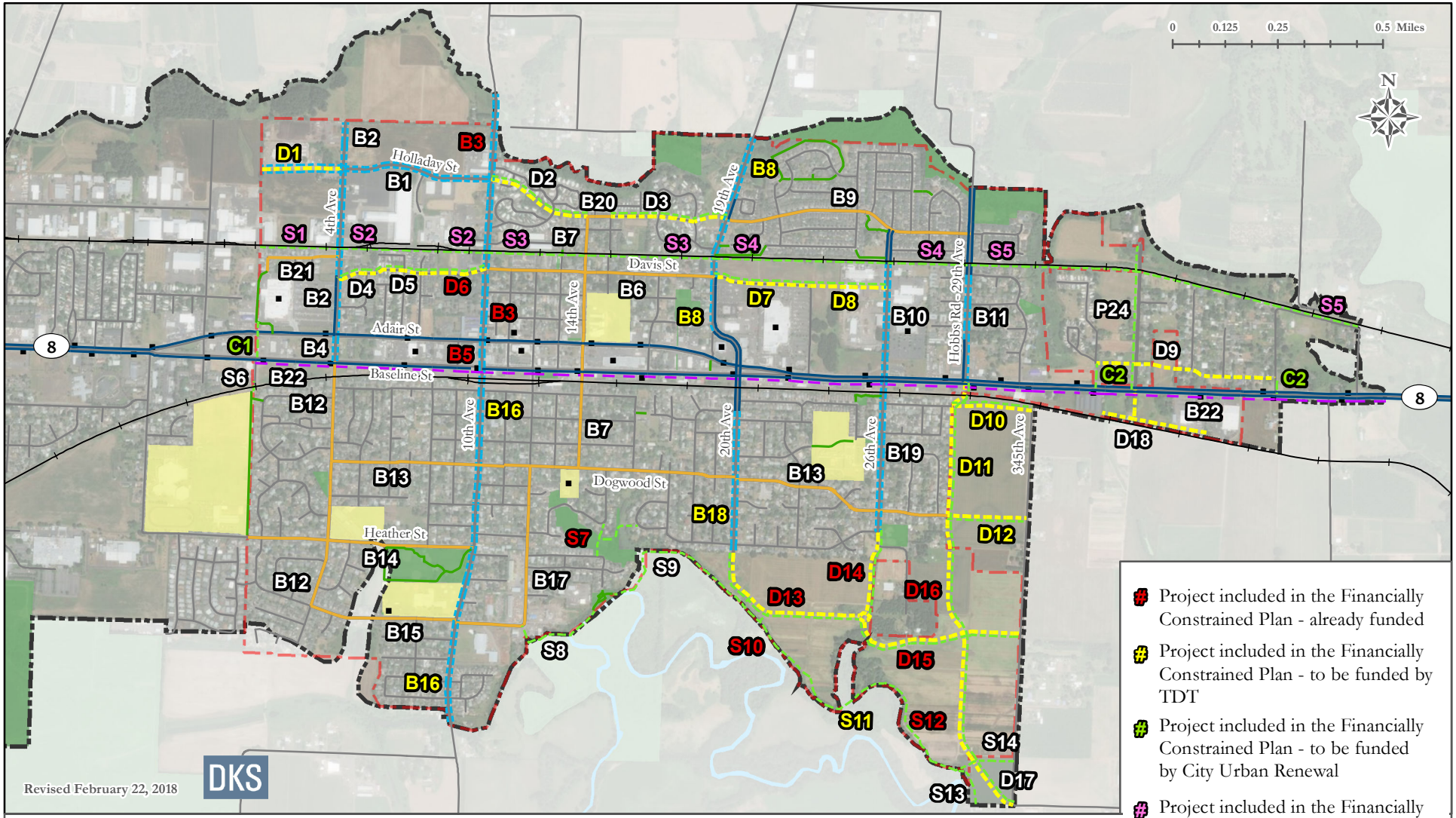
Table 6-2: Bicycle Strategic System

Project ID	Project Description	Project Elements	Estimated Cost (2017 Dollars)	Priority
B1	Holladay Street Bicycle Improvements between 4th Ave and 10th Ave	Add bicycle improvements to Holladay Street between 4th Avenue and 10th Avenue (e.g., restripe with bike lanes).	$25,000	Low
B2	4th Avenue Bicycle Improvements between Adair Street and the northern terminus of the street	Add bicycle improvements to 4th Avenue between Adair Street and the northern terminus of the street (e.g., bike lanes).	$555,000	Medium
B4	4th Avenue Bicycle Improvements between Baseline Street and Adair Street	Add bicycle improvements to 4th Avenue between Baseline Street and Adair Street (e.g., bike lanes).	$145,000	Medium
B6	Davis Street Bicycle Improvements between 10th Avenue and 19th Avenue	Add bicycle improvements to Davis Street between 10th Avenue and 19th Avenue (e.g., pavement markings/ signage designating a shared street for bikes).	$35,000	Medium
B7	14th Avenue Bicycle Improvements between Gray Street and Dogwood Street	Add bicycle improvements to 14th Avenue between Gray Street and Dogwood Street (e.g., pavement markings/ signage designating a shared street for bikes).	$40,000	Medium
B9	Holladay Street Bicycle Improvements between 19th Avenue and Hobbs Road-29th Avenue	Add bicycle improvements to Holladay Street between 19th Avenue and Hobbs Road-29th Avenue (e.g., pavement markings/signage designating a shared street for bikes).	$40,000	Medium
B10	26th Avenue Bicycle Improvements - Baseline St and Fremont St	Add bicycle improvements to 26th Avenue between Baseline Street and Fremont Street (e.g., bike lanes).	$665,000	Medium
B11	Hobbs Road-29th Avenue Bicycle Improvements between Baseline St and Davis Dr	Add bicycle improvements to Hobbs Road-29th Avenue between Baseline Street and Davis Drive (e.g., bike lanes).	$600,000	Medium

Project ID	Project Description	Project Elements	Estimated Cost (2017 Dollars)	Priority
B12	4th Avenue Bicycle Improvements between Baseline Street and Linden Street	Add bicycle improvements to 4th Ave - Baseline Street and Linden Street (e.g., pavement markings/ signage designating a shared street for bikes).	$40,000	Medium
B13	Dogwood Street Bicycle Improvements between 4th Avenue and the eastern terminus of the street	Add bicycle improvements to Dogwood Street between 4th Avenue and the eastern terminus of the street (e.g., pavement markings/signage designating a shared street for bikes).	$95,000	Medium
B14	Heather Street Bicycle Improvements between the city boundary and 10th Avenue	Add bicycle improvements to Heather Street between the city boundary and 10th Avenue (e.g., pavement markings/ signage designating a shared street for bikes).	$35,000	Medium
B15	Linden Street Bicycle Improvements between 4th Avenue and 10th Avenue	Add bicycle improvements to Linden Street between 4th Avenue and 10th Avenue (e.g., pavement markings/ signage designating a shared street for bikes).	$25,000	Low
B17	12th Avenue-Flax Plant Road Bicycle Improvements between Dogwood Street and 10th Avenue	Add bicycle improvements to 12th Avenue-Flax Plant Road between Dogwood Street and 10th Avenue (e.g., pavement markings/signage designating a shared street for bikes).	$35,000	Low
B19	26th Avenue Bicycle Improvements between Baseline Street and the southern terminus of the street	Add bicycle improvements to 26th Avenue between Baseline Street and the southern terminus of the street (e.g., restripe with bike lanes).	$25,000	Medium
B20	Gray Street Bicycle Improvements between 14th Avenue and 15th Avenue	Add bicycle improvements to Gray Street between 14th Avenue and 15th Avenue (e.g., pavement markings/ signage designating a shared street for bikes).	$5,000	Low
B21	Davis Street-1st Place Bicycle Improvements between 4th Avenue and the shared-use path on the west side of the Walmart parking lot	Add bicycle improvements to Davis Street-1st Place between 4th Avenue and the shared-use path on the west side of the Walmart parking lot (e.g., pavement markings/ signage designating a shared street for bikes).	$15,000	Low
B22	Baseline Street Bike Boulevard	Add a two-way bike boulevard on the south side of Baseline Street through town	$1,500,000	Low

Note: Projects on ODOT facilities will require approval from the State Traffic Engineer.

6-1 Bicycle Master Plan



7. Transit Plan

This chapter summarizes existing and future transit needs in the City of Cornelius and presents the Transit Financially Constrained Plan and Strategic Plan. The goals and project development approach used to identify transit needs and prioritize solutions are provided in Chapter 2. A detailed description of the existing transit system and needs is provided in Chapter 3.

Development of Transit Solutions

TriMet is the regional transit provider for the Portland metro area. Future transit coverage, frequency and reliability needs will be determined through TriMet-led planning efforts in coordination with local agencies. The City will work jointly with TriMet to provide and maintain transit stop amenities to improve the convenience and attractiveness of using the system. The city's primary contribution to improving the transit system is adding new sidewalks and improving roadway crossing locations. Potential overall system needs include:

- **Bus shelters** – The convenience of using the transit system should be improved by providing a comfortable place to wait for the bus.
- **Bus bulb-outs** – The extension of the sidewalk area into the parking lane provides a more convenient and comfortable pedestrian connection to a stopped bus.
- **Street lighting** – Bus stops should be highly visible locations so pedestrians can easily identify the locations and good security can be provided.
- **Information kiosks at bus stops** – This amenity provides transit riders information such as forecasts for next bus arrival times.
- **Sidewalk infill and crossing enhancements** – Bus stops located on high volume roadways benefit from complete sidewalks and improved pedestrian crossing locations.

Transit Plan

Transit solutions will enhance the quality and convenience for passengers and support the potential for future high capacity transit service. The full development of transit projects and programs is provided in the Technical Appendix - Technical Memorandum #6. Transit projects include a park and ride lot, bus stop amenities and a high-capacity transit system study to support safe and convenient transit travel through the city and the region. Cornelius identified four transit projects that will cost an estimated $2.2 million to complete.

Other improvement projects that would benefit the transit system include sidewalk infill, and intersection and crossing improvements (see Chapter 5 – Pedestrian Plan) and construction of sidewalks on new roadways (see Chapter 8 - Motor Vehicle Plan).

Financially Constrained System

The Transit Financially Constrained Plan identifies the transportation solutions reasonably expected to be funded by 2040, as summarized in Table 7-1. The financially constrained project list for transit includes projects identified as funded in the Draft Metro Regional Transportation Plan Project List (dated July 24, 2017) are noted with the corresponding RTP project number. The TSP project numbers are denoted as transit ("T"). Planning level cost estimates used to determine the likeliness of funding are also included in Table 7-1.

Table 7-1: Transit Financially Constrained System

Project ID	Project Description	Project Elements	Estimated Cost (2017 Dollars)	Primary Funding Source	Priority
T3	OR 8 Park & Ride	Develop a Park & Ride along OR 8 at 10th Avenue and 26th Avenue and incorporate other transit amenities.	$1,700,000	TDT (RTP #10807)	Medium

Strategic System

The Transit Strategic Transportation Plan identifies those transportation solutions that are not reasonably expected to be funded by 2040 based on currently anticipated funding streams, but many of which are critically important to the transportation system. Some of the projects will require funding and resources beyond what is known or available in the time frame of this plan. Others are contingent upon redevelopment that makes it possible to provide the missing infrastructure, such as street connections. Transit Strategic Transportation Plan solutions and planning level cost estimates are summarized in Table 7-2.

Table 7-2: Transit Strategic System

Project ID	Project Description	Project Elements	Estimated Cost (2017 Dollars)	Priority
T1	Baseline Street/17th Avenue Bus Stop	Work with TriMet to provide a bus stop on Baseline Street at 17th Avenue.	$60,000	Medium
T2	Transit Stop Improvements	Upgrade transit stop amenities as needed, to include sheltered stops with seating, landing pads, route information, bicycle parking and improved lighting.	$500,000	High
T4	High Capacity Transit Feasibility Study	Prepare a feasibility study for high capacity transit to Cornelius, including expected costs, expected revenue, and potential funding sources.	$125,000	Medium

8. Motor Vehicle Plan

This chapter summarizes needs for the motor vehicle system in the City of Cornelius, identifies system management strategies and presents the Motor Vehicle Financially Constrained Plan and Strategic Plan. The motor vehicle plans are intended to be consistent with other jurisdictional plans including Metro's Regional Transportation System Plan (RTP) and Regional Transportation Functional Plan (RTFP), Washington County's Transportation System Plan (TSP) and ODOT's Oregon Highway Plan (OHP). The goals and project development approach used to identify motor vehicle needs and prioritize solutions are provided in Chapter 2. A detailed description of the existing transportation system and needs for motor vehicles is provided in Chapter 3. The City of Cornelius Public Works Standards includes local roadway standards such cross-sections and access spacing standards.

Development of Driving Solutions

Several primary deficiencies, summarized below, were identified for the existing and future motor vehicle system. The TSP solutions focused on the identified needs below.

- Arterial and collector connectivity gaps which result in trip reliance on OR 8 and out of direction travel for all modes
- Intersections forecasted to operate below mobility targets in 2040
- Intersections with reported high crash rates during the past five years
- Significant number of public street intersections and private driveways not compliant with ODOT spacing standards OR 8 on the east side of Cornelius
- Lack of system management strategies to promote more efficient use of the transportation system

Motor Vehicle Plan

Driving projects are needed to serve expected growth and improve connectivity and safety throughout the City. Cornelius' approach to developing TSP projects to address the needs of the future transportation system emphasized improved system efficiency and management over adding capacity. The approach considered five categories of solutions, described in the Technical Appendix - Technical Memorandum #6. The solution categories applicable to motor vehicles began with system management strategies then expanded to include intersection capacity and safety projects then street extensions. No street or intersection widening projects are needed to accommodate future travel demand in Cornelius. The various categories of driving solutions are presented in the Motor Vehicle

Plan (Figure 8-3). Cornelius identified 23 driving projects that will cost an estimated $33.7 million to complete.

Transportation System Management Solutions

Solutions and strategies were developed to manage system performance by reducing traffic conflicts, increasing safety or all users, and encouraging more efficient use of the transportation system.

Transportation System Management and Operations

Transportation System Management and Operations will be applied to improve the performance of the existing transportation infrastructure through a combination of transportation system management (TSM) and transportation demand management (TDM) strategies and programs.

TSM strategies will be implemented to improve the efficiency of the transportation system in Cornelius. Traffic signal timings on OR 8 within Cornelius are planned to be optimized in 2017/2018 to reduce vehicle delay and improve freight and motor vehicle travel times along the corridor. The addition of next-generation transit signal priority (e.g., vehicle-to-center or connected vehicle) would help maintain bus service reliability.

Opportunities to expand TDM measures in Cornelius include:

- Support Metro's Regional Travel Options (RTO) program, which assists partners such as the Westside Transportation Alliance (WTA) to serve the commute needs of residents throughout urbanized Washington County.
- Improve street connectivity (included in the Motor Vehicle Plan)
- Invest in pedestrian/bicycle facilities (see Chapter 5 and 6 projects)
- Improve amenities and access for transit stops (see Chapter 7 projects)

Functional Classification

Traditionally, roadways are classified based on the type of vehicular travel they are intended to serve (local versus through traffic). In Cornelius, the functional classification of a roadway (shown in Figure 8-1) determines the level of mobility for all travel modes, level of access, and use. The roadway functional classification system recognizes that individual roadways do not act independently, but instead form a network that serves travel needs on a local and regional level. From highest to lowest intended use, the classifications in Cornelius are arterial, collector, and local streets.

- **Arterial Streets** serve as the main travel route through the city or act as a corridor connecting many parts of the city. These roadways serve the highest volume of motor vehicle traffic and are primarily utilized for longer distance regional trips.
- **Collector Streets** often connect the neighborhoods to the arterial roadways. These roadways generally provide more direct property access than arterial roadways, while providing efficient through movement for local traffic.

- **Local Streets** provide more direct access to residences without serving through travel in the city. These roadways are often lined with residences and are designed to serve lower volumes of traffic with a statutory speed limit of 25 miles per hour.

The city further classifies collector and local streets in industrial areas as Industrial Collectors or Industrial Locals. Roadways with higher intended usage generally limit access to adjacent property in favor of more efficient motor vehicle traffic movement (i.e., mobility). Local roadways with lower intended usage have more driveway access and intersections, and generally accommodate shorter trips to nearby destinations.

Truck Routes

Truck routes were designated in Cornelius to ensure trucks can efficiently travel through and access major destinations in the city (see Figure 8-2). Efficient truck movement plays a vital role in the economical movement of raw materials and finished products. The designation of through truck routes provides for this efficient movement, while at the same time maintaining neighborhood livability, public safety, and minimizing maintenance costs of the roadway system.

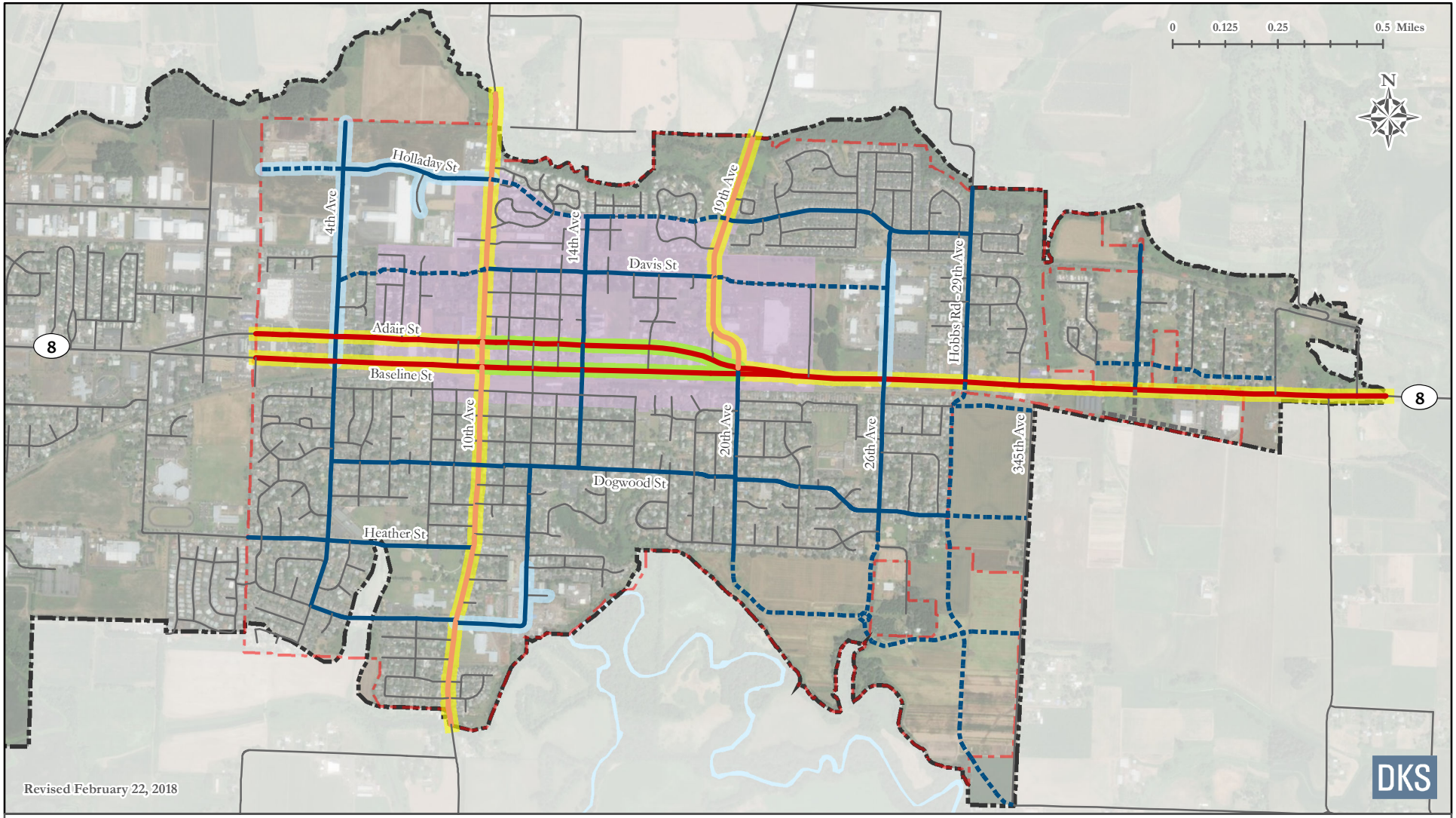
Much of the freight activity in Cornelius will be related to the Metro designated employment land. Designated employment land is located primarily in the northwest (including along Holladay Street between 4th Avenue and 10th Avenue), but also south of OR 8 at the east end of town, and along 12th Avenue and Flax Plant Road at the south end of town. Freight activity is also generated within the Metro designated Cornelius Town Center. To allow for efficient movement between these designated areas and regional freight routes, Metro has classified OR 8, Baseline Street and Adair Street, and 10th Avenue north of Baseline Street in the city as freight connectors. Washington County identifies OR 8, Baseline Street and Adair Street through Cornelius as an Over-Dimensional Truck Route and 10th Avenue north of Baseline Street as a Truck Route.

Safety Improvements

Historic crash data at the study intersections was evaluated as part of the TSP update to monitor safety conditions. The evaluation found several existing safety deficiencies at study intersections (see page 3-40). The recommended solutions include targeted police enforcement, driver education and city monitoring of recently constructed improvements to verify reduction in crashes. Based on the safety evaluation, the Motor Vehicle Plan does not include projects aimed at a specific safety deficiency at a study intersection.

Access management strategies aim to improve the efficiency and safety of travel. An access inventory and evaluation was conducted for OR 8 on the east side of Cornelius to document deficient locations (see page 3-9). The Motor Vehicle Plan includes several solutions to improve management of the system; expanded local street network to reduce driveways and a future OR 8 corridor study to identify specific access management treatments (e.g., raised center median, allowed U-turns at key locations and closed access points).

8-1 Functional Classification



Legend:

Functional Classification:

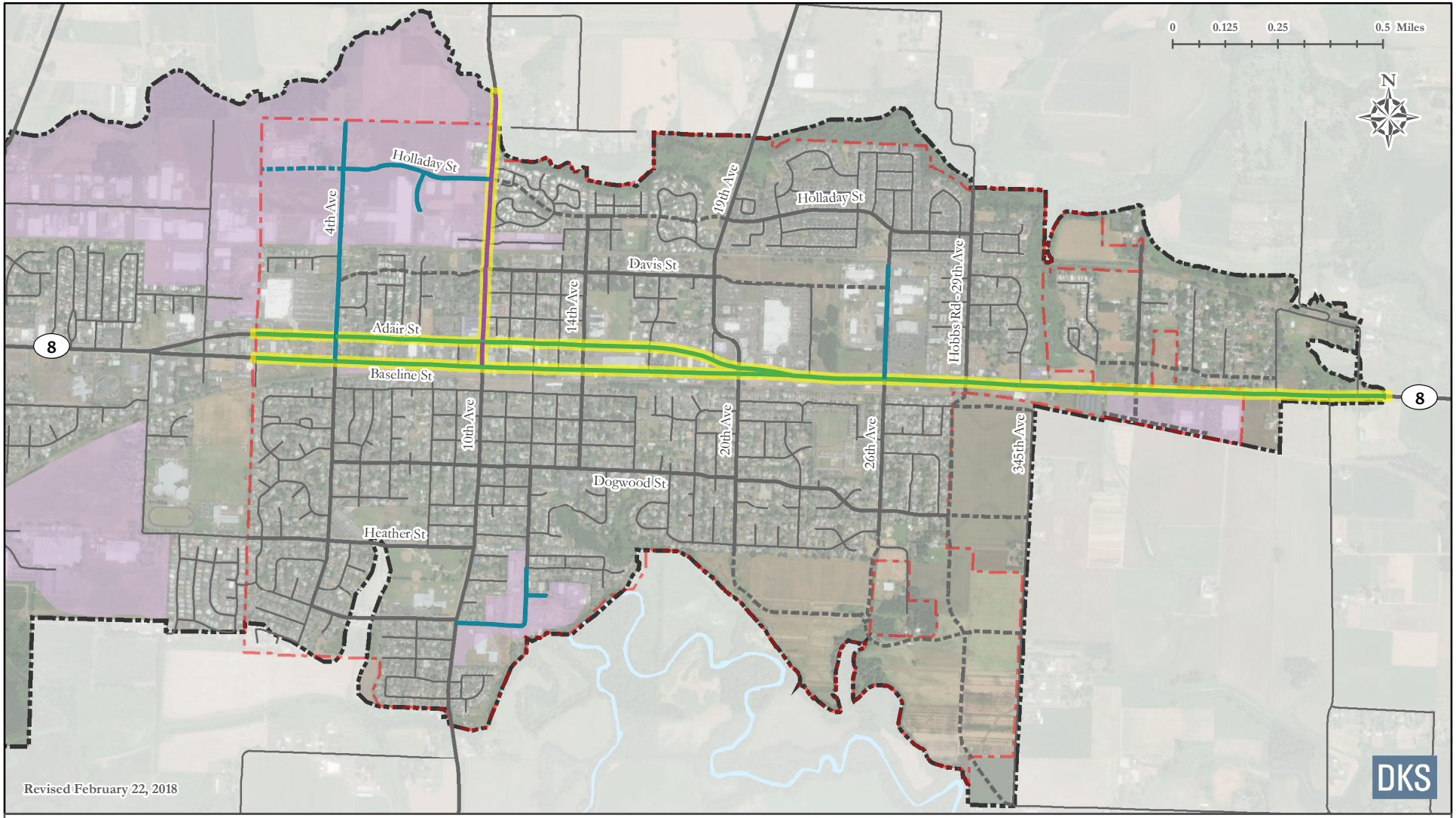
Existing	Planned (Conceptual Alignments)	
		Principal Arterial Streets
		Arterial Streets
		Collector Streets
		Local Streets

Special Designation

- Cornelius Industrial Street
- Regional Arterial and Throughway Network
- Special Transportation Area
- Regional Town Center

- Urban Growth Boundary
- Cornelius City Limit

8-2 Truck Routes



Legend:

Freight Routes

- Cornelius Industrial Street
- Washington County Over-Dimensional Truck Route
- Washington County Truck Route
- Regional Freight Road Connector

Land Use

- Employment Land

- Urban Growth Boundary
- Cornelius City Limit
- Arterial or Collector Street
- Planned Street Extension (Conceptual alignment)

Pavement Management

The City of Cornelius street system infrastructure is a significant asset which should be maintained in the most cost-effective manner possible. The street system is the largest single asset the City owns; more than the value of all City owned buildings and parks. The Cornelius Public Works Department is responsible for maintaining the City's street system with the mission to maintain pavements to the optimum level within the funding that is available. All streets deteriorate over time, and Cornelius' street infrastructure is currently deteriorating faster than it is being maintained. Timely intervention with appropriate maintenance will result in the lowest life-cycle costs.

Pavement management and design strategies have been identified to reduce the cost of roadway project construction and long-term maintenance in Cornelius. Opportunities include:

- Implement a pro-active asset management approach to roadway construction and maintenance. Select pavement maintenance projects based on the financial consequences of delaying a project rather than the condition of the pavement. This concept shifts the emphasis from pavement reconstruction of the worst conditions to preserving good pavements, keeping them in good condition while dealing with the backlog of poor pavements.
- Develop a Pavement Management System that provides a toolbox of pavement treatments and updated design standards, process for prioritizing projects and short-term implementation plan.
- Update roadway cross-section standards to find opportunities to narrow pavement widths. The cross-sections are shown in the City of Cornelius Public Works Standards.
- Update roadway pavement structure standards to reduce long-term maintenance requirements.

Congestion Standards

Establishing mobility standards for intersections in Cornelius provides the city more flexibility in the future with regard to how funds are allocated for intersection and roadway improvements. By allowing more flexibility, the city will help encourage a sustainable transportation system and will focus funding on higher priority multi-modal improvements rather than driving-focused improvements at locations that are operating below capacity but over the city standard.

The following mobility standards apply to non-state owned streets in Cornelius. State owned streets should comply with the mobility targets included in the Oregon Highway Plan.

For streets not designated on the Metro Arterial and Throughway Network in the Regional Transportation Plan, the following mobility standards apply (all streets in the city, except for 10th Avenue and 19th-20th Avenue north of OR 8):

Signalized, All-way Stop, or Roundabout Controlled Intersections:

- During the highest one-hour period of the day (typically, but not always during the evening peak period between 4 and 6 p.m.): LOS D or better will be required for the intersection

Two-way Stop and Yield Controlled Intersections:

- During the highest one-hour period of the day (typically, but not always during the evening peak period between 4 and 6 p.m.): LOS E or better will be required for each movement

For streets designated on the Metro Arterial and Throughway Network in the Regional Transportation Plan, the following mobility standards apply (10th Avenue and 19th-20th Avenue north of OR 8):

- During the highest one-hour period of the day (typically, but not always during the evening peak period between 4 and 6 p.m.): A maximum v/c ratio of 0.99 shall be maintained at all intersections. For signalized intersections, this standard applies to the overall intersection. For unsignalized intersections, this standard applies to the worst movement.
- For the second hour (either the hour before or hour after the peak hour): A maximum v/c ratio of 0.99 shall be maintained at all intersections. For signalized intersections, this standard applies to the overall intersection. For unsignalized intersections, this standard applies to the worst movement.

Street Extension Solutions

The existing transportation system was evaluated to determine the need for street extensions. These solutions help the city work towards complying with Metro street spacing standards, provide alternate collector routes to alleviate congestion in the city, reduce emergency vehicle response times and enhances multi-modal connectivity by reducing out-of-direction travel for walking and biking. Several new collector streets are included in the Motor Vehicle Plan to support future development and comply with the Metro RTFP. The full street connectivity analysis for arterial and collector facilities is provided in Chapter 3 (page 3-22).

The extension of local streets is important to adequately connect neighborhood destinations such as schools, parks and community services. Both S Ivy Street and S Jasper Street are high priority local connections between S 10th Avenue and S 12th Avenue to connect the residential neighborhood to the east and Harleman Park and Echo Shaw Elementary School to the west.

Capacity Solutions

The motor vehicle capacity and circulation needs in Cornelius were determined for future conditions over the next 22 years. The projected year 2040 growth in the TSP study area and traffic forecast methodology is provided in Chapter 4. Year 2040 traffic volumes at the TSP study intersections and along key roadways were evaluated to identify potential locations where evening peak hour performance may drop below mobility targets.

The majority of the study intersections are expected to meet mobility targets in 2040. The signalized study intersections on OR 8 would meet ODOT mobility targets during the PM peak hour. The OR 8/20th Avenue intersection is expected to operate at LOS E due to high vehicle delays. Several unsignalized study intersection are forecasted to operate with LOS F conditions on the minor street approach; OR 8/345th Avenue, OR 8/29th Avenue and Davis Street/19th Avenue intersections. Under these conditions, the minor street approach at the intersection experiences moderate to long delays and the major street movements are not impeded. The future volumes at these intersections are not high enough to recommend adding a traffic signal. Providing a frontage road both north and south of Baseline Street (OR 8) with redevelopment would allow closure of the unsignalized intersections and provide a single intersection for improved access. The future operations analysis is provided in the TSP Technical Appendix.

Financially Constrained System

The Motor Vehicle Financially Constrained Plan identifies the transportation solutions reasonably expected to be funded by 2040, as summarized in Table 8-1 and illustrated in Figure 8-3. The projects numbered on Figure 8-3 correspond with the project numbers in Table 8-1. The financially constrained projects were selected based on several factors and added to the list until the combined project costs exhausted the estimated available funding. The financially constrained project list for motor vehicles includes projects with high to low evaluation scores, projects in areas where development is expected and projects identified as funded in other plans. Projects identified as financially constrained in the Draft Metro Regional Transportation Plan Project List (dated July 24, 2017) are noted with the corresponding RTP project number. The project numbers are denoted as driving ("D"). Several projects have dedicated funds (including projects that are development conditions of approval) but have not been constructed (shown with gray highlighting). Planning level cost estimates used to determine the likeliness of funding are also included in Table 8-1.

Table 8-1: Motor Vehicle Financially Constrained System

Project ID	Project Description	Project Elements	Estimated Cost (2017 Dollars)	Primary Funding Source	Priority
D1	Holladay Street extension from 4th Avenue to the west city limits	Extend Holladay Street from 4th Avenue to the west city limits, construct as an Industrial Collector, with sidewalks and bike lanes. Alignment should connect with a future street extension from Yew Street.	$2,960,000	TDT (RTP #10795)	Low
D6	Davis Street extension from 7th Avenue to 10th Avenue	Extend Davis Street from 7th Avenue to 10th Avenue constructed as a Collector, with a sidewalk on south side and shared-use path on the north side.	Funded		

Project ID	Project Description	Project Elements	Estimated Cost (2017 Dollars)	Primary Funding Source	Priority
D7	Davis Street extension from 19th Avenue to the Fred Meyer driveway.	Extend Davis Street from 19th Avenue to the Fred Meyer driveway constructed as a Collector, with a sidewalk on the south side and shared-use path on the north side.	$2,530,000	Development	Low
D9	Baseline Street (OR 8) frontage road (north side) between East Lane (private) and 334th Avenue	Create a collector frontage road on the north side of Baseline Street between East Lane and 334th Avenue as properties redevelop. Close the East Lane, 338th Avenue, and 336th Avenue connections to OR 8 to traffic but maintain access for pedestrians, bicycles and emergency vehicles.	$2,080,000	Development	Medium
D10	Alpine Street extension from 28th Avenue to the east Urban Growth Boundary	Extend Alpine Street from 28th Avenue to the east Urban Growth Boundary, construct as a Collector, with a sidewalk on south side and shared-use path on the north side.	$2,110,000	TDT	Medium
D11	29th Boulevard extension from Baseline Street to Dogwood Street	Extend 29th Boulevard from Baseline Street to Dogwood Street as a Collector, with a shared-use path on east side. Close 345th Avenue railroad crossing and relocate to 29th Avenue (pending coordination and permitting with ODOT Rail). Includes possible installation of a traffic signal at Baseline Street, if warranted (see D21).	$4,530,000	TDT (RTP #11251)	Medium
D12	Dogwood Street extension from 28th Avenue to the east Urban Growth Boundary	Extend Dogwood Street from 28th Avenue to the east Urban Growth Boundary, constructed as a Collector, with a sidewalk on the north side and shared-use path on the south side.	$2,085,000	TDT	Low
D13	20th Avenue extension from Ginger Street to the 26th Avenue extension	Extend 20th Avenue from Ginger Street to the 26th Avenue extension constructed as a Collector, with a sidewalk on the north side and shared-use path on the south side.	Funded by Approved Development		
D14	26th Avenue extension from Ginger Street to the 20th Avenue extension	Extend 26th Avenue from Ginger Street to the 20th Avenue extension constructed as a Collector, with a sidewalk on the west side and shared-use path on the east side.	Funded by Approved Development		

Project ID	Project Description	Project Elements	Estimated Cost (2017 Dollars)	Primary Funding Source	Priority
D15	Kodiak Street extension from the 20th Avenue extension to the east Urban Growth Boundary	Extend Kodiak Street from the 20th Avenue extension to the east Urban Growth Boundary constructed as a Collector, with a sidewalk on the north side and shared-use path on the south side.	Funded by Approved Development		
D16	29th Boulevard extension from Dogwood Street to the south city limits	Extend 29th Boulevard from Dogwood Street to the south city limits as a Collector, with a sidewalk on the west side and shared-use path on the east side.	Funded by Approved Development		
D19	Baseline Street Access Management Plan	Study for access management strategies and improvements along Baseline Street at the east end of the city.	$50,000	City Urban Renewal	Low
D20	Baseline Street/ 341st Avenue Intersection Improvements	Intersection improvements (e.g., possible installation of a traffic signal, if warranted and approved by State Traffic Engineer).	$750,000	TDT	Medium
D21	Baseline Street/ Hobbs Road-29th Avenue Intersection Improvements	Intersection improvements (e.g., possible installation of a traffic signal, if warranted and approved by State Traffic Engineer).	$2,000,000	TDT (RTP #10802)	Medium
D22	Hobbs Rd-29th Ave extension/ Alpine Street extension Intersection Improvements	Intersection improvements (e.g., installation of a mini-roundabout).	$750,000	TDT	Medium
D23	20th Avenue extension/ 26th Avenue extension Intersection Improvement	Intersection improvements (e.g., installation of a roundabout).	Funded by Approved Development		

Note: RTP projects shown reflect Draft Regional Transportation Plan Project List dated July 24, 2017
TDT is the Washington County Transportation Development Tax
Projects on ODOT facilities will require approval from the State Traffic Engineer. Inclusion of highway projects on this table does not obligate or imply ODOT funds for any project.

Strategic System

The Motor Vehicle Strategic Transportation Plan identifies those transportation solutions that are not reasonably expected to be funded by 2040 based on currently anticipated funding streams, but many of which are critically important to the transportation system. Some of the projects will require funding and resources beyond what is known or available in the time frame of this plan. Others are contingent upon redevelopment that makes it possible to provide the missing infrastructure, such as street connections.

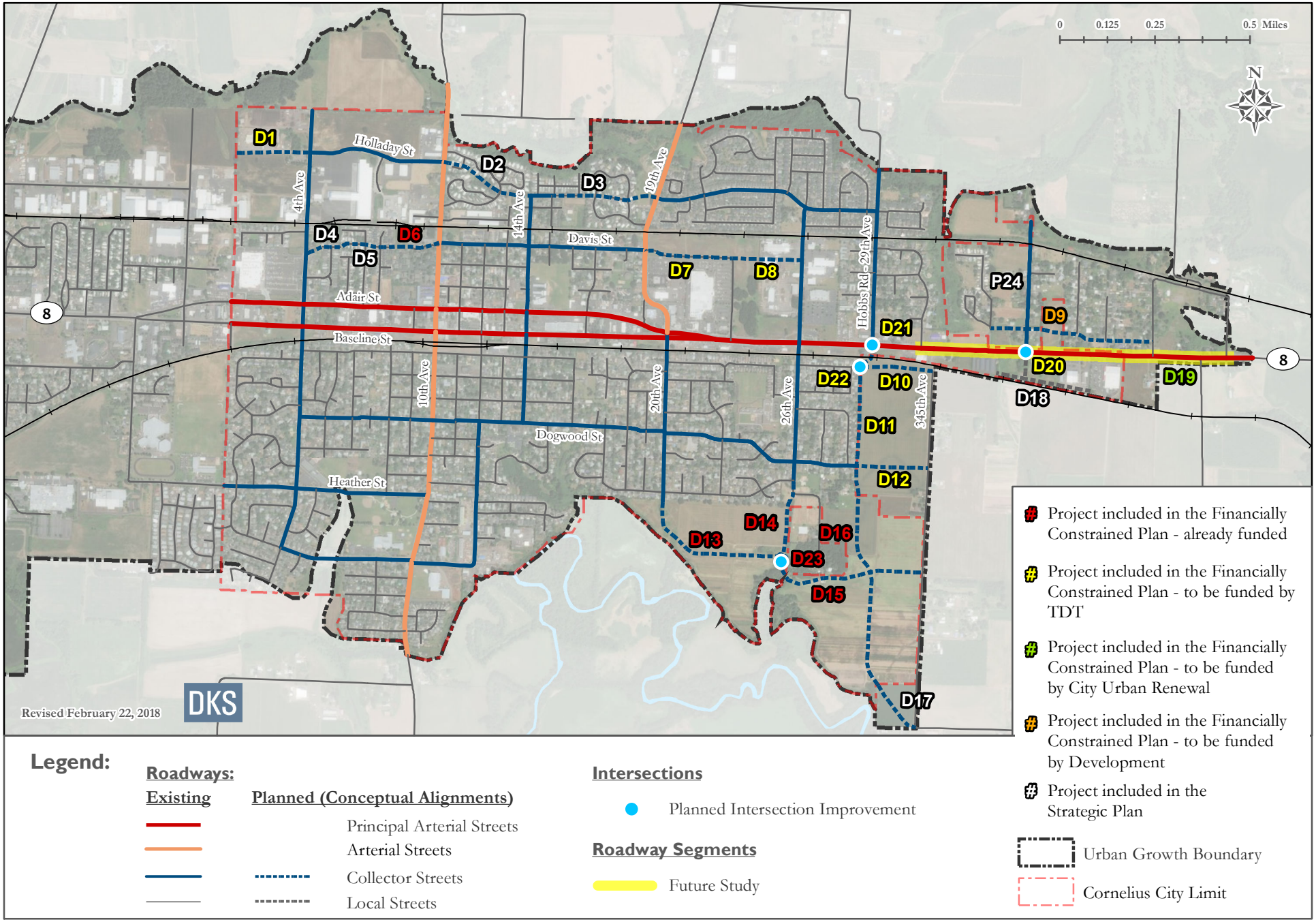
Motor Vehicle Strategic Transportation Plan solutions are summarized in Table 8-2 and illustrated in Figure 8-3. The projects numbered on Figure 8-3 correspond with the project numbers in Table 8-2. Planning level cost estimates used to determine the likeliness of funding are also included in Table 8-1.

Table 8-2: Motor Vehicle Strategic System

Project ID	Project Description	Project Elements	Estimated Cost (2017 Dollars)	Priority
D2	Holladay Street extension from 10th Avenue to Gray Street	Extend Holladay Street from 10th Avenue to Gray Street. This street shall be constructed as a Collector, with a sidewalk on the south side and shared-use path on the north side.	$2,810,000	Low
D3	Holladay Street extension from Gray Street to 19th Avenue	Extend Holladay Street from Gray Street to 19th Avenue. This street shall be constructed as a Collector, with a sidewalk on the south side and shared-use path on the north side.	$3,085,000	Low
D4	Davis Street extension from 4th Avenue to 5th Avenue	Extend Davis Street from 4th Avenue to 5th Avenue. This street shall be constructed as a Collector, with a sidewalk on the south side and shared-use path on the north side.	$790,000	Low
D5	Davis Street extension from 5th Avenue to 7th Avenue	Extend Davis Street from 5th Avenue to 7th Avenue. This street shall be constructed as a Collector, with a sidewalk on south side and shared-use path on the north side.	$1,465,000	Low
D8	Davis Street extension from the Fred Meyer driveway to 26th Avenue	Extend Davis Street from the Fred Meyer driveway to 26th Avenue constructed as a Collector, with a sidewalk on south side and shared-use path on the north side.	$2,065,000	Low
D17	29th Avenue extension from the south city limits to the south Urban Growth Boundary	Extend 29th Avenue from the south city limits to the south Urban Growth Boundary. This street shall be constructed as a Collector, with a sidewalk on the west side and shared-use path on the east side.	$2,120,000	Low
D18	Baseline Street frontage road (south side) connecting to 341st Avenue	Create a frontage road on the south side of Baseline Street connecting to 341st Avenue as properties redevelop. This street shall be constructed as a local street.	$1,545,000	Low

Note: Projects on ODOT facilities will require approval from the State Traffic Engineer. Inclusion of highway project on this table does not obligate or imply funds for any project.

8-3 Motor Vehicle Plan



Legend:

Roadways:

Existing

Planned (Conceptual Alignments)

- Principal Arterial Streets
- Arterial Streets
- Collector Streets
- Local Streets

Intersections

- Planned Intersection Improvement

Roadway Segments

- Future Study

9. Other Transportation Modes

While auto, transit, bicycle and pedestrian transportation modes are the primary means of travel in Cornelius, other modes of transportation must be considered. Future needs for rail, air and water infrastructure are identified and summarized below.

Facilities

Rail

Portland & Western Railroad (PNWR) has two freight lines that pass through Cornelius, the Seghers District (the FAA Line) and Forest Grove District (the 3F line). The FAA line passes through Cornelius one-half block south of OR 8. The 3F line passes through Cornelius approximately five blocks north of OR 8 and one block north of Davis Street. The volume, length and schedule of the freight trains are not expected to change significantly over the 22-year planning horizon.

There are a significant number of public at-grade rail crossings within Cornelius with inadequate facilities for pedestrians. Several TSP projects would provide improvements at the rail crossings. These include projects P7, P8 and P12 on the 3F Line (see Tables 5-1 and 5-2) and project D11 on the FFA Line (see Table 8-1). The extension of 29th Boulevard south of OR 8 (project D11) would close the 345th Avenue rail crossing and relocate it to 29th Avenue. Future improvements at the rail crossings will require a coordinated effort between PNWR, ODOT Rail Division and City of Cornelius.

A high capacity transit feasibility study was identified to support future needs (see Table 7-1). The existing PNWR 3F rail line and FAA rail line are possible locations for future high capacity transit projects. Commuter rail and freight rail can be accommodated on the same rail lines. However, light rail would require the freight rail use to end and the light rail line would utilize the existing rail right-of-way.

Air

There are no designated airports or heliports in the Cornelius TSP study area. No policies or recommendations in this area of transportation are provided.

Water

There are no navigable waterways in the Cornelius TSP study area. No policies or recommendations in this area of transportation are provided.

10. Financing

This chapter outlines the funding sources that can be used to meet the needs of the transportation system. The costs for the elements of the transportation system plan are outlined and compared to the potential revenue sources. Options are discussed regarding how the costs of the plan and revenues can be balanced.

Current Funding Strategies

Transportation funding is commonly viewed as a user fee system where the users of the system pay for infrastructure through motor vehicle fees (such as gas tax and registration fees) or transit fares. However, a great share of motor vehicle user fees goes to road maintenance, operations, and preservation of the system rather than construction of new system capacity. Much of what the public views as new construction is commonly funded (partially or fully) through local improvement districts (LIDs) and frontage or off-site improvements required as mitigation for land development.

The City of Cornelius currently utilizes three sources to fund construction and maintenance of its transportation infrastructure as described below. Each source collects revenue each year that is used to repair street facilities or construct new streets, with some restrictions on the type and location of projects.

State Fuel Tax and Vehicle License Fee

The State of Oregon Highway Trust Fund collects various taxes and fees on fuel, vehicle licenses, and permits. A portion is paid to cities annually on a per capita basis. By statute, the money must be used for any road-related purpose. Cornelius uses it for street operating needs such as street maintenance and repaving, street lighting costs, pothole repair, street sign maintenance, winter sanding, and completing sidewalk gaps.

Oregon gas taxes are collected as a fixed amount per gallon of gasoline served. Gas tax in Oregon is currently 30 cents per gallon, and this tax does not vary with changes in gasoline prices. There is no adjustment for inflation tied to the gas tax, and there was no change in the gas tax from 1992 until 2011, which means that the net revenue collected has gradually eroded over time as the cost to construct and repair transport systems increase. Fuel efficiency in new vehicles has further reduced the total dollars collected through this system.

Oregon vehicle registration fees are collected as a fixed amount at the time a vehicle is registered with the Department of Motor Vehicles. Vehicle registration fees in Oregon have recently increased from

$27 per vehicle per year to $86 per vehicle per year for passenger cars, with similar increases for other vehicle types. There is no adjustment for inflation tied to vehicle registration fees. Cornelius gets about $696,000 per year in State gas tax and vehicle license fee revenue for streets, bikeways and sidewalks. The City of Cornelius can expect to receive $15.3 million over the next 22 years, by 2040. Essentially, these funds are spent on surface restoration of local streets. Because there is no index for cost inflation, this revenue level will increase only proportionate with the city's population growth relative to the rest of the county, which is expected to be substantial over the planning period.

State House Bill 2017

Keep Oregon Moving (House Bill 2017) establishes a new dedicated source of funding for expanding public transportation service in Oregon. This bill will increase several taxes and fees such as the state gas tax and vehicle registration fees. It directs significant new revenue to earmarked projects, and additional funding to some local jurisdictions. The estimated allocation to City of Cornelius is $2,755,300 over a 10-year period (2018 to 2027). The first increase in the state gas tax associated with HB 2017 became effective in January 2018. The revenue will be available for local transportation improvements, the city has chosen to use the funds for street maintenance needs.

Washington County Gas Tax

In addition to the State of Oregon gas tax, Washington County collects a one-cent per gallon tax that is distributed to jurisdictions in the County. Distribution of Washington County gas tax revenue parallels the state model in that jurisdictions receive a portion of the county revenue based on population. For the fiscal year 2015/2016, the estimated Washington County gas tax revenue for the City of Cornelius is $44,000. Assuming the current tax will not increase, and since it is not pegged to inflation, the City of Cornelius can expect to receive $968,000 over the next 22 years, by 2040. These funds have historically been used for roadway maintenance of local streets.

Washington County Conditional Vehicle Registration Fee

An ordinance establishing a conditional $30 vehicle registration fee (VRF) to offset some of the maintenance funding shortfall and to improve transportation safety was adopted on Sept. 20, 2016, by the Washington County Board of Commissioners.[1]

Under the provisions of the ordinance, the fee will only go into effect on the condition that the state Legislature fails to pass a 2017 transportation funding package that provides additional County revenue equal to or greater than $8.1 million annually –the County's share of revenue generated by a $30 VRF – in the first year.

As the 2017 transportation funding package did not met this legislative threshold, the County VRF will be collected by the state Department of Motor Vehicles, in conjunction with state registration fees,

[1] www.co.washington.or.us/lut/transportationfunding/2016-vehicle-registration-fee.cfm

starting July 1, 2018. The fee will be $30 per year, or $2.50 per month, for most vehicle owners. The fee for motorcycles/mopeds will be $17 per year. Owners of trailers eligible for permanent registration will pay a one-time fee of $10.

The VRF is expected to generate an estimated $13.5 million in revenue. This revenue will be split 60/40 between the County ($8.1 million) and the cities within the County ($5.4 million) as required by state statute. All funds received by the County may be used only for local maintenance to improve the safety and condition of County roads, bridges and culverts.

The cities' portion would be allocated based on population and Cornelius will be entitled to an estimated $190,000 annually, which would be equivalent to about $4.2 million over the 22-year planning horizon (by 2040).

Washington County Transportation Development Tax (TDT)

Washington County adopted a Transportation Development Tax (TDT) in 2009. New development is required to pay the TDT based on the type of development that is planned in Cornelius (e.g. residential, commercial, employment, etc.). Cities within Washington County are eligible to use TDT money for roadway improvements identified within the City of Cornelius if it has been identified as a potential improvement that is on the TDT list. The City keeps TDT money and must obtain approval from the Washington County Coordinating Committee (WCCC) for projects on the TDT list, however approval is typically a formality. The City has collected approximately $100,000 annually, based on the trends over the past seven years.

The current TDT rates (year 2017-2018) include $8,458 for a single-family dwelling and $11,613 per thousand square-feet of shopping center. The TDT rates for other types of development vary depending on the specific land use. Based on the growth assumed in the future traffic forecast (see Chapter 4, Table 4-1), the projected TDT revenues for Cornelius from 2018 through 2040 are shown in Table 10-1.

Table 10-1: Washington County Transportation Development Tax Estimate for Cornelius

Land Use	30-year Growth (2010 to 2040)	Estimated TDT Revenue
Households	2,287	$18,005,500
Retail Employees	1,074	$6,236,000
Service Employees	1,374	$6,098,000
Other Employees	3,279	$9,837,000
30-year Total Revenue		**$40,176,500**
22-year Adjusted Revenue		**$29,463,000**

City Gas Tax

The City of Cornelius collects a two-center per gallon tax, which was approved by voters in 2009. The estimated annual City gas tax revenue is $192,000. These funds are used solely for maintenance of local streets. Based on forecasted trip growth from 2018 to 2040, the City is expected to collect approximately $4,224,000 in City gas tax over the next 22 years, by 2040.

MSTIP and Grants

Federal and County monies have provided extensive funding over the past 15 years to construct major street improvements in Cornelius. These improvements included a heavy emphasis on improving non-motor vehicle connections.

The Washington County MSTIP program provides funding from property taxes. This funding is used to construct regionally important transportation projects. MSTIP monies funded the reconstruction of the 19th/20th Avenue/OR 8 intersection in 2004 to 2006. In 2016 to 17, $5.5 million in MSTIP funds are being used to reconstruct 10th Avenue from Alpine Street to Holladay Street in Cornelius.

Federal grants from the Federal Highway Administration are another source funding for capital projects. In 2006 to 2008, $4 million in federal funds paid for reconstruction of Adair Street (OR 8 westbound) from 11th to 19th Avenue through downtown Cornelius. Then in 2013 to 2016, federal funds helped pay for reconstruction of Baseline Street (OR 8 eastbound) from 11th to 19th Avenue, including a new pedestrian crossing of the railroad tracks south of Baseline Street.

Community Development Block Grants (CDBG) are another source the City has used extensively to construct transportation improvements, especially related to improving pedestrian connections.

Finally, ODOT Rail provided funding in conjunction with the signalization project at 14th Avenue/Baseline Street which improved and gated the railroad crossing at 14th Avenue, just south of Baseline Street. This new crossing included an 8-foot wide sidewalk on 14th Avenue across the railroad tracks.

Future funding of projects from non-City sources such as MSTIP and CDBG is not guaranteed and is awarded through a competitive application and review process, but these do provide an opportunity for securing funding for important capital projects that do not have sufficient city funds to complete.

Summary

Under the above funding programs, the City of Cornelius will collect approximately $29.4 million from Washington County TDT and $27.4 million from the remaining sources, totaling $56.9 million. Table 10-2 summarizes the current funding sources. The estimated use of revenue for operations and maintenance versus capital projects is shown in Table 10-3.

Table 10-2: Current Transportation Revenues for Cornelius

Funding Source	Historic Annual Amount	Estimated 22 Year Revenues (2018-2040)
State Fuel Apportionment & Vehicle License Fee	$696,000	$15,312,000
State House Bill 2017	-	$2,755,300
Washington County Gas Tax	$44,000	$968,000
Washington County Vehicle Registration Fee	$190,000	$4,180,000
City Gas Tax	$192,000	$4,224,000
Washington County TDT	-	$29,463,000
Total Revenues	**$1,122,000**	**$56,902,300**

Source: City of Cornelius, Adopted Budget, Fiscal Year 2016-2017 and TDT estimate based on forecasted growth

Table 10-3: Cornelius Operations and Maintenance versus Capital Projects

Operation and Maintenance vs. Capital Projects and Programs	Estimated 22 Year (2018 – 2040)		
	Total Revenue	Operations and Maintenance	Capital Projects
Revenue (Non TDT Sources)	$27,439,300	$27,439,300	$0
Washington County TDT	$29,463,000	$0	$29,463,000
Total Revenue	**$56,902,300**	**$27,439,300**	**$29,463,000**

Notes:
Operations and Maintenance (O&M) costs relate to any program revenue supporting the operations and maintenance of existing roads within the agency's street network. Capital Projects costs are those funds committed to new capacity road projects, road expansion projects, or any other type of transportation improvement project not associated with the operations and maintenance of the existing road system.
The O&M vs. Capital Projects ratio comparison is intended to illustrate the significant investment the agency commits annually to maintain their existing roads.

Projects and Programs

This section presents the planned projects and programs developed for Cornelius to serve local travel through 2040. Pedestrian, bicycle, transit, and motor vehicle projects are identified in the Financially Constrained Plan for each mode, representing those projects that have the highest short-term need for implementation to satisfy performance standards or other policies established for the Cornelius TSP, and projects with dedicated funding. The costs for the remaining projects are identified, but these have not been included in the funding needs analysis for the city because the Financially Constrained Plan is limited to projects most likely to be funded within the planning horizon. Remaining projects on the Strategic Plan will require additional funding, and they are expected to be built beyond the 2040 planning horizon.

Project Cost Estimates

Planning level cost estimates were developed for the projects identified in the pedestrian, bicycle, transit and motor vehicle plans. Cost estimates from the existing RTP, County and/or City projects in Cornelius were used in this study, if available. Other projects were estimated using general unit costs for transportation improvements, but do not reflect the unique project elements that can significantly add to project costs[2]. Development of more detailed project costs can be prepared in the future with more refined financial analysis. Since many of the projects overlap elements of various modes, the costs were developed at a project level incorporating all modes, as appropriate. It may be desirable to break project mode elements out separately, however, in most cases, there are greater cost efficiencies of undertaking a combined, overall project. Each of these project costs will need further refinement to detail right-of-way requirements and costs associated with special design details as projects are pursued.

Roadway Maintenance

The annual cost of maintaining streets within Cornelius is in the $3 to 4 million per year range, well above the City's annual revenue. Recent funding availability was estimated at $1,122,000 annually, a portion of which is paid for by gas tax revenues from the city, county and state. New House Bill 2017 funds will go exclusively to maintenance needs over the next 10 years. Over 22 years, the City's ability to fund road maintenance is about $27.4 million (revenue from non-Washington County TDT funds shown in Table 10-3), far short of its need of about $65 to $90 million. Current funding levels allow the City to maintain its system on a 75 to 80-year cycle, which greatly exceeds the desired 20-year maintenance cycle. Roadway maintenance is the highest cost component of the transportation plan. Additional funding sources are desperately needed for this critical system element.

[2] General plan level cost estimates do not reflect specific project construction costs, but represent an average estimate. Further preliminary engineering evaluation is required to determine impacts to right-of-way, environmental mitigation and/or utilities. Experience has shown that individual projects costs can increase by 25 to 75 percent as a result of the above factors.

Costs for Financially Constrained Plan

The cost estimates outlined in the TSP to implement the financially constrained project list for motor vehicles, transit, bicycles and pedestrians total $28.9 million of city funds, and the recommended transportation operations and maintenance programs would add $24.7 million for a total cost of $53.6 million through 2040. Refer to Chapter 4 through 9 for details on the individual projects by travel mode. The estimated $28.9 million for city funded projects on the financially constrained lists are expected to be adequately funded by the 22-year revenue estimate from Washington County TDT of $29.4 million (see Table 10-2).

Note that several additional projects are listed on the financially constrained project lists that are expected to be funded by other sources (Metro, TriMet, development, etc.). These non-city project costs have not been included in the estimates in Table 10-4, but are identified in the financially constrained plans for each mode.

Table 10-4: Financially Constrained Plan City Costs over 22 years (2017 Dollars)

Transportation Element	Approximate Cost
Improvement Projects (Financially Constrained)	
Pedestrian	$10,487,000
Bicycle	$1,485,000
Transit	$1,700,000
Motor Vehicle*	$15,235,000
Total Capital Projects	**$28,907,000**
Total Operations and Maintenance Programs	**$24,684,000**
22 YEAR TOTAL	**$53,591,000**

*Motor vehicle financially constrained plan includes sidewalks and bike facilities on new roadways

For the TSP finance assessment, it was assumed the remaining local revenue of $24.7 million would be used for maintaining the transportation system. The estimated total funding need for roadway maintenance will not be adequately funded by the forecasted transportation revenue (see Table 10-1). Potential new funding sources to cover the future roadway maintenance needs and funding shortfall are discussed in the next section.

New Funding Sources and Opportunities

The new transportation improvement projects and recommended programs will require funding beyond the levels currently collected by the City. There are several potential funding sources for transportation improvements. This section summarizes several funding options available for transportation improvements. These are sources that have been used in the past by agencies in Oregon. In most cases, these funding sources, when used collectively, are sufficient to fund transportation improvements for local communities. Due to the complexity of today's transportation projects, it is necessary to seek several avenues of funding projects. Unique or hybrid funding of projects generally will include these funding sources combined in a new package.

Transportation program funding options range from local taxes, assessments, and charges to state and federal appropriations, grants, and loans. All these resources can be constrained based on a variety of factors, including the willingness of local leadership and the electorate to burden citizens and businesses; the availability of local funds to be dedicated or diverted to transportation issues from other competing City programs; and the availability and competitiveness of state and federal funds. Nonetheless, it is important for the City to consider all its options and understand where opportunities may exist to provide and enhance funding for its transportation programs.

The following funding sources have been used by cities to fund the capital and maintenance aspects of their transportation programs. There may be means to begin to or further utilize these sources, as described below, to address needs identified in the Transportation System Plan.

General Fund Revenues

At the discretion of the City Council, the City can allocate General Fund revenues to pay for its transportation program. General Fund revenues primarily include property taxes, use taxes, and any other miscellaneous taxes and fees imposed by the City. This allocation is completed as a part of the City's annual budget process, but the funding potential of this approach is constrained by competing community priorities set by the City Council. General Fund resources can fund any aspect of the program, from capital improvements to operations, maintenance, and administration. Additional revenues available from this source to fund new aspects of the transportation program are only available to the extent that either General Fund revenues are increased or City Council directs and diverts funding from other City programs.

Voter-Approved Local Gas Tax

Cornelius collects a two-cent per gallon gas tax, which was approved by voters in 2009. The local gas tax provides annual revenue of approximately $192,000. Based on this, each one-cent per gallon added to the local gas tax could generate almost $100,000 annually. In 2016, a measure proposing an increase to the gas tax of $0.02/gallon was rejected. However, it could still be considered as a potential future funding source.

Several other communities in Oregon have also adopted local gas taxes by public vote. The process for presenting such a tax to voters must be consistent with Oregon State law as well as the laws of the City of Cornelius. Table 10-5 summarizes the cities in Oregon that collect a local gas tax.

Table 10-5: Local Gas Taxes in Oregon

City	Vote Passage Date	Tax Rate
Astoria	2007	3 cents/gallon
Brookings	2015	4 cents/gallon
Canby	2008	3 cents/gallon
Coburg	2007	3 cents/gallon
Coquille	2007	3 cents/gallon
Cornelius	2009	2 cents/gallon
Cottage Grove	2003	3 cents/gallon
Dundee	2004	2 cents/gallon
Eugene	2003	5 cents/gallon
Hood River	2009	3 cents/gallon
Milwaukie	2007	2 cents/gallon
Oakridge	2004	3 cents/gallon
Phoenix	2015	2 cents/gallon
Sandy	2002	1 cent/gallon
Sisters	2009	3 cents/gallon
Springfield	2003	3 cents/gallon
The Dalles	1980	3 cents/gallon
Tigard	2006	3 cents/gallon
Troutdale	2015	3 cents/gallon
Tillamook	1982	1.5 cents/gallon
Veneta	2004	3 cents/gallon
Warrenton	2007	3 cents/gallon
Woodburn	1989	1 cent/gallon

Source: League of Oregon Cities' website (http://www.orcities.org/MemberServices/AZIndex/tabid/810/itemid/180/), Local Gas Tax Information, November 2016.

Street Utility Fee Revenue

Many Oregon cities supplement their street funds with street utility fees (also known as transportation utility fees). Local cities with adopted street utility fees include Corvallis, La Grande, Milwaukie, North Plains, Philomath, Hillsboro and Tualatin.[3] Establishing user fees to fund applicable transportation

[3] League of Oregon Cities, TUF Solutions for Local Street Funding: A Survey on Transportation Utility Fees (TUF's), January 2008.

activities and/or capital construction ensures that those who create the demand for service pay for it proportionate to their use. The street utility fees are recurring monthly or bi-monthly charges that are paid by all residential, commercial, industrial, and institutional users. The fees are charged proportionate with the amount of traffic generated, so a retail commercial user pays a higher rate than a residential user. Typically, there are provisions for reduced fees for those that can demonstrate they use less than the average rate implies, for example, a resident that does not own an automobile or truck or has an income below a predetermined eligibility level.

From a system health perspective, forming a street utility fee program also helps to support the ongoing viability of the program by establishing a source of reliable, dedicated funding for that specific function. Fee revenues can be used to secure revenue bond debt used to finance capital construction. A street utility fee can be formed by Council action and does not require a public vote.

A preliminary estimate for street utility fee revenue in Cornelius ranges between $75,000 to $250,000 annually, based on the average rates charged around the state. A specific fee study would be required to establish a fee program for the City of Cornelius to determine specific allocations to its residents and merchants.

Other Funding Sources

Urban Renewal District

An Urban Renewal District (URD) would be a tax-funded district within the City. The URD would be funded with the incremental increases in property taxes consistent with state law and/or that result from construction of applicable improvements; this would not result in a new tax assessed on Cornelius property owners. This type of tax increment financing has been used in Oregon since 1960. Uses of the funding can include, but are not limited to, transportation. It is tax-increment funded rather than fee funded and the URD could provide for renewal projects such as streetscape, water, sewer, wastewater, undergrounding utilities, or parking improvements to support downtown businesses.

Local Improvement District Assessment Revenue

The City may set up Local Improvement Districts (LIDs) to fund specific capital improvement projects within defined geographic areas, or zones of benefit. LIDs impose assessments on properties within its boundaries. LIDs may not fund ongoing maintenance costs. They require separate accounting, and the assessments collected may only be spent on capital projects within the geographic area. Citizens representing 33% of the assessment can terminate a LID and overturn the planned projects so projects and costs of a LID must be met with broad approval of those within the boundaries of the LID.

Direct Appropriations

The City can seek direct appropriations from the State Legislature and/or U.S. Congress for transportation capital improvements. There may be projects identified in the Plan for which the City may want to pursue these special, one-time appropriations.

Special Assessments

A variety of special assessments are available in Oregon to defray costs of sidewalks, curbs, gutters, street lighting, parking and CBD or commercial zone transportation improvements. These assessments would likely fall within the Measure 50 limitations. A regional example would be the Westside LRT where the local share of funding was voter approved as an addition to property tax.

Employment Taxes

TriMet collects a tax for transit operations in the Portland region through payroll and self-employment taxes.

Debt Financing

While not a direct funding source, debt financing can be used to mitigate the immediate impacts of significant capital improvement projects and spread costs over the life of a project. Though interest costs are incurred, the use of debt financing can serve not only as a practical means of funding major improvements, but is also viewed as an equitable funding strategy, spreading the burden of repayment over existing and future customers who will benefit from the projects. The obvious caution in relying on debt service is that a funding source must still be identified to fulfill annual repayment obligations.

Voter-Approved General Obligation Bond Proceeds: Subject to voter approval, the City can issue General Obligation (GO) bonds to debt finance capital improvement projects. GO bonds are backed by the increased taxing authority of the City, and the annual principal and interest repayment is funded through a new, voter-approved assessment on property City-wide (a property tax increase). Depending on the critical nature of any projects identified in the Transportation System Plan, and the willingness of the electorate to accept increased taxation for transportation improvements, voter-approved GO bonds may be a feasible funding option for specific projects. Proceeds may not be used for ongoing maintenance.

Revenue Bonds*:* Revenue bonds are debt instruments secured by rate revenue. In order for the City to issue revenue bonds for transportation projects, it would need to identify a stable source of ongoing rate funding. Interest costs for revenue bonds are slightly higher than for general obligation bonds, due to the perceived stability offered by the "full faith and credit" of a jurisdiction.

Oregon Transportation Infrastructure Bank Loans: A statewide revolving loan fund designed to promote innovative transportation funding solutions. State support for the program is provided by the Financial Services Branch of ODOT. In general, eligible projects include highway, transit, bikeway and pedestrian access projects. Projects are rated on established criteria and recommended based on the rankings. Repayment of loans must begin within five years of project completion and must be complete within 30 years or at the end of the useful life of the project.

Recommendations for New Transportation Funds

It is recommended that the City continue to pursue an increase in the local gas tax. We estimate that a two-cent per gallon local gas tax could generate roughly $200,000 per year, or $4.4 million over the next 22 years. In addition, the City should actively pursue grant and other special program funding to mitigate the costs to its citizens of transportation capital construction. The City is currently preparing an Urban Renewal Plan, which will identify and fund transportation and other infrastructure projects such as streetscape, water, sewer, wastewater, undergrounding utilities or parking to support downtown businesses.