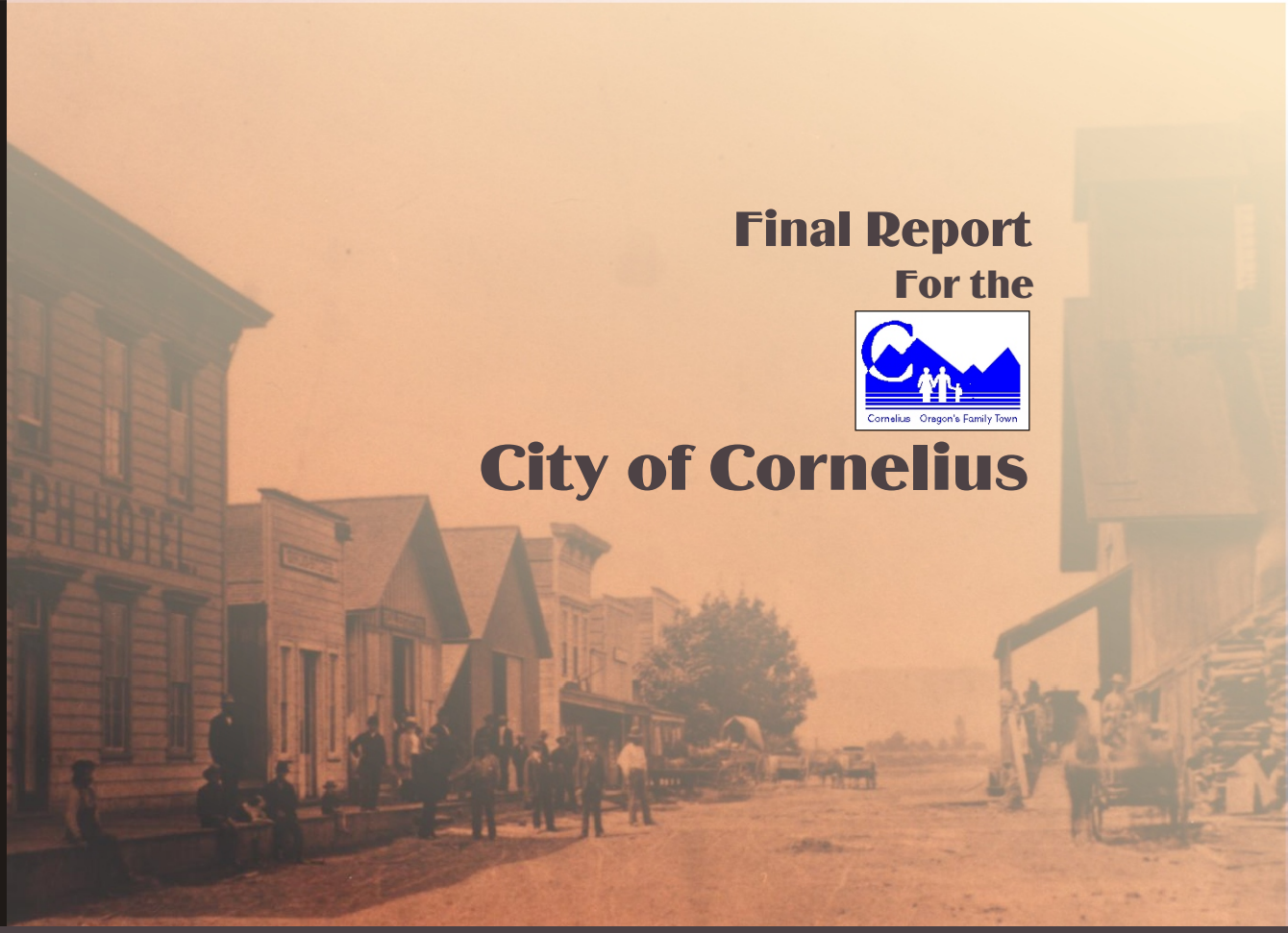

Final Report
For the
City of Cornelius

Cornelius Transportation System Plan

Prepared by

DKS Associates
TRANSPORTATION SOLUTIONS

Adopted
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1. Summary

The current Cornelius Transportation System Plan (TSP) was adopted in June 1995. Since that time, the City has grown by an estimated 50% in population, depleted much of its vacant land inventory and projected significant redevelopment and urban growth boundary (UGB) expansion. The primary purpose of this update is to ensure the recommended system plan can adequately serve planned major growth areas, including the recently approved 260-acre industrial expansion of the urban growth boundary just north of the Cornelius city limits and confirm consistency with the current Washington County TSP, Regional Transportation Plan and Statewide Planning Policies.

The TSP Update provides specific information regarding transportation needs to guide future transportation investment in the City and determine how land use and transportation decisions can be brought together beneficially for the City and is based on needs required to meet transportation demand based on 2025 future needs. This executive summary provides the plan committees and organization, transportation plans for each mode and funding and implementation summaries.

Plan Committees

The plan was developed in close coordination with Cornelius city staff, citizen representatives and key representatives from the surrounding communities. Two formal committees were formed to guide in the plan development:

- *Technical Advisory Committee* – Agency staff from Metro, Oregon Department of Transportation, TriMet, Washington County, City of Hillsboro and City of Forest Grove participated in reviewing the technical methods and findings of the study. The focus of this group was on consistency with the plans and past decisions in adjoining jurisdictions, and consensus on new recommendations.
- *Citizen Advisory Committee* – The Cornelius Planning Commission and five additional business and neighborhood leaders served as the representatives for the community. A series of meetings were held to review interim study findings and policy issues that benefited from their direction.

Plan Organization

This document is divided into ten chapters and a separate Technical Appendix. The title and focus of each chapter is summarized below:

- *Chapter 1: Summary* – This chapter provides a brief overview of the plan recommendations and presents the estimated funding needed to implement it.
- *Chapter 2: Goals and Measures of Effectiveness* – This chapter presents the recommended goals applied to develop strategies and implementing measures for each of the travel modes. The measures of effectiveness provide the performance standards applied to the TSP evaluation.

- *Chapter 3: Existing Conditions* – This chapter examines the current transportation system in terms of the built facilities, how well they perform and comply with existing policies, and where current deficiencies exist.
- *Chapter 4: Land Use Forecasts and Travel Demands* – This chapter presents the details of how the City of Cornelius is expected to grow over the next 20 years, and how travel demands on the city and regional facilities will change from general growth in the Metro and nearby areas.
- *Chapter 5: Pedestrian Plan* – This chapter presents plan recommendations to enhance pedestrian facilities and focus new improvements in areas with the highest concentration of activity.
- *Chapter 6: Bicycle Plan* – This chapter presents plan recommendations to enhance bicycle facilities and focus new improvements in areas with the highest concentration of activity.
- *Chapter 7: Transit* – This chapter makes recommendations to be considered by TriMet in their future enhancements to transit services.
- *Chapter 8: Motor Vehicles* – This chapter presents plan recommendations to provide adequate mobility and access to the city, county and state facilities as travel demands grow to 2025 levels. This chapter also recommends new street design standards, access spacing standards, functional class designations and other programs to monitor and manage travel demand.
- *Chapter 9: Other Modes* – This chapter discusses transportation issues related to rail, air, water and pipeline transportation.
- *Chapter 10: Financing and Implementation* – This chapter presents the complete estimated revenues and costs for the transportation projects and programs developed in the plan. New funding alternatives are presented to bridge the gaps between the two.

Goals

The city's Comprehensive Plan provides a transportation vision and several policies which were built on to to establish goals for this TSP udpate. The specific goals are described in Chapter 2. Goals are defined as brief guiding statements that describe a desired result. These goals were applied in the development of this Transportation System Plan to develop strategies and implementing measures for each of the travel modes applied in the City of Cornelius.

Transportation Plans

The Cornelius TSP Update identifies projects and programs needed to support the City's Goals and to serve planned growth over the next 20 years.This document presents the recommended investments and priorities for the Pedestrian, Bicycle, Transit, and Motor Vehicle systems along with new transportation programs to correct existing shortfalls and enhance critical services. For each travel mode, a Master Plan project map and list are identified to support the city's transportation goals and policies. Projects that are reasonably expected to be funded over the next 20 years were identified and are referred to as Action Plans. The following sections summarize the plan for each mode.

Pedestrian Plan

The existing pedestrian system has significant needs that include a complete arterial/collector sidewalk system, sidewalk gap infill on local streets, additional crossings on TV Highway (Adair Street and Baseline Street) and multi-use trails. Metro's RTP identifies TV Highway with a pedestrian designation of a transit/mixed use corridor. Additionally, the City of Cornelius has designated a Main Street District[1] on the Baseline Street/Adair Street couplet from 10th Avenue to 20th Avenue. One major goal of the Main Street District Plan is to promote the use of non-auto travel modes.

Based on these needs, a Pedestrian Master Plan was developed and is shown in Figure 5-1. The Pedestrian Master Plan will require incremental implementation. As development occurs, streets are rebuilt and other project funding opportunities (such as grant programs) arise, projects on the Master Plan should be integrated into project development.

The pedestrian goals and strategies were reviewed to create a Pedestrian Action Plan, which are projects that are reasonably expected to be funded by the year 2025. The highest ranking City projects that are reasonably expected to be funded were combined with projects from other agencies identified in the RTP Financially Constrained scenario to create the project list shown in Table 5-2.

Bicycle Plan

The existing bike lane system on arterial and collector streets does not provide adequate connections from neighborhoods to schools, parks, retail centers, or transit stops. Continuity and connectivity are key issues for bicyclists and the lack of facilities (or gaps) cause significant problems for bicyclists in Cornelius. Metro's RTP identifies TV Highway with a bicycle designation of a regional corridor bikeway. Additionally, the City of Cornelius has designated a Main Street District[2] on the Baseline Street/Adair Street couplet from 10th Avenue to 19th Avenue. One major goal of the Main Street District Plan is to promote the use of non-auto travel modes.

A Bicycle Master Plan (Figure 6-1) was developed based on these identified needs. The Bicycle Master Plan will require incremental implementation. As development occurs, streets are rebuilt and other project funding opportunities (such as grant programs) arise, projects on the Master Plan should be integrated into project development.

The bicycle goals and strategies were reviewed to create a Bicycle Action Plan, which are projects

[1] *Cornelius Main Street Plan*, City of Cornelius, adopted July 23, 2002.

[2] *Cornelius Main Street Plan*, City of Cornelius, adopted July 23, 2002.

that are reasonably expected to be funded by the year 2025. The highest ranking City projects that are reasonably expected to be funded were combined with projects from other agencies identified in the RTP Financially Constrained scenario to create the project list shown in Table 6-2.

Transit Plan

TriMet is the regional transit provider for the Portland metro area and operates one bus route within Cornelius, #57 – TV Highway/Forest Grove which recently (Fall 2004) began providing frequent service with buses at stops every 15-minutes every day. Metro's RTP identifies TV Highway with a potential light rail or rapid bus and major bus stop transit designation. The recommended high capacity transit study areas would evaluate improvements to east-west transit facilities in Cornelius, such as commuter rail, light rail and bus rapid transit service. Additional needs were identified for the quality of service in Cornelius, including transit route reliability and user amenities. Based on these needs, a Transit System Master Plan was created that is shown in Figure 7-2.

The transit goals and strategies were reviewed to create a Transit Action Plan, which are projects that are reasonably expected to be funded by the year 2025. The highest ranking City projects that are reasonably expected to be funded were combined with projects from other agencies identified in the RTP Financially Constrained scenario to create the project list shown in Table 7-2.

Motor Vehicle Plan

The TSP Update forecasted 2025 growth to identify motor vehicle system needs in Cornelius. Without a significant investment in Transportation System Management (TSM), Travel Demand Management (TDM), and roadway improvements, several key facilities in the City would operate with congested conditions in the future. Improvement alternatives were analyzed for meeting these needs.

The following sections summarize the recommended motor vehicle system plans that meet the demands of future growth and comply with local and regional planning requirements.

Transportation System Management (TSM)

Transportation System Management (TSM) focuses on low cost strategies to enhance operational performance of the transportation system by seeking solutions to immediate transportation problems, finding ways to better manage transportation, maximizing urban mobility, and treating all modes of travel as a coordinated system. TSM measures focus primarily on region wide improvements, however there are a number of TSM measures that are recommended for use in Cornelius, which include:

Intelligent Transportation Systems (ITS): ITS focuses on increasing the efficiency of existing transportation infrastructure, which enhances the overall system performance and reduces the need to add capacity (e.g. travel lanes). Efficiency is achieved by providing services and information to travelers so they can (and will) make better travel decisions and to transportation system operators so they can better manage the system and improve system reliability.

In order to support future ITS projects and the local interconnect infrastructure, the City of Cornelius standards should be updated to include the installation of 3" conduit during roadway improvement projects.

Neighborhood Traffic Management (NTM): The City of Cornelius has several neighborhood traffic management elements including speeds humps, a traffic circle and crosswalk pavement texture. The city should consider additional traffic calming measures and work with the community to find the traffic calming solution that best meets their needs and maintains roadway function. Additional NTM measure descriptions that include diagrams, benefits, and costs are included in the technical appendix. Any NTM project should include coordination with emergency agency staff to assure public safety.

Access Management: 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 the individual destination. Staff should propose revisions to the development code to reflect the standards being developed in the TSP Update. Additional attention should be given to the specific standards and whether exceptions are appropriate to be written into the code or if variances are the action needed. Additional attention should be given to the specific standards and a determination made whether exceptions should be written into the development code or if variance provisions would be the appropriate implementation method.

The following recommendations are made for access management:

- An access report requirement as part of the land development application. The report would verify driveway design and spacing, proper on-site circulation, adequate stacking, sight and deceleration distance as set by ODOT (including their approach permitting process), Washington County, the City and AASHTO (utilizing future traffic volumes from this plan as a future base for evaluation).
- Driveways should not be placed in the influence area of intersections. The influence area is that area where queues of traffic commonly form on the approach to an intersection (typically between 150 to 300 feet). In a case where a project has less than 150 feet of frontage, the site would need to explore potential shared access, or if that were not practical, place driveways as far from the intersection as the frontage would allow (permitting for five feet from the property line).
- Access to arterials should only be from public roads. When a site that has private access onto a principal arterial is redeveloped, the private access will be eliminated if alternate access exists to the site.
- A restriction of direct access of new single-family units on arterials and collectors (this would include an exception process that addresses safety and neighborhood traffic management needs).

Local Street Connectivity: Much of the local street network in Cornelius is built but is not well connected. Multiple access opportunities for entering or exiting neighborhoods are limited. There are a number of locations where neighborhood traffic is funneled onto one single street. This type of street network results in out-of-direction travel for motorists and an imbalance of traffic volumes that impacts residential frontage.

A Local Street Connectivity Plan is shown in Figure 8-2. In most cases, the connector alignments are not specific and are aimed at reducing potential neighborhood traffic impacts by better balancing traffic flows on neighborhood routes. To protect existing neighborhoods from potential traffic impacts of extending stub end streets, connector roadways should incorporate neighborhood traffic management into their design and construction. All stub streets should have signs indicating the potential for future connectivity.

Additionally, new development that constructs new streets, or street extensions, should meet the following connectivity standards:

- Provide full street connections with spacing of no more than 530 feet between connections except where prevented by barriers.
- Provide bike and pedestrian access ways with spacing of no more than 330 feet except where prevented by barriers.
- Limit use of cul-de-sacs and other closed-end street systems to situations where barriers prevent full street connections
- Include no close-end street longer than 200 feet or having no more than 25 dwelling units.
- Include street cross-sections demonstrating dimensions of ROW improvements, with streets designed for posted or expected speed limits.

Functional Classification: The proposed functional classification (shown in Figure 8-3) differs from the previous TSP functional classifications. In order to allow for more flexibility in facility access and design and maintain consistency with other jurisdictions, the Cornelius functional classification system was updated and now includes neighborhood routes as a classification.

Roadway Cross-Section Standards: The City of Cornelius has current standards for street cross sections that apply citywide to residential local streets (36' curb-to-curb, 28' curb-to-curb and 20' curb-to-curb), collector streets (36' curb-to-curb) and industrial streets (36' curb-to-curb). The City should adopt the recommended additional cross-section standards (shown in Figures 8-4 through 8-7 in chapter 8) for arterial streets, neighborhood routes, TV Highway, Baseline Street and Adair Street.

Parking Requirements: The City of Cornelius should consider several parking policies to be consistent with the TPR and RTP[3]. These policies include:

- Allow the designation of residential parking districts to protect residential areas from spillover parking generated by adjacent commercial, employment, or mixed-use areas, or other uses that generate a high demand for parking.
- Provide Metro annual parking data when requested that demonstrates compliance with the minimum and maximum parking ratios, including the application of any variances to the regional standards.
- Require parking lots more than 3 acres in size to provide street-like features along major driveways; including curbs, sidewalks, and street trees or planter strips. Major driveways in new residential and mixed-use areas shall meet connectivity standards for full street connections.

Transportation Demand Management (TDM)

Transportation Demand Management (TDM) is the general term used to describe any action that removes single occupant vehicle trips from the roadway network during peak travel demand periods. Generally, TDM focuses on reducing vehicle miles traveled and promoting alternative modes of travel for large employers of an area.

[3] *Urban Growth Management Functional Plan*, Title 2: Regional Parking Policy, Metro, September 22, 2004.

The City of Cornelius should coordinate with Washington County and TriMet to implement strategies to assure that the TDM assumptions in the RTP are implemented. The City of Cornelius, Washington County and TriMet should coordinate to implement the pedestrian, bicycle, and transit system improvements, which offer alternative modes of travel. The recommended TDM action plan includes:

- Support continued efforts by TriMet, Metro, ODOT, and Washington County to develop productive TDM measures that reduce commuter vehicle miles and peak hour trips.
- Encourage the development of high speed communication in all part of the city (fiber optic, digital cable, DSL, etc). The objective is to provide employers and residents a full range of options for conducting business and activities (such as home office, telecommuting), which can contribute to a reduction in peak hour travel on the roadway system.
- Encourage developments that effectively mix land uses to reduce vehicle trip generation. Development proposals should consider linkages (particularly non-auto) to support greater use of alternative travel modes.
- Increase industrial, commercial and institutional land uses within Cornelius to provide additional employment opportunities and reduce the average commute length.
- Continued implementation of motor vehicle minimum and maximum parking ratios for new development.
- Continued implementation of street connectivity requirements.
- Require new development to install bicycle racks.
- Implementation of bicycle, pedestrian, motor vehicle and transit system action plan.

Capacity and Circulation Improvements

The motor vehicle capacity and circulation needs in Cornelius were determined for 2030 future conditions. The extent and nature of the recommended street improvements for Cornelius are moderate. The majority of study intersections are expected to meet performance standards without major capacity improvements. However, the need for circulation improvements in Cornelius is significant. The existing roadway network is inadequate with limited connectivity.

Roadway extension projects would:

- Allow local traffic to make in-town trips using well connected streets without traveling on arterials.
- Reduce congestion on TV Highway, Baseline Street and Adair Street by providing alternative routes for local trips.
- Reduce vehicle miles travelled (VMT) within the study area by limiting out of way travel patterns for all modes.
- Provide an adequate roadway system for future local development.

Based on these needs, a Motor Vehicle Master Plan was created that is shown in Figure 8-10. The Motor Vehicle Master Plan will require incremental implementation. As development occurs, streets are rebuilt and other project funding opportunities (such as grant programs) arise, projects on the Master Plan should be integrated into project development.

The motor vehicle goals were reviewed to create a Motor Vehicle Action Plan, which are projects that are reasonably expected to be funded by the year 2025. The highest ranking City projects that

are reasonably expected to be funded were combined with projects from other agencies identified in the RTP Financially Constrained scenario to create the project list shown in Table 8-13. The identified local TIF/Developer projects would only occur with development or redevelopement and would not be initianted by the City.

Trucks

Efficient truck movement plays a vital role in the economical movement of raw materials and finished products. The establishment 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. Figure 8-11 shows the recommended designated through truck routes in the TSP study area. The objective of this route designation is to allow these routes to focus on design criteria that are "truck friendly"; i.e. 12-foot travel lanes, longer access spacing, 35-foot (or larger) curb returns, and pavement design that accommodates a larger share of trucks.

Washington County identifies TV Highway, Baseline Street and Adair Street through Cornelius and 10th Avenue as a freight route. Metro has designated TV Highway, Baseline Street and Adair Street as a Roadway Connector defined as a road that connects freight facilities and freight generation areas to the main roadway route. TV Highway, Baseline Street and Adair Street are not a designated State Freight Route.

The recommended truck route map is consistent with Washington County TSP designations for TV Highway, Baseline Street, Adair Street and 10th Avenue. The truck route map exceeds the Metro RTP designation for TV Highway, Baseline Street and Adair Street.

Other 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.

Rail

Portland & Western Railroad (P&W) has two freight lines that pass through Cornelius, the Westside-Seghers District (FAA) and Forest Grove District (3F) Lines. The FAA line passes through Cornelius one-half block south of TV Highway. The 3F line passes through Cornelius approximately five blocks north of TV Highway and one block north of Davis Street. The volume, length and schedule of the freight trains are not expected to change significantly over the 20 year planning horizon. Figure 9-1 summarizes the Rail Lines and Crossings Plan.

The Cooperative Improvement Agreement (CIA) between the City of Cornelius and ODOT was approved in June 1999. The agreement includes three phases of improvements. The first phase was constructed in 2001. Planned phases 2 and 3 are summarized below:

- Phase 2 – Upon signalization of the intersection of 20th Avenue/TV Highway, which includes flashing lights and gates at 20th Avenue and the grade rail crossing, the City will close the grade rail crossing at 11th Avenue to vehicular traffic. This phase is schedule for construction in the summer of 2005.
- Phase 3 – Upon signalization of the intersection of 14th Avenue/TV Highway (Adair Street and Baseline Street), which includes flashing lights and gates at 14th Avenue and

the grade rail crossing, the City will close the grade rail crossing at 12th Avenue to vehicular traffic. This phase has not yet been designed or scheduled for construction.

There are a significant number of public at-grade rail crossings within Cornelius. The Cooperative Improvement Agreement plans to upgrade two of the rail crossings with safety features. As vehicle, bicycle and pedestrian volumes increase at the remaining rail crossings, the need for safety controls should be evaluated. The existing at-grade rail crossing on the P&W 3F line at 10th Avenue and 19th Avenue and the P&W FAA line at 10th Avenue should be considered for future safety improvements. Future improvements at the rail crossings will require a coordinated effort between P&W staff, ODOT Rail Division and Cornelius.

ODOT has issued a rail order to close the existing P&W 3F line rail crossing at either 13th Avenue or 14th Avenue in exchange for upgrading the existing P&W 3F line rail crossing at 26th Avenue from private to public ownership. This future rail crossing closure should be studied further to determine the appropriate location based on transportation issues such as roadway functional classification, daily traffic volumes, local street network and adjacent land uses.

A high capacity transit study area is identified in the Transit Master Plan (Figure 7-2) on both rail lines in Cornelius. The P&W 3F rail line is a possible location for commuter rail which would extended from downtown Hillsboro to Forest Grove. Commuter rail and freight rail can be accommodated on the same rail lines. The existing P&W FAA rail line is a possible location for light rail. However, this project would require the freight rail use to end and the light rail line would utilze the existing rail right-of-way. The potential for these projects will require a coordinated effort between P&W staff, ODOT Rail Division, TriMet, Metro and local jurisductions.

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.

Pipeline

There are no major pipelines in the Cornelius TSP study area. The future service of gas pipelines are not expected to change significantly over the 20 year planning horizon. No policies or recommendations in this area of transportation are provided.

Funding

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, operation 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 property tax levies, traffic impact fees and fronting improvements to land development. The City of Cornelius utilizes a number of mechanisms to fund construction of its transportation infrastructure, including:

- State Fuel Tax and Vehicle License Fee
- County Fuel Tax
- Traffic Impact Fee

Under the above funding programs, the City of Cornelius will collect approximately $508,000 for street construction and repair each year, with the previously noted restrictions. Total revenues collected over 20 years would be $9.3 million with the current sources.

The costs outlined in the Transportation System Plan to implement the Action Plans for Motor Vehicles, Transit, Bicycles and Pedestrians total $2.9 million, and several other recommended transportation operations and maintenance programs would add $13.2 million for a total cost over 20 years of $16.1 million. Refer to Chapter 4 through 9 for details on the individual projects by travel mode. Note that additional projects are listed in the Action Plans that are expected to be funded by other agencies. These non-City costs have not been included in the estimates in Table 1-1, but are identified in the master plans.

Table 1-1: Cornelius Transportation Action Plans Costs over 20 years (2004 Dollars)

Transportation Element	Approximate Cost ($1,000)
System Improvement Projects (Action Plans projects to be funded by City)	
Pedesterian	$1,687
Bicycle	$1,284
Transit	$0
Motor Vehicle	$0
Total Capital Projects	**$2,971**
Operations and Maintenance Programs and Services	
Road Maintenance ($640,000/yr)	$12,800
School Safety Program ($5,000/yr)	$100
Sidewalk Grant Program ($10,000/yr)	$200
Neighborhood Traffic Management ($5,000/yr)	$100
Total Operations and Maintenance Programs	**$13,200**
20 YEAR TOTAL	**$16,171**

It is recommended that the City consider establishing a street utility fee as the backbone of its capital funding approach. Street utility fees can provide a stable source of dedicated revenue useable for transportation system operations and maintenance and/or capital construction. Rate revenues can also secure revenue bond debt if used to finance capital improvements. Street utilities can be formed by Council action, and billed through the City utility billing system.

In addition, the City should actively pursue grant and other special program funding in order to mitigate the costs to its citizens of transportation capital construction.

We estimate that a one-cent per gallon local gas tax and a street utility fee could generate roughly $150,000 per year, or $3 million over the next 20 years, and shown in Table 1-2 below. These additional funds would not be expected to generate sufficient revenues to fully capitalize the Action Plan projects and maintenance programs.

Table 1-2: Recommended New Transportation Funding Sources for Cornelius

Transportation Funding Source	Estimated Additional Annual Revenues
Local Gas Tax	$50,000
Street Utility Fee	$100,000
Annual New Revenues	**$150,000**
20 YEAR TOTAL	**$3,000,000**

The estimated revenue from the City TIF ($746,000) combined with revenue from the recommended new transportation funding sources ($3 million) over the next 20 years would provide adequate funding for the capital project costs identified in the TSP action plans ($2.9 million). However, the estimated $12.8 million for roadway maintenance costs over the next 20-years would be significantly underfunded.

2. Goals and Measures of Effectiveness

This chapter presents the goals and measures of effectiveness established for the Cornelius TSP Update. The goals were applied in the development of this Transportation System Plan to develop strategies and implementing measures for each of the travel modes applied in the City of Cornelius. The measures of effectiveness provide the performance standards applied to the evaluation of Existing Conditions in Cornelius. They are derived from existing regional policies and standards of professional transportation planning practice.

Goals

Roadway Network

Provide a supportive transportation network to the land use plan that provides opportunities for transportation choices and the use of alternative modes serving all residential and commercial areas.

- Ensure that public roads and streets are planned to provide safe, convenient, efficient and economic movement of persons, goods and services between and within the major land use activities. Existing rights of way should be classified and improved and new streets built based on the type, origin, destination and volume of current and future traffic.
- Through traffic should be provided with routes that do not congest local streets and impact residential areas. Outside traffic destined for Cornelius commercial areas should provide convenient and efficient access without the need to use residential streets.
- Local traffic routes should be planned to provide convenient circulation between home, school, work, recreation and shopping. Convenient access to major out-of-town routes should be provided from all areas of the city.
- Reduce vehicle miles travelled (VMT) within the study area by limiting out of way travel patterns for all modes.

Traffic Operations

Adopt an acceptable level of service for the roadway network that is consistent with regional transportation policies.

- LOS for signalized intersections
- LOS for unsignalized intersections
- ODOT V/C ratios apply to TV Highway based on roadway designation

Pedestrians and Bicycles

Develop complementary infrastructure for bicycles and pedestrian facilities to provide a diverse range of transportation choices for city residents.

- Sidewalk gaps shall be filled in to complete the pedestrian network. Priority to sidewalks connecting to schools, parks, libraries and transit stops.
- Sidewalks and bikeways shall be provided on all arterial and collector streets.
- Development of a local trail system with connections to regional trail facilities.
- The preferred spacing of signalized or unsignalized crossings of TV Highway.
- Bicycle parking on large commercial, industrial and multi-family residential projects.

Transit

Provide reliable convenient transit service to Cornelius residents and businesses as well as special-transit options for the city's elderly and disabled residents.

- Expand transit services with more frequent service and transit oriented street improvements.
- Park and ride facilities should be located with convenient access to the arterial system to facilitate rider transfer to transit and car pools and should be sited for the maximum convenience of commuters and transit riders.
- Transit stop amenities such as bus shelters, curb extensions, bench, etc.
- Paratransit (van/car pools, dial-a-ride) by Tri Met and community-based service providers.
- Special transportation services to the elderly and handicapped by Tri-Met and community-based service providers.
- Study options for development of high capacity transit service east-west through the City.

Safety

- The safety impacts of excessive vehicle speeds on roadways within Cornelius. Traffic calming measures and traffic control changes may be appropriate.
- The significant number of at-grade rail crossings within Cornelius should be evaluated as vehicle, bicycle and pedestrian volumes increase.

Environmental

Roadway improvements will limit impact to environmentally sensitive areas. The City will encourage more energy efficient and environmentally sound alternatives to the automobile by:

- The designation and construction of bike paths and pedestrian ways.
- The scheduling and routing of existing mass transit systems and the development of new systems to meet local resident needs.
- Encouraging the development of self-contained communities, providing a wide range of land use activities within a single area.

- Ensure the transportation system is developed in a manner consistent with state and federal standards for the protection of air, land and water quality, including the State Implementation Plan for complying with the Clean Air Act and the Clean Water Act.

Measures of Effectiveness

The performance standards summarized in Table 2-1 are the thresholds for determining acceptable versus unacceptable conditions in the transportation system.

Table 2-1: Transportation Performance Measures

Characteristic	Description	Methodology or Other Comments
Motor Vehicle		
Intersection	Peak hour level of service: ▪ Minimum LOS D (traffic signal) ▪ Minimum LOS E (no signal) Peak hour volume to capacity ratio: ▪ Maximum 1.1 v/c on TV Highway in Main Street District (10th to 20th Ave) ▪ Maximum 0.99 v/c on TV Highway	Highway Capacity Manual, 2000, Chapters 16 and 17, based on average vehicle delay. Oregon Department of Transportation
Vehicle Safety	Intersection collision rate per million entering vehicles (MEV) ▪ Less than 1.0 collision rate	Based on collision data reported by the Oregon Department of Transportation.
Pedestrian		
System Connectivity	Continuity and proximity of sidewalk/trail system. Minimum standard: ▪ 1/2 mile from schools, parks, retail and other major pedestrian generators	Based on GIS data and field review.
Crossing Spacing on Arterial Facilities	Minimum standard between adjacent crossing facilities ▪ 1/4-mile on arterials	Crossing control types, in descending order (grade-separated structure, pedestrian signal with crosswalks, uncontrolled crosswalk.
Bicycle		
System Connectivity	Continuity and proximity of sidewalk/trail system. Minimum standard: ▪ 1 mile from schools, parks, retail and other major non-auto generators	Based on GIS data and field review.
Transit		
Bus Headway	Frequency of bus service during hours of operation.	Based on methods in Highway Capacity Manual, 2000, Chapter 27.
Service Coverage	Level of service rating for employment and housing densities above minimum required for transit service within 1/4 mile walking distance from bus stops.	Based on methods in Highway Capacity Manual, 2000, Chapter 27.
Reliability	Measures the likelihood of on-time transit service based on historical travel data.	Requires detailed operation information by route and time of day.

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3. Existing Conditions

Overview

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 memorandum 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 2004 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 study area includes the City of Cornelius and the surrounding area transportation system network. The study area which will serve as the focus for this TSP update is shown in Figure 3-1. Eighteen intersections within the study area were selected for operational analysis. Data was gathered at these locations to evaluate area traffic conditions including vehicle delays and levels of service. 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.

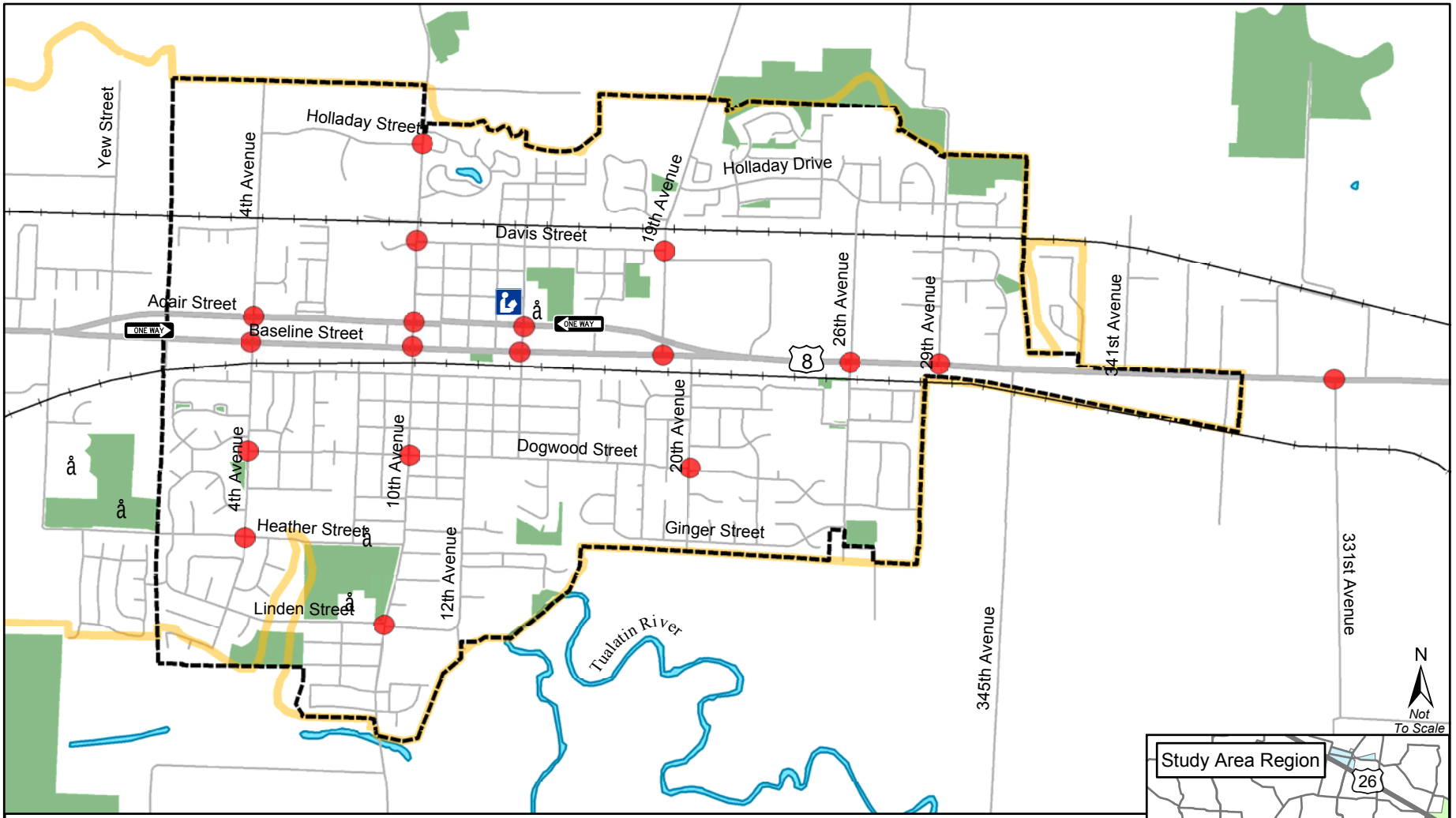


Figure 3-1
STUDY AREA

Sources:
- Metro RLIS
- TriMet
- City of Cornelius
- Washington County

LEGEND

- Study Intersections
- Parks/Open Space
- Library
- Schools
- Streams
- Rail Lines
- Cornelius City Limit
- Urban Growth Boundary

Pedestrians

In general, arterial, collector and residential streets in Cornelius have sidewalks on at least one side of the street. There are several locations within the downtown area and the neighborhoods where sidewalks are not connected. There is one multi-use path within the City located in Steamboat Park. Figure 3-2 shows the existing sidewalk and trail inventory in Cornelius.

Signalized pedestrian crossings are provided on Baseline Street and Adair Street at 14th Avenue. The pedestrian signals provide crossing locations for pedestrians traveling between the north and south portions of Cornelius. The pedestrian signals also improve pedestrian access to the Cornelius Public Library and Cornelius Elementary School on the north side of Adair Street at 14th Avenue.

***Issue**: Sidewalk gap infill and pedestrian crossings on TV Highway would improve the pedestrian system and connect residential areas with bus stops, schools, parks and retail centers.*

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 one evening peak hour during the fall of 2004. 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 in Table 3-1.

Table 3-1: Pedestrian Crossing Volumes at Study Intersections (Weekday PM Peak Hour)

Intersection	Pedestrian Crossing Volume
Adair Street/10th Avenue	37
Dogwood Street/4th Avenue	31
Baseline Street/14th Avenue	29
Baseline Street/26th Avenue	20
Dogwood Street/20th Avenue	12
Baseline Street/4th Avenue	12
Dogwood Street/10th Avenue	11
Heather Street/4th Avenue	10
Adair Street/14th Avenue	10
Davis Street/10th Avenue	10
Adair Street/4th Avenue	9
Baseline Street/10th Avenue	9
Davis Street/19th Avenue	8
Linden Street/10th Avenue	2
Baseline Street/19th Avenue	1
TV Highway/29th Avenue	1
Holladay Street/10th Avenue	0
TV Highway/331st Avenue	0

The most significant pedestrian movements occur at Baseline Street and Adair Street along the corridor. These pedestrian trips are likely generated by the adjacent commercial land use and close proximity to transit facilities. Dogwood Street at 4th Avenue, 10th Avenue and 20th Avenue also experienced significant pedestrian volumes.

***Issue:** Additional crossings and connections to the pedestrian system should be considered along the Adair Street and Baseline Street commercial corridor to improve pedestrian crossing spacing and safety.*

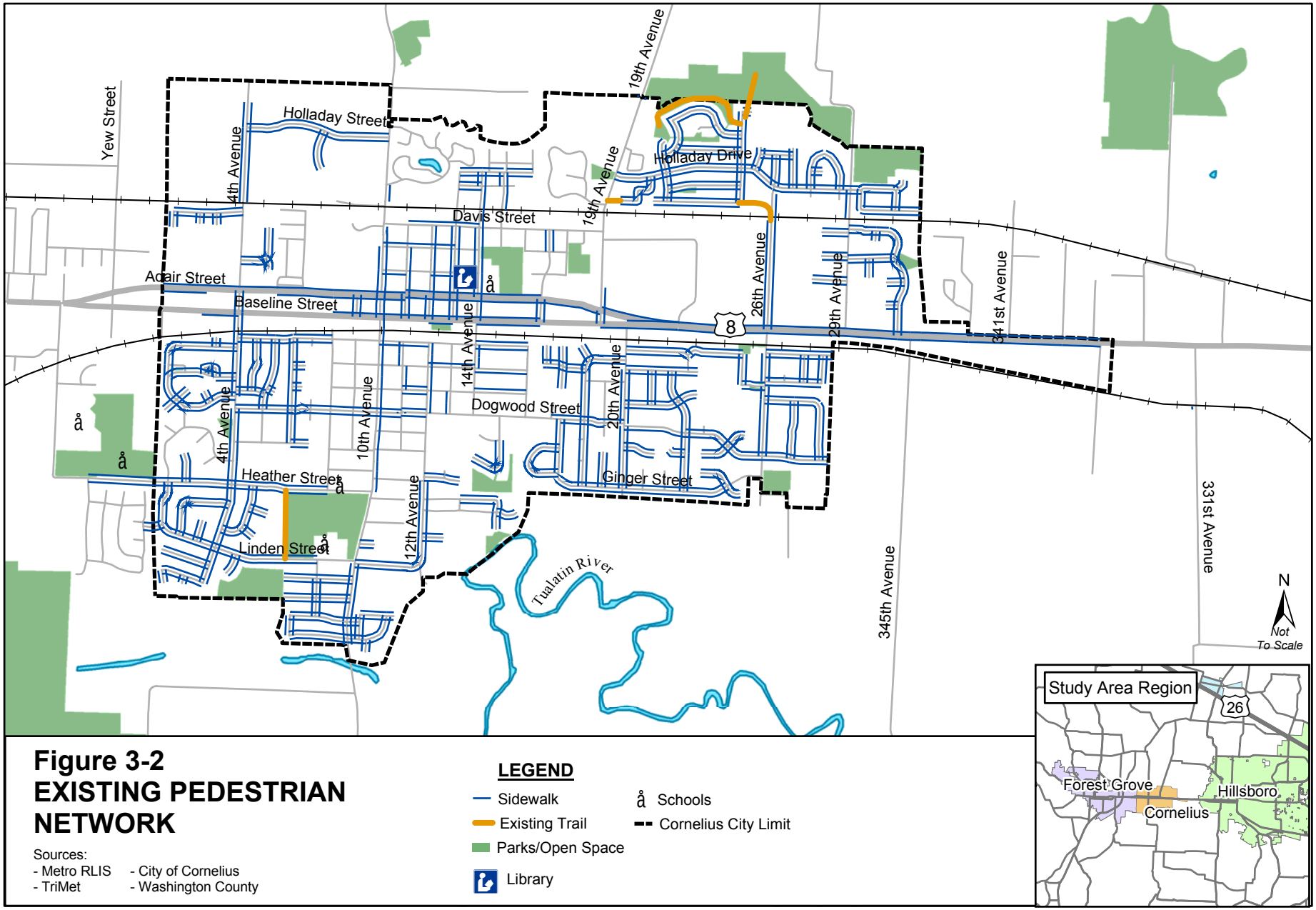


Figure 3-2
EXISTING PEDESTRIAN NETWORK

Sources:
- Metro RLIS
- TriMet
- City of Cornelius
- Washington County

LEGEND

- Sidewalk
- Existing Trail
- Parks/Open Space
- Library
- å Schools
- Cornelius City Limit

Bicycles

TV Highway provides bike lanes west of 26th Avenue to east of 29th Avenue. On the couplet, the south side of Baseline Street and the north side of Adair Street provide a wide shoulder (four to eight feet) that can be used by cyclists as a travel lane. In general, the shoulder provides a substandard bicycle facility with widths less than five-feet and on-street parking potentially sharing the shoulder width.

The majority of the collector and arterial routes in Cornelius do not provide bike lanes. There are several bike routes in the City which do not provide standard signed and striped bike lanes but are designated routes for cyclists to use. There are four designated east/west bike routes (Baseline Street/Adair Street, Davis Street, Linden Street and Dogwood Street) and four north/south bike routes (4th Avenue south of Baseline Street, 10th Avenue, 19th Avenue north of Adair Street and 26th Avenue south of Baseline Street) in Cornelius. Bicycles are permitted on all roadways in the City. Figure 3-3 shows the existing designated bike routes and trails in the study area.

Issue: *A complete bike lane network should be addressed to provide connectivity for bicyclists on arterials and collectors from neighborhoods to schools, parks, retail centers and transit stops.*

Bicycle counts were conducted during the PM peak hour at the study intersections. The bicycle volumes observed are summarized in Table 3-2. The highest bicycle volumes were observed on Dogwood Street, 4th Avenue, 10th Avenue and the Baseline Street/Adair Street couplet. These counts represent a sample of the existing bicycle activity based on one evening peak hour during the fall of 2004. The level of bicycle ridership is influences by several factors such as time of year and weather. Variations in bicycle activity at the study intersections would be expected with data collection over extended periods of time. Bicycle use in Cornelius is generally for recreational and school purposes.

Table 3-2: Bicycle Crossing Volumes at Study Intersections (Weekday PM Peak Hour)

Intersection	Bicycle Volumes
Dogwood Street/4th Avenue	17
Heather Street/4th Avenue	13
Dogwood Street/10th Avenue	13
Baseline Street/4th Avenue	11
Davis Street/10th Avenue	10
Adair Street/14th Avenue	10
Baseline Street/14th Avenue	9
Baseline Street/19th Avenue	9
Adair Street/10th Avenue	9
Davis Street/19th Avenue	8
Adair Street/4th Avenue	5
Baseline Street/26th Avenue	5
TV Highway/331st Avenue	4
Baseline Street/10th Avenue	2
Linden Street/10th Avenue	1
TV Highway/29th Avenue	1
Holladay Street/10th Avenue	0

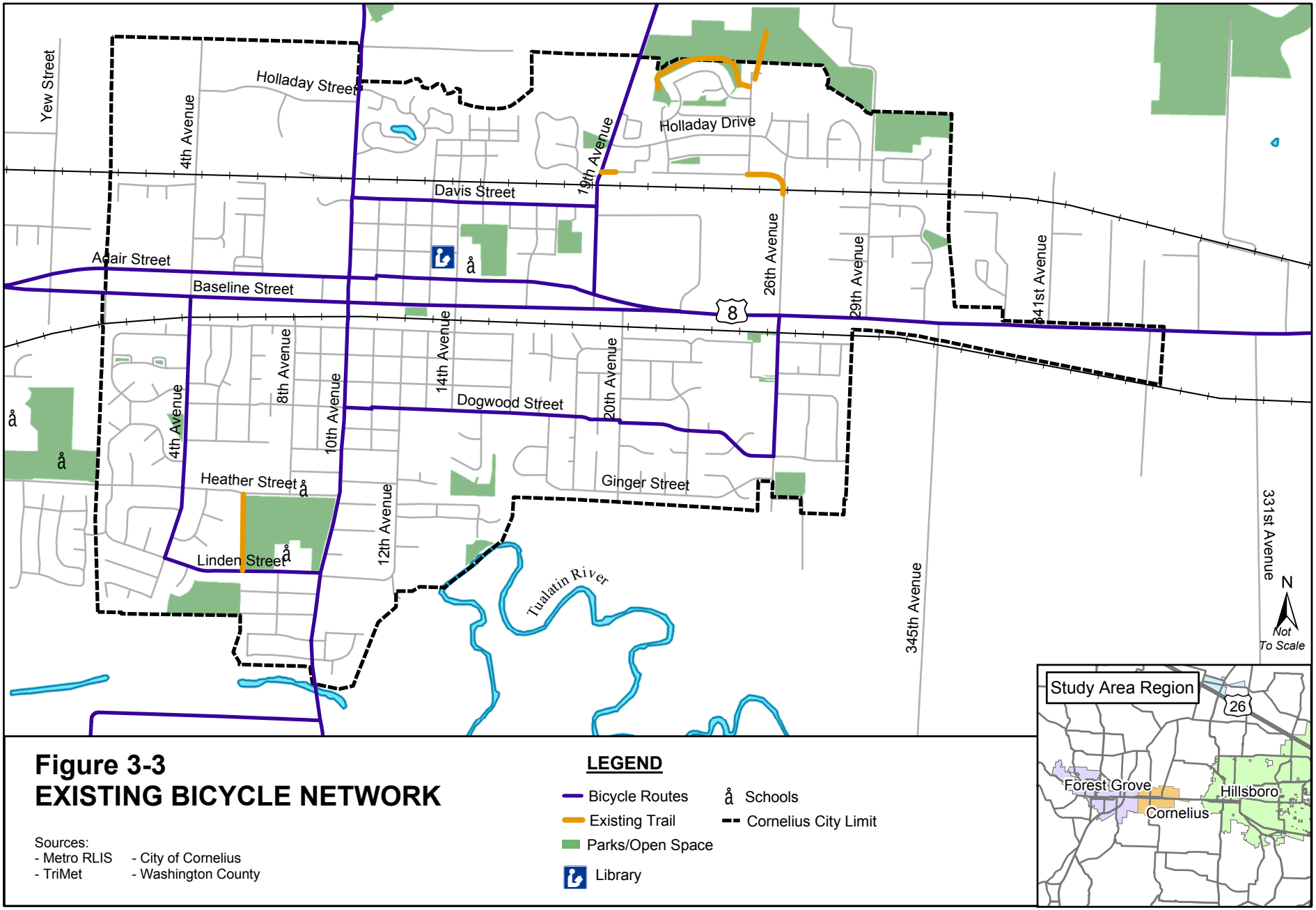


Figure 3-3
EXISTING BICYCLE NETWORK

Sources:
- Metro RLIS
- TriMet
- City of Cornelius
- Washington County

LEGEND

- Bicycle Routes
- Existing Trail
- Parks/Open Space
- Library
- Schools
- Cornelius City Limit

Transit

Transit service is provided in Cornelius by the Tri-Met. Bus route 57 connects Cornelius, Forest Grove, Hillsboro and Aloha to the Beaverton Transit Center. Bus route 57 recently began providing frequent service with buses at stops every 15-minutes or better during the day. During weekends, holidays and off peak periods, bus service frequency is reduced to every 30 to 60-minutes. The frequent service is planned to include new signs, signal priority, low floor buses and new bus shelters by 2006. A park-and-ride lot serving bus route 57 is located at the St. Anthony's Catholic Church on Adair Street at 10th Avenue.

Figure 3-4 shows bus route 57 and stop locations serving Cornelius. The 2003 weekday ridership volumes for bus stops within Cornelius are summarized in Table 3-3. This data represents the number of passengers that get on and get off at each bus stop during an average weekday (24-hour period). Outbound represents westbound travel and inbound represents eastbound travel. The downtown area and Fred Meyer bus stops serve the highest number of riders. The Cornelius Public Library and Hispanic Centro Cultural are also transit trip generators. Pedestrian access to the 1st Avenue/Baseline Street bus stop is difficult due to the lack of rail crossing on 1st Street.

Table 3-3: TriMet Bus Route 57 Weekday Ridership (Spring 2003)

Bus Stop	Direction	Ons	Offs	Total
331st Avenue/TV Highway	Westbound	2	5	7
331st Avenue/TV Highway	Eastbound	5	4	9
334th Avenue/TV Highway	Westbound	0	1	1
334th Avenue/TV Highway	Eastbound	1	0	1
Valley View/TV Highway	Westbound	1	8	9
Valley View/TV Highway	Eastbound	7	3	10
31st Avenue/TV Highway	Westbound	1	8	9
345th Avenue/TV Highway	Eastbound	1	3	4
29th Avenue/TV Highway	Westbound	5	17	22
29th Avenue/TV Highway	Eastbound	11	4	15
26th Avenue/TV Highway	Westbound	8	30	38
26th Avenue/TV Highway	Eastbound	-	-	-
Fred Meyer Access/TV Highway	Westbound	35	77	112
Fred Meyer Access/TV Highway	Eastbound	64	33	97
19th Avenue/Adair Street	Westbound	3	13	16
19th Avenue/Baseline Street	Eastbound	13	11	24
17th Avenue/Adair Street	Westbound	5	31	36
14th Avenue/Adair Street (Public Library)	Westbound	24	51	75
14th Avenue/Baseline Street (Public Library)	Eastbound	60	30	90
12th Avenue/Adair Street (Hispanic Centro Cultural)	Westbound	10	79	89
12th Avenue/Baseline Street	Eastbound	81	20	101
10th Avenue/Adair Street	Westbound	28	85	113
10th Avenue/Baseline Street	Eastbound	68	32	100
7th Avenue/Adair Street	Westbound	2	13	15
7th Avenue/Baseline Street	Eastbound	7	4	11
4th Avenue/Adair Street	Westbound	19	75	94
4th Avenue/Baseline Street	Eastbound	84	23	107
West City Limits/Adair Street	Westbound	1	7	8
1st Avenue/Baseline Street	Eastbound	5	2	7
Total		551	669	1,220

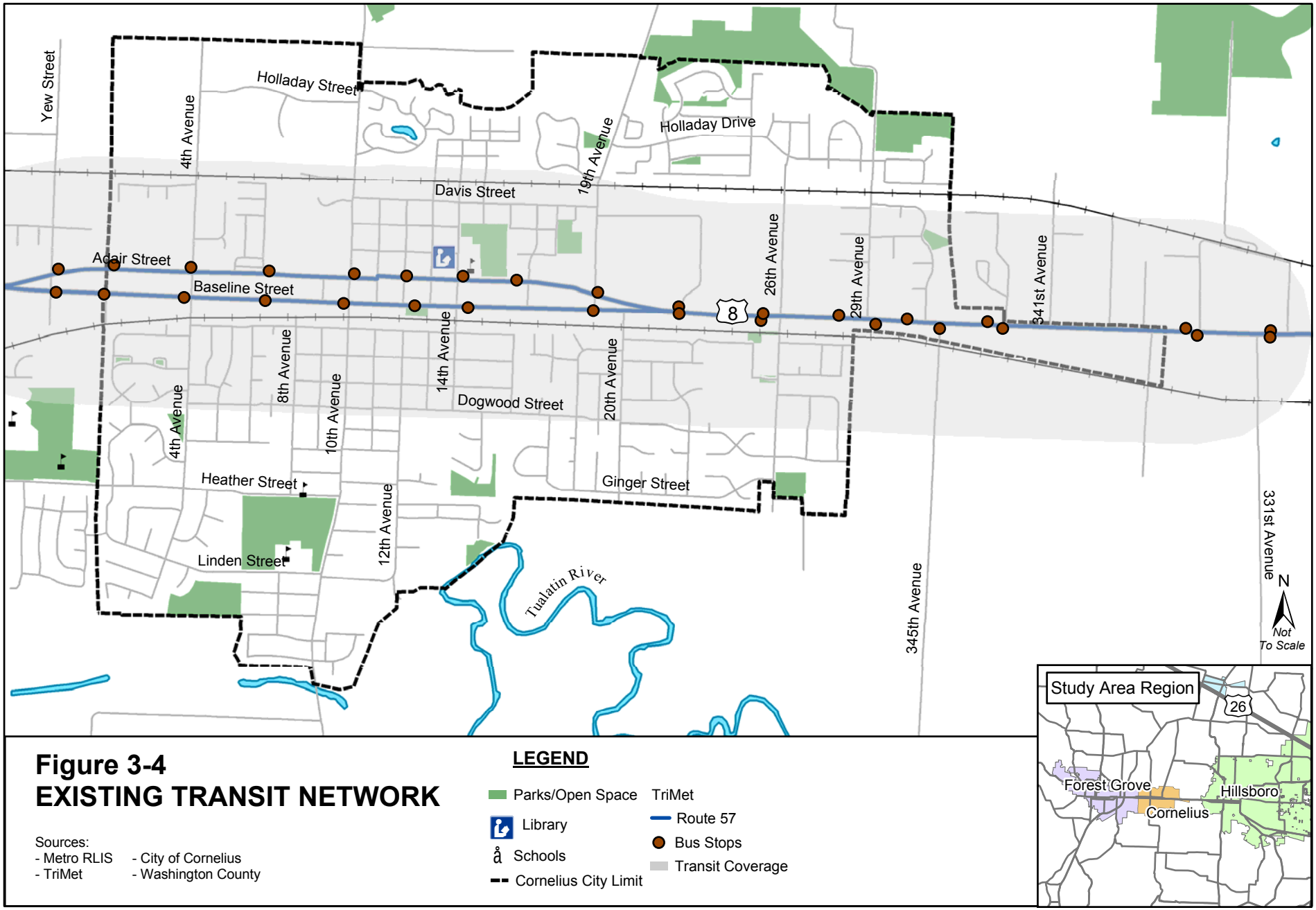


Figure 3-4
EXISTING TRANSIT NETWORK

Sources:
- Metro RLIS
- TriMet
- City of Cornelius
- Washington County

LEGEND

- Parks/Open Space
- Library
- Schools
- Cornelius City Limit
- TriMet
- Route 57
- Bus Stops
- Transit Coverage

Tri Met'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 Tri Met'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 operated by the American Red Cross and provides rides for medical, shopping, social and recreation, and other purposes in Washington County. Reservations must be made at least three days in advance. No fee is charged but a donation is suggested. Service is provided between 9 a.m. - 3:30 p.m. Monday through Friday.

Issue: *The bus stops on Baseline Street at 14th Avenue and 19th Avenue are located approximately 1,500-feet apart. A new bus stop on Baseline Street near 17th Avenue should be considered.*

Table 3-4 summarizes the average route headways (time increment between buses at a stop) and corresponding level of service (based on the *Highway Capacity Manual* methodology[1]) for bus route 57 in Cornelius. The transit performance is LOS C throughout the day which corresponds to existing headways of 15 minutes or better.

Table 3-4: TriMet Service Routes and Weekday Peak Period Level of Service

	Average Headways (minutes)			Level of Service		
Route	**AM**	**Midday**	**PM**	**AM**	**Midday**	**PM**
#57 TV Highway/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.

Issue: *Transit amenities should be considered to improve the convenience and attractiveness of using transit system. Amenities can include bus shelters, curb extensions, and continuous sidewalks to transit stops.*

Transit level of service can also be analyzed based on area of coverage and route reliability. Transit coverage is based on comparing land that has a high enough density to support transit service versus a ¼ mile walking distance buffer around transit stops. As land use details are completed for the travel demand forecasting for the TSP, transit coverage analysis will be added as a performance measure. The existing transit coverage is shown in Figure 4. Transit service reliability is primarily measured by the ability for buses to maintain schedules along corridors.

Issue: *Transit reliability should be addressed on TV Highway (Baseline Street and Adair Street) by maintaining adequate travel speeds and intersection operation. Future improvements to consider include traffic signal coordination and bus priority services.*

Motor Vehicles

Functional Classification

The functional classification system is designed to serve transport needs within the community. The schematic diagram below shows the competing functional nature of roadway facilities as it relates to access, mobility, multi-modal transport, and facility design. The diagram is useful to understand how worthwhile objectives can have opposing effects. For example, as mobility is increased (bottom axis), the provision for non-motor vehicle modes (top axis) is decreased

[1] *2000 Highway Capacity Manual*, Transportation Research Board, 2000, Chapter 27.

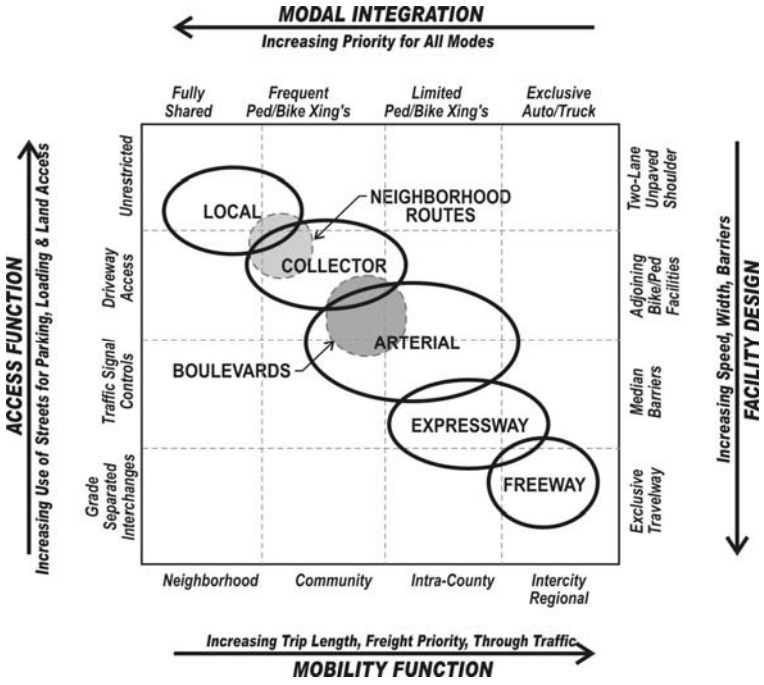
accordingly. Similarly, as access increases (left axis), the facility design (right axis) dictates slower speeds, narrower roadways, and non-exclusive facilities. The goal of selecting functional classes for particular roadways is to provide a suitable balance of these four competing objectives.

The diagram shows that as street classes progress from local to freeway the following occurs:

- *Mobility Increases* – Longer trips between destinations, greater proportion of freight traffic movement, and a higher proportion of through traffic.
- *Integration of Pedestrian and Bicycle Decreases* – Provisions for sidewalks and bike facilities are required up through the arterial class, however, the frequency of intersection or mid-block crossings for non-motorized vehicles steadily decreases with higher functional classes. The expressway and freeway facilities typically do not allow pedestrian and bike facilities adjacent to the roadway and crossings are grade-separated to enhance mobility and safety.
- *Access Decreases* – The shared uses for parking, loading, and direct land access is reduced. This occurs through parking regulation, access control and spacing standards (see opposite axis).
- *Facility Design Standards Increase* – Roadway design standards require increasingly wider, faster facilities leading to exclusive travelways for autos and trucks only. The opposite end of the scale is the most basic two-lane roadway with unpaved shoulders

The existing Cornelius functional classification plan[2] for roadway facilities is shown in Figure 3-5. The plan identifies three roadway classifications: arterial, collector and local.

Issue: *The limitations of the existing functional classifications should be addressed to establish an updated system that better meets City and regional policy issues. Additional functional classifications allow for more flexibility in facility access and design.*



[2] *Cornelius Transportation System Plan*, City of Cornelius, Kittelson & Associates, June 1995, Figure 1 – Circulation Plan.

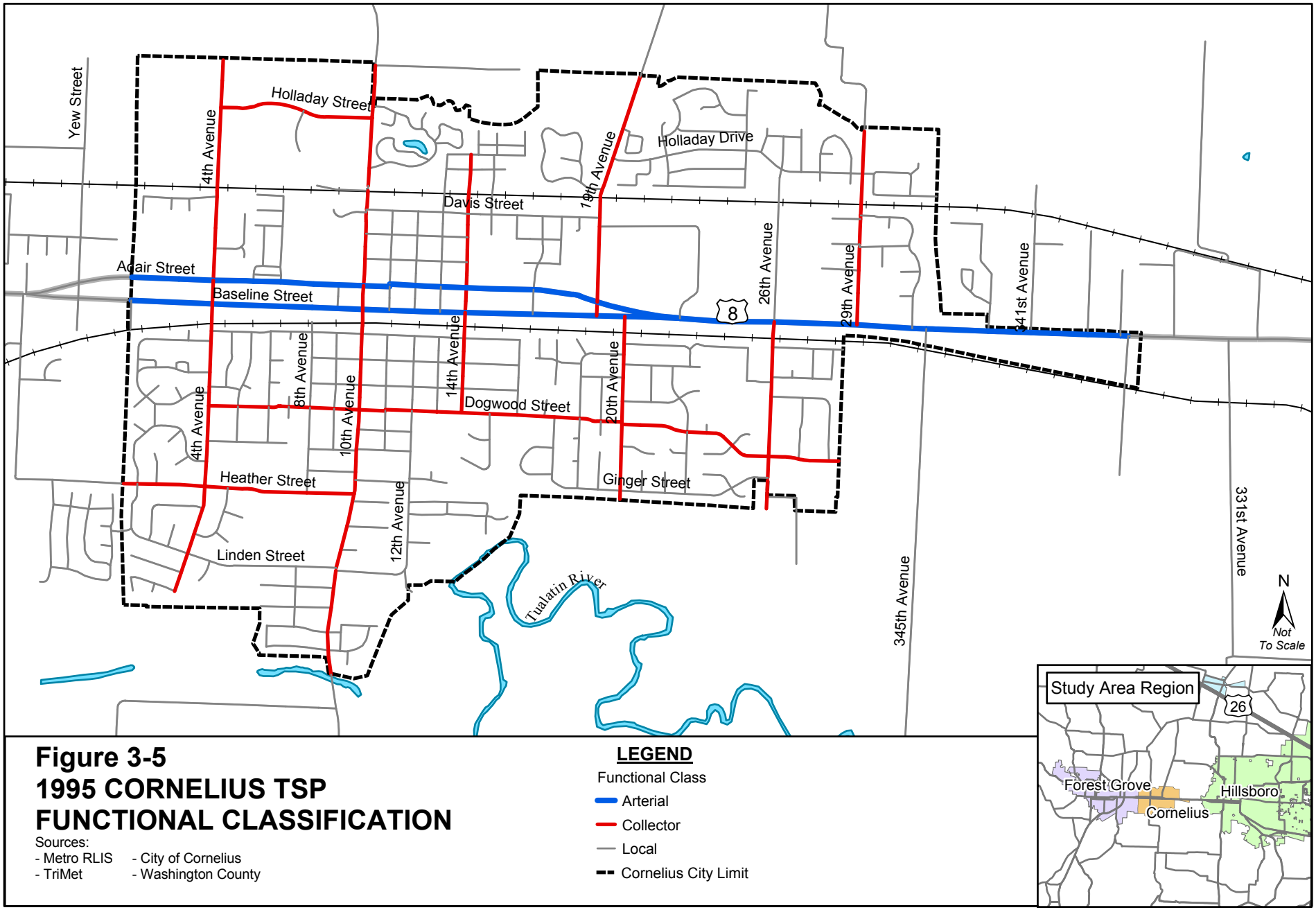


Figure 3-5
1995 CORNELIUS TSP
FUNCTIONAL CLASSIFICATION

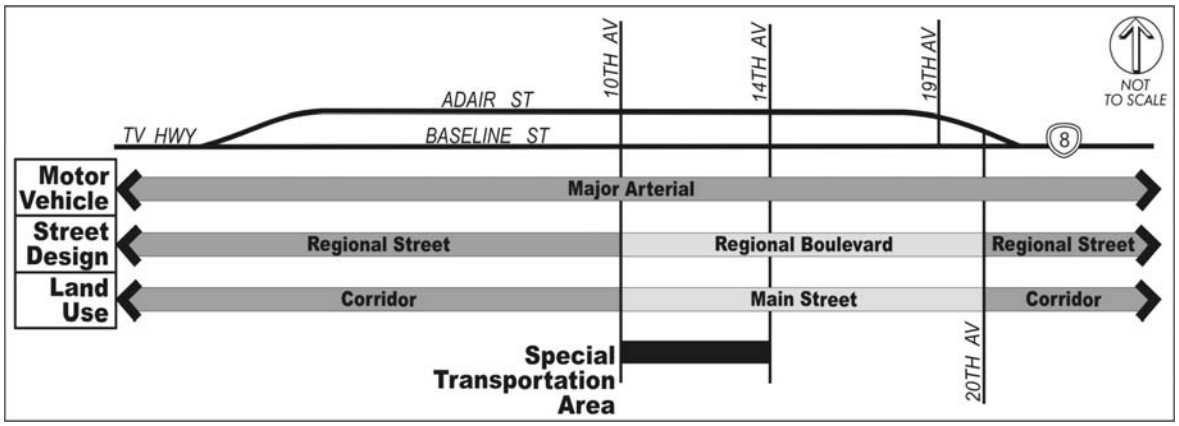
Sources:
- Metro RLIS
- TriMet
- City of Cornelius
- Washington County

LEGEND

Functional Class
- Arterial
- Collector
- Local
- Cornelius City Limit

Regional TV Highway Designations

The design and function of individual transportation facilities have a significant impact on adjacent land uses and the character of the communities they serve. The Tualatin Valley Highway has several designations within the City of Cornelius. TV Highway is designated State Highway 8 (ORE 8) in the OHP[3] and runs between ORE 217 in Beaverton and ORE 47 in Forest Grove. TV Highway from 10th Avenue to 14th Avenue was adopted as a Special Transportation Area (STA) in January 2004. There is potential for the remainder of Adair Street and Baseline Street within the Main Street District to be designated within the STA. The Regional Transportation Plan (RTP) applies motor vehicle, street design and land use designations to TV Highway which guide planning and implementation of the region's transportation system. The TV Highway motor vehicle, street design and land use designations and the STA location are summarized below.



Connectivity

The existing street network within Cornelius is made up of a grid configuration for several blocks north and south of TV Highway (Adair Street and Baseline Street) between 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.

Future roadway connections will be constrained by the exiting rail lines which pass through Cornelius approximately one-half block south of TV Highway and five blocks north of TV Highway. Street connectivity needs to be coordinated with public rail crossings.

Issue: *Several roadway connections should be considered within the City to reduce out of direction travel for vehicles, pedestrians and bicyclists. Local traffic should be able to make trips to in-town destinations using well connected streets without traveling on arterials.*

[3] Oregon Highway Plan, *1999 Oregon Highway Plan*, Oregon Department of Transportation, State Highway Classification System map.

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 and intersection controls. 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 3-6. TV Highway 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.

Vehicle Speeds

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 3-7 shows a limited inventory of the posted speeds in Cornelius. Adair Street and Baseline Street are posted at 30 miles per hour (mph) on the couplet, 40 mph west of Cornelius and 50 mph east of Cornelius. In general, local and collector roadways are posted at 25 mph.

Roadway speed surveys were conducted on Baseline Street, Adair Street and 19th Avenue over a 24-hour period to determine existing vehicle speed conditions. The 85 percentile vehicle speed represents a condition when 15 percent of the vehicles surveyed were traveling faster than the 85th percentile speed and 85 percent of the vehicles were traveling slower than the 85th percentile speed. Table 3-5 summarizes the speed survey findings.

Two locations surveyed indicate significant speeding issues exist today. The surveyed 85th percentile speed on 19th Avenue north of Adair Street is significantly higher than the 25 mph posted speed. The surveyed 85th percentile speed on Baseline Street west of 19th Avenue is significantly higher than the 30 mph posted speed.

Table 3-5: Speed Survey Data

Speed Survey Location	Posted Speed (mph)	85th Percentile Speed (mph)		
		northbound	*southbound*	*average*
20th Avenue south of Baseline Street	25	29.9	28.9	29.4
19th Avenue north of Adair Street	25	34.3	35.0	34.7
		eastbound	*westbound*	*average*
Baseline Street west of 19th Avenue	30	39.4	-	39.4
Adair Street west of 19th Avenue	30	-	34.9	34.9

Issue: *The safety impacts of excessive vehicle speeds on 19th Avenue north of Adair Street and Baseline Street west of 19th Avenue should be addressed. Traffic calming measures and traffic control changes may be appropriate.*

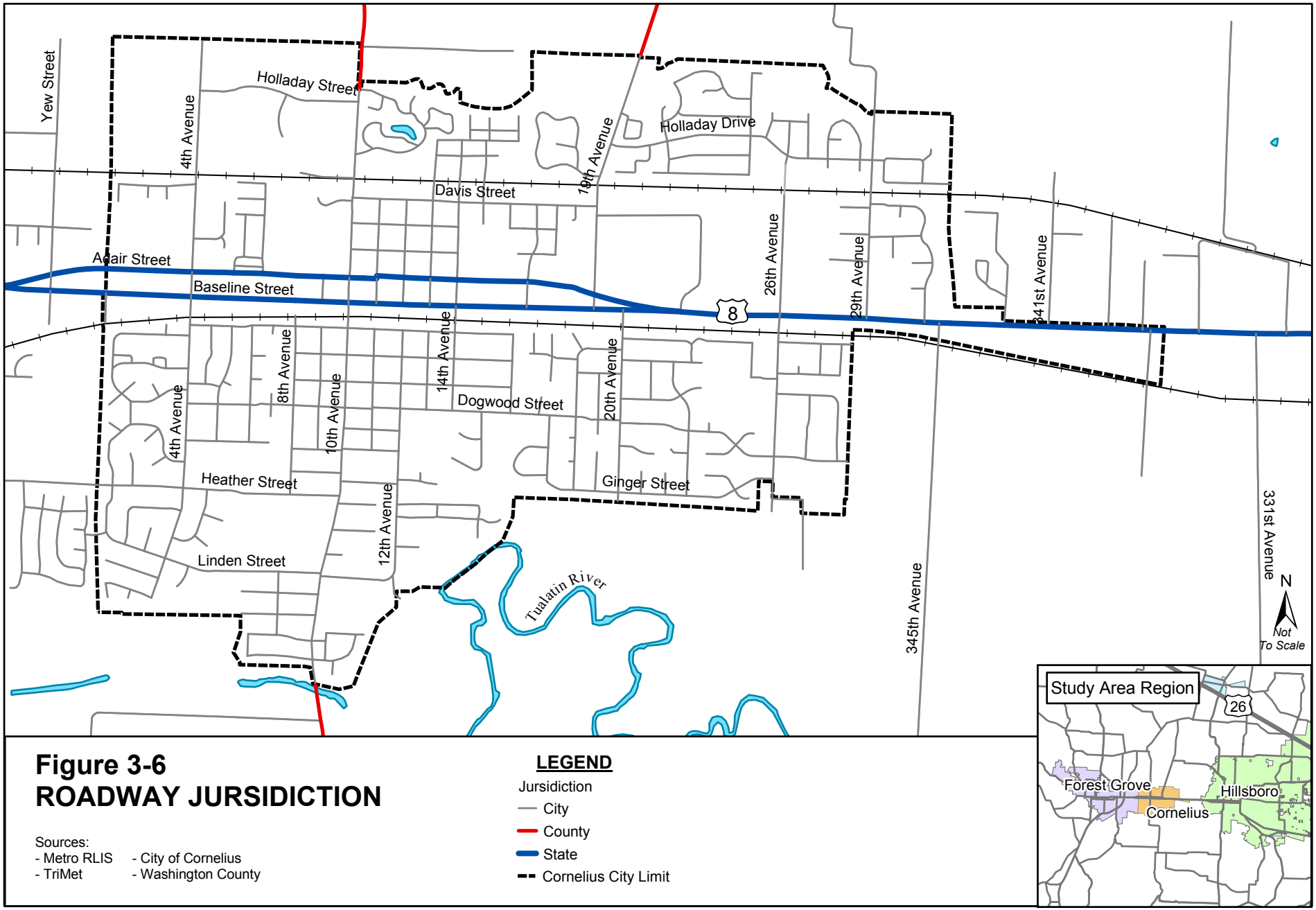


Figure 3-6
ROADWAY JURSIDICTION

Sources:
- Metro RLIS
- TriMet
- City of Cornelius
- Washington County

LEGEND

Jurisdiction
- City
- County
- State
- Cornelius City Limit

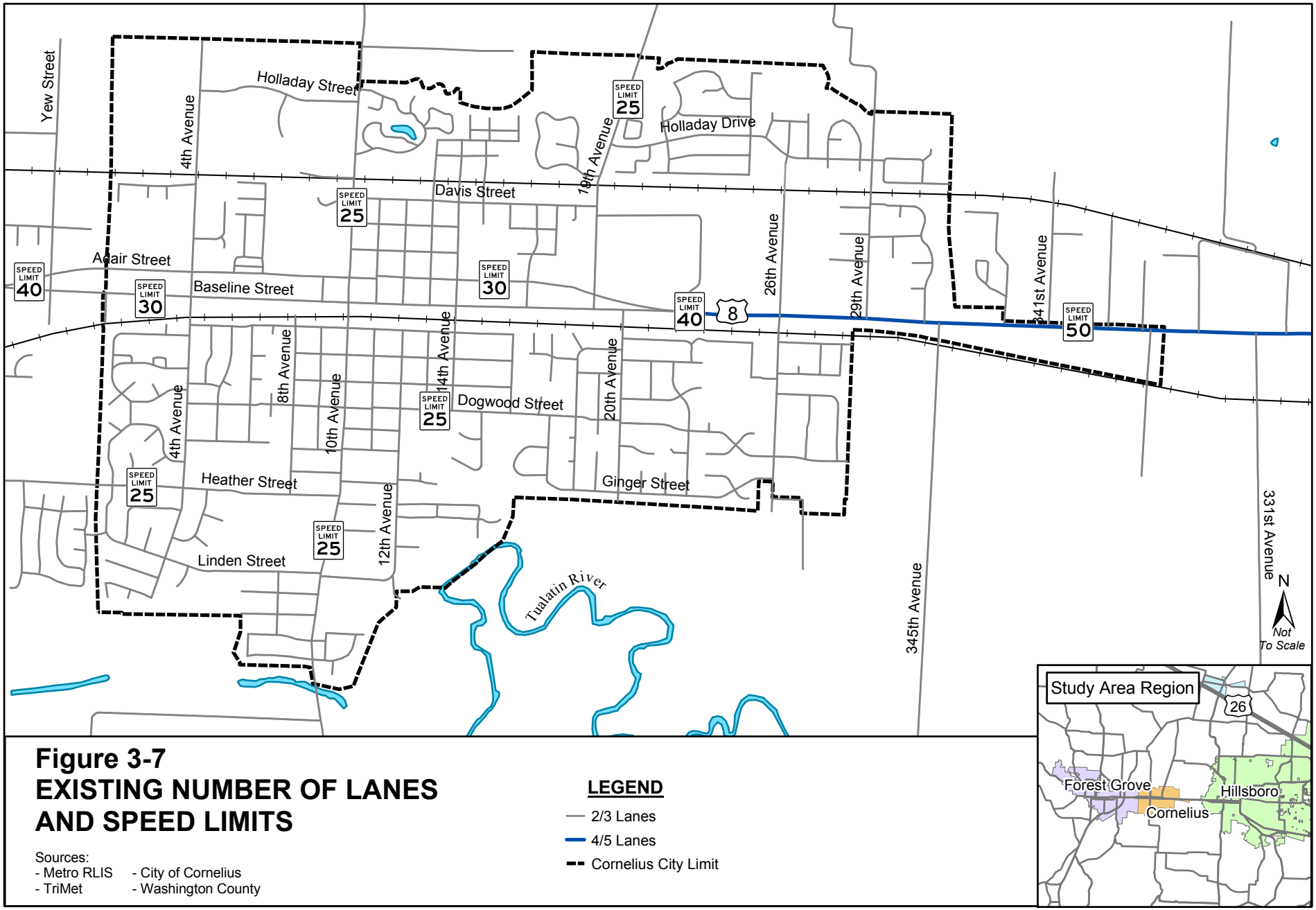


Figure 3-7
EXISTING NUMBER OF LANES AND SPEED LIMITS

Sources:
- Metro RLIS
- TriMet
- City of Cornelius
- Washington County

LEGEND

- 2/3 Lanes
- 4/5 Lanes
- Cornelius City Limit

Roadway Cross-section

The existing number of lanes on each major roadway in Cornelius is also shown in Figure 3-7. TV Highway 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 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. Table 3-6 summarizes the findings.

Table 3-6: Study Roadway Cross-sections

Roadway	Location	Width*
10th Avenue	south of Holladay Street	33'
10th Avenue	south of Beech Street	40'
10th Avenue/Golf Course Road	south of Linden Street	40'
Dogwood Street	west of 16th Avenue	24'
19th Avenue	north of Davis Street	32'
Adair Street	east of 4th Avenue	45'
Baseline Street	east of 4th Avenue	44'
Adair Street	west of 19th Avenue	41'
Baseline Street	west of 19th Avenue	42'

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

Traffic Control

The study intersection locations and the existing intersection controls are shown in Figure 3-8. Traffic signals are only located along TV Highway (Baseline Street/Adair Street). The remaining study intersections are stop sign controlled. The study intersections include five signalized intersections, 12 intersections with stop sign control and one all-way stop controlled intersection. The Fred Meyer/TV Highway intersection is controlled by a traffic signal but is not a study intersection.

Special Transportation Area Access Spacing

Adair Street and Baseline Street from 10th Avenue to 14th Avenue are designated as a Special Transportation Area (STA). In an STA, direct property access is discouraged and direct street connections and shared on-street parking are encouraged. The existing access locations within the TV Highway STA are shown in Figure 3-9. There are numerous driveways within the STA that do not meet the minimum spacing standard of 175-feet or one mid-block access if the city block spacing is less than 350-feet.

On-Street Parking

Allowed on-street parking on TV Highway (Adair Street and Baseline Street) is shown in Figure 3-10. On-street parking is allowed on both sides of Adair Street between 10th Avenue to 14th Avenue except for bus stop areas and sections with limited roadway width. On-street parking is only allowed on the south side of Baseline Street within the town center area. Outside the TV Highway town center area, on-street parking is limited.

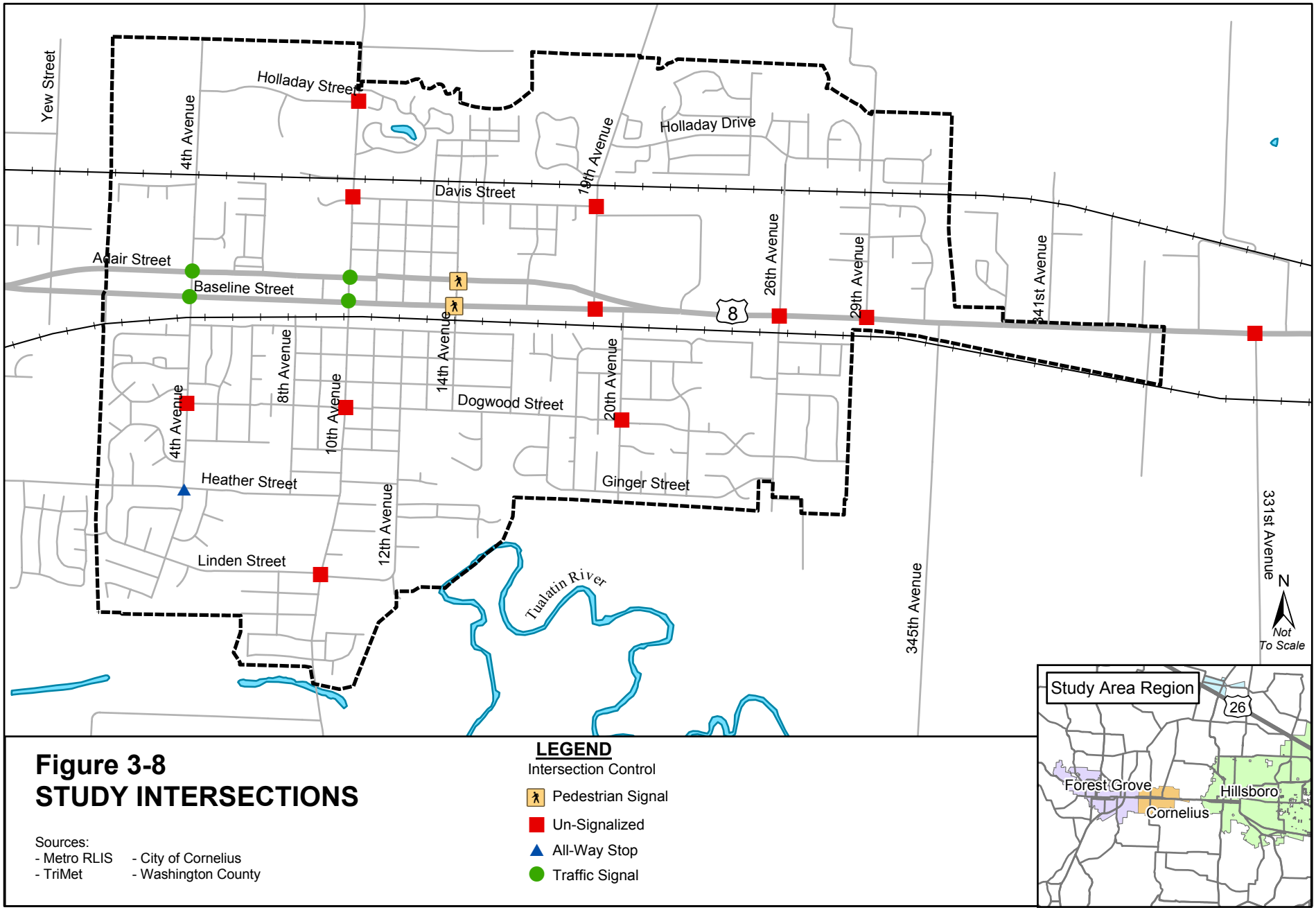


Figure 3-8
STUDY INTERSECTIONS

Sources:
- Metro RLIS
- TriMet
- City of Cornelius
- Washington County

LEGEND
Intersection Control
- Pedestrian Signal
- Un-Signalized
- All-Way Stop
- Traffic Signal

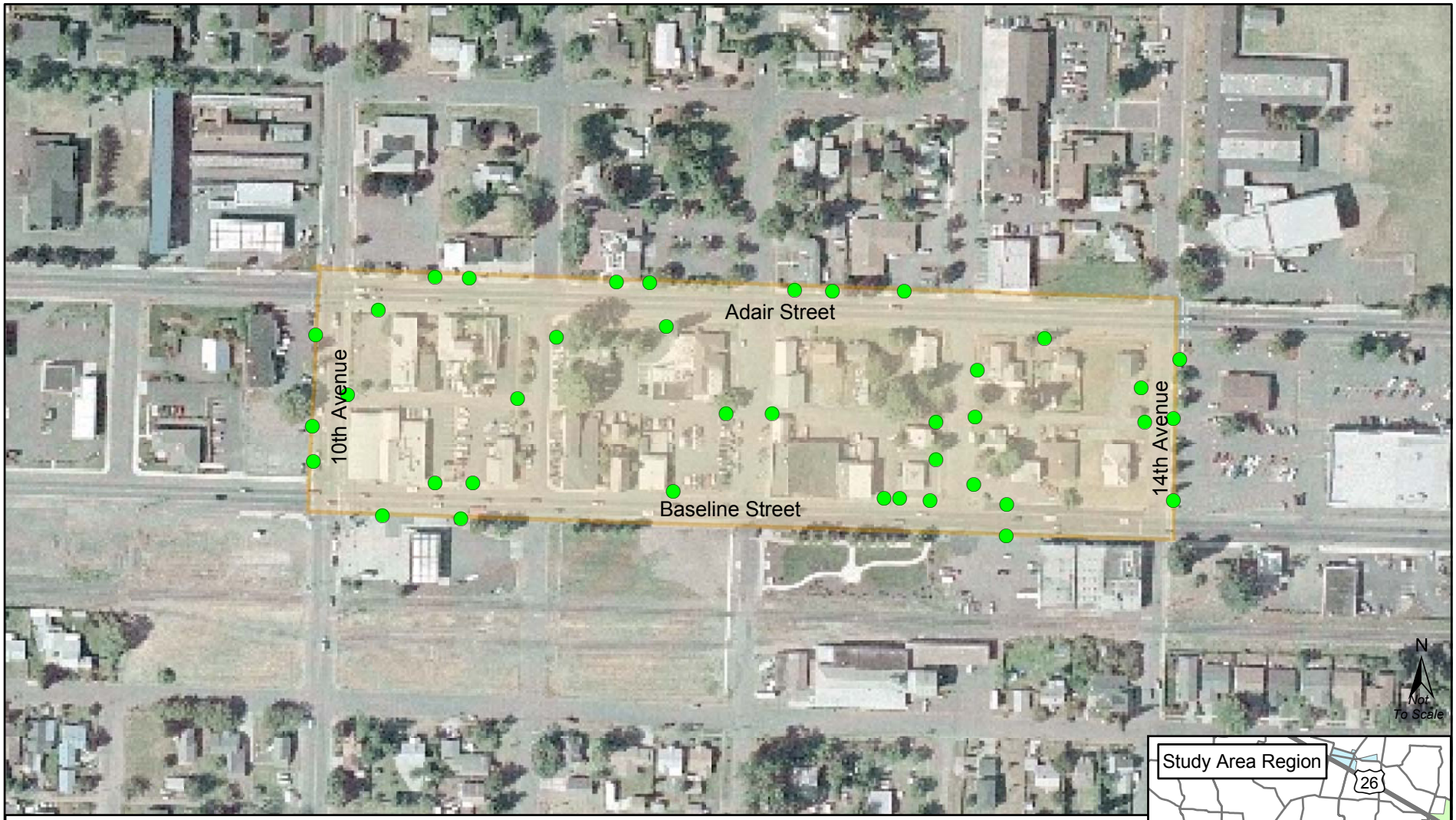


Figure 3-9
EXISTING STA ACCESS LOCATIONS

LEGEND

- Special Transportation Area
- Access Points Within the STA

Sources:
- Metro RLIS
- TriMet
- City of Cornelius
- Washington County

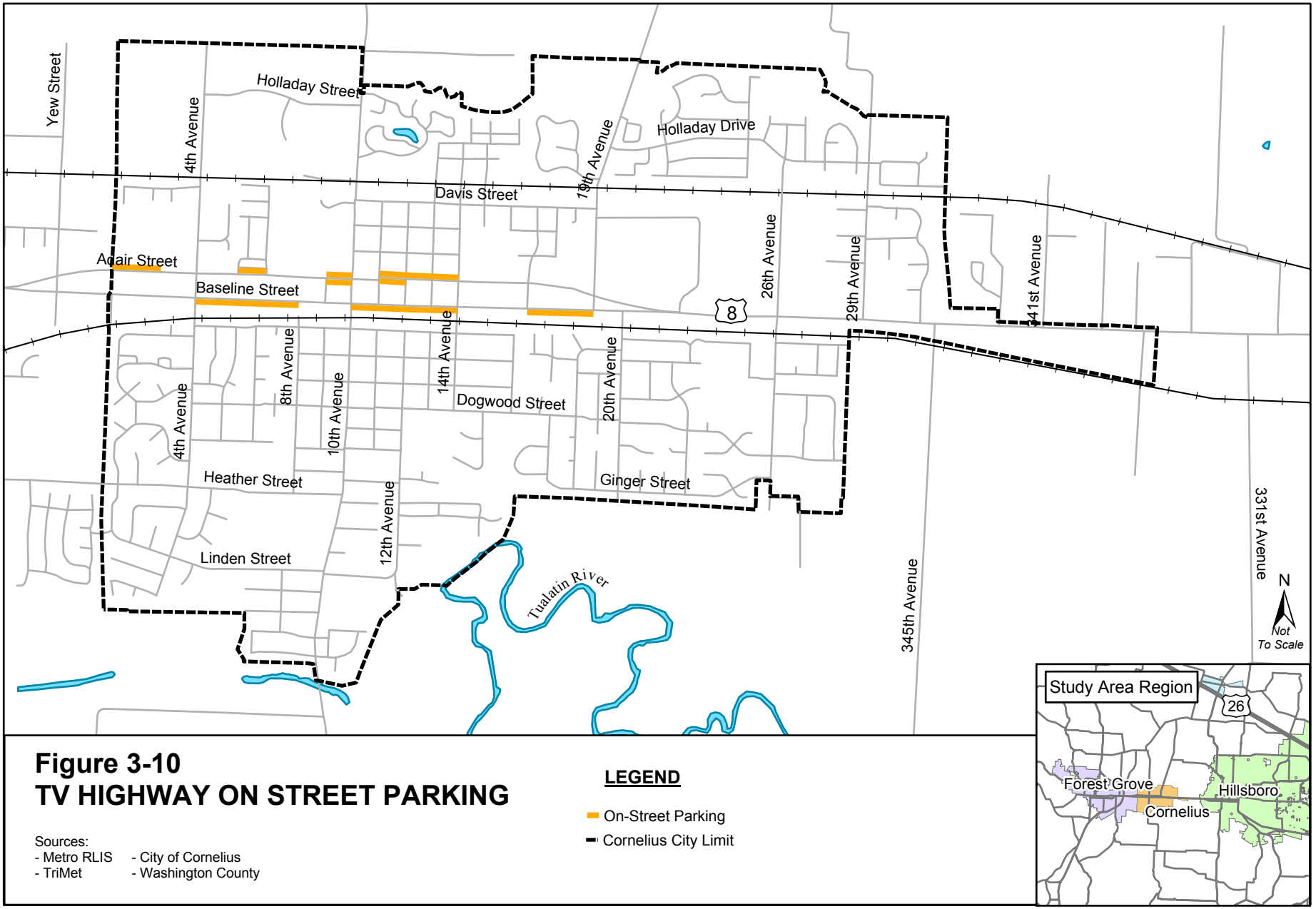


Figure 3-10
TV HIGHWAY ON STREET PARKING

LEGEND

- On-Street Parking
- Cornelius City Limit

Sources:
- Metro RLIS
- TriMet
- City of Cornelius
- Washington County

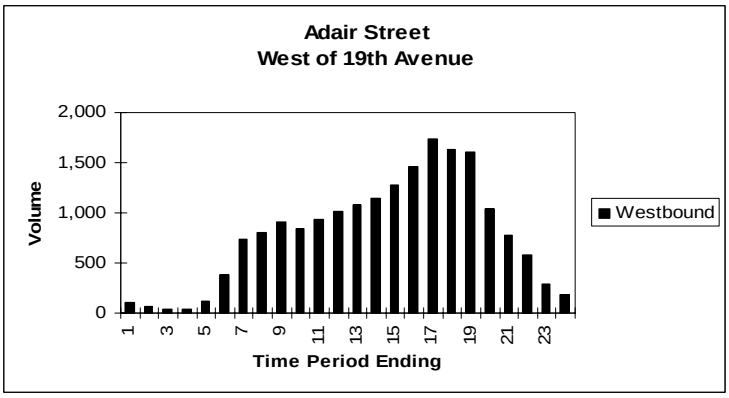
Motor Vehicle Volume

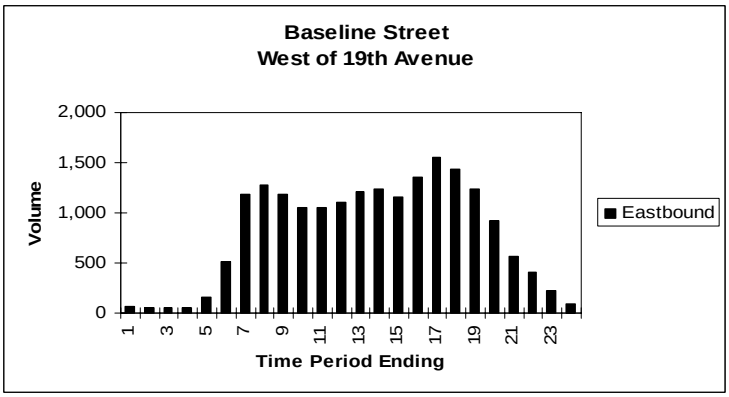
An inventory of evening peak hour traffic conditions was performed in the fall of 2004 as part of the Cornelius TSP update. The traffic turn movement counts conducted as part of this inventory provide the basis for analyzing existing problem areas as well as establishing a base condition for future monitoring. Study intersections were chosen in coordination with the City of Cornelius 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 – 7 PM) to determine existing operating conditions. In addition, 14-hour turn movement counts (6 AM – 8 PM) were conducted at 3 intersections to establish conditions throughout the day. In general, the PM peak hour in Cornelius occurs within the 4:00 PM to 6:00 PM commute period. The PM peak hour at two study intersections occurs after 6:00 PM. The PM peak hour at 4th Avenue and 10th Avenue at Dogwood Street occurs from 5:10-6:10 PM and 5:20-6:20 respectively.

Roadway volume surveys were conducted on Baseline Street, Adair Street and 19th Avenue over a 24-hour period to determine existing daily traffic volumes by direction. Figure 3-11 shows the existing daily two-way traffic volumes on select roadways in Cornelius. These estimated average daily traffic (ADT) volumes are based on the PM peak hour, 14-hour turn movement counts and daily roadway survey data available.

Traffic volume profiles were developed for Adair Street and Baseline Street west of 19th Avenue with recently conducted 24-hour volume survey data. The traffic volume profile for Adair Street shows a strong peak occurring during the evening commute period. Baseline Street also shows the highest volumes during the evening commute period, however the morning commute period volumes are close behind.





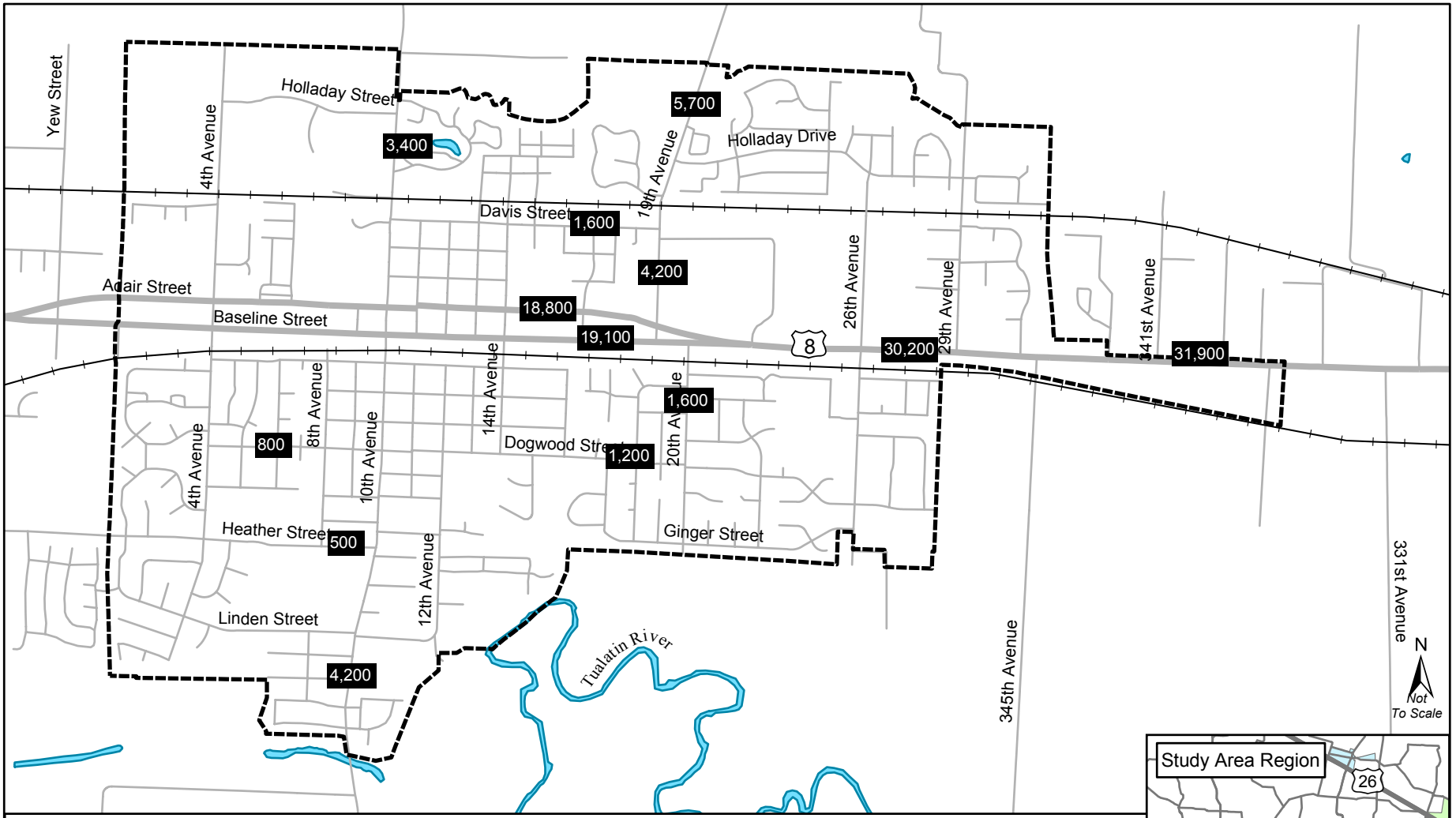


Figure 3-11
AVERAGE DAILY TRAFFIC
(based on 2004 counts)

Sources:
- Metro RLIS
- TriMet
- City of Cornelius
- Washington County

LEGEND

-- Cornelius City Limit

X,XXX Average Daily Traffic

Traffic Levels of Service

Level of Service (LOS) is used as a measure of effectiveness for intersection operation. It is similar to a "report card" rating based upon average vehicle delay. Level of Service A, B, and C indicate conditions where traffic moves without significant delays over periods of peak hour travel demand. Level of Service D and E are progressively worse peak hour operating conditions. Level of Service F represents conditions where demand has exceeded capacity. This condition is typically evident in long queues and delays.

The unsignalized intersection level of service calculation evaluates each movement separately to identify problems (typically left turns from side streets). The calculation is based on the average total delay per vehicle for stop-controlled movements (typically on the minor side street or left turn movements). Level of service (LOS) F indicates that there are insufficient gaps of suitable size to allow minor street traffic to safely enter or cross the major street. This is generally evident by long delays and queuing on the minor street. Level of service F may also result in more aggressive driving, with side street vehicles accepting shorter gaps. It should be noted that the major street traffic moves without delay and the LOS F is for side street or left turns, which may be only a small percentage of the total intersection volume. It is for these reasons that level of service results must be interpreted differently for signalized and unsignalized locations. A summary of the descriptions for level of service will be provided in the TSP technical appendix.

The volume to capacity ratio (V/C) is used as a measure of effectiveness for signalized and unsignalized intersection operation. The V/C is calculated by dividing the volume entering the intersection by the total capacity (maximum volume the intersection could serve). The V/C describes the amount of intersection capacity that is utilized by the volume. For example, a 0.85 V/C represents intersection volumes consuming 85% of the available capacity at that intersection. A V/C of 1.0 suggests there is no available capacity at that intersection and not one more vehicle could be accommodated.

ODOT performance standards set a maximum volume to capacity ratio of 1.1 for TV Highway within the Cornelius Main Street District (10th Avenue to 20th Avenue) and 0.99 for TV Highway outside the Main Street District. These operating standards apply to all study intersections located on TV Highway (Adair Street and Baseline Street).

The PM peak hour intersection counts were used to determine the existing 2004 level of service based on the *2000 Highway Capacity Manual* methodology[4]. Traffic counts and level of service calculation sheets will be provided in the TSP appendix. Table 3-7 summarizes the existing weekday PM peak hour study intersection operation conditions.

The signalized study intersections operate at a LOS of B or better and meet the ODOT minimum performance standard during the PM peak hour. Several unsignalized study intersection operate with LOS E or F conditions on the minor street approach. The Adair Street/14th Avenue, Baseline Street/14th Avenue and TV Highway/29th Avenue intersections operate at LOS F with significant minor street delay.

Issue: *The unsignalized study intersections with significant delay on the minor street approaches should be evaluated for possible traffic signal control.*

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

Table 3-7: Existing Weekday Intersection Level of Service (PM Peak Hour)

Intersection	Level of Service	Delay	Volume/ Capacity
Unsignalized Intersections			
Dogwood Street/4th Avenue	A/B	9.5	—
Heather Street/4th Avenue*	A	7.8	0.17
Holladay Street/10th Avenue	A/B	10.8	—
Davis Street/10th Avenue	A/B	13.2	—
Dogwood Street/10th Avenue	A/B	13.8	—
Linden Street/10th Avenue	A/B	11.9	—
Adair Street/14th Avenue	A/F	> 50	—
Baseline Street/14th Avenue	A/F	> 50	—
Davis Street/19th Avenue	A/C	17.3	—
Baseline Street/19th Avenue	A/E	37.0	—
Dogwood Street 20th Avenue	A/B	10.0	—
TV Highway/29th Avenue	A/F	> 50	—
TV Highway/331st Avenue	B/E	49.8	—
Signalized Intersections			
Adair Street/4th Avenue	B	7.8	0.66
Baseline Street/4th Avenue	B	8.0	0.61
Adair Street/10th Avenue	B	12.3	0.70
Baseline Street/10th Avenue	B	12.0	0.71
TV Highway/26th Avenue	B	10.4	0.71

Notes: A/A=major street LOS/minor street LOS
Signalized and all-way stop delay = average vehicle delay in seconds for entire intersection
Unsignalized delay = highest minor street approach delay
*All-way stop control intersection

Traffic Safety

Accident data was also obtained from Washington County for the period from 2000 through 2002. Washington County takes data collected by the State of Oregon and converts it to a Safety Priority Index System (SPIS) number. SPIS represents the combination of accident rates, frequency, severity and volumes. The SPIS numbers for each intersection in Washington County where accidents have occurred were then ranked from highest to lowest. Table 3-8 summarizes the ranked intersections within the study area based on the current data.

Issue : *The safety at these locations on Baseline Street and TV Highway should be considered.*

Table 3-8: SPIS Ranking of Cornelius TSP Study Area Intersections (2000-2002)

Ranking	Street	Cross Street	Number of Collisions	Fatal Collisions	Injury Collisions
26	Baseline Street	10th Avenue	48	0	12
74	Baseline Street	1st Avenue	34	0	5
91	TV Highway	341st Avenue	7	1	3

Truck Freight

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 and Cornelius identify TV Highway, Baseline Street and Adair Street through Cornelius as a freight route. Metro has designated TV Highway, Baseline Street and Adair Street as a Roadway Connector defined as a road that connects freight facilities and freight generation areas to the main roadway route. It is not a designated State Freight Route. Washington County and Cornelius identify 10th Avenue as a freight route. The current freight routes are shown in Figure 3-12.

The Adair Street and Baseline Street intersections at 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.

Vehicle classification surveys were conducted on Baseline Street, Adair Street, 19th Avenue and 20th Avenue over a 24-hour period to determine the existing truck use in Cornelius. The vehicle classification percentages are summarized in Table 3-9.

Table 3-9: Vehicle Classification Survey Data

Vehicle Classification Survey Location	% passenger cars	% single-unit trucks/buses	% multi-unit trucks
20th Avenue south of Baseline Street	73	21	6
19th Avenue north of Adair Street	68	25	7
Baseline Street west of 19th Avenue	69	23	8
Adair Street west of 19th Avenue	72	21	7

Issue: *The efficient movement of truck freight on TV Highway (Baseline Street and Adair Street), and 10th Avenue should be addressed by maintaining adequate travel speeds, roadway design and intersection operation.*

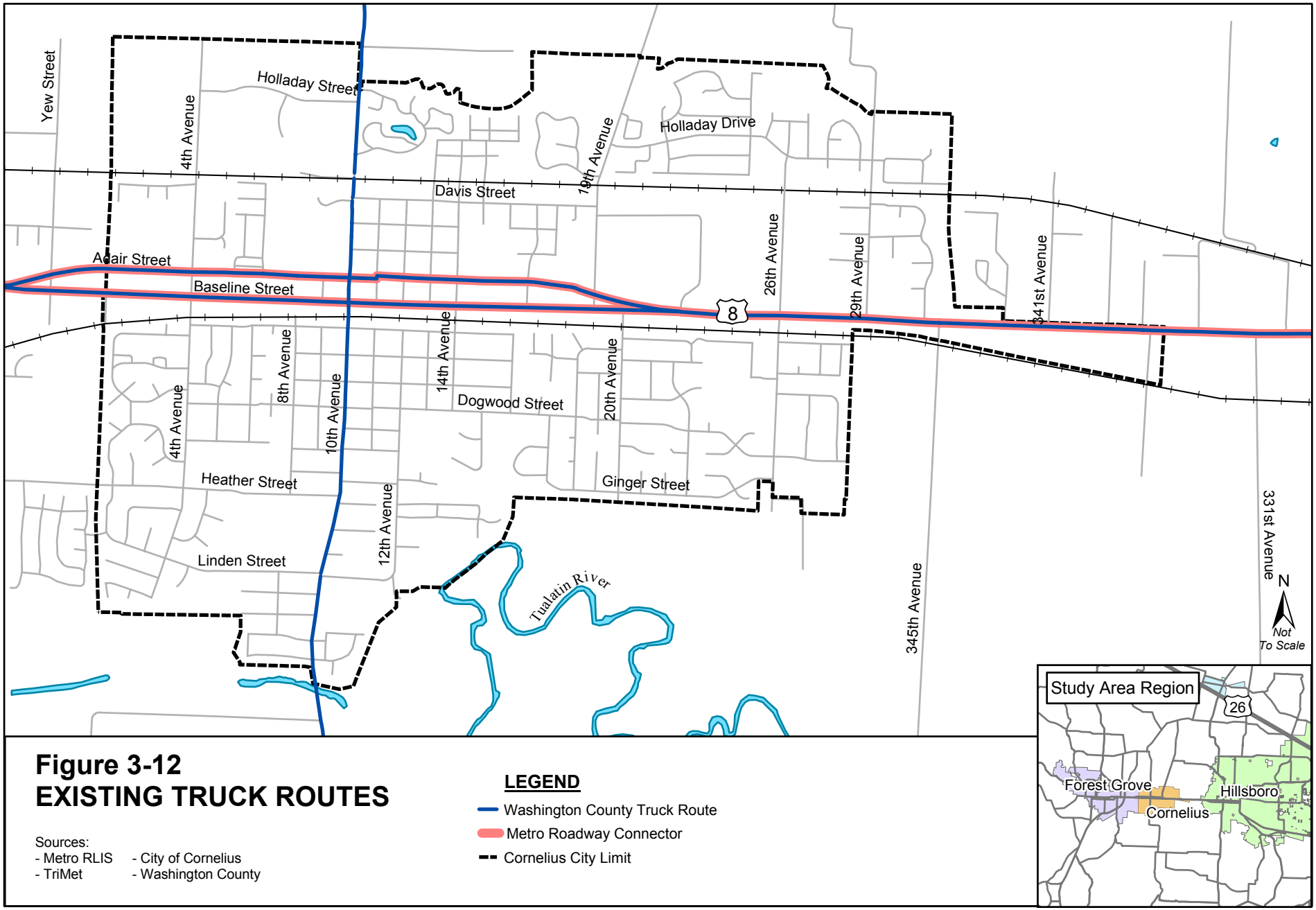


Figure 3-12
EXISTING TRUCK ROUTES

Sources:
- Metro RLIS
- TriMet
- City of Cornelius
- Washington County

LEGEND

- Washington County Truck Route
- Metro Roadway Connector
- Cornelius City Limit

Other Modes

Rail Freight

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

PNWR owns and operates both lines as a class III railroad. There are one to two trains a day at maximum authorized speed of 10 mph on the FAA Line, and less than one train a day at maximum authorized speed of 10 mph on the 3F Line. The FAA Line has nine grade crossings and the 3F Line has seven 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 3-13 shows the existing rail freight lines and type of control at each crossing.

Public crossing incident data from 1965 to the present was provided by Portland & Western Railroad for both rail lines in the study area. Thirteen public crossing incidents have occurred over the last forty years with five total injuries and no fatalities. The public crossing incident data is shown in Table 3-10.

Table 3-10: Public Rail Crossing Incident Data (1965 to Present)

Public Crossing Location	Number of Incidents	Injuries	Fatalities
N 10th Avenue (Schefflin Road)	3	3	0
S 12th Avenue	3	1	0
S 26th Avenue (Webb Road)	3	1	0
S 4th Avenue	2	0	0
N 19th Avenue (Susbauer Road)	1	0	0
N 14th Avenue	1	0	0

Issue: There are a significant number of at-grade rail crossings within Cornelius. As vehicle, bicycle and pedestrian volumes increase, the need for safety controls at these locations should be evaluated.

Air

There are no designated airports or heliports in the Cornelius TSP study area. The Meyers Airport is a private aviation facility with a dirt runway located just west of 19th Avenue approximately one half mile north of the Cornelius city limits. The Hillsboro Airport, located at Cornell Road and Brookwood Parkway, is an 870-acre executive airport which supports all facets of general aviation activity. The airport facility is owned and operated by the Port of Portland as part of the Port's general aviation reliever system of airports.

Water

There are no navigable waterways within the vicinity of Cornelius that support commercial use. The Tualatin River, to the south of Cornelius is used for recreational purposes. No policies or recommendations in this area of transportation are provided.

Pipeline

No major pipeline facilities are located within the Cornelius study area. The nearest pipelines are high pressure natural gas feeder lines owned and operated by Northwest Natural Gas Company.

The gas lines run north of the City along Porter Road, Verboort Road, Cornelius-Schefflin Road, Zion Church Road and Glencoe Road.

Land Use

Land use plays a large role in determining future transportation alternatives. Consequently, land use within the City of Cornelius is a key ingredient in understanding current transportation patterns and roadway traffic volumes. The City of Cornelius Comprehensive Plan Map (adopted in January 2004) provides a framework for future development by presenting land use designations. The Cornelius Zoning Map (adopted in January 2004) identifies the current zoning within the study area. The Cornelius Main Street District Plan (Revised 2002) includes policies and implementation action items for land use within the main street area. The land use maps are provided in the appendix.

Transportation Demand Management

Transportation Demand Management (TDM) describes any activity that provides an alternative to single occupant vehicle trips during peak travel demand periods. Demand management strategies include programs implemented by employers to reduce trips such as flexible work hours, bicycle commuting (bike parking, showers), ridesharing (priority parking) and transit use (far subsidies). State regulations require employers with more than 50 employees to have programs in place that reduce the number of employees who drive to work alone.

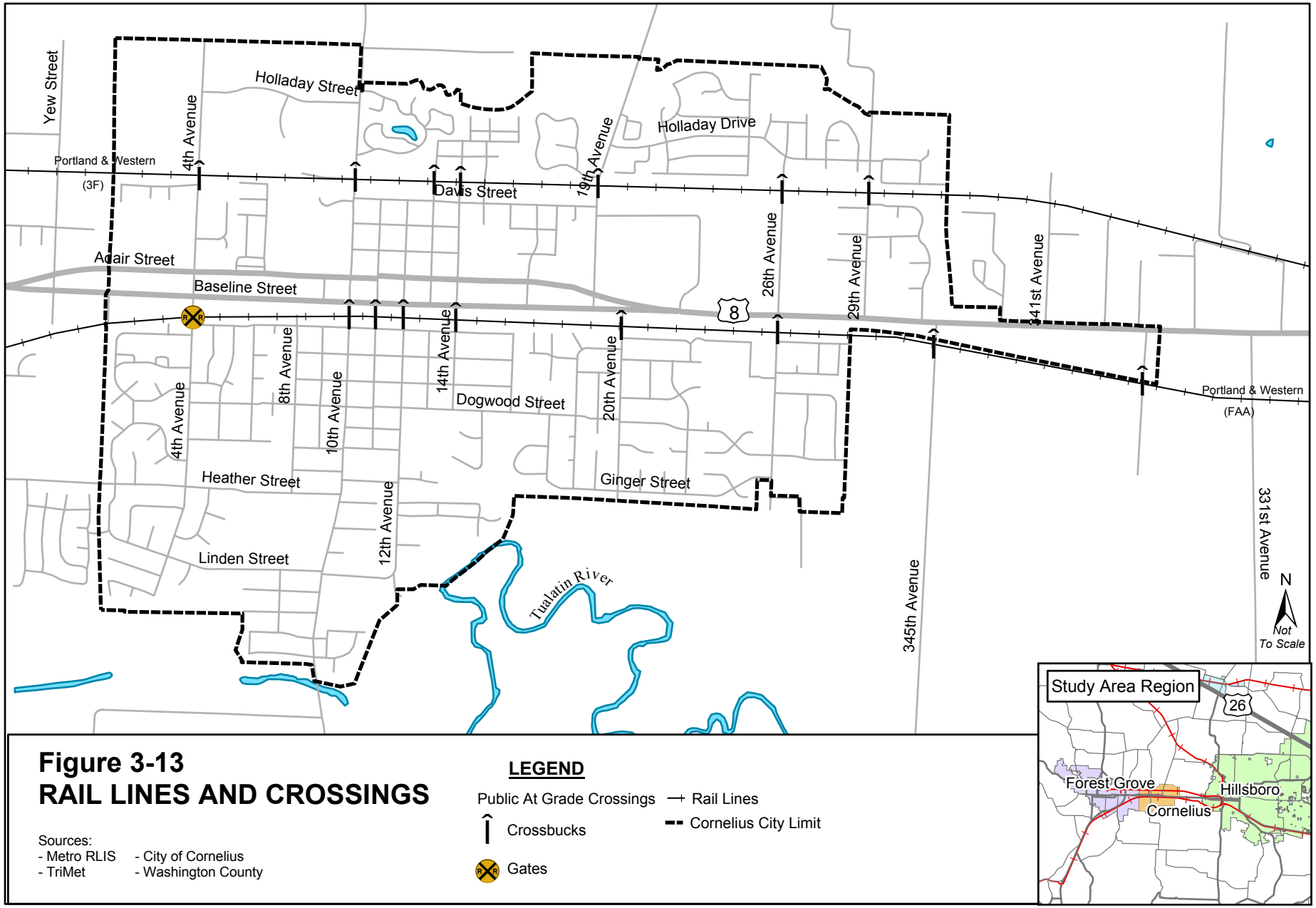


Figure 3-13
RAIL LINES AND CROSSINGS

Sources:
- Metro RLIS
- TriMet
- City of Cornelius
- Washington County

LEGEND

Public At Grade Crossings
Crossbucks
Gates
Rail Lines
Cornelius City Limit

Findings and Conclusions

This section summarizes current transportation issues to be addressed in the TSP update. It outlines the deficiencies that are present under current (2004) conditions and identifies issues that should be evaluated further. The major issues found after analyzing the existing transportation conditions in the Cornelius community fall into several distinct categories: connectivity, safety and alternative travel modes.

Connectivity: A well connected transportation system provides several advantages. It reduces travel time and miles of driving required as origins and destinations are connected through more direct routes. Current connectivity issues that need to be addressed include:

- Conflict between through traffic along TV Highway and local traffic. Additional traffic signalization on TV Highway to improve north-south mobility within the City.
- New roadway connections within the City to reduce out of direction travel for vehicles, pedestrians and bicyclists.
- Poor access from industrial and commercial areas to regional roadway facilities, including US 26-Sunset Highway.

Safety: Transportation infrastructure must be safe for users of all modes, including pedestrians, bicyclists and motor vehicles. Identified safety issues in the existing conditions analysis include:

- Limited intersection signalization on TV Highway may contribute to unsafe crossing conditions for north-south traffic movement within the City.
- The safety impacts of excessive vehicle speeds on 19th Avenue and Baseline Streets should be addressed. Traffic calming measures and traffic control changes may be appropriate.
- Three intersections in the study area are on the most recent County Safety Priority Index System (SPIS) rankings, meaning that these intersections have more severe safety issues than many other intersections in the County. Mitigation measures for these locations should be addressed.
- There are a significant number of at-grade rail crossings within Cornelius. As vehicle, bicycle and pedestrian volumes increase, the need for safety controls at these locations should be evaluated.

Alternative Travel Modes: Alternative travel modes should be provided in a community to reduce dependency on motor vehicles and allow the entire community (children, seniors, handicapped, low income, etc.) access to destinations in the City and the region. Identified issues for alternative travel modes in the existing conditions analysis include:

- Sidewalk gap infill and multi-use path connections to complete the pedestrian grid system and connect parks, retail centers and other trip generators with residential areas.
- Additional crossings and connections to the pedestrian system along the Adair Street and Baseline Street commercial corridor to improve pedestrian crossing opportunities.
- A complete bike lane network to provide connectivity for bicyclists on arterials and collectors from neighborhoods to schools, parks, retail centers and transit stops
- Transit improvements to encourage transit ridership. Improvements can include an expanded service area. and amenities (bus shelters, curb extensions and continuous sidewalks to transit stops).

4. Future Needs and Improvements

Travel Demand and Land Use

The Cornelius Transportation System Plan (TSP) Update addresses existing system needs and additional facilities that are required to serve future growth beyond the 2015 forecast year of the existing TSP. 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.

Projected land uses were developed for the study area and reflect the Comprehensive Plan and Metro's land use assumptions for the year 2025. Complete land use data sets were developed for the following conditions.

- Existing 2000 Conditions (base travel forecast for the region)
- Future 2025 Conditions

The following sections summarize the forecasted growth that will influence travel within Cornelius. Metro has recently approved a 260-acre expansion of the urban growth boundary just north of the Cornelius city limits. The expansion area is planned to be designated with industrial zoning. As new development occurs within the expansion area, the lands will likely be annexed to the City of Cornelius. Future forecasts will reflect a significant growth in employment in this area which are essentially rural lands today with little employment opportunities. This planned urban growth boundary expansion will be incorporated into the 2025 forecasts.

Growth within Cornelius

The base year travel model is updated periodically and for this study effort, the available base model provided by Metro was for 2000. This land use database includes the number of dwelling units, retail employees and other employees. Table 4-1 summarizes the land uses for the 2000 base and future 2025 scenarios within the Cornelius TSP Update study area. These land use projections are significantly higher than the previous 2015 forecasts, reflecting the urban growth boundary expansion area development potential. A detailed summary of the uses for each Transportation Analysis Zone (TAZ) within the Cornelius study area is provided in the technical appendix.

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

Land Use	2000	2025	Increase	Percent Increase
Households (HH)	5,453	7,796	2,343	43%
Retail Employees (RET)	1,510	3,156	1,646	109%
Other Employees (OTH)	4,029	8,635	4,606	114%

At the existing level of land development, the transportation system generally operates without significant deficiencies in the study area. As land uses are changed 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 6,300 jobs) is expected in Cornelius in the coming decades. In the 2025 land uses, approximately 1,300 of the other employees are attributed to the urban growth boundary expansion planned just north of the city limits. 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 2025 land uses.

For transportation forecasting, the land use data is stratified into geographical areas called transportation analysis zones (TAZs), which represent the sources of vehicle trip generation. There are approximately five Metro TAZs within the Cornelius TSP Update study area. These five TAZs were subdivided, as part of this plan, into approximately 15 TAZs to more specifically represent land use and access to the transportation system in Cornelius. The disaggregated model zone boundaries are shown in Figure 4-1. The planned urban growth boundary area is identified by TAZs 1504, 1510 and 1512.

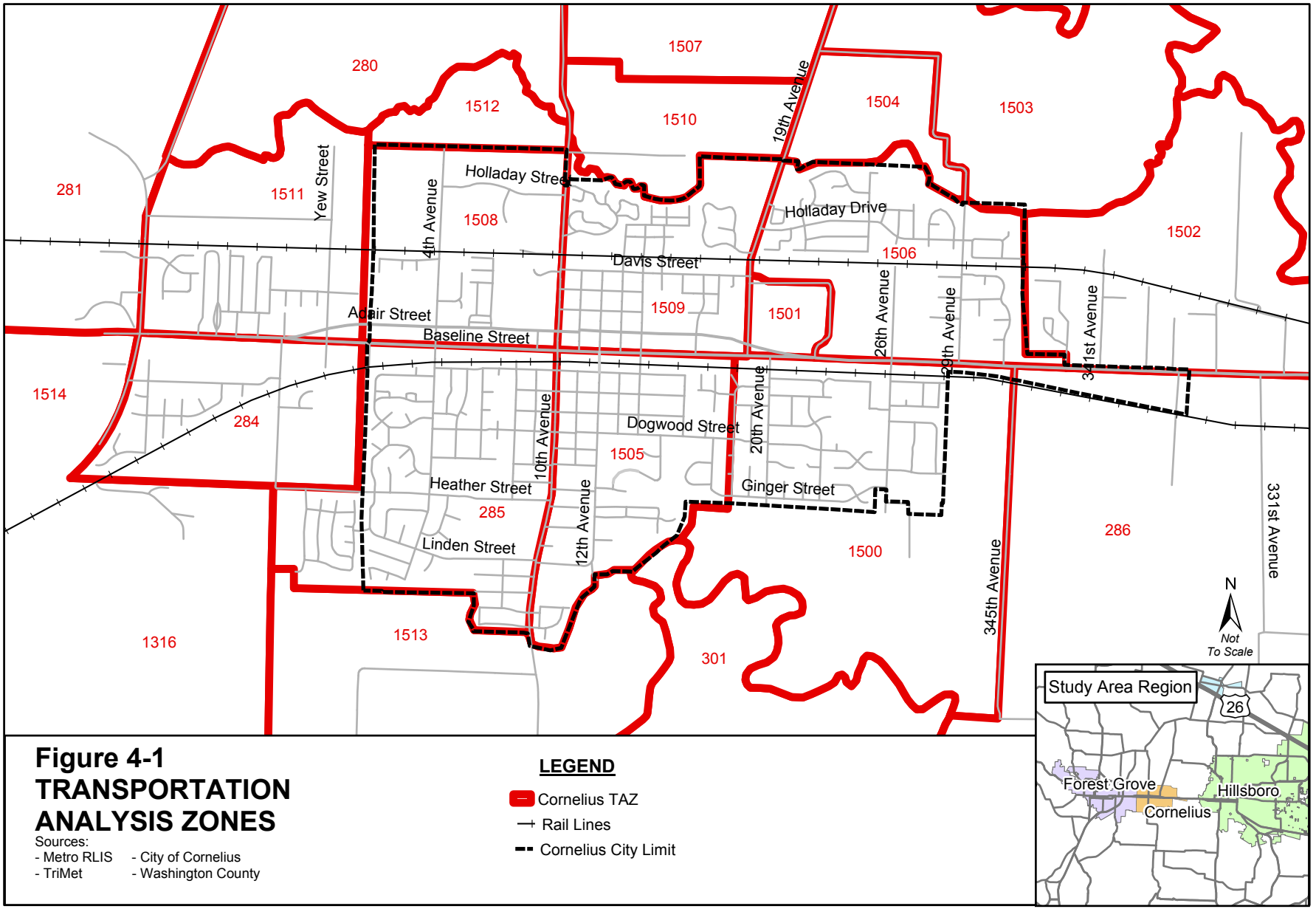


Figure 4-1
TRANSPORTATION ANALYSIS ZONES

Sources:
- Metro RLIS
- TriMet
- City of Cornelius
- Washington County

LEGEND

- Cornelius TAZ
- Rail Lines
- Cornelius City Limit

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 EMME/2, 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 2025 model used for the 2004 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 4-2). 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 2025 land use scenarios were tested and roadway improvements were added to mitigate the impacts of motor vehicle traffic growth, using the RTP Priority System and the 2015 Cornelius TSP improvements as a starting basis. Improvements in each of these plans (the RTP and TSP) 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 most collector streets. Some local streets were included in the model, but many are represented by centroid connectors in the model process.

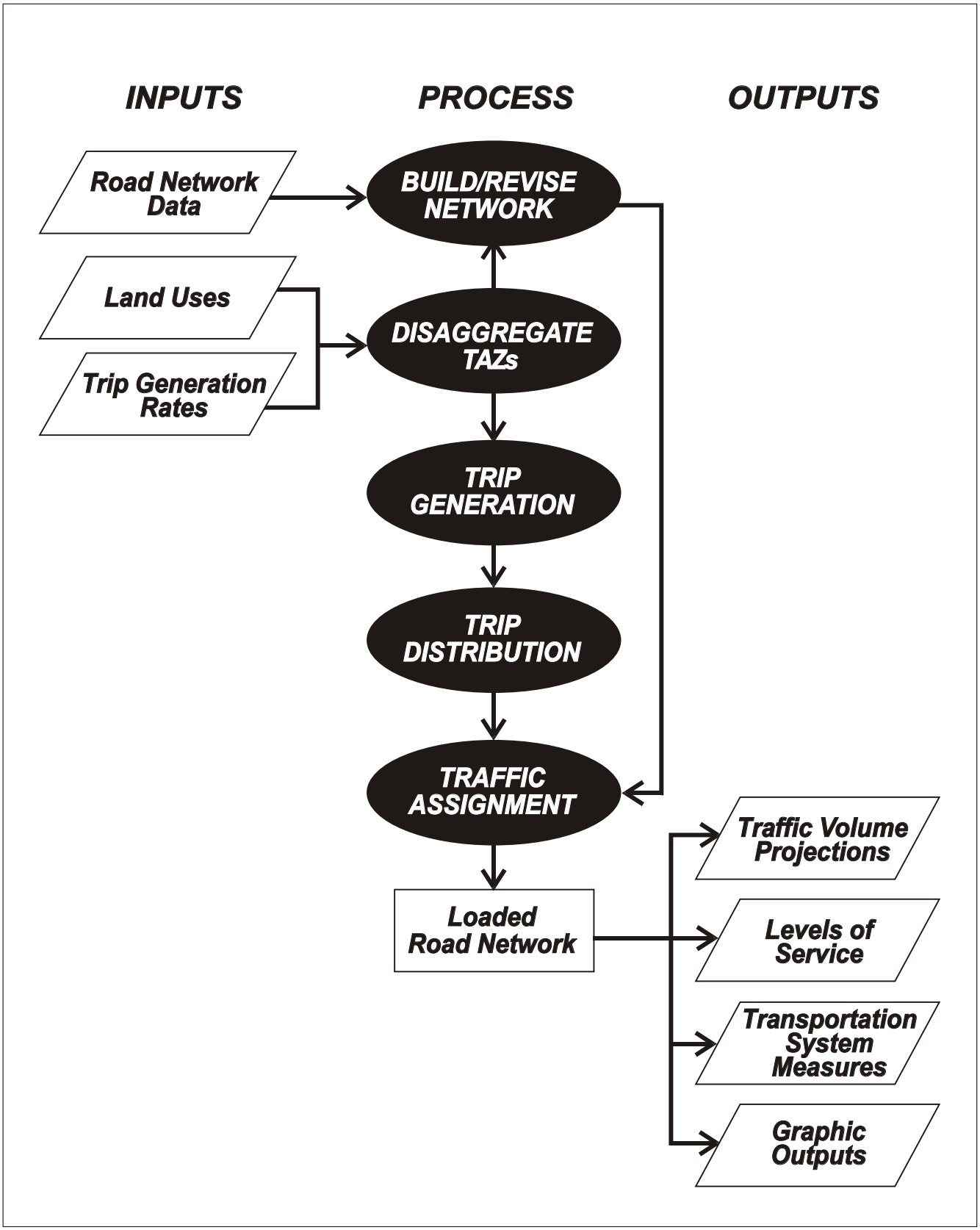


Figure 4-2
MODEL PROCESS

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 elaborate, entailing detailed trip characteristics for various types of housing, retail employment, non-retail employment, and special activities. Typically, most traffic impact studies rely on the Institute of Transportation Engineers (ITE) research for analysis[1]. The model process is tailored to variations in travel characteristics and activities in the region. For reference, Table 4-2 provides a summary of the approximate average evening peak hour trip rates used in the Metro model. 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 Used in Metro Model

	Average Trip Rate/Unit		
Unit	**In**	**Out**	**Total**
Household (HH)	0.43	0.19	0.62
Retail Employee (RET)	0.78	0.69	1.47
Other Employee (OTH)	0.07	0.29	0.36

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 2000 and 2025. It indicates that vehicle trips in Cornelius would grow by approximately 78 percent between 2000 and 2025 if the land develops according to Metro's 2025 land use assumptions. Assuming a 25-year horizon to the 2025 scenario, this represents annualized growth rate of approximately 2.4 percent per year.

Table 4-3: Cornelius Vehicle Trip Generation (1-Hour PM Period)

	2000 Trips	**2025 Trips**	**Percent Increase**
Cornelius TSP Update Study Area	7,000	12,500	78%

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

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

(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 area 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 2000 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 2025.

Based upon analysis of the forecasted mode choice in 2025, 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 level. Figure 4-3 summarizes the level of non-SOV mode share estimated for 2025 using the regional travel demand forecast model in comparison to the modal targets established in the RTP through Table 1-3 of the RTP. 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 EMME/2. 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 2000 modeled traffic volumes were compared against actual traffic volume counts across screenlines, on key arterials and at key intersections. Most arterial traffic volumes meet 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 2000 and forecast year 2025 scenarios. These intersection turn movements were not used directly, but a portion of the increment of the year 2025 turn movements over the 2000 turn movements was applied (added) to existing (actual 2004) turn movement counts in Cornelius. A post processing technique is utilized to refine model travel forecasts to the volume forecasts utilized for 2025 intersection analysis. The turn movement volumes used for future year intersection analysis can be found in the technical appendix.

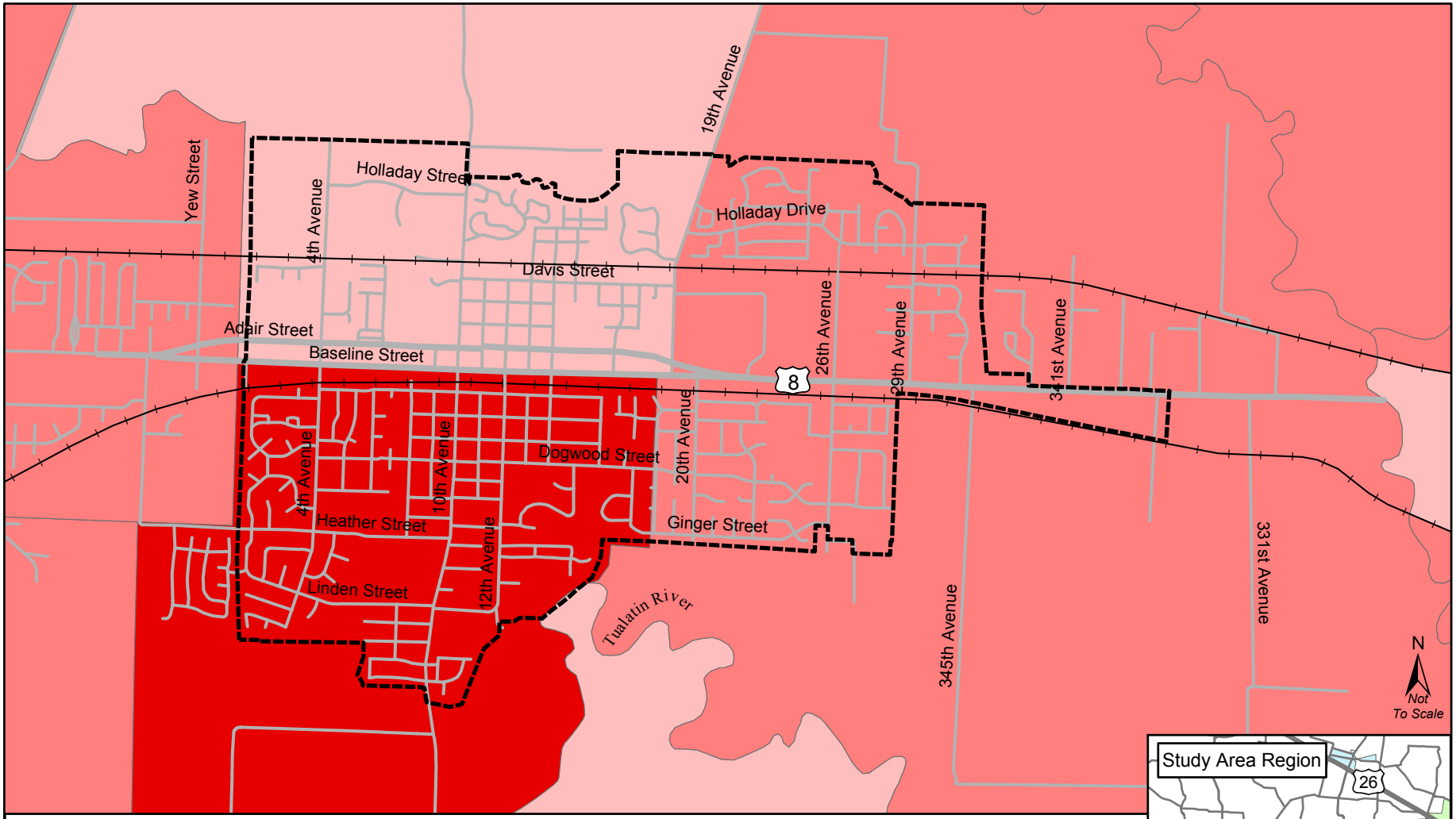


Figure 4-3
NON-SINGLE OCCUPANCY VEHICLE ANALYSIS

Sources:
- Metro RLIS
- TriMet
- City of Cornelius
- Washington County

LEGEND

- Less than 35%
- 35% - 40%
- 40% - 45%
- 45% - 50%
- Greater than 50%
- UGB Expansion
- Cornelius City Limit

5. Pedestrian Plan

This chapter summarizes existing and future pedestrian needs in the City of Cornelius and outlines strategies and a recommended Pedestrian Master Plan. The criteria used in evaluating pedestrian needs and the strategies for addressing needs were identified through work with the City's Citizen Advisory Committee.

Criteria

A set of goals to guide transportation system development in Cornelius has been developed as part of this TSP. Several goals pertain specifically to pedestrian facilities and represent the criteria that all pedestrian improvements or changes should be measured against to determine if they conform to the intended direction of the City.

Develop complementary infrastructure for bicycles and pedestrian facilities to provide a diverse range of transportation choices for city residents.

- Sidewalk gaps shall be filled in to complete the pedestrian network. Priority to sidewalks connecting to schools, parks, libraries and transit stops.
- Sidewalks and bikeways shall be provided on all arterial and collector streets.
- Development of a local trail system with connections to regional trail facilities.
- The preferred spacing of signalized or unsignalized crossings of TV Highway.

Needs

Arterial and collector streets in Cornelius provide limited sidewalks (see Figure 3-2) with several locations within the downtown area and on older roadways with no sidewalks. Sidewalks are provided on residential streets in newer neighborhoods but are limited in older neighborhoods. The Council Creek residential area provides the only public off-street trail in Cornelius. There are limited pedestrian crossing opportunities on TV Highway. These conditions result in a poor existing pedestrian network.

An important existing pedestrian need in Cornelius is providing sidewalks on all arterial and collector roadways and gap infill on local streets to connect residential areas with bus stops, schools, parks and retail centers. This includes the need for safe, well lighted arterials and collector streets with suitable pedestrian amenities for on-street and crossing facilities to reduce the barriers for pedestrian travel. Pedestrian facility needs in Cornelius must consider the three most prevalent trip types:

- Residential based trips – home to school, home to home, home to retail, home to park, home to transit, home to entertainment, and home to library

- Service based trips – multi-stop retail trips, work to restaurant, work to services, work/shop to transit
- Recreational based trips – home to park, exercise trips, casual walking trips

Residential trips need a set of interconnected sidewalks radiating out from homes to destinations within one-half to one mile. Beyond these distances, walking trips of this type become substantially less common (over 20 minutes). Service based trips require direct, conflict-free connectivity between uses (for example, a shopping mall with its central spine walkway that connects multiple destinations). Service based trips need a clear definition of connectivity. This requires mixed use developments to locate front doors which relate directly to the public right-of-way and provide walking links between uses within one-half mile. Recreational walking trips have different needs. Off-street trails, well landscaped sidewalks and relationships to unique environment (creeks, trees, farmland) are important.

Another important existing need is the availability and convenience for crossing TV Highway with pedestrian traffic signals or marked crosswalks. Typically, the spacing between these marked and controlled crossings is designed to facilitate safe and efficient vehicular traffic flow rather than accessibility by pedestrian travelers. This can create situations where pedestrians cross arterials at mid-block locations without any controls.

Because all of these needs are different, there is no one pedestrian solution. The most common need is to provide a safe and interconnected system that affords the opportunity to consider the walking mode of travel, especially for trips less than one mile in length.

Facilities

Sidewalks should be built to current design standards of the City of Cornelius and in compliance with the Americans with Disabilities Act (at least four feet of unobstructed sidewalk).[1] Wider sidewalks may be constructed in commercial districts or on arterial streets. Additional pedestrian facilities may include accessways, pedestrian districts and pedestrian plazas.

- Accessway – A walkway that provides pedestrian and/or bicycle passage either between streets or from a street to a building or other destinations such as a school, park or transit stop.
- Pedestrian District – A plan designation or zoning classification that establishes a safe and convenient pedestrian environment in an area planned for a mix of uses likely to support a relatively high level of pedestrian activity.
- Pedestrian Plaza – A small, semi-enclosed area usually adjoining a sidewalk or a transit stop which provides a place for pedestrians to sit, stand or rest.

The Metro 2000 Regional Transportation System Plan (RTP) identifies TV Highway with a pedestrian designation of a transit/mixed use corridor. The RTP defines transit/ mixed-use corridors as priority areas for pedestrian travel that are served by good quality transit service and that will generate substantial pedestrian traffic near neighborhood-oriented retail development, schools, parks, and bus stops. These corridors should include such design features as wide sidewalks with buffering from traffic, pedestrian-scale lighting, benches, bus shelters, and street trees.

[1] *Americans with Disabilities Act*, Uniform Building Code.

Metro has proposed the Council Creek Trail, Tualatin River Water Trail and McKay Creek Greenway projects as conceptual parts of the regional trails and greenways system. Before decisions are made about trail alignment and appropriate use, there will be a master planning process and many opportunities for public involvement.

- The Council Creek Trail is planned from the end of the westside MAX light-rail line in Hillsboro west to Banks via Cornelius and Forest Grove, with an additional short trail extension south connecting to the Tualatin River.
- The Tualatin River Trail runs from the Tualatin's confluence with the Willamette River west toward Hagg Lake. Trails in rivers and other waterways offer a unique view of the nature of the region. Developing water trails means providing access points for canoes, kayaks, boats and rafts.
- The McKay Creek Greenway is planned to run from the confluence with the Tualatin River, north through Hillsboro to the confluence with Dairy Creek and continues to North Plains. Greenways generally follow rivers and streams and may not provide for public access. Some greenways may allow for an environmentally compatible trail, viewpoint or canoe launch site.

Additionally, the City of Cornelius has designated a Main Street District[2] which focuses on the Baseline Street/Adair Street couplet from 10th Avenue to 20th Avenue. One major goal of the Main Street District Plan is to promote the use of non-auto travel modes. The Main Street Plan calls for wider sidewalks (minimum 11-feet wide) along Adair Street and Baseline Street with separation from traffic by a parking lane or a buffer and frequent pedestian crossings with special treatments such as striping, raised pavement and curb extended sidewalks.

Guidelines for marking crosswalks or other pedestrian enhancements for street crossings are found in the Institute of Transportation Engineer's Traffic Control Devices Handbook[3]. Standards applicable to TV Highway are found in the ODOT Highway Design Manual. Sidewalks should be sized to meet the specific needs of the adjacent land uses and needs. Guidance to assess capacity needs for pedestrians can be found in the Highway Capacity Manual.[4] Typically, the base sidewalk sizing for local and neighborhood routes should be six feet (clear of obstruction). The critical element is the effective width of the walkway. Because of street utilities and amenities, a six-foot walkway can be reduced to three feet of effective walking area. This is the greatest capacity constraint to pedestrian flow. Therefore, landscape strips should be considered on all walkways to reduce the impacts of utilities and amenities – retaining the full sidewalk capacity.

As functional classification of roadways change, so should the design of pedestrian facilities. Collectors may need to consider minimum sidewalks widths of 6 to 8 feet and arterials should have sidewalk widths of 6 to 10 feet. Wider sidewalks may be necessary depending upon urban design needs and pedestrian flows (for example, adjacent to storefront retail or near transit stations).

[2] *Cornelius Main Street Plan*, City of Cornelius, adopted July 23, 2002.

[3] *Traffic Control Devices Handbook*, Institute of Transportation Engineers, 2001, Chapter 13.

[4] *Highway Capacity Manual*, Transportation Research Board, 2000; Chapter 18.

Strategies

Several strategies were developed for future pedestrian projects in Cornelius. These strategies are aimed at providing the City with priorities to direct its funds towards pedestrian projects that meet the goals and policies of the City.

The strategies for pedestrian facilities are:

- Arterial crossing enhancements
- Connect key pedestrian corridors to schools, parks, and activity centers
- Pedestrian corridors that connect neighborhoods
- Fill in gaps in the network where some sidewalks exist
- Pedestrian corridors that connect to major transit locations
- Pedestrian corridors that connect to major recreational uses
- Reconstruct all sidewalks to City standards

The first three strategies in the list above placed a strong emphasis on those types of improvements that have the most use (connection to schools versus commuters) and provide a more significant safety benefit (arterial crossing enhancement versus filling in sidewalk gaps). These strategies were found to be a reasonable approach to making improvement investments for the purposes of the plan update by the Technical Advisory Committee and Citizen Advisory Committee.

Pedestrian Master Plan

To meet transportation performance standards and serve future growth, the future transportation system needs multi-modal improvements to manage the forecasted travel demand. The extent of the recommended multi-modal improvements for Cornelius is significant. Future growth can be accommodated with significant investment in transportation improvements.

A list of potential pedestrian projects to meet the identified needs and achieve these strategies was developed into a Pedestrian Master Plan. The Master Plan shown in Figure 5-1 and summarized in Table 5-1 is an overall plan and summarizes the 'wish list' of pedestrian related projects in Cornelius. These projects will be used to create a Pedestrian Action Plan. The Action Plan consists of projects that the City should give priority to in funding. As development occurs, streets are rebuilt and other opportunities (such as grant programs) arise, projects on the Master Plan should be pursued as well.

The Master Plan elements recommending new facilities on TV Highway are consistent with the RTP designations. Additional local facilities such as new sidewalks, off-street trails and crossing enhancements recommended in this plan extend beyond the regional scope of the RTP.

Table 5-1: Pedestrian Master Plan Projects

Project	Location/Side	From	To	Cost ($1,000s)
Sidewalks on Arterials & Collectors				
Adair Street	North	17th Avenue	19th Avenue	$84
Adair Street	South	316 Baseline	738 N Adair Street	$95
Adair Street	South	19th Avenue	East end of couplet	$84
Baseline Street	North	West city limits	812 Baseline Street	$231
Baseline Street	North	17th Avenue	20th Avenue	$116
Baseline Street	South	West city limits	10th Avenue	$284
Baseline Street	South	10th Avenue	12th Avenue	$84
Baseline Street	South	13th Avenue	14th Avenue	$32
Baseline Street	South	17th Avenue	20th Avenue	$84
4th Avenue	East/West	Adair Street	3F Railroad Line	$231
4th Avenue	East/West	Dogwood Street	Dogwood Drive	$34
10th Avenue	East/West	Linden Street	Heather Street	$210
10th Avenue	East	Davis Street	North city limits	$137
10th Avenue	West	Barlow Street	North city limits	$157
12th Avenue	East/West	Ginger Street	Dogwood Street	$189
14th Avenue	East	Dogwood Street	Beech Street	$63
14th Avenue	East	Alpine Street	Baseline Street	$32
14th Avenue	West	Dogwood Street	Adair Street	$158
14th Avenue	West	Davis Street	Fremont Street	$53
19th Avenue	East	113 N 19th Avenue	Fred Meyer Drive	$80
19th Avenue	East	Fred Meyer Drive	North city limits	$183
19th Avenue	West	Adair Street	North city limits	$305
20th Avenue	East/West	Beech Street	Baseline Street	$168
26th Avenue	East/West	Alpine Street	Baseline Street	$63
26th Avenue	East/West	Beech Street (north)	Beech Street (south)	$21
26th Avenue	East/West	Dogwood Street	South city limits	$63
29th Avenue	East/West	Baseline Street	3F Railroad Line	$294
Davis Street	North	10th Avenue	11th Avenue	$32
Davis Street	North/South	14th Avenue	19th Avenue	$126
Davis Street	South	10th Avenue	14th Avenue	$315
Dogwood Street	North	12th Avenue	17th Court	$168
Dogwood Street	North	20th Avenue	23rd Avenue	$84
Dogwood Street	South	12th Avenue	18th Avenue	$168
Dogwood Street	South	19th Place	20th Avenue	$27
Heather Street	North/South	8th Avenue	10th Avenue	$63
Linden Street	North/South	9th Avenue	10th Avenue	$126
Holladay Street Extension	North/South	4th Avenue	Yew Street	$378*
Davis Street Extension	North/South	4th Avenue	10th Avenue	$378*
Davis Street Extension	North/South	19th Avenue	29th Avenue	$672*

Project	Location/Side	From	To	Cost ($1,000s)
29th Avenue Extension	East/West	TV Highway	345th Avenue	$483*
Dogwood Street Extension	North/South	East city limits	345th Avenue	$210*
Enhanced Pedestrian Crossing				
TV Highway	29th Avenue			$150*
Adair Street	12th Avenue			$150
Baseline Street	12th Avenue			$150
Adair Street	17th Avenue			$150
Baseline Street	17th Avenue			$150
Adair Street	1st Avenue			$150
Baseline Street	1st Avenue			$150
19th Avenue	Davis Street	South of Davis Street	North of Fred Meyer	$15
10th Avenue	Heather Street			$15
10th Avenue	Linden Street			$15
Multi-Use Trail				
Council Creek Trail		East city limit	West city limit	$900**
Tualatin River Water Trail		345th Avenue	15th Avenue	$547**
West Side Trail		15th Avenue	Council Creek Trail	$975**
345th Avenue Trail		TV Highway	Tualatin River Water Trail	$578**
	Sidewalks on Arterials & Collectors			$6,765
	Enhanced Pedestrian Crossing			$1,095
	Multi-Use Trail			$3,000**
	Subtotal			$10,860
	Less Portion Included in Motor Vehicle and Bicycle Projects			$5,271
	Remaining Amount of Pedestrian Only Projects			$5,589

*These project costs are included in a motor vehicle plans.
**These project costs are included in the bicycle plans.

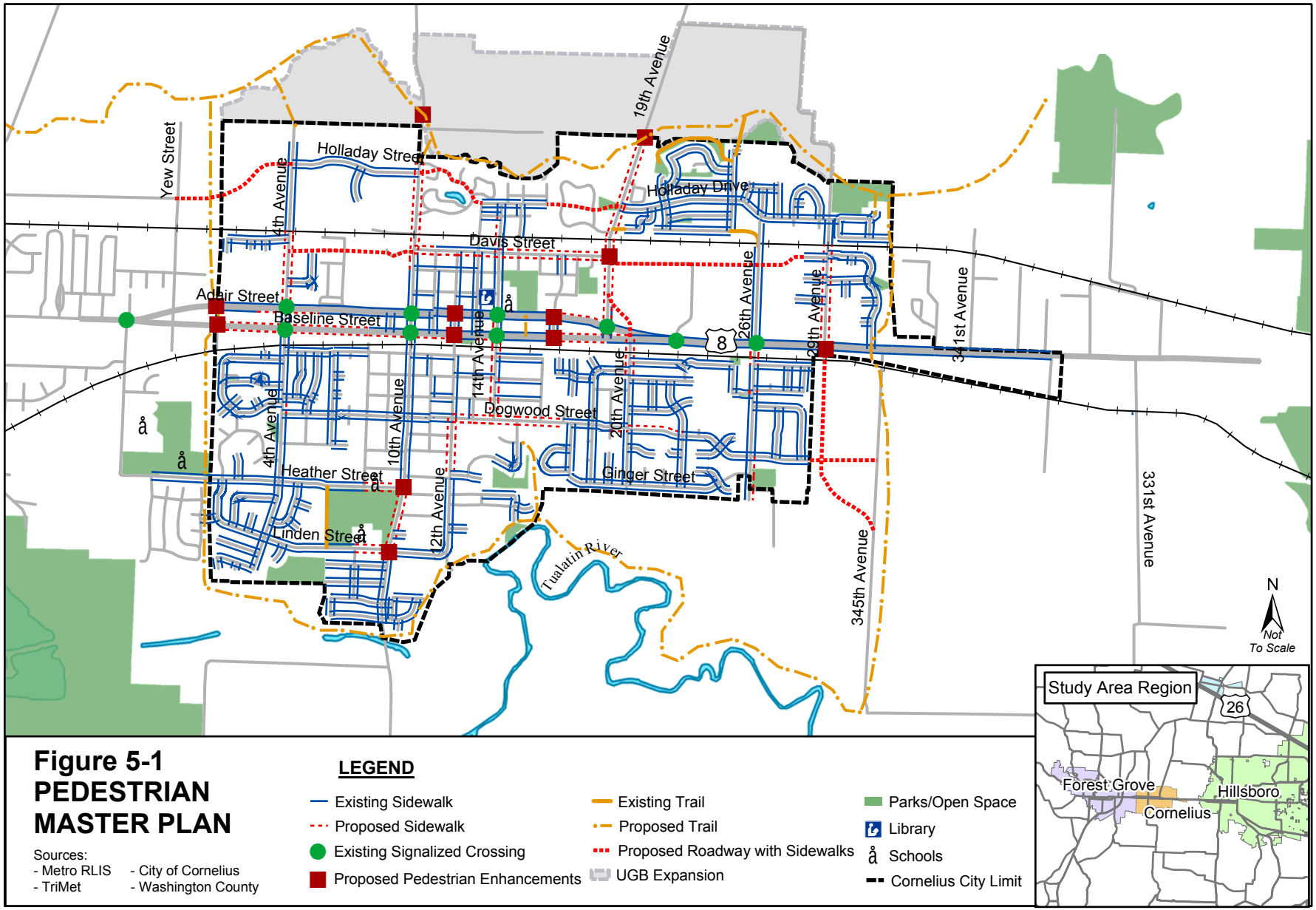


Figure 5-1
PEDESTRIAN MASTER PLAN

Sources:
- Metro RLIS
- TriMet
- City of Cornelius
- Washington County

LEGEND

- Existing Sidewalk
- Proposed Sidewalk
- Existing Signalized Crossing
- Proposed Pedestrian Enhancements
- Existing Trail
- Proposed Trail
- Proposed Roadway with Sidewalks
- UGB Expansion
- Parks/Open Space
- Library
- Schools
- Cornelius City Limit

Pedestrian Action Plan

The pedestrian action plan identifies projects that are reasonably expected to be funded by 2025, which meets the requirements of the updated TPR[5]. The TSP goals and strategies were used to rank the projects. The highest ranking City projects that are reasonably expected to be funded (see Chapter 10) were combined with projects identified in the RTP Financially Constrained scenario and projects with anticipated funding from other agencies to create the list shown in Table 5-2.

Table 5-2: Pedestrian Action Plan Projects

Project	Location/Side	From	To	City Cost ($1,000s)
Sidewalks on Arterials & Collectors				
Adair Street	North	17th Avenue	19th Avenue	-
Adair Street	South	19th Avenue	East end of couplet	$84
Baseline Street	North	17th Avenue	20th Avenue	-
Baseline Street	South	10th Avenue	12th Avenue	$84
Baseline Street	South	13th Avenue	14th Avenue	$32
Baseline Street	South	17th Avenue	20th Avenue	-
4th Avenue	East/West	Adair Street	3F Railroad Line	$231
10th Avenue	East/West	Linden Street	Heather Street	$210
10th Avenue	East	Davis Street	North city limits	$137
12th Avenue	East/West	Ginger Street	Dogwood Street	$189
14th Avenue	East	Dogwood Street	Beech Street	$63
14th Avenue	East	Alpine Street	Baseline Street	$32
19th Avenue	East	113 N 19th Avenue	Fred Meyer Drive	$80
26th Avenue	East/West	Alpine Street	Baseline Street	$63
26th Avenue	East/West	Beech Street (north)	Beech Street (south)	$21
Davis Street	North	10th Avenue	11th Avenue	$32
Davis Street	North/South	14th Avenue	19th Avenue	-
Dogwood Street	South	12th Avenue	18th Avenue	$168
Dogwood Street	South	19th Place	20th Avenue	$27
Heather Street	North/South	8th Avenue	10th Avenue	$63
Linden Street	North/South	9th Avenue	10th Avenue	$126
Enhanced Pedestrian Crossing				
Adair Street	12th Avenue			-
Baseline Street	12th Avenue			-
Adair Street	17th Avenue			-
Baseline Street	17th Avenue			-
19th Avenue	Davis Street	South of Davis Street	North of Fred Meyer	$15
10th Avenue	Heather Street			$15
10th Avenue	Linden Street			$15
Pedestrian Projects to be Funded by the City				$1,687

- These projects are under the jurisdiction of, and/or will be funded by, other agencies.

[5] *OAR Chapter 660*, Department of Land Conservation and Development, Division 012, Transportation Planning, adopted on March 15, 2005, effective April 2005.

Enhanced Pedestrian Crossings

Several enhanced pedestrian crossings were identified in the Pedestrian Master Plan project list. These crossings are located on arterials with volumes and speeds that would require significant crossing enhancements based on published guidelines in the Traffic Control Devices Handbook[6]. Table 5-3 provides a description of possible crossing enhancements.

The enhanced pedestrian crossing projects identified on TV Highway would likely require significant enhancements, such as signalization. The enhanced pedestrian crossing projects identified on 10th Avenue and 19th Avenue could require less expensive treatments, such as a marked crosswalk with a median refuge.

Table 5-3: Potential Measures for Enhancing Pedestrian Crossings

Improvement	Description	Illustration	Cost Range
Marked Crosswalk	White, thermoplastic markings at street corner. Alternative material could include non-white color or textured surfaces.		$500 to $1,000 each crossing
Raised Crosswalk	Crosswalks that are level with the adjacent sidewalks, making pedestrians more visible to approaching traffic.		$4,000
New Corner Sidewalk Ramp	Construct ADA compliant wheelchair ramps consistent with city standards		$3,000 to $5,000 each corner
Median Refuge	Construct new raised median refuge area. Minimum width 6 feet, and minimum length of 30 feet. Curb can be mountable to allow emergency vehicles to cross, if required.		$3,000 to $10,000 depending on overall length and amenities.

[6] *Traffic Control Devices Handbook*, Institute of Transportation Engineers, 2001, Chapter 13, Table 13-2.

Pedestrian Count Down Timer Signal	Install supplemental pedestrian signal controls to indicate the time remaining before crossing vehicles get 'green' signal indication.		$500 each signal head
Curb Extensions	Construct curb extension on road segments with on-street parking. Reduces pedestrian crossing area, and exposure to vehicle conflicts.		$5,000 to $8,000 depending on design amenities and aesthetic treatments.
Mid-Block Pedestrian Signal and Crossing	Construct new pedestrian signal that is synchronized with major street traffic progression to reduce interruption of through traffic. Appropriate near high pedestrian generators.		$100,000 to $150,000

Plan Implemention

Address Gaps in Pedestrian System

In an effort to provide adequate pedestrian infrastructure, land developers in the City of Cornelius are required to build sidewalks on project frontages. However, developers often have little means or incentive to extend sidewalks beyond their property. Additionally, property owners without sidewalks are unlikely to independently build sidewalks that do not connect to anything. In fact, some property owners are resistant to sidewalk improvements due to cost (they do not want to pay) or changes to their frontage (they may have landscaping in the public right-of-way). As an incentive to fill some of these gaps concurrent with development activities, the City could consider an annual walkway fund that would supplement capital improvement-type projects. A fund of about $10,000 per year could build over 600-feet of sidewalk annually to help fill gaps. If matching funds were provided, over double this amount may be possible. The fund could be used several ways:

- Matching other governmental transportation funds to build connecting sidewalks identified in the master plan.
- Matching funds with land use development projects to extend a developer's sidewalks off-site to connect to non-contiguous sidewalks.
- Supplemental funds to roadway projects which build new arterial/collector sidewalks to create better linkages into neighborhoods.
- Matching funds with adjacent land owners that front the proposed sidewalk.
- Reimbursement agreements with developers

Complementing Land Use Actions

Land use actions enable significant improvements to the pedestrian system to occur. A change in land use from vacant or under utilized land creates two key impacts to the pedestrian system:

- Added vehicle trips that conflict with pedestrian flows
- Added pedestrian volume that requires safe facilities

The above mentioned impacts require mitigation to maintain a safe pedestrian system. Pedestrians walking in the traveled way of motor vehicles are exposed to potential conflicts that can be minimized or removed entirely with sidewalk installation. The cost of a fronting sidewalk to an individual single family home would be roughly $1,000 to $2,000 (representing less than one percent of the cost of a house). Over a typical 50-year life of a house, this would represent less than $50 per year assuming that cost of money is 4% annually. This cost is substantially less than the potential risk associated with the cost of an injury accident or fatality without safe pedestrian facilities (injury accidents are likely to be $10,000 to $50,000 per occurrence and fatalities are $500,000 to $1,000,000). Sidewalks are essential for the safety of elderly persons, the disabled, transit patrons and children walking to school, a park or a neighbor's house. No area of the city can be isolated from the needs of these users (not residential, employment areas or shopping districts). Therefore, fronting improvements including sidewalks are required on every change in land use or roadway project.

For any developing or redeveloping property in Cornelius, the cost savings to the private developer is the only benefit of not providing sidewalks – at the potential risk and future expense to the public. Therefore, sidewalks are required in Cornelius with all new development and roadway projects.

Developments should be responsible for provide a pedestrian connection from the site main entrance to the public right-of-way. Also, buildings should be sited to be supportive and convenient to pedestrians, bicyclists and transit riders. This is most critical for residential, commercial and public service (library, community center) developments where higher pedestrian volumes would be expected. Pedestrian circulation through large parking lots should generally be provided in the form of accessways. Conflict free paths and traffic calming elements should be identified, as appropriate.

It is important that, as new development occurs, connections or accessways are provided to link the development to the existing pedestrian facilities in as direct manner as possible. As a guideline, the sidewalk distance from the building entrance to the public right-of-way should not exceed 1.25 times the straight line distance.

It is also very important that residential developments consider the routes that children will use to walk to school. Safe and accessible sidewalks should be provided to accommodate these routes, particularly within one mile of a school site.

6. Bicycle Plan

This chapter summarizes existing and future facility needs for bicycles in the City of Cornelius. The following sections evaluate needs, provide a number of strategies for implementing a bikeway plan and recommend a bikeway plan for the City of Cornelius. The strategies used in evaluating bicycle needs were identified through work with the City's Citizen Advisory Committee.

Criteria

A set of goals to guide transportation system development in Cornelius has been developed as part of this TSP. Several goals pertain specifically to bicycle facilities and represent the criteria that all bicycle improvements or changes should be measured against to determine if they conform to the intended direction of the City.

Develop complementary infrastructure for bicycles and pedestrian facilities to provide a diverse range of transportation choices for city residents.

- Sidewalks and bikeways shall be provided on all arterial and collector streets.
- Development of a local trail system with connections to regional trail facilities.
- The preferred spacing of signalized or unsignalized crossings of TV Highway.
- Bicycle parking on large commercial, industrial and multi-family residential projects.
- Provide bicycle lane connections to regional trail facilities.

Needs

The existing bike lane system on arterial and collector streets does not provide adequate connections from neighborhoods to schools, parks, retail centers, or transit stops. Continuity and connectivity are key issues for bicyclists and the lack of facilities (or gaps) cause significant problems for bicyclists in Cornelius. Without connectivity of the bicycle system, this mode of travel is severely limited. Local streets do not require dedicated bike facilities since the lower motor vehicle volumes and speeds typically allow for both autos and bikes to share the roadway. Cyclists desiring to travel through the City generally either share the roadway with motor vehicles on major streets or find alternate routes on lower volume local streets. There are designated on-street bike facilities (striped bike lane or wide shoulder) along Adair Street, Baseline Street and TV Highway within the Cornelius City limits. However, these facilities are substandard and should be improved to meet ODOT bike lane standards.

Bicycle trips are different from pedestrian and motor vehicle trips. Common bicycle trips are longer than walking trips and generally shorter than motor vehicle trips. Where walking trips are attractive at lengths of a quarter mile (generally not more than a mile), bicycle trips are attractive up to three miles. Bicycle trips can generally fall into three groups: commuting, activity-based and recreational. Commuter trips are typically home/work/home (sometimes linking to transit) and are

made on direct, major connecting roadways and/or local streets. Bicycle lanes provide good accommodations for these trips. Activity based trips can be home-to-school, home-to-park, home-to-neighborhood commercial or home-to-home. Many of these trips are made on local streets with some connections to arterials and collectors. Their needs are for lower volume/speed traffic streets, safety and connectivity.

The Council Creek residential area provides the only public off-street trail in Cornelius. Recreational trips share many of the needs of both the commuter and activity-based trips, but create greater needs for off-street routes, connections to rural routes and safety. Typically, recreational bike trips will exceed the normal bike trip length.

Facilities

Bicycle lanes and designated bike routes are the most common bicycle facilities in Cornelius. Bicycle ways can generally be categorized as bike lanes, bicycle accommodation, or off-street bike paths/multi-use trails. Bike lanes are areas within the street right-of-way designated specifically for bicycle use. Federal research has indicated that bike lanes are the most cost effective and safe facilities for bicyclists when considering all factors of design. Bicycle accommodations are where bicyclists and autos share the same travel lanes, including a wider outside lane and/or bicycle boulevard treatment (priority to through bikes on local streets). Multi-use paths are generally off-street routes (typically recreationally focused) that can be used by several transportation modes, including bicycles, pedestrians and other non-motorized modes (i.e. skateboards, roller blades, etc.). Wide sidewalks (8 foot wide on residential collectors(wide being defined as greater than eight feet), can also be considered multi-use paths, however, the provision of wide sidewalks. The term bikeway is used in this plan to represent any of the bicycle accommodations described above. The bicycle plan designates where bike lanes and multi-use paths are anticipated and any other bicycleways are expected to be bike accommodations (i.e. shared with motor vehicles).

Bicycle lanes adjacent to the curb are preferred to bicycle lanes adjacent to parked cars or bicycle lanes combined with sidewalks. Six-foot bicycle lanes are recommended. Provision of a bicycle lane not only benefits bicyclist but also motor vehicles which gain greater shy distance/emergency shoulder area and pedestrians which gain buffer between walking areas and moving vehicles. On reconstruction projects, bicycle lanes of five feet may need to be considered. Widening the curb travel lane (for example, from 12 feet to 14 or 15 feet can provide bicycle accommodations. This extra width makes bicycle travel more accommodating and provides a greater measure of safety). Off-street trails and sidewalks that are constructed under a curb tight basis should be planned for 12 feet in width, which is desirable for mixed-use activity (pedestrian and bike). Signing and marking of bicycle lanes should follow the *Manual on Uniform Traffic Control Devices*. Design features in the roadway can improve bicycle safety. For example, using curb storm drain inlets rather than catch basins significantly improves bicycle facilities.

The Metro 2000 Regional Transportation System Plan (RTP) identifies TV Highway with a bicycle designation of a regional corridor bikeway (see Table 1-3). A regional corridor bikeway provides point-to-point connections between the central city, regional centers, and larger town centers. They generally carry higher automobile speeds and volumes than community connector bikeways. By complying with the RTP designation, the Cornlius Bicycle Master Plan, is consistent with plans developed by Metro, Washington County, and the State.

Additionally, the City of Cornelius has designated a Main Street District[1] which focuses on the Baseline Street/Adair Street couplet from 10th Avenue to 19th Avenue. One major goal of the Main Street District Plan is to promote the use of non-auto travel modes. The Main Street Plan calls for bicycle lanes on the south side of Baseline Street and the north side of Adair Street between 14th and 20th Avenue. The plan also identifies an off-street path in the alley between Adair Street and Barlow Street from 10th to 14th Avenue. The off-street path recommendation is not consistent with Metro plans.

Strategies

Several strategies were considered for construction of future bikeway facilities in Cornelius. These strategies are aimed at providing the City with priorities since it is likely that the available funding will be insufficient to address all of the projects identified in the Bikeway Master Plan.

The strategies for bicycle facilities are:

- Reconstruct all bikeways on City facilities to Washington County standards and on TV Highway to ODOT standards
- Fill in gaps in the network where some bikeways exist (arterials and collectors)
- Construct bike lanes on all arterials and collectors
- Connect key bicycle corridors to schools, parks, and activity centers
- Arterial crossing enhancements
- Bicycle corridors that connect neighborhoods
- Bicycle corridors that connect to major recreational facilities

The first two strategies in the list above are targeted at TV Highway, Adair Street and Baseline Street to provide a regional route with significant safety benefits. The remaining strategies are focused on promoting local bike trips within Cornelius and the adjacent communities. These strategies were found to be a reasonable approach to making improvement investments for the purposes of the plan update by the Technical Advisory Committee and Citizen Advisory Committee.

Bicycle Master Plan

To meet transportation performance standards and serve future growth, the future transportation system needs multi-modal improvements to manage the forecasted travel demand. The extent of the recommended multi-modal improvements for Cornelius is significant. Future growth can be accommodated with significant investment in transportation improvements.

A list of potential bicycle projects to meet the identified needs and achieve these strategies was developed into a Bicycle Master Plan. The Master Plan shown in Figure 6-1 and summarized in Table 6-1 is an overall plan and summarizes the 'wish list' of bicycle related projects in Cornelius, providing a long-term map for planning bicycle facilities. These projects will be used to create an updated Bicycle Action Plan. The Action Plan consists of projects that the City should give priority to in funding. As development occurs, streets are rebuilt and other opportunities (such as grant programs) arise, projects on the Master Plan should be pursued as well.

[1] *Cornelius Main Street Plan,* City of Cornelius, adopted July 23, 2002.

The Master Plan elements recommending bike lanes on TV Highway is consistent with the RTP designations. Additional local facilities such as bike lanes, bike routes, off-street trails and crossing enhancements recommended in this plan extend beyond the regional scope of the RTP.

Several enhanced bicycle crossings are identified in the Bicycle Master Plan project list. These crossings are located on arterials with volumes and speeds that would require significant crossing enhancements based on published guidelines in the Traffic Control Devices Handbook[2]. Table 5-2 (in the Pedestrian Plan chapter) provides a description of possible crossing enhancements.

Table 6-1: Bicycle Master Plan Projects

Project	Location/Side	From	To	Cost ($1,000s)
Bike Lanes on Arterials & Collectors				
Adair Street	North	West city limit	20th Avenue	$660
Baseline Street	South	West city limit	20th Avenue	$660
TV Highway	North/South	29th Avenue	East city limit	$638
Holladay Street	North/South	4th Avenue	10th Avenue	$396
Dogwood Street	North/South	4th Avenue	East city limit	$1,760
Davis Street	North/South	10th Avenue	19th Avenue	$660
Heather Street	North/South	10th Avenue	West city limits	$638
10th Avenue	East/West	North city limit	Baseline Street	$660
10th Avenue	East/West	Baseline Street	South city limit	$990
14th Avenue	East/West	Dogwood Street	Holladay Street	$660
19th Avenue	East/West	Baseline Street	Davis Street	$220
19th Avenue	East/West	Davis Street	North city limit	$440
20th Avenue	East/West	Dogwood Street	Baseline Street	$264
26th Avenue	East/West	Dogwood Street	Davis Street	$682
29th Avenue	East/West	TV Highway	Holladay Drive	$396
Holladay Street Extension	North/South	4th Avenue	Yew Street	$270*
Holladay Street Extension	North/South	10th Avenue	19th Avenue	$660*
Davis Street Extension	North/South	4th Avenue	10th Avenue	$270*
Davis Street Extension	North/South	19th Avenue	29th Avenue	$480*
29th Avenue Extension	East/West	TV Highway	345th Avenue	$345*
Dogwood Street Extension	North/South	East city limits	345th Avenue	$150*
Enhanced Pedestrian Crossing				
TV Highway	29th Avenue			$150**
Adair Street	17th Avenue			$150**
Baseline Street	17th Avenue			$150**
Adair Street	12th Avenue			$150
Baseline Street	12th Avenue			$150
Adair Street	1st Avenue			$150**
Baseline Street	1st Avenue			$150**
19th Avenue	Davis Street	South of Davis Street	North of Fred Meyer	$15**

[2] *Traffic Control Devices Handbook*, Institute of Transportation Engineers, 2001, Chapter 13, Table 13-2.

Project	Location/Side	From	To	Cost ($1,000s)
10th Avenue	Heather Street			$15**
10th Avenue	Linden Street			$15**
Multi-Use Trail				
Council Creek Trail		East city limit	West city limit	$900
Tualatin River Water Trail		345th Avenue	15th Avenue	$547
West Side Trail		15th Avenue	Council Creek Trail	$975
345th Avenue Trail		TV Highway	Tualatin River Water Trail	$578
	Bikelanes on Arterials & Collectors			$11,899
	Enhanced Pedestrian Crossing			$1,095**
	Multi-Use Trail			$3,000
	Subtotal			$15,994
	Less Portion Included in Motor Vehicle and Pedestrian Projects			$3,270
	Remaining Amount of Bicycle Only Projects			$12,674

*These project costs are included in a motor vehicle roadway improvement.
**These project costs are included in the pedestrian plans.

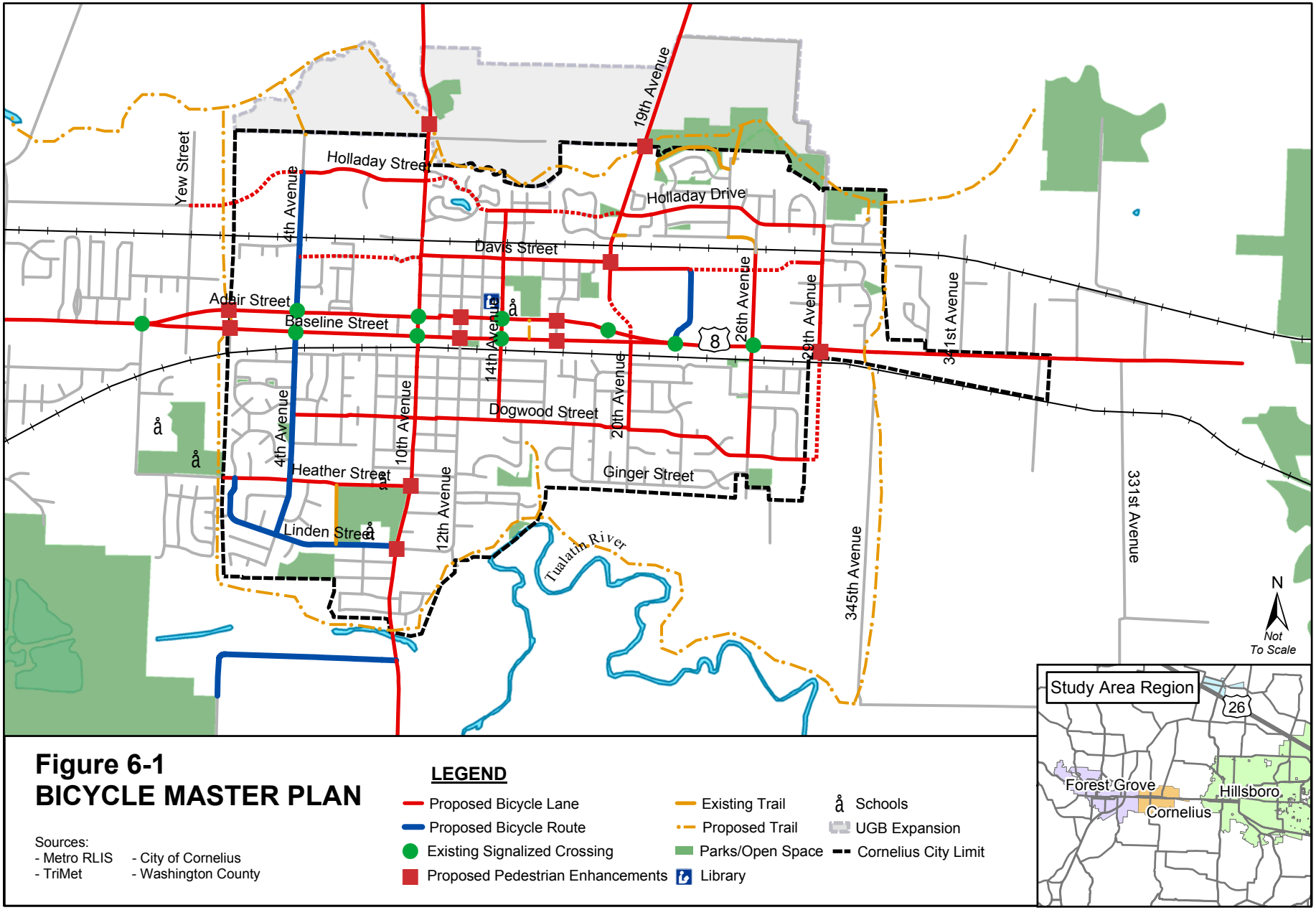


Figure 6-1
BICYCLE MASTER PLAN

Sources:
- Metro RLIS
- TriMet
- City of Cornelius
- Washington County

LEGEND

- Proposed Bicycle Lane
- Proposed Bicycle Route
- Existing Signalized Crossing
- Proposed Pedestrian Enhancements
- Existing Trail
- Proposed Trail
- Parks/Open Space
- Library
- Schools
- UGB Expansion
- Cornelius City Limit

Bicycle Action Plan

A bicycle system action plan project list was created to identify bicycle projects that are reasonably expected to be funded by the year 2025, which meets the requirements of the updated Transportation Planning Rule[3]. The TSP goals and bicycle strategies were used to rank the bicycle projects. The highest ranking City projects that are reasonably expected to be funded (see Chapter 10) were combined with projects identified in the RTP Financially Constrained scenario and projects with anticipated funding from other agencies to create the project list shown in Table 6-2.

Table 6-2: Bicycle Action Plan Projects

Project	Location/Side	From	To	City Cost ($1,000s)
Bike Lanes on Arterials & Collectors				
Adair Street	North	West city limit	20th Avenue	-
Baseline Street	South	West city limit	20th Avenue	-
19th Avenue	East/West	Baseline Street	Davis Street	$220
10th Avenue	East/West	Heather Street	Davis Street	$800
20th Avenue	East/West	Dogwood Street	Baseline Street	$264
Multi-Use Trail				
Council Creek Trail		East city limit	West city limit	-
Bicycle Projects to be Funded by the City				$1,284

- These projects are under the jurisdiction of, and/or will be funded by, other agencies.

Plan Implemention

The city's development code could recommend that on-site bicycle parking facilities must be located within fifty feet of an entrance to a building. Since the provision of a bicycle network will not be fully utilized without the supporting infrastructure, it is in the City's best interest to make bicycle options available.

It is important that, as new development occurs, connections or accessways are provided to link the development to the existing bicycle and pedestrian facilities in as direct manner as is reasonable. If a development fronts a bikeway or sidewalk (as shown in the Bicycle or Pedestrian Master Plans), the developer shall be responsible for providing the bikeway or walkway facility as part of any half-street improvement required for project mitigation.

[3] *OAR Chapter 660*, Department of Land Conservation and Development, Division 012, Transportation Planning, adopted on March 15, 2005, effective April, 2005.

7. Transit Plan

This chapter summarizes existing and future transit needs in the City of Cornelius. The following sections outline the criteria used to evaluate needs, strategies for implementing a transit plan and the recommended transit plan for the City of Cornelius. The method used to develop the transit plan combined TriMet, city staff and other agencies input.

Criteria

A set of goals to guide transportation system development in Cornelius has been developed as part of this TSP. Several goals pertain specifically to transit facilities and represent the criteria that all transit improvements or changes should be measured against to determine if they conform to the intended direction of the City.

Provide reliable convenient transit service to Cornelius residents and businesses as well as special-transit options for the city's elderly and disabled residents.

- Expand transit services with more frequent service, and transit oriented street improvements.
- Park and ride facilities should be located with convenient access to the arterial system to facilitate rider transfer to transit and car pools and should be sited for the maximum convenience of commuters and transit riders.
- Transit stop amenities such as bus shelters, curb extensions, bench, etc.
- Paratransit (i.e., van pools, or car pools, dial-a-ride, etc.) by TriMet and community-based service providers.
- Special transportation services to the elderly and handicapped by TriMet and community-based service providers.

Needs

TriMet is the regional transit provider for the Portland metro area and operates one bus route within Cornelius, #57 – TV Highway/Forest Grove route. This bus route travels on Adair Street, Baseline Street and TV Highway in Cornelius and connects to Forest Grove, Hillsboro, Aloha and the Beaverton Transit Center. Within Cornelius there is one park and ride lot and 25 bus stops that support the #57 – TV Highway/Forest Grove route.

TriMet's Transit Investment Plan[1] (TIP) identifies strategies for meeting regional public transportation needs, focusing on investments and improvements to the total transit system, such as

[1] *Transit Investment Plan* TriMet, 2003.

improvements on existing lines. Therefore the TIP focuses on targeted, strategic improvements to the system, with priorities in the following order:

- Maintain the quality of the existing system
- Expand the high capacity transit system (commuter rail or bus rapid transit)
- Expand the Frequent Service system
- Improve local service

The quality of transit service within Cornelius can be characterized by the following indicators:

- Transit route coverage,
- Frequency,
- Reliability, and
- User amenities

The following sections present the analysis and findings for each of these service characteristics, and identify potential needs for future transit service improvements in Cornelius.

Transit Coverage

The minimum land use density[2] required to support a fixed route transit bus service with 1-hour scheduled between arrivals is about four housing units per acre or three employees per acre. Figure 7-1 shows those areas in Cornelius that meet this transit supportive density threshold with the 2025 development forecasts, as well as the transit coverage area represented by a 0.25 mile radius from transit stops.

In general, about half of the transit supportive areas are covered with transit service. The residential area of the City south of Dogwood Street between 10th Avenue and 19th Avenue and the portion of the City north of the 3F railroad line show a potential need for future transit coverage. The recently approved urban growth boundary expansion area located just north of the city is expected to develop as an industrial area and shows a potential need for future transit coverage. The remaining portions of the City either are supported by transit service or are not expected to meet the density thresholds in 2025. It is important to continue Tri Met's LIFT Program and Ride Connection operated by the American Red Cross to areas within the City not supported by transit service.

Transit coverage can also be improved by providing adequate access to transit service. Typically, the recommended transit stop spacing in urban areas is approximately 500 feet minimum. Today, the bus stops on Baseline Street at 14th Avenue and 19th Avenue are located approximately 1,500-feet apart. This section of Baseline Street is within the main street district and near community facilities, such as the post office. The addition of an eastbound bus stop on Baseline Street at 17th Avenue would improve local transit stop coverage.

[2] Thresholds for minimum land use density to support fixed-route transit service are based on definitions in the 2000 *Highway Capacity Manual*, Chapter 27 for transit service analysis methodologies.

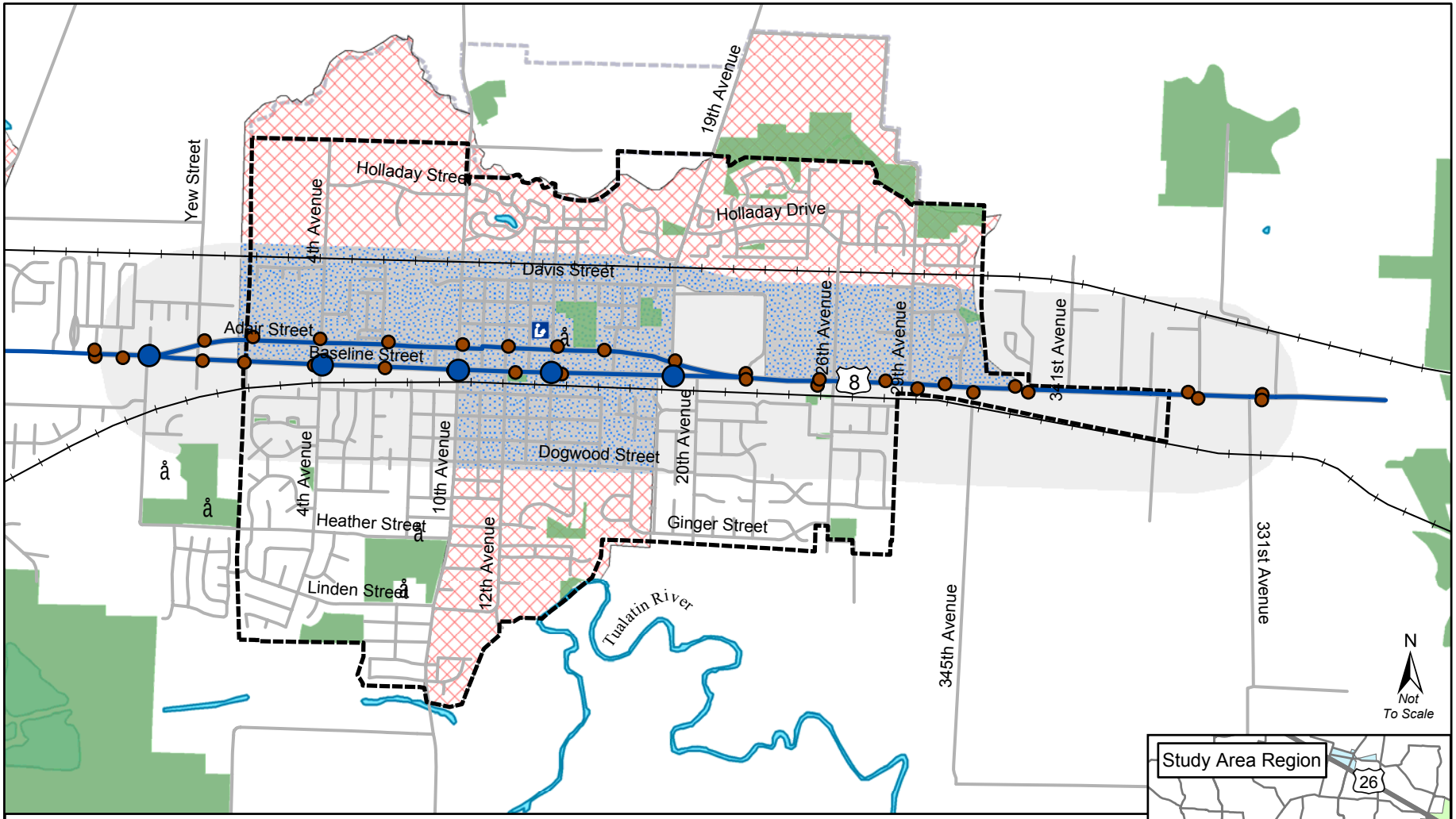


Figure 7-1
FUTURE TRANSIT COVERAGE

Sources:
- Metro RLIS
- TriMet
- City of Cornelius
- Washington County

LEGEND

- Transit Coverage
- 2025 Transit Supportative Area
- 2025 Transit Supportative Area Covered
- Route 57
- Bus Stops
- Major Bus Stops
- Parks/Open Space
- Library
- Schools
- Cornelius City Limit
- UGB Expansion

Transit Frequency

In addition to providing service to a geographic area, transit route frequency is a measure of transit quality of service and mode attractiveness. Bus route 57 recently (Fall 2004) began providing frequent service with buses at stops every 15-minutes or better during the day. This service frequency translates to level of service[3] C during peak periods. During weekends, holidays and off peak periods, bus service frequency is reduced to every 30 to 60-minutes.

Transit Reliability

Transit service reliability is a key performance characteristic for retaining riders. Congested roadways, bottlenecks and traffic signals can delay transit vehicles and cause transit vehicles to arrive off schedule and close together. The TV Highway transit corridor in Cornelius must deal with signal controls and forecasted congestion.

A bus rapid transit system (BRT) can significantly improve bus operations, reliability and travel times for a modest capital investment. A BRT utilizes buses in service that are integrated with key components of the existing automobile transportation infrastructure, such as roads and rights-of-way, intersections and traffic signals. It allows for incremental construction and implementation and can be easily tailored to meet the specific transportation needs and opportunities within individual neighborhoods and transportation corridors.

Specific elements of a Bus Rapid Transit system include:

- Bus lanes – A lane on an urban arterial or city street is reserved for the exclusive or near-exclusive use of buses. Allows buses to avoid traffic congestion.

- Bus signal priority– Preferential treatment of buses at intersections can involve the extension of green time or actuation of the green light at signalized intersections upon detection of an approaching bus. Intersection priority can be particularly helpful when implemented in conjunction with bus lanes or streets, because general-purpose traffic does not intervene between buses and traffic signals.

- Traffic management improvements – Low-cost infrastructure elements that can increase the speed and reliability of bus service include bus boarding islands and curb realignments.

Bus stop consolidation or relocation can also improve transit reliability. Transit stops should be spaced appropriately to provide adequate accessibility to riders while limiting bus delays from frequent stops. Typically, the recommended transit stop spacing in urban areas is approximately 500 feet minimum. Transit stop relocations should be coordinated with pedestrian improvements, such as curb extensions, as they are construction.

[3] *2000 Highway Capacity Manual*, Transportation Research Board, 2000, Chapter 27.

User Amenities

The purpose of transit stop amenities is to improve the convenience and attractiveness of using the transit system. Good public transportation is important to the livability of a community. Accessible transit stops are essential to a useable system. Potential improvements to the overall system include:

- Bus shelters – The convenience of using the transit system should be improved by providing a comfortable place to wait for the bus.
- Curb extensions – The extension of the sidewalk area into the parking lane provides a more convenience 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.
- Pedestrian crossing enhancements – Transit stops located on high volume roadways benefit from improved pedestrian crossing locations.

One of the most significant user amenities for bus services is a shelter at the transit stop. Bus route 57 recently began providing frequent service which is planned to include new signs, signal priority, low floor buses and new bus shelters by 2006.

Metro RTP

In addition to the performance based needs discussed above, the Cornelius TSP needs to consider Metro RTP designations for consistency. The RTP identifies Adair Street, Baseline Street and TV Highway with the following transit designations[4].

- Rapid bus – Similar to LRT service in speed, frequency and comfort, serving major transit routes with limited stops. Regional rapid bus passenger amenities include schedule information, ticket machines, special lighting, benches, covered bus shelters and bicycle parking.
- Major transit stops – Intended to provide a high degree of transit passenger comfort and access. Major transit stops shall provide schedule information, lighting, benches, shelters and trash cans.

[4] Based on the *2000 Regional Transportation Plan*, Metro, August 12, 2000.

Strategies

TriMet is responsible for any changes in routes through their annual transit service plan process. In order for the City to have its transit needs assessed, the City can provide input to TriMet through this process. Several strategies were developed for the implementation of future transit facilities in Cornelius. These strategies were developed to provide the City with priorities in providing guidance to TriMet since it is likely that the available funding will be insufficient to address all of the projects identified in the Transit Master Plan. The strategies for transit facilities include:

- Provide direct/express access to MAX
- Provide access to employment areas
- Provide access to activity and service centers
- Provide access to commercial areas
- Provide express routes to regional employment centers
- Provide park-and-ride lots
- Provide bus shelters
- Bus stop consolidation/relocation
- Provide frequent service in peak commute periods

Transit Master Plan

To meet transportation performance standards and serve future growth, the future transportation system needs multi-modal improvements to manage the forecasted travel demand. The extent of the recommended multi-modal improvements for Cornelius is significant. Future growth can be accommodated with significant investment in transportation improvements.

Transit projects were determined based on the identified needs and strategies and project feasibility. Proposed transit master plan projects are summarized in Table 7-1 and shown in Figure 7-2. Transit enhancements within the Tri-Met service area are ultimately decided based on regional transit goals. As such, Cornelius has little control over dictating the expansion of local service or decreasing headways. These decisions can be influenced however, if the proper densities are achieved along the transit routes, a decision over which the City has more control. Another tactic for increasing transit service to Cornelius is through inter-governmental agreements and funding strategies between Cornelius and Tri-Met in order to leverage transit dollars for local projects, providing better connections to transit facilities and supplying amenities at transit locations.

Table 7-1: Transit Master Plan Projects

Project	Description	Cost ($1,000s)
Bus Stop Enhancements	Coordinate with TriMet to provide transit stop amenities including bus shelters and street lighting at all transit stops. Information kiosks and curb extensions should be considered at all transit stops on Baseline Street and Adair Street within the main street area. Enhanced pedestrian crossings should be provided on TV Highway as identified in the Pedestrian Master Plan (Figure 5-1).	$20
High Capacity Transit System	Coordinate with TriMet to provide high capacity transit within Cornelius. A feasiblity study should be conducted to evaluate Bus Rapid Transit on TV Highway. The study should also evaluate the existing 3F railroad line through the north portion of Cornelius and the existing FAA railroad line just south of TV Highway for a potential commuter rail line or light rail line.	$350
Transit Signal Priority	Coordinate with TriMet and ODOT to construct and implement transit signal priority on TV Highway, Adair Street and Baseline Street.	$50
Baseline Street/17th Avenue Bus Stop	Provide an eastbound bus stop on Baseline Street at 17th Avenue to improve transit stop coverage in the main street district.	-
Transit Corridors	Direct growth to increase the density of development along transit routes in the City of Cornelius in an effort to support regional transit service goals.	-
RTP Designated Major Transit Stops	To meet RTP requirements, amend development code regulations to require new retail, office, and institutional buildings on sites at major transit stops to: ▪ Locate buildings within 20 feet of or provide a pedestrian plaza at the major transit stops. ▪ Provide reasonably direct pedestrian connections between the transit stop and building entrances on the site. ▪ Provide a transit passenger landing pad accessible to disabled persons (if not already existing to transit agency standards). ▪ Provide an easement or dedication for a passenger shelter and underground utility connection from the new development to the transit amenity if requested by the public transit provider. ▪ Provide lighting at a transit stop (if not already existing to transit agency standards).	-
	Transit Project Total	**$420**

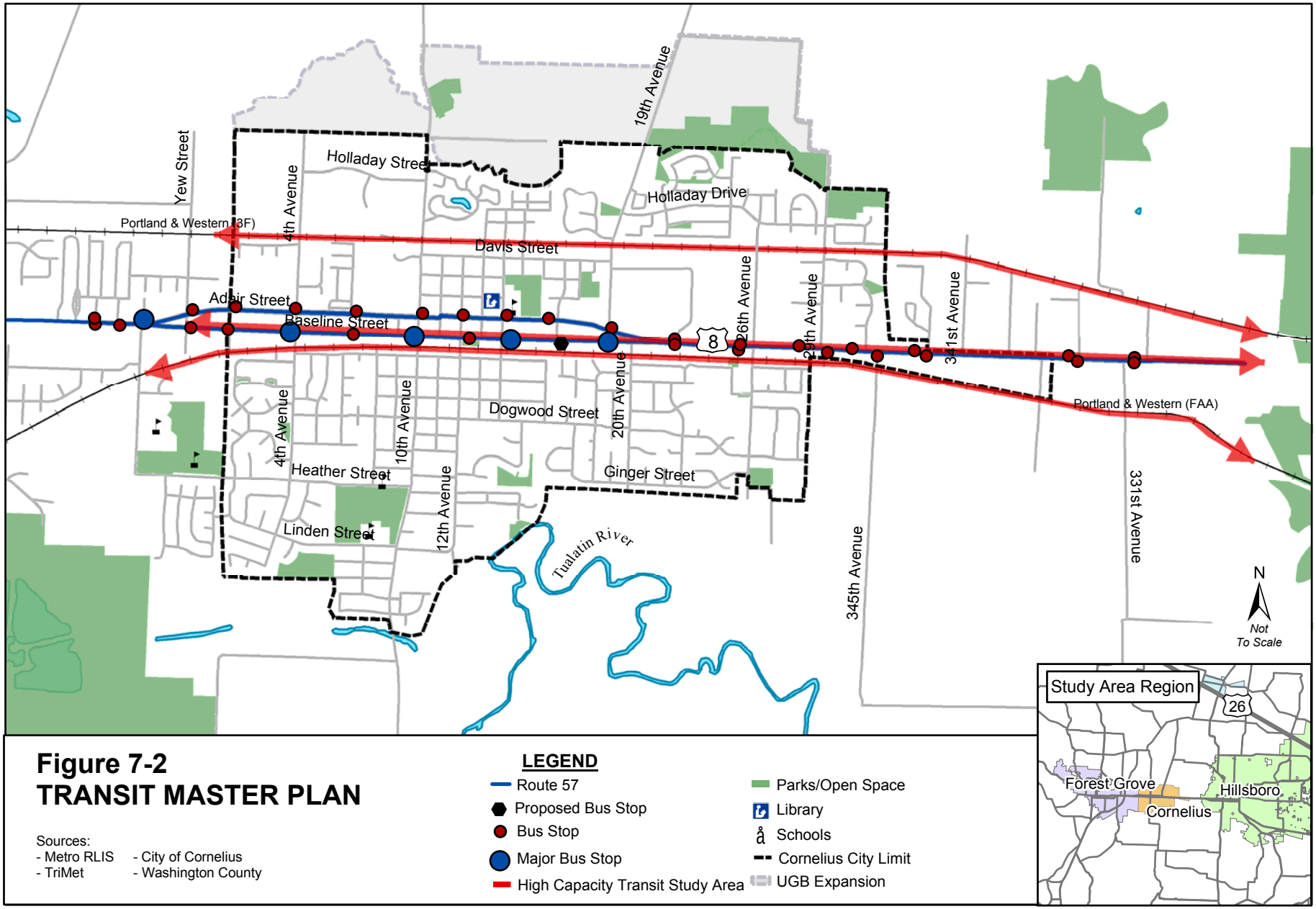


Figure 7-2
TRANSIT MASTER PLAN

Sources:
- Metro RLIS
- TriMet
- City of Cornelius
- Washington County

LEGEND

- Route 57
- Proposed Bus Stop
- Bus Stop
- Major Bus Stop
- High Capacity Transit Study Area
- Parks/Open Space
- Library
- Schools
- Cornelius City Limit
- UGB Expansion

Transit Action Plan

A transit system action plan project list was created to identify transit projects that are reasonably expected to be funded by the year 2025, which meets the requirements of the updated Transportation Planning Rule[5]. The TSP goals and transit strategies were used to rank the transit projects. The highest ranking City projects that are reasonably expected to be funded (see Chapter 10) were combined with projects identified in the RTP Financially Constrained scenario to create the project list shown in Table 7-2.

Table 7-2: Transit Action Plan Projects

Project	Description	City Cost ($1,000s)
Bus Stop Enhancements	Coordinate with TriMet to provide transit stop amenities including bus shelters and street lighting at all transit stops. Information kiosks and curb extensions should be considered at all transit stops on Baseline Street and Adair Street within the main street area. Enhanced pedestrian crossings should be provided on TV Highway as identified in the Pedestrian Master Plan (Figure 5-1).	-
High Capacity Transit System	Coordinate with TriMet to provide high capacity transit within Cornelius. A feasiblity study should be conducted to evaluate Bus Rapid Transit on TV Highway. The study should also evaluate the existing 3F railroad line through the north portion of Cornelius and the existing FAA railroad line just south of TV Highway for a potential commuter rail line or light rail line.	-
Transit Signal Priority	Coordinate with TriMet and ODOT to construct and implement transit signal priority on TV Highway, Adair Street and Baseline Street.	-
Transit Corridors	Direct growth to increase the density of development along transit routes in the City of Cornelius in an effort to support regional transit service goals.	-
RTP Designated Major Transit Stops	To meet RTP requirements, amend development code regulations to require new retail, office, and institutional buildings on sites at major transit stops to: ▪ Locate buildings within 20 feet of or provide a pedestrian plaza at the major transit stops. ▪ Provide reasonably direct pedestrian connections between the transit stop and building entrances on the site. ▪ Provide a transit passenger landing pad accessible to disabled persons (if not already existing to transit agency standards). ▪ Provide an easement or dedication for a passenger shelter and underground utility connection from the new development to the transit amenity if requested by the public transit provider. ▪ Provide lighting at a transit stop (if not already existing to transit agency standards).	-
	Transit Projects to be Funded by the City	**$0**

- These projects are under the jurisdiction of, and/or will be funded by, other agencies.

[5] *OAR Chapter 660*, Department of Land Conservation and Development, Division 012, Transportation Planning, adopted on March 15, 2005, effective April, 2005.

Plan Implemention

There are three determining factors that play a role in the provision of a successful transit system: net housing density, transit level of service (frequencies) and proximity to station locations. The City of Cornelius has the ability to control the net housing densities located around current and potential transit stops and the proximity of development to these stops. While TriMet makes decisions regarding the other factors, transit level of service, the focus of development and land use decisions within proximity of transit locations will greatly effect the service decisions made by TriMet.

In order to provide a density high enough to support high capacity transit, the housing density along TV Highway, Adair Street and Baseline Street should be increased. Guiding development along this corridor would help support the regional transit goal of providing an efficient and effective transit system, as well as reducing the reliance on the automobile for inter-jurisdictional work trips made by individuals living or working in this corridor.

In order to promote higher density developments, the City should consider code requirements that provide approval criteria related to public transit. The following provisions:

- Provisions within the plan shall be included for providing for transit if the development proposal is adjacent[6] to existing or proposed transit route;
- The requirements for transit facilities shall be based on:
  - The location of other transit facilities in the area; and
  - The size and type of the proposal.
- The following facilities may be required after City and TriMet review:
  - Bus stop shelters;
  - Curb extensions at bus stops; and
  - Connecting paths to the shelters.

[6] The code provision should define adjacent as having a bus stop within 500 feet of the property.

8. Motor Vehicle Plan

This chapter summarizes needs for the motor vehicle system for future conditions in the City of Cornelius. It also outlines the strategies to be used in evaluating needs and recommends plans for motor vehicles (automobiles, trucks, buses and other vehicles). The Motor Vehicle modal plan is intended to be consistent with other jurisdictional plans including Metro's *Regional Transportation System Plan* (RTP), and Washington County's *Transportation System Plan* (TSP) and ODOT's *Oregon Highway Plan* (OHP).

Criteria

A set of goals to guide transportation system development in Cornelius has been developed as part of this TSP. Many of these goals pertain specifically to motor vehicles and represent the criteria that all motor vehicle improvements or changes should be measured against to determine if they conform to the intended direction of the City.

- Provide a supportive transportation network to the land use plan that provides opportunities for transportation choices and the use of alternative modes serving all residential and commercial areas.
- Ensure that public roads and streets are planned to provide safe, convenient, efficient and economic movement of persons, goods and services between and within the major land use activities. Existing rights of way should be classified and improved and new streets built based on the type, origin, destination and volume of current and future traffic.
- Through traffic should be provided with routes that do not congest local streets and impact residential areas. Outside traffic destined for Cornelius commercial areas should provide convenient and efficient access without the need to use residential streets.
- Local traffic routes should be planned to provide convenient circulation between home, school, work, recreation and shopping. Convenient access to major out-of-town routes should be provided from all areas of the city.
- Reduce vehicle miles traveled (VMT) within the study area by limiting out of way travel patterns for all modes.

Strategies

The base case analysis for the forecasted 2025 growth was based on the RTP Financially Constrained funding scenario. This scenario includes transportation system improvements that are expected to be constructed/implemented with the current funding levels. Figure 8-1 shows the forecasted demand/capacity on roadways within the Cornelius 2025 TSP Study Area for the

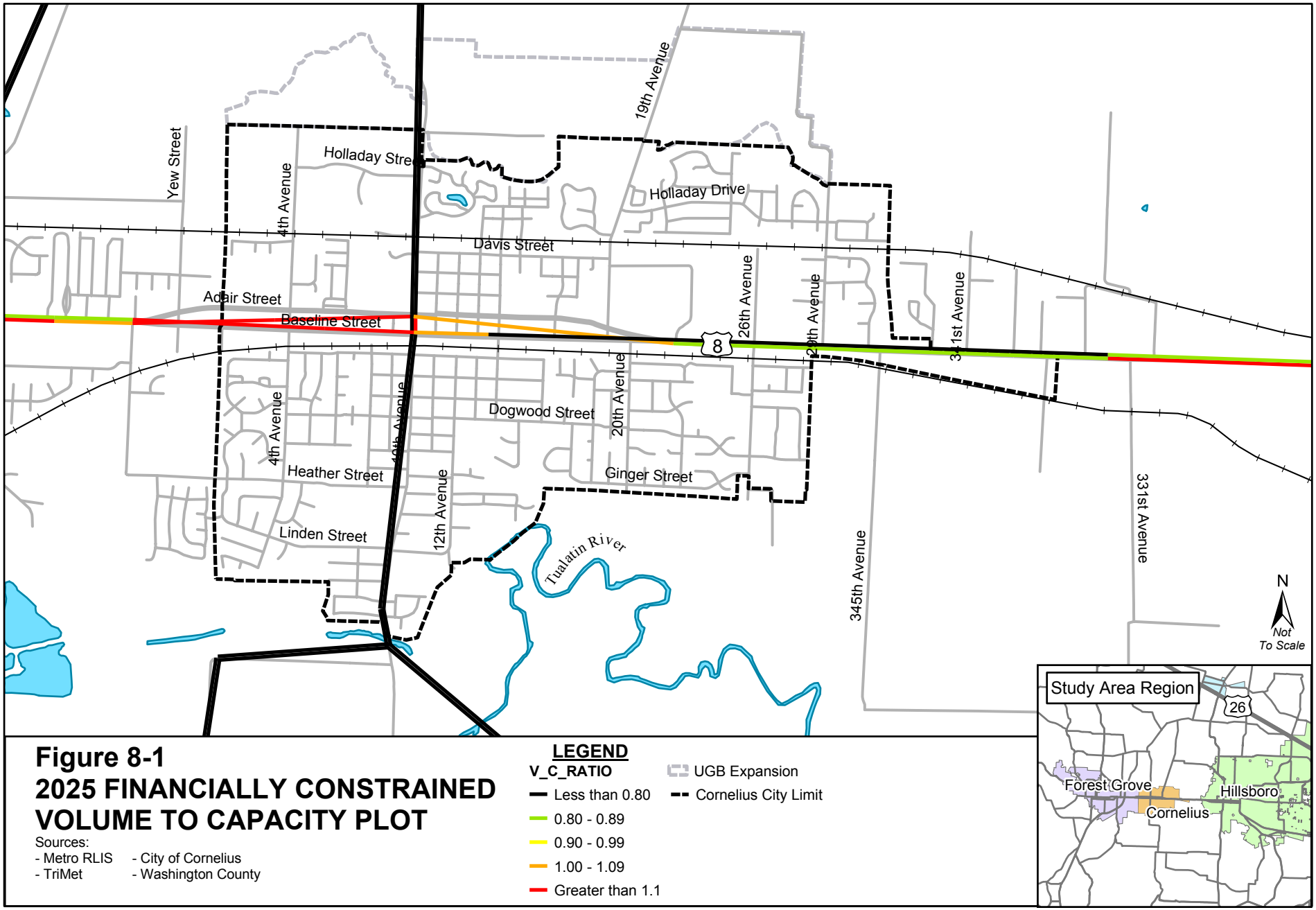


Figure 8-1
2025 FINANCIALLY CONSTRAINED VOLUME TO CAPACITY PLOT

Sources:
- Metro RLIS
- TriMet
- City of Cornelius
- Washington County

LEGEND

V_C_RATIO
- Less than 0.80
- 0.80 - 0.89
- 0.90 - 0.99
- 1.00 - 1.09
- Greater than 1.1

- UGB Expansion
- Cornelius City Limit

Financially Constrained funding scenario. As shown in the figure, the Financially Constrained scenario has Demand/Capacity (D/C) ratios that exceed 1.0 on several sections of TV Highway in the study area.

Within the Cornelius TSP study area, portions of Adair Street, Baseline Street and TV Highway do not meet performance standards under a Financially Constrained funding scenario. To meet performance standards and serve future growth, the future transportation system needs multi-modal improvements and strategies to manage the forecasted travel demand. The extent and nature of the multi-modal improvements for Cornelius are significant. The impact of future growth would be severe without investment in transportation improvements. Strategies for meeting automobile facility needs include the following:

- Local Circulation Enhancements
- Neighborhood Traffic Management
- Transportation Demand Management Programs to Reduce Peak Traffic for Employers in Cornelius
- Additional Signals on Arterial/Collector Intersections
- Access Management
- Intelligent Transportation Systems (ITS)
- Intersection Modifications
- Transportation System Management (TSM)
- Regional Circulation Enhancements
- Mitigate all Intersections to Level of Service D and V/C of 0.99 in the PM Peak Hour

The following sections outline the type of improvements that would be necessary as part of a long-range Motor Vehicle Master Plan. Phasing of implementation will be necessary since all of the improvements cannot be done at once. This will require prioritization of projects and periodic updating to reflect current needs. Most importantly, it should be understood that the improvements outlined in the following sections are a guide to managing growth in Cornelius as it occurs over the next 20 years.

Transportation System Management (TSM)

Transportation System Management (TSM) focuses on low cost strategies to enhance operational performance of the transportation system by seeking solutions to immediate transportation problems, finding ways to better manage transportation, maximizing urban mobility, and treating all modes of travel as a coordinated system. These types of measures include such things as signal improvements, traffic signal coordination, traffic calming, access management, local street connectivity and intelligent transportation systems (ITS). Typically, the most significant measures that can provide tangible benefits to the traveling public are traffic signal coordination and systems. Measures that are more difficult to measure but provide system reliability to maintain transportation flows include transit signal priority and incident management.

TSM measures focus primarily on region wide improvements, however there are a number of TSM measures that could be used in a smaller scale environment such as the Cornelius area. The following sections discuss TSM measures that could be appropriate for the Cornelius 2025 TSP study area.

Intelligent Transportation Systems (ITS)

ITS involves the application of advanced technologies and proven management techniques to relieve congestion, enhance safety, provide services to travelers and assist transportation system operators in implementing suitable traffic management strategies. ITS focuses on increasing the efficiency of existing transportation infrastructure, which enhances the overall system performance and reduces the need to add capacity (e.g. travel lanes). Efficiency is achieved by providing services and information to travelers so they can (and will) make better travel decisions and to transportation system operators so they can better manage the system and improve system reliability.

Washington County and ODOT do not have any ITS projects identified within Cornelius at this time. ITS projects to consider in the future may include:

- Transit signal priority
- Signal coordination and optimization
- Rail crossing information
- Traffic monitoring and surveillance
- Information availability
- Incident management

In order to support future ITS projects and the local interconnect infrastructure, the City of Cornelius standards should be updated to include the installation of 3-inch conduit during roadway improvement projects.

Neighborhood Traffic Management (NTM)

The City of Cornelius has several neighborhood traffic management elements including speeds humps, a traffic circle and crosswalk pavement texture. The city should consider additional traffic calming measures and work with the community to find the traffic calming solution that best meets their needs and maintains roadway function. Table 8-1 lists common NTM applications and suggests which devices may be supported by the Cornelius Fire Department. Additional NTM measure descriptions that include diagrams, benefits, and costs are included in the technical appendix. Any NTM project should include coordination with emergency agency staff to assure public safety.

Table 8-1: Traffic Calming Measures by Roadway Functional Classification

Traffic Calming Measure	Roadway Classification		
	Arterial	Collector	Neighborhood/Local Street
Curb Extensions	Supported	Supported	Calming measures are okay on lesser response routes that have connectivity (more than two accesses) and are accepted and field tested by the Cornelius Fire Department.
Medians	Supported	Supported	
Pavement Texture	Not Supported	Supported	
Speed Hump	Not Supported	Not Supported	
Roundabout	Not Supported	Supported	
Raised Crosswalk	Not Supported	Not Supported	
Speed Cushion (provides emergency pass-through with no vertical deflection)	Not Supported	Supported	
Choker[1]	Not Supported	Not Supported	
On-Street Parking	Supported	Supported	
Traffic Circle	Not Supported	Not Supported	
Diverter (with emergency vehicle pass through)	Not Supported	Not Supported	

Note: It is desirable to have all traffic calming measures meet Cornelius Fire Department guidelines including minimum street width, emergency vehicle turning radius, and accessibility/connectivity.

Access Management

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 the individual destination. ODOT and Washington County have clear access management policies and the supporting documentation to ensure that the highway system is managed as wisely as possible for the traveling public. Proper implementation of access management techniques should guarantee reduced congestion, reduced accident rates, less need for highway widening, conservation of energy, and reduced air pollution.

Access management is control or limiting of access on arterial and collector facilities to maximize the capacity of the existing facilities and preserve their functional integrity. Numerous driveways erode the capacity of arterial and collector roadways. Preservation of capacity is particularly important on higher volume roadways for maintaining traffic flow and mobility. Whereas local and neighborhood streets function to provide access, collector and arterial streets serve greater traffic volume. Numerous driveways or street intersections increase the number of conflicts and potential for accidents and decrease mobility and traffic flow. Cornelius, as with every city, needs a balance of streets that provide access with streets that serve mobility.

Several access management strategies were identified to improve access and mobility in Cornelius:

- Meet ODOT access requirements on TV Highway, Baseline Street and Adair Street[2]
- New development, redevelopment and roadway projects require an access report for new access points stating that the driveway/roadway is safe as designed, meeting adequate

[1] Chokers are not supported when they do not shadow parking. If parking is shadowed, see curb extensions.

[2] For example, the 19th/20th Avenue Intersection Improvement Project developed an Access Management Plan that relocated and consolidated driveways within the project area. It's provisions are hereby incorporated by reference and will guide future development in the intersection area.

stacking, sight distance and deceleration requirements as set by ODOT, Washington County and AASHTO.

- Meet Metro's maximum spacing standard[3] of 530 feet for roadways and driveways on collector, neighborhood route and local facilities
- Provide left turn lanes where warranted for access onto cross streets
- Work with land use development applications to consolidate driveways where feasible
- Establish City access standards for new developments on collectors and arterials

New development and roadway projects located on City street facilities should meet the recommended access spacing standards summarized in Table 8-2. The minimum spacing of roadways and driveways listed for arterials, collectors and neighborhood/local roadways meets or exceeds Washington County's access spacing standards[4]. The maximum spacing of roadways and driveways listed in this table is consistent with Metro[5].

Table 8-2: Recommended Access Spacing Standards for City Street Facilities

Street Facility	Maximum spacing of roadways and driveways	Minimum spacing of roadways
Arterial	-	530 feet
Collector	530 feet	100 feet
Neighborhood/Local	530 feet	-
All Roads	Require an access report for new access points stating that the driveway/roadway is safe as designed meeting adequate stacking, sight distance and deceleration requirements as set by ODOT, Washington County and AASHTO.	

TV Highway from 10th Avenue to 14th Avenue was adopted as a Special Transportation Area (STA) in January 2004. There is potential for the extension of the STA designation on TV Highway between 14th Avenue and 20th Avenue, within the Main Street District. In an STA, direct property access is discouraged and direct street connections and shared on-street parking are encouraged. Local auto, pedestrian, bicycle and transit movements are generally as important as the through movement of traffic. Access management standards for a STA apply to a posted speed of 35 miles per hour or less. Where driveways are allowed and land use patterns permitted, the minimum spacing of driveways is 175-feet or mid-block if the city block spacing is less than 350-feet.

Access management standards on TV Highway outside the STA require a minimum spacing of roadways and driveways of 770-feet for a posted speed of 30 to 35 miles per hour, 990-feet for a posted speed of 40 to 45 miles per hour and 1,100-feet for a posted speed of 50 miles per hour.

Access management is not easy to implement and requires long institutional memory of the impacts of short access spacing – increased collisions, reduced capacity, poor sight distance and greater pedestrian exposure to vehicle conflicts. The most common opposition response to access control is that "there are driveways all over the place at closer spacing than mine – just look out there".

[3] Metro Regional Transportation Plan, 2000.

[4] Washington County Community Development Code, Section 501-8.5 Access to County and Public Roads.

[5] Metro Regional Transportation Plan, 2000.

These statements are commonly made without historical reference. Many of the pre-existing driveways that do not meet access spacing requirements were put in when traffic volumes were substantially lower and no access spacing criteria were mandated. With higher and higher traffic volume in the future, the need for access control on all arterial roadways is critical – the outcome of not managing access properly is additional wider roadways which have much greater impact than access control.

Staff should propose revisions to the development code to reflect the standards being developed in the Transportation System Plan. Additional attention should be given to the specific standards and whether exceptions are appropriate to be written into the code or if variances are the action needed. Four access management standards are recommended.

- A restriction of direct access of new single-family units on arterials and collectors (with an exception process that addresses safety and neighborhood traffic management needs).
- An access report requirement as part of the land development application. The report would verify driveway design and spacing, proper on-site circulation, adequate stacking, sight and deceleration distance as set by ODOT (including their approach permitting process), Washington County, the City and AASHTO (utilizing future traffic volumes from this plan as a future base for evaluation). Where possible, new developments should be required to provide "cross-over easements" as a condition to approval, thus insuring shared driveway access points.
- Driveways should not be placed in the influence area of intersections. The influence area is that area where queues of traffic commonly form on the approach to an intersection (typically between 150 to 300 feet). In a case where a project has less than 150 feet of frontage, the site would need to explore potential shared access, or if that were not practical, place driveways as far from the intersection as the frontage would allow (permitting for five feet from the property line).
- Access to arterials should only be from public roads. When a site that has private access onto a principal arterial is redeveloped, the private access will be eliminated if alternate access exists to the site.

Local Street Connectivity

Much of the local street network in Cornelius is built but is not well connected. Multiple access opportunities for entering or exiting neighborhoods are limited. There are a number of locations where neighborhood traffic is funneled onto one single street. This type of street network results in out-of-direction travel for motorists and an imbalance of traffic volumes that impacts residential frontage. The outcome can result in the need for wider roads, traffic signals and turn lanes (all of which negatively impact traffic flow and degrade safety). By providing connectivity between neighborhoods, out-of-direction travel and vehicle miles traveled (VMT) can be reduced, accessibility between various travel modes can be enhanced and traffic levels can be balanced out between various streets. Additionally, public safety response time is reduced.

Some of these local connections can contribute with other street improvements to mitigate capacity deficiencies by better dispersing traffic. Several roadway connections will be needed within neighborhood areas to reduce out of direction travel for vehicles, pedestrians and bicyclists. This is most important in the areas where a significant amount of new development is possible.

Figure 8-2 shows the proposed Local Street Connectivity Plan for Cornelius. In most cases, the connector alignments are not specific and are aimed at reducing potential neighborhood traffic

impacts by better balancing traffic flows on neighborhood routes. The arrows shown in the figures represent potential connections and the general direction for the placement of the connection. In each case, the specific alignments and design will be better determined upon development review. New street approaches to TV Highway must be reviewed by permitted by ODOT.

The criteria used for providing local connections are based on the Metro RTP requirements for new residential or mixed-use developments.

- Every 330 feet, a grid for pedestrians and bicycles
- Every 530 feet, a grid for automobiles

To protect existing neighborhoods from potential traffic impacts of extending stub end streets, connector roadways should incorporate neighborhood traffic management into their design and construction. All stub streets should have signs indicating the potential for future connectivity. Additionally, new development that constructs new streets, or street extensions, must provide a proposed street map that:

- Provides full street connections with spacing of no more than 530 feet between connections except where prevented by barriers
- Provides bike and pedestrian access ways with spacing of no more than 330 feet except where prevented by barriers
- Limits use of cul-de-sacs and other closed-end street systems to situations where barriers prevent full street connections
- Includes no close-end street longer than 200 feet or having no more than 25 dwelling units
- Includes street cross-sections demonstrating dimensions of ROW improvements, with streets designed for posted or expected speed limits

The arrows shown on Figure 8-2 indicate priority connections only. Topography, railroads and environmental conditions limit the level of connectivity in several areas of Cornelius. Other stub end streets in the City's road network may become cul-de-sacs, extended cul-de-sacs or provide local connections. Pedestrian connections from the end of any stub end street that results in a cul-de-sac should be considered mandatory as future development occurs. The goal would continue to be improved city connectivity for all modes of transportation.

Several street extensions are recommended as a part of the connectivity development to reduce the amount of local vehicles that travel on TV Highway. Davis Street should be extended west of 10th Avenue to 4th Avenue and east of 19th Avenue to 29th Avenue. Currently, there is no roadway connection between Cornelius and Forest Grove north of TV Highway. Holladay Street should be extended to connect between 4th Avenue and Yew Street at 24th Avenue in Forest Grove. Holladay Street should be extended east of 10th Avenue and west of 19th Avenue to connect to Gray Street. Construction of this project could only be implemented with the redevelopment of the Smoke Tree Trailer Park and the Forest Hills Mobile Village. Dogwood Street should be extended east to 345th Avenue and 29th Avenue should be extended south connecting to Dogwood Street. This roadway network is expected to serve the proposed high school development south of TV Highway just west of 345th Avenue.

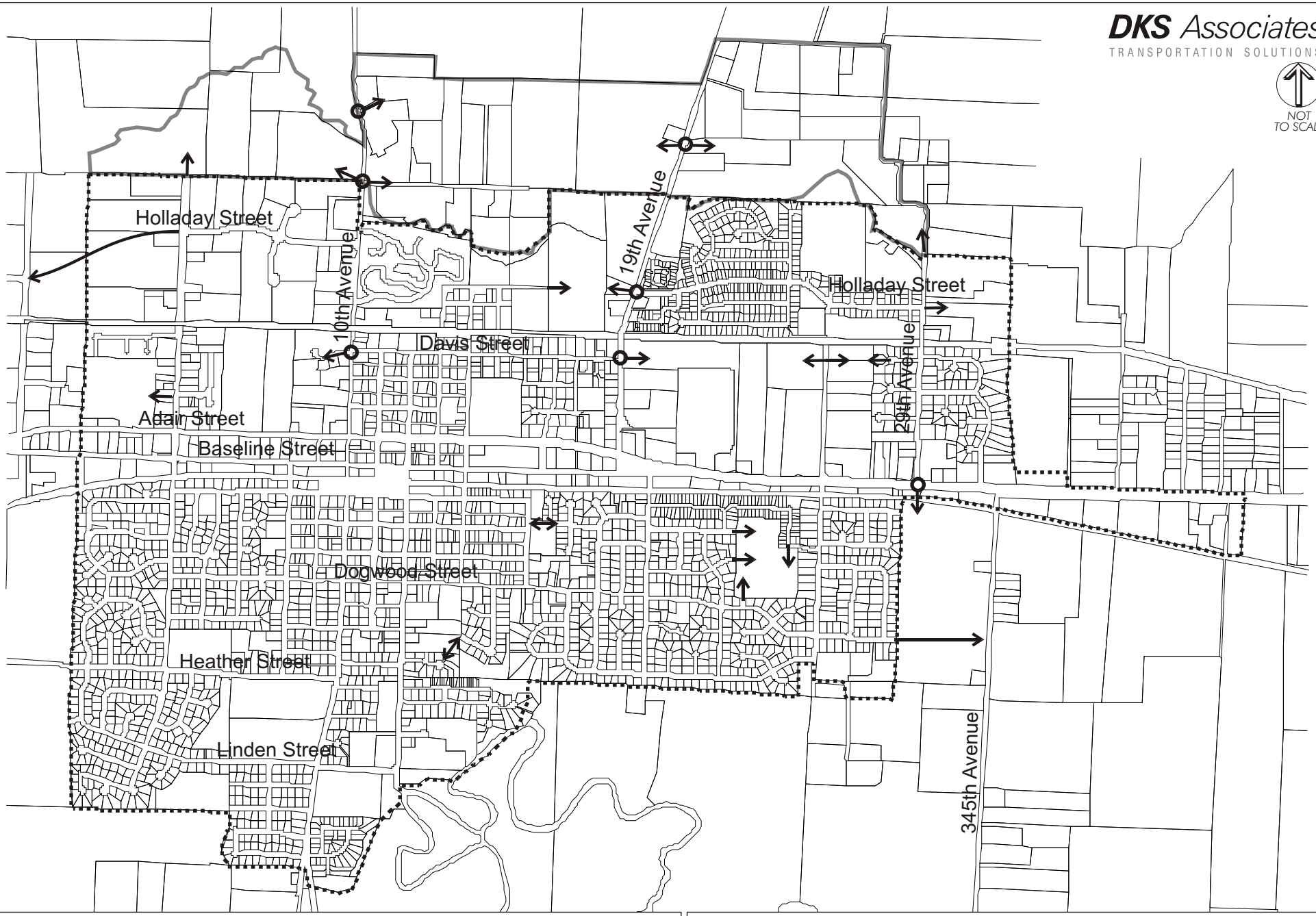


Figure 8-2
STREET CONNECTIVITY MAP

Functional Classification

The proposed functional classification (shown in Figure 8-3) differs from the previous TSP functional classifications. In order to allow for more flexibility in facility access and design and maintain consistency with other jurisdictions, the Cornelius functional classification system was updated and now includes neighborhood routes as a classification.

Changes made to functional classification map include:

- A neighborhood route classification was added to two roadways
  - Linden Street – Heather Street to 12th Avenue
  - 12th Avenue – Linden Street to Dogwood Street
- A collector classification was added to six roadways
  - 26th Avenue – TV Highway to Holladay Drive
  - Davis Street – 4th Avenue to 29th Avenue
  - Holladay Drive – 10th Avenue to 29th Avenue
  - Dogwood Street extension
  - Holladay Street extension
  - 29th Avenue extension
- 10th Avenue was changed from collector to arterial
- 19th Avenue was changed from a collector to arterial

The proposed functional classification was developed following detailed review of Cornelius and Washington County's functional classification. The criteria used to assess connectivity have two components: the extent of connectivity and the frequency of the facility type. Maps can be used to determine regional, city/district and neighborhood connections. The frequency or need for facilities of certain classifications is not routine or easy to package into a single criterion. While planning textbooks call for arterial spacing of a mile, collector spacing of a quarter to a half-mile, and neighborhood connections at an eighth to a sixteenth of a mile, this does not form the only basis for defining functional classification. Changes in land use, environmental issues or barriers, topographic constraints, and demand for facilities can change the frequency for routes of certain functional classifications. While spacing standards can be a guide, they must consider other features and potential long term uses in the area (some areas would not experience significant changes in demand, where others will).

It is acceptable for the city to re-classify street functional designations to have different naming conventions than the RTP street functional classifications, however, the general intent and purpose of the facility, whatever the name, should be consistent with regional, state and federal guidelines.

Special Transportation Area

A Special Transportation Area (STA) has been designated on TV Highway from 10th to 14th Avenues (see Figure 3-9). The City proposes to extend the STA designation from 14th to 19th/20th Avenues. This five block area is located within the City's Main Street District. Both areas have similar existing development. The City of Cornelius' adopted Main Street Plan includes land use, site design and circulation guidance consistent with STA designation. Baseline Street and Adair Street between 10th Avenue and 20th Avenue are identified as a "Main Street" in the Metro RTP and as a "Regional Boulevard" in the RTP. These regional classifications are also consistent with an STA.

Boulevard-type improvements planned between 10th Avenue and 20th Avenue will reduce conflicts between pedestrians, bicyclists, transit riders and motor vehicles (including freight trucks). In particular, wider sidewalks, additional pedestrian crossings and curb extensions, on-street parking, and bicycle lanes foster a human-scale downtown environment. Additionally, access spacing within the STA will improve as properties redevelop and modernization roadway projects are implemented. The STA roadway improvements discourage mid-block crossings, improve safety and provide for a more balanced transportation system.

The Oregon Highway Plan does not classify this section of OR 8 as a state Freight Route. However, the City, Washington County and Metro designate TV Highway for freight use and provide for major freight access from the City to US 26 on 10th Avenue. STA designations are not anticipated to incur any reduction in freight mobility on TV Highway through Cornelius.

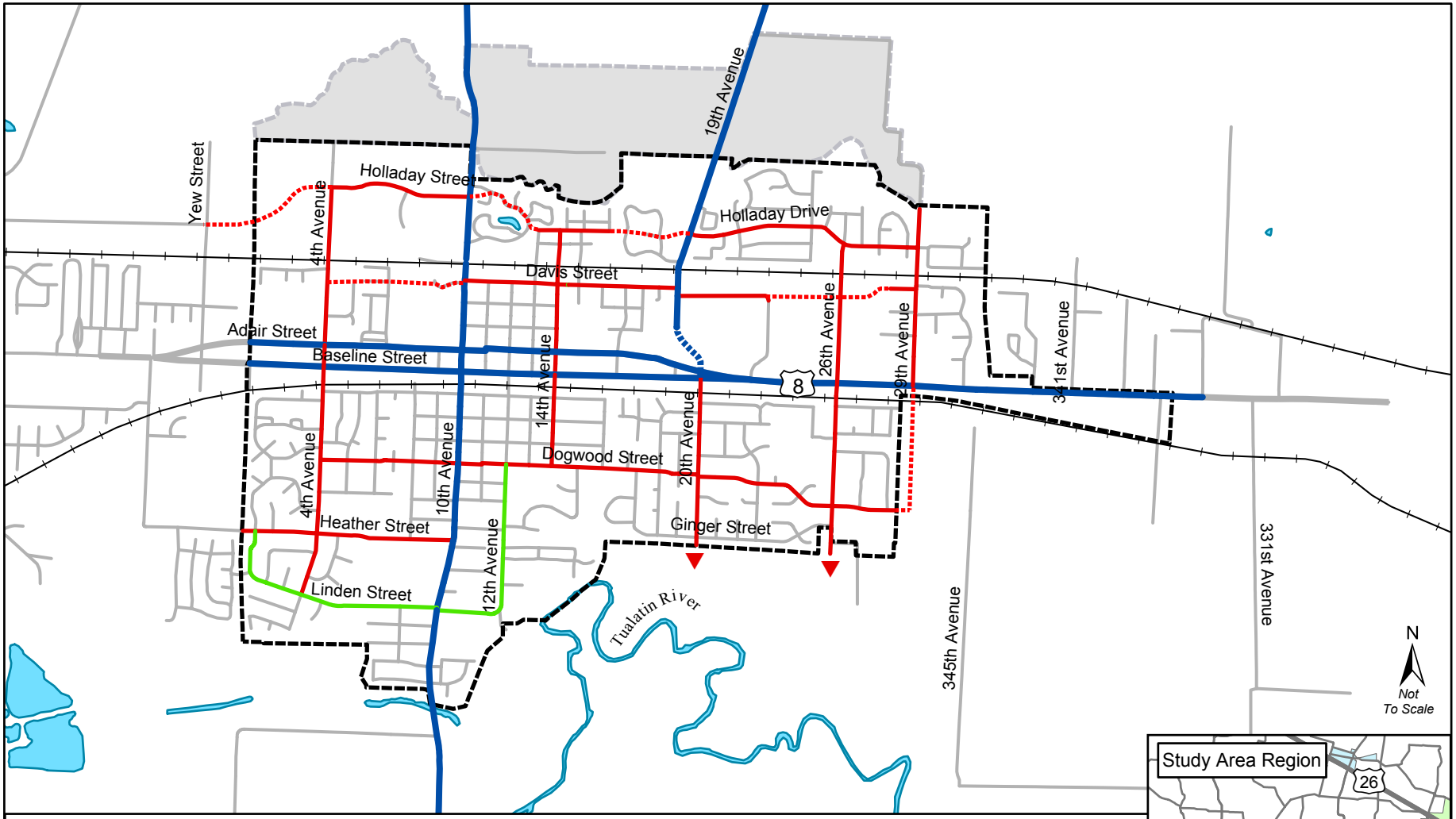


Figure 8-3
FUNCTIONAL CLASSIFICATION

Sources:
- Metro RLIS
- TriMet
- City of Cornelius
- Washington County

LEGEND

Existing Roadways	Proposed Roadways	
Arterial	Arterial	UGB Expansion
Collector	Collector	Cornelius City Limit
Neighborhood Route	Neighborhood Route	

Roadway Cross-Section Standards

The design characteristics of streets in Cornelius were developed to meet the function and demand for each facility type. Table 8-3 outlines the proposed street characteristics. Because the actual design of a roadway can vary from segment to segment due to adjacent land uses and demands, the objective was to define a system that allows standardization of key characteristics to provide consistency, but also to provide criteria for application that provides some flexibility, while meeting the design standards.

Table 8-3: Proposed Street Characteristics

Street Element	Characteristic	Width/Options
Vehicle Lane Widths:	Truck Route =	12 feet
(Minimum widths)	Bus Route =	11 feet
	Arterial =	12 feet
	Collector =	12 feet
	Neighborhood =	10 feet
	Local =	10 feet
	Turn Lane =	12 feet[6]
On-Street Parking:		8 feet[7]
Bicycle Lanes:	New Construction =	6 feet
(minimum widths)	Reconstruction =	5 to 6 feet
Sidewalks:	Local =	5 to 8 feet
(Minimum width[8])	Neighborhood =	5 to 8 feet
	Collector =	5 to 8 feet
	Arterial =	5 to 11 feet
Landscape Strips:	Required on all streets	4 to 6 feet
Medians:	5-Lane =	Required
	3-Lane =	Required
	2-Lane =	Optional
Neighborhood Traffic Management:	Local =	Should not be necessary
	Neighborhood =	Should consider if appropriate
	Collectors =	Under special conditions
	Arterials =	Prohibited
Transit:	Arterial/collectors =	Appropriate
	Neighborhood =	Only in special circumstances
	Local =	Not appropriate

[6] In constrained conditions on collectors, neighborhood and local routes, a minimum width of 10 feet may be considered.

[7] On arterials, on-street parking should be limited to special circumstances, such as in the main street area.

[8] Sidewalks in the main street area should be a minimum width of 11 feet on Adair Street and Baseline Street and 8 feet on the remaining roadways as identified in the Cornelius Main Street Plan.

Figures 8-4 through 8-7 show the roadway cross-sections for TV Highway, arterials, collectors, neighborhood routes and local streets in Cornelius. Where center left turn lanes are identified (3 lane section), the actual design may include sections without center turn lanes (2 lane section) adjacent to environmentally sensitive or physically constrained areas or with median treatments, where feasible. The actual treatment will be determined within the design and public process for implementation of each project. For TV Highway, roadway design must be approved by ODOT.

The roadway cross sections for TV Highway, Adair Street and Baseline Street show trees within the landscape strip. Street trees provide several benefits such as improved air quality, shade for pedestrians and bicyclists and a visual clue to motorists to reduce speeds. ODOT has adopted the AASHTO Roadside Design Guide to address hazard prevention. Therefore, a design exception would need to be approved by ODOT for tree installation on all ODOT facilities. The City would need to accept responsibility for maintenance of landscaping back of the curb through an Intergovernmental Agreement before ODOT would allow installation of roadside landscaping.

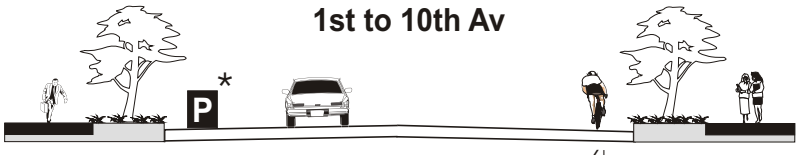
Under some conditions a deviation to the adopted street cross-sections may be requested from the City Engineer. Typical conditions that may warrant consideration of a deviation include (but are not limited to) the following:

- Infill sites
- Innovative designs (such as green streets or roundabouts)
- Severe topographic or environmental constraints
- Existing developments and/or buildings that make it extremely difficult or impossible to meet the design standards.

Wherever arterial or collectors cross each other, planning for additional right-of-way to accommodate turn lanes should be considered within 500 feet of the intersection. Figure 8-8 summarizes the Cornelius streets that are anticipated within the Transportation System Plan horizon to require right-of-way for more than two lanes. Planning level right-of-way needs can be determined utilizing street cross-sections and the lane geometry outlined later in this chapter. Specific right-of-way needs will need to be monitored continuously through the development review process to reflect current needs and conditions. This will be necessary since more specific detail may become evident in development review which requires improvements other than these outlined in this 20 year general planning assessment of street needs.

A deviation requires demonstration of hardship or other exceptional circumstances resulting from conditions of the property. Deviations must meet Cornelius Development Code and TPR criteria.

Adair Street
1st to 10th Av

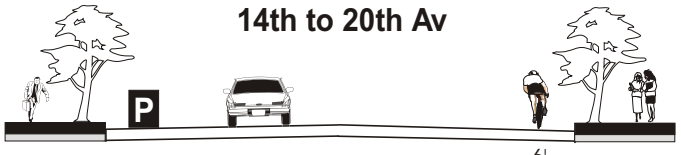


FACING WESTBOUND

Adair Street
10th to 14th Av

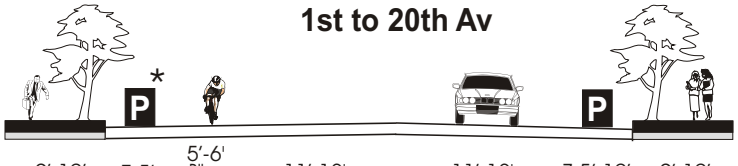
FACING WESTBOUND

Adair Street
14th to 20th Av



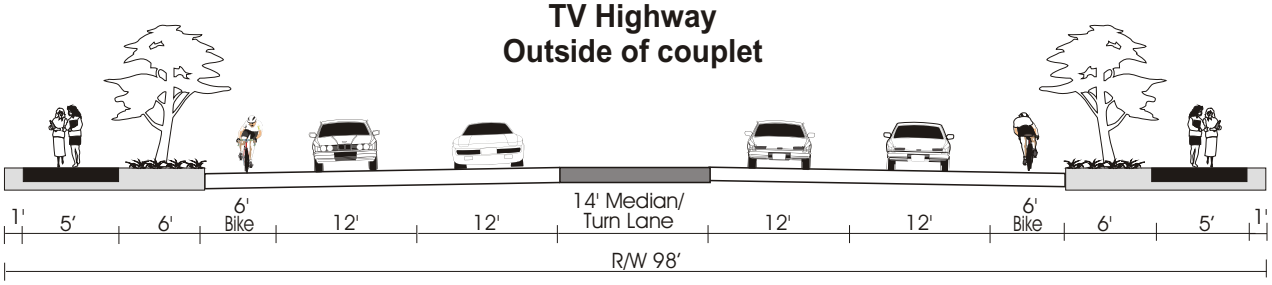
FACING WESTBOUND

Baseline Street
1st to 20th Av



FACING WESTBOUND

TV Highway
Outside of couplet



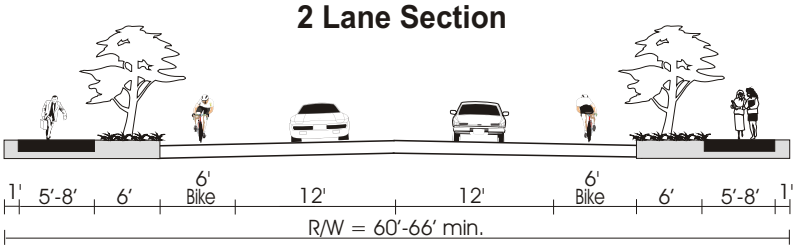
Notes:

1. On-street parking requirements at select locations (*) to be determined based on future streetscape design and input from City engineering staff.

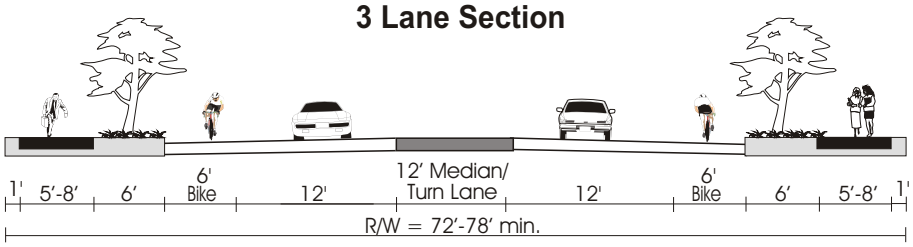
2. Turn lane warrants should be reviewed using Highway Research Record No. 211, NCHRP Report No. 279 or other updated/superseding reference.

Figure 8-4
TV HIGHWAY STREET CROSS SECTIONS

2 Lane Section



3 Lane Section



Arterial
Street Design Characteristics

Characteristic	*Arterials*
Vehicle Lane Widths (Turn Lane - 12 ft.)	*12 ft.*
On-Street Parking	*8 ft. Only in main street area*
Bicycle Lanes (minimums)	*6 ft.*
Sidewalks (minimums)	*5-8 ft. *1*
Landscape Strips	*Required*
Raised Medians	*Required*
Neighborhood Traffic Management (NTM)	*Prohibited*
Transit	*Appropriate*
Turn Lanes	*When Warranted *2*

A deviation requires demonstration of hardship or other exceptional circumstances resulting from conditions of the property. Deviations must meet Cornelius Development Code and TPR criteria.

Notes:

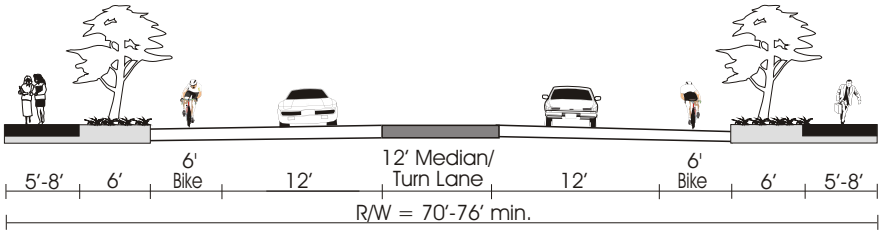
1. *8 feet minimumwithin the main street area.*
2. *Turn lane warrants should be reviewed using Highway Research Record No. 211, NCHRP Report No. 279 or other updated/superseding reference.*

Figure 8-5
ARTERIAL STREETS CROSS SECTIONS

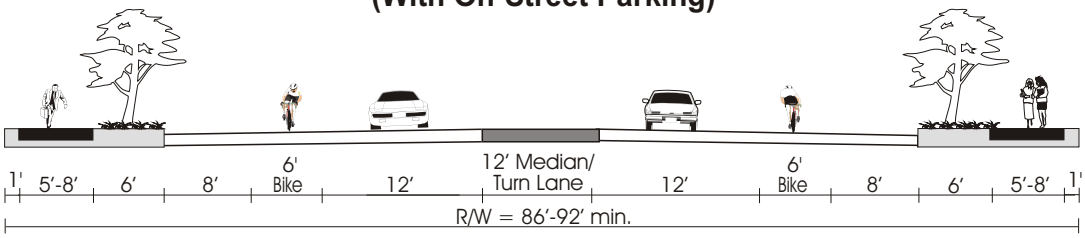
DKS Associates
TRANSPORTATION SOLUTIONS

Cornelius Oregon's Family Town

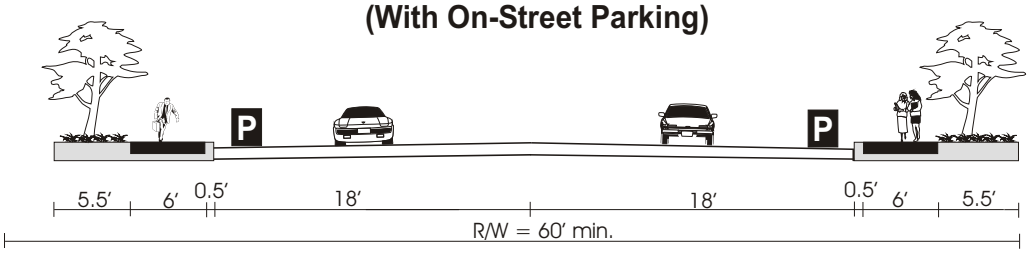
3 Lane Section
(Without On-Street Parking)



3 Lane Section
(With On-Street Parking)



Industrial
2 Lane Section
(With On-Street Parking)



P - *On-street Parking Lane (except at intersections)*

Notes:

1. *In constrained conditions on collectors a minimum width of 10 feet may be considered (i.e. for intersection turn lanes).*
2. *8 feet minimum within the main street area.*
3. *Turn lane warrants should be reviewed using Highway Research Record No. 211, NCHRP Report No. 279 or other updated/superseding reference.*

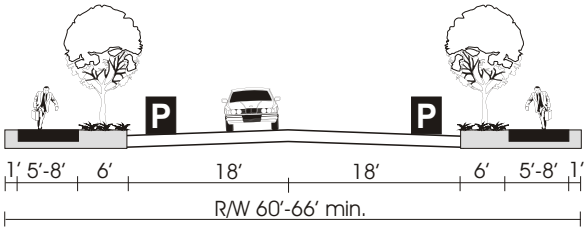
A deviation requires demonstration of hardship or other exceptional circumstances resulting from conditions of the property. Deviations must meet Cornelius Development Code and TPR criteria.

Collector
Street Design Characteristics

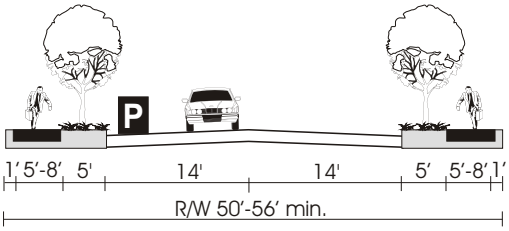
Characteristic	*Collectors*
Vehicle Lane Widths *(Turn Lane - 12 ft.)* **1*	*12 ft.*
On-Street Parking	*8 ft.-Optional*
Bicycle Lanes (minimums)	*6 ft.*
Sidewalks (minimums)	*5-8 ft. *2*
Landscape Strips	*Required*
Raised Medians	*Optional (Required where 3-lane section used)*
Neighborhood Traffic Management (NTM)	*Under Special Conditions*
Transit	*Appropriate*
Turn Lanes	*When Warranted *3*

Figure 8-6
COLLECTOR STREETS CROSS SECTIONS

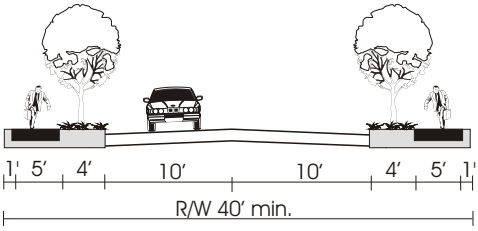
Neighborhood Route



Local Street



Constrained Local Street



Residential Street Design Characteristics
(typically minimums unless stated otherwise)

Characteristic	*Neighborhood Route*	*Local Street*	*Constrained Local Street*
Vehicle Lane Widths	*10 ft.*	*10 ft.*	*10 ft.*
On-Street Parking	*8 ft.*	*8 ft.*	*Not Appropriate*
Sidewalks	*5 ft.*	*5 ft.*	*5 ft.*
Landscape Strips	*6 ft.*	*5 ft.*	*4 ft.*
Neighborhood Traffic Management (NTM)	*Acceptable*	*Should Not be Necessary*	*Should Not be Necessary*
Bus Route	*11 ft. Special Circumstances*	*Not Appropriate*	*Not Appropriate*

P - *On-street Parking Lane*

A deviation requires demonstration of hardship or other exceptional circumstances resulting from conditions of the property. Deviations must meet Cornelius Development Code and TPR criteria.

Figure 8-7
RESIDENTIAL STREETS CROSS SECTIONS

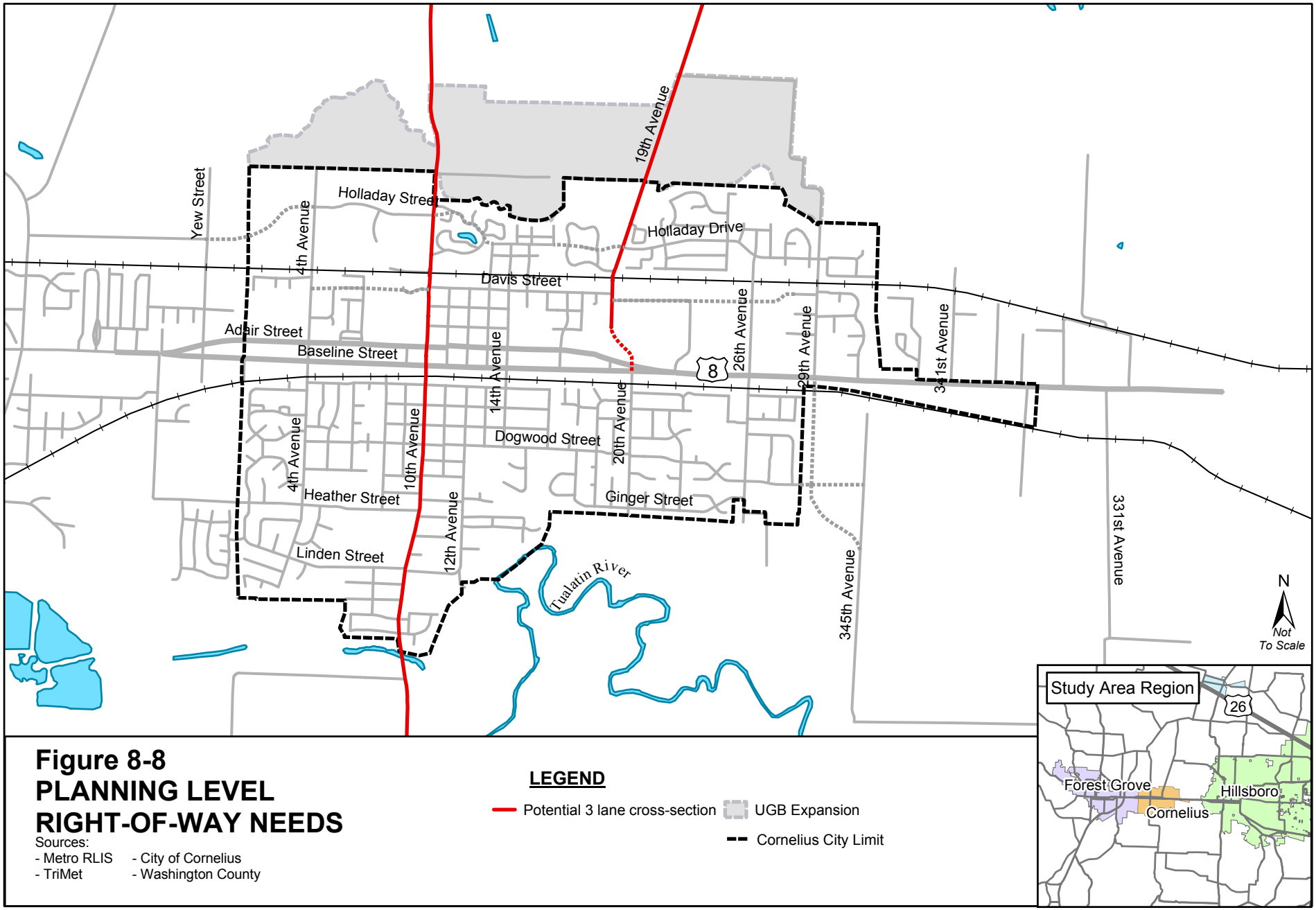


Figure 8-8
PLANNING LEVEL RIGHT-OF-WAY NEEDS

Sources:
- Metro RLIS
- TriMet
- City of Cornelius
- Washington County

LEGEND

- Potential 3 lane cross-section
- UGB Expansion
- Cornelius City Limit

Parking Requirements

The City of Cornelius should consider several parking policies to be consistent with the TPR and RTP[9]. These policies include:

- Allow the designation of residential parking districts to protect residential areas from spillover parking generated by adjacent commercial, employment, or mixed-use areas, or other uses that generate a high demand for parking.
- Provide Metro annual parking data when requested that demonstrates compliance with the minimum and maximum parking ratios, including the application of any variances to the regional standards.
- Require parking lots more than 3 acres in size to provide street-like features along major driveways; including curbs, sidewalks, and street trees or planter strips. Major driveways in new residential and mixed-use areas shall meet connectivity standards for full street connections.

Transportation Demand Management (TDM)

Transportation Demand Management (TDM) is the general term used to describe any action that removes single occupant vehicle trips from the roadway network during peak travel demand periods. As growth in the Cornelius area occurs, the number of vehicle trips and travel demand in the area will also increase. The ability to change a user's travel behavior and provide alternative mode choices will help accommodate this growth.

Generally, TDM focuses on reducing vehicle miles traveled and promoting alternative modes of travel for large employers of an area. This is due in part to the Employee Commute Options (ECO) rules that were passed by the Oregon Legislature in 1993 to help protect the health of Portland area residents from air pollution and to ensure that the area complied with the Federal Clean Air Act.[10]

Research has shown that a comprehensive set of complementary policies implemented over a large geographic area can have an effect on the number of vehicle miles traveled to/from that area.[11] However, the same research indicates that in order for TDM measures to be effective, they should go beyond the low-cost, uncontroversial measures commonly used such as carpooling, transportation coordinators/associations, priority parking spaces, etc.

The more effective TDM measures include elements related to parking and congestion pricing, improved services for alternative modes of travel, and other market-based measures. However, TDM includes a wide variety of actions that are specifically tailored to the individual needs of an area. Table 8-4 provides a list of several strategies outlined in the ECO program that could be applicable to the Cornelius area.

[9] *Urban Growth Management Functional Plan*, Title 2: Regional Parking Policy, Metro, September 22, 2004.

[10] Oregon Administrative Rules, Chapter 340, Division 30.

[11] *The Potential for Land Use Demand Management Policies to Reduce Automobile Trips*, ODOT, by ECO Northwest, June 1992.

Table 8-4: Transportation Demand Management Strategies

Strategy	Description	Potential Trip Reduction
Telecommuting	Employees perform regular work duties at home or at a work center closer to home, rather than commuting from home to work. This can be full time or on selected workdays. This can require computer equipment to be most effective.	82-91% (Full Time) 14-36% (1-2 day/wk)
Compressed Work Week	Schedule where employees work their regular scheduled number of hours in fewer days per week.	7-9% (9 day/80 hr) 16-18% (4 day/40 hr) 32-36% (3 day/36 hr)
Transit Pass Subsidy	For employees who take transit to work on a regular basis, the employer pays for all or part of the cost of a monthly transit pass.	19-32% (full subsidy, high transit service) 2-3% (half subsidy, medium transit service)
Cash Out Employee Parking	An employer that has been subsidizing parking (free parking) discontinues the subsidy and charges all employees for parking. An amount equivalent to the previous subsidy is then provided to each employee, who then can decide which mode of travel to use.	Reduction / Transit 8-20% High 5-9% Medium 2-4% Low
Reduced Parking Cost for HOVs	Parking costs charged to employees are reduced for high occupancy vehicles (HOV) such as carpools and vanpools.	1-3%
Alternative Mode Subsidy	For employees that commute to work by modes other than driving alone, the employer provides a monetary bonus to the employee.	21-34% (full subsidy of cost, high alternative modes) 2-4% (half subsidy of cost, medium alternative modes)
Bicycle Program	Provides support services to those employees that bicycle to work. Examples include: safe/secure bicycle storage, shower facilities and subsidy of commute bicycle purchase.	0-10%
On-site Rideshare Matching for HOVs	Employees who are interested in carpooling or vanpooling provide information to a transportation coordinator regarding their work hours, availability of a vehicle and place of residence. The coordinator then matches employees who can reasonably rideshare together.	1-2%
Provide Vanpools	Employees that live near each other are organized into a vanpool for their trip to work. The employer may subsidize the cost of operation and maintaining the van.	15-25% (company provided van with fee) 30-40% (subsidized van)
Gift/Awards for Alternative Mode Use	Employees are offered the opportunity to receive a gift or an award for using modes other than driving alone.	0-3%
Walking Program	Provide support services for those who walk to work. This could include buying walking shoes or providing lockers and showers.	0-3%
Company Cars for Business Travel	Employees are allowed to use company cars for business-related travel during the day	0-1%
Guaranteed Ride Home Program	A company owned or leased vehicle or taxi fare is provided in the case of an emergency for employees that use alternative modes.	1-3%
Time off with Pay for Alternative Mode Use	Employees are offered time off with pay as an incentive to use alternative modes.	1-2%

Source: *Guidance for Estimating Trip Reductions from Commute Options*, Oregon Department of Environmental Quality, August 1996.

The urban growth boundary expansion area north of the city which is planned for industrial land use would allow for TDM friendly development. Setting TDM goals and policies for new development will be necessary to help implement TDM measures in the future.

With many regional trips destined to, or traveling through, the Cornelius area, region wide TDM measures should help to reduce congestion. Metro has established non-SOV (Single Occupancy Vehicle) mode share targets to be achieved by 2040. The 2040 non-SOV model target for corridors and main streets (TV Highway) is 45-55%.[12] The Metro 2025 Regional Demand Model provides an analysis tool for monitoring non-SOV trip percentages between the various RTP funding scenarios. The forecasted non-SOV trip percentages take into account all RTP improvement projects (including transit, pedestrian, and bicycle system improvements), as well as the TAZ performance factors (which includes an increase in parking pricing and a decrease in transit pass fees paid by individual riders).

The overall Cornelius TSP study area forecasted non-SOV percentage with the RTP financially constrained improvements is 43%. Additional improvements in the RTP priority scenario increase the overall non-SOV percentage to 44%, which corresponds to an increase of approximately 1%. Figure 8-9 shows the non-SOV percentage increase at the TAZ level, which shows the areas with the greatest growth toward meeting the 2040 targets.

These forecasted non-SOV percentages can only be achieved with significant improvements to the transportation system and implementation of trip reduction strategies. The City of Cornelius should coordinate with Washington County and Tri-Met to implement strategies to assure that the TDM assumptions in the RTP are implemented. The City of Cornelius, Washington County and Tri-Met should coordinate to implement the pedestrian, bicycle, and transit system improvements, which offer alternative modes of travel. The recommended TDM action plan includes:

- Support continued efforts by TriMet, Metro, ODOT and Washington County to develop productive TDM measures that reduce commuter vehicle miles and peak hour trips.
- Encourage the development of high speed communication in all part of the city (fiber optic, digital cable, DSL, etc). The objective is to provide employers and residents a full range of options for conducting business and activities (such as home office, telecommuting), which can contribute to a reduction in peak hour travel on the roadway system.
- Encourage developments that effectively mix land uses to reduce vehicle trip generation. Development proposals should consider linkages (particularly non-auto) to support greater use of alternative travel modes.
- Increase industrial, commercial and institutional land uses within Cornelius to provide additional employment opportunities and reduce the average commute length.
- Continued implementation of motor vehicle minimum and maximum parking ratios for new development.
- Continued implementation of street connectivity requirements.
- Work with employers to install bicycle racks.
- Implementation of bicycle, pedestrian, motor vehicle and transit system action plan.
- Establish parking pricing in the Main Street District.

[12] Based on the *2000 Metro Regional Transportation Plan*, Ordinance No. 00-869A (August 10, 2000), page 1-62.

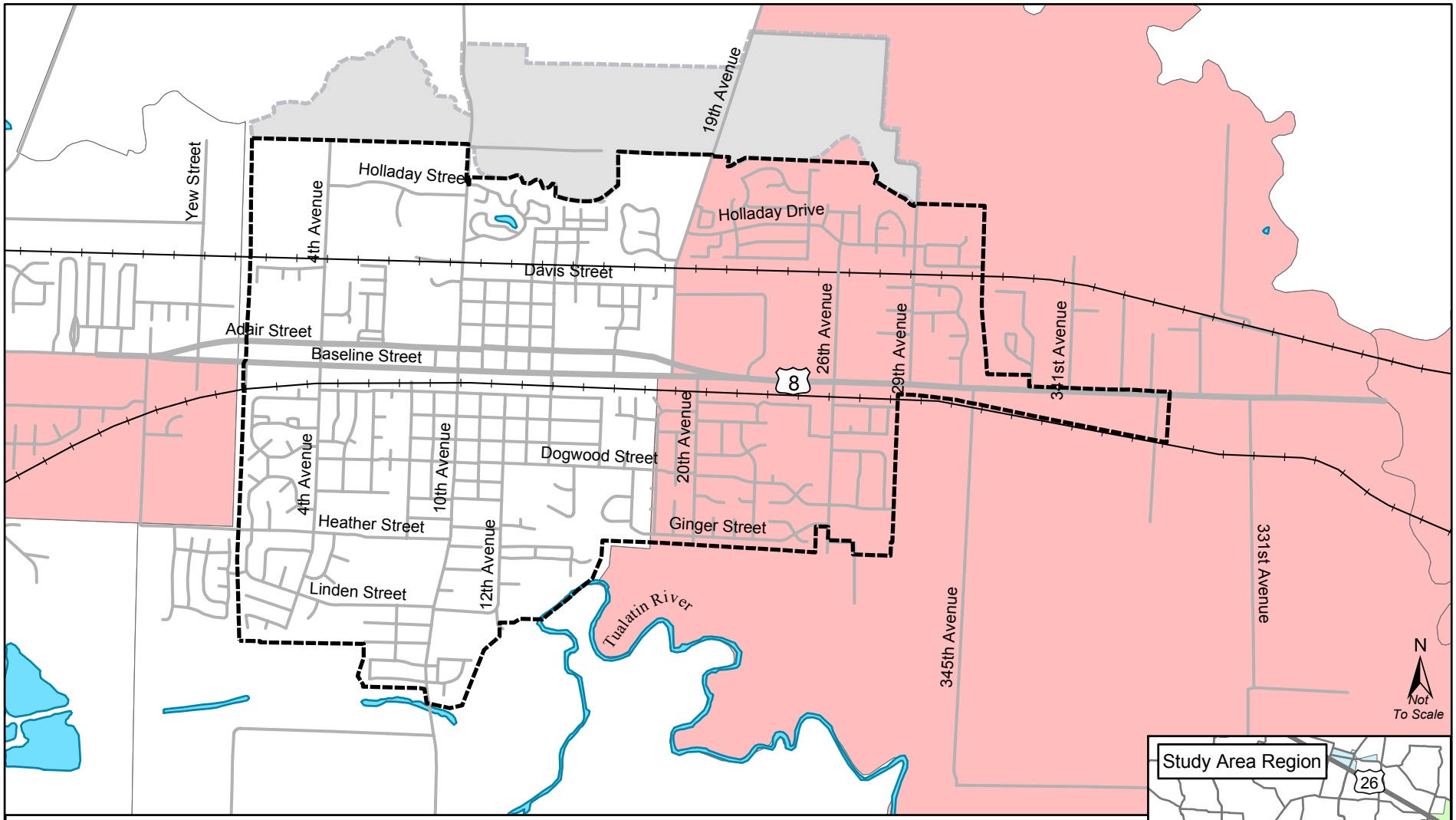


Figure 8-9
NON-SINGLE OCCUPANCY VEHICLE INCREASE

Sources:
- Metro RLIS
- TriMet
- City of Cornelius
- Washington County

LEGEND

- Less than 2%
- 2%-4%
- Greater than 4%
- UGB Expansion
- Cornelius City Limit

Capacity and Circulation Needs

The motor vehicle capacity and circulation needs in Cornelius were determined for future conditions over the next 20 years. The process used for analysis is outlined below, followed by the findings and recommendations of the analysis. The extent and nature of the street improvements for Cornelius are moderate. Several of the improvements discussed in this section were previously identified in the Washington County TSP and the RTP. The 2025 capacity analysis conducted through the city's Transportation System Plan confirmed the need for investments.

This section outlines street improvements that would be necessary as part of a long-range master plan for motor vehicles. Phasing of implementation of the projects will be necessary since not all the improvements can be done at once. This will require prioritization of projects and periodic updating to reflect current needs. It should be understood that the motor vehicle improvements outlined in the following section are a guide to defining the types of right-of-way and street needs that will be required as development occurs.

Future Intersection Capacity Analysis

Year 2025 traffic volume forecasts were analyzed to identify locations where peak hour performance will drop below minimum desirable levels. This analysis focuses on the 18 study intersections selected by the City of Cornelius. Traffic volumes were developed as described previously and applied to existing intersection geometries. The value in reviewing the motor vehicle system performance is that it highlights where the planned system fails to meet performance standards. These locations will be reviewed to consider street improvements alternatives that could better serve planned growth.

The 2025 Financially Constrained funding scenario includes several capacity project in the TSP study area. The identified RTP projects for Cornelius are shown in Table 8-5.

Table 8-5: RTP System* Motor Vehicle Capacity Improvements

RTP #	Location	Improvement	Jurisdiction	Time-Line	Cost ($1,000s)
3166	Highway 8 (TV Highway) – 10th Avenue	Increase turning radii, add protected turn lanes, and improve pedestrian crossings to support freight access and improve pedestrian and vehicle safety	Cornelius/ ODOT	2000-2005	$879
3167	Highway 8 (TV Highway)	Create new intersection by the aligning of 19th Avenue/20th Avenue at Highway 8; improve S. 20th (including RR crossing) to S. Alpine and improve N. 19th to RR crossing north of N. Davis)	Cornelius/ ODOT	2006-2010	$3,100
3168	Baseline Street/Adair Street	Intersection geometry improvements and conversion of pedestrian signal to full mode signalization at 14th Avenue for improved Main Street District circulation and improved pedestrian safety on Adair and Baseline streets	Cornelius/ ODOT	2006-2010	$450
3169	Adair Street and Baseline Street – 10th to 19th Avenue	Complete boulevard design improvements to Baseline, 11th, 12th, 13th, 14th, and 17th Avenues, and pedestrian alley within the Adair/Baseline couplet in Main Street District	Cornelius/ ODOT	2000-2005	$6,930
3170	Adair Street and Baseline Street – 1st to 10th Avenue	Complete boulevard design improvements	Cornelius/ ODOT	2006-2010	$3,465
3171	N Davis Street Reconstruction	Reconstruct street to urban standards	Cornelius/ Wash Co	2010-2015	$1,600
3156	Forest Grove Connectivity Improvements	Two-lane improvements parallel to TV Highway, includes sidewalks and bike lanes	Forest Grove/Wash Co	2011-2020	$1,440

* Based on *2004 Federal Regional Transportation Plan Update* and includes Financially Constrained Motor Vehicle System projects.

Table 8-6 summarizes the study intersection performance for the 2025 Financially Constrained funding scenario. Based on the analysis, the majority of the study intersections would meet operating standards. All signalized intersections operate with a v/c less than 0.99 which meets ODOT minimum performance standards. The TV Highway/29th Avenue unsignalized intersection operates at LOS F for the minor street approach. Under these conditions, the minor street approach at the intersection experiences moderate to long delays. The major street movements generally are not impeded and typically only a handful of minor street vehicles experience delay.

Table 8-6: 2025 Financially Constrained Intersection Level of Service (PM Peak Hour)

Intersection	Level of Service	Delay	Volume/ Capacity
Unsignalized Intersections			
Dogwood Street/4th Avenue	A/A	9.2	—
Heather Street/4th Avenue*	A	7.8	0.16
Holladay Street/10th Avenue	A/C	19.4	—
Davis Street/10th Avenue	A/C	21.0	—
Dogwood Street/10th Avenue	A/B	13.2	—
Linden Street/10th Avenue	A/B	11.8	—
Davis Street/19th Avenue	A/C	21.9	—
Dogwood Street 20th Avenue	A/B	10.0	—
TV Highway/29th Avenue	C/F	> 50	—
TV Highway/331st Avenue	B/C	19.8	—
Signalized Intersections			
Adair Street/4th Avenue	A	8.1	0.71
Baseline Street/4th Avenue	A	7.8	0.64
Adair Street/10th Avenue	B	14.8	0.84
Baseline Street/10th Avenue	B	11.8	0.69
Adair Street/14th Avenue	B	11.1	0.83
Baseline Street/14th Avenue	A	7.0	0.68
Baseline Street/20th Avenue	C	23.8	0.91
TV Highway/26th Avenue	A	8.9	0.66

Notes: A/A=major street LOS/minor street LOS
Signalized and all-way stop delay = average vehicle delay in seconds for entire intersection
Unsignalized delay = highest minor street approach delay
*All-way stop control intersection

Preliminary Traffic Signal Warrants

Preliminary signal warrants[13] were evaluated at all unsignalized study intersections under year 2025 Financially Constrained traffic volume conditions. The results of this analysis are shown in Table 8-7. Meeting signal warrants does not guarantee that a signal will be installed. Before a signal can be installed on a state highway, a traffic signal investigation must be conducted or reviewed by the Oregon Department of Transportation. Traffic signal warrants must be met and the State Highway Engineer approval obtained before a signal will be placed on a state highway. Signals on non-state facilities need to be reviewed and approved by appropriate local officials.

Since only peak hour traffic volumes were available for study intersections, peak hour volumes were factored to estimate eighth highest hour traffic volumes. Condition A—Minimum Vehicular Volume reflects whether there is enough volume on both the main street and side street to warrant a traffic signal. Condition B—Interruption of Continuous Traffic is also a measure of volume, but puts more emphasis on the volume of the main street. If either Condition A or Condition B is met, Warrant 1 is met. Intersections meeting signal warrants should be analyzed further to determine if the intersection should be improved with a signal, turn lanes, a roundabout or increasing roadway connectivity. Based on the signal warrant analysis findings, none of the unsignalized study intersections meet signal warrant Condition A or Condition B.

Table 8-7: 2025 Signal Warrant Analysis

Intersection	2025 Financially Constrained		
	Condition A Met	Condition B Met	Signal Warrant Met
Dogwood Street/4th Avenue	No	No	No
Heather Street/4th Avenue	No	No	No
Holladay Street/10th Avenue	No	No	No
Davis Street/10th Avenue	No	No	No
Dogwood Street/10th Avenue	No	No	No
Linden Street/10th Avenue	No	No	No
Davis Street/19th Avenue	No	No	No
Dogwood Street 20th Avenue	No	No	No
TV Highway/29th Avenue	No	No	No
TV Highway/331st Avenue	No	No	No

[13] Preliminary Signal Warrants, MUTCD Warrant 1 (Eight Hour Vehicular Volume). Eight hour volumes were estimated based on peak hour volumes.

System Circulation Needs

The existing roadway network in Cornelius does not provide adequate circulation. The local street network is made up of a mix of grid configured blocks and 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 local 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.

Several roadway extension projects are recommended to:

- Allow local traffic to make in-town trips using well connected streets without traveling on arterials.
- Reduce congestion on TV Highway, Baseline Street and Adair Street by providing alternative routes for local trips.
- Reduce vehicle miles traveled (VMT) within the study area by limiting out of way travel patterns for all modes.
- Provide an adequate roadway system for future local development.

Davis Street, Dogwood Street and Holladay Street provide limited parallel routes to TV Highway today. Extensions of these roadways would fill in large gaps and greatly improve connectivity within Cornelius for all modes of travel. With these recommended street extension in place, three east-west roadways would provide a continuous connection between the east and west edge of Cornelius. The recommended street extensions would limit out of way travel patterns and reduce vehicle miles traveled within the study area.

The TV Highway corridor (including the Baseline Street and Adair Street couplet) is expected to experience congested conditions in 2025 (see Figure 8-1) and would benefit from an improved local street network in Cornelius. The recommended east-west street extensions would provide alternative routes to local trips and reduce local trips on TV Highway. Although these roadway extensions would not completely alleviate congestion on TV Highway, they would contribute to improved traffic operations on the corridor.

The future 2025 land use indicates significant growth within the TSP study area. Metro has recently approved a 260-acre expansion of the urban growth boundary just north of the Cornelius city limits for industrial use. Access to this property is expected from 10th Avenue, 19th Avenue and 29th Avenue. Also, a potential urban growth boundary expansion area is located south of TV Highway between the east Cornelius city limits and 331st Avenue. To provide an adequate roadway system for these potential future developments, an extension of 29th Avenue as a collector south of TV Highway and Dogwood Street as a collector east to 331st Avenue is recommended. The recommended roadway extensions are shown in Figure 8-10.

Traffic signal control is recommended at the TV Highway/29th Avenue intersection based on traffic signal warrant analysis to improve traffic operations and safety for both vehicles and pedestrians. A traffic signal at TV Highway/29th Avenue would allow for the extension of 29th Avenue to the south and accommodate future land use development to the south of TV Highway and the planned industrial area to the north of the City, a portion of which would have a direction connection to the recommended traffic signal. ODOT approval is required for installation or modification of signals on TV Highway based on the State's adopted Signal Policy.

Motor Vehicle Master Plan

The Motor Vehicle Master Plan combines both improvement projects identified in prior plans (Washington County's TSP, Metro's RTP) and those determined as the outcome of the Cornelius TSP update analysis. These improvements are shown in Figure 8-10 and listed in Table 8-8.

Table 8-8: Motor Vehicle Master Plan Projects

Location	Improvement	Cost ($1,000s)
Highway 8 (TV Highway) – 10th Avenue	Increase turning radii, add protected turn lanes, and improve pedestrian crossings to support freight access and improve pedestrian and vehicle safety.	$840
TV Highway at 19th/20th Avenue	Create new intersection by the aligning of 19th Avenue/20th Avenue at Highway 8; improve S. 20th (including RR crossing) to S. Alpine and improve N. 19th to RR crossing north of N. Davis). This project is currently in the design process.	$3,000
Baseline Street/Adair Street at 14th Avenue	Intersection geometry improvements and conversion of pedestrian signal to full mode signalization at 14th Avenue for improved Main Street District circulation and improved pedestrian safety on Adair and Baseline streets. May require modifications to the 14th Avenue rail crossing.	$450
Adair Street and Baseline Street – 10th to 19th Avenue	Complete boulevard design improvements to Baseline, 11th, 12th, 13th, 14th, and 17th Avenues.	$6,930
Adair Street and Baseline Street – 1st to 10th Avenue	Complete boulevard design improvements	$3,465
N Davis Street Reconstruction	Reconstruct street to urban standards	$1,600
Forest Grove Connectivity Improvements	Two-lane improvements parallel to TV Highway, includes sidewalks and bike lanes	$1,440
Holladay St Extension*	Construct a new roadway between 4th Avenue and Yew Street	$1,720
Holladay St Extension*	Construct a new roadway between 10th Avenue and Gray Street	$880
Holladay St Extension*	Construct a new roadway between Gray Street and 19th Avenue	$880
Davis St Extension*	Construct a new roadway between 4th Avenue and 10th Avenue	$1,720
Davis St Extension*	Construct a new roadway between 19th Avenue and 29th Avenue	$3,000
Dogwood St Extension*	Construct a new roadway between the Cornelius east city limits and 345th Avenue	$950
29th Avenue Extension*	Construct a new roadway south of TV Highway connecting to 345th Avenue south of the Dogwood Street extension	$3,000
29th Avenue Signal*	Construct a traffic signal at 29th Avenue/TV Highway and rail crossing signal modification with interconnect	$300
TV Highway Corridor	Provide traffic coordination from 29th Avenue to Highway 47 in Forest Grove	$290
	Total	**$30,465**

* These projects would only occur with development or redevelopement and would not be initiated by the City.

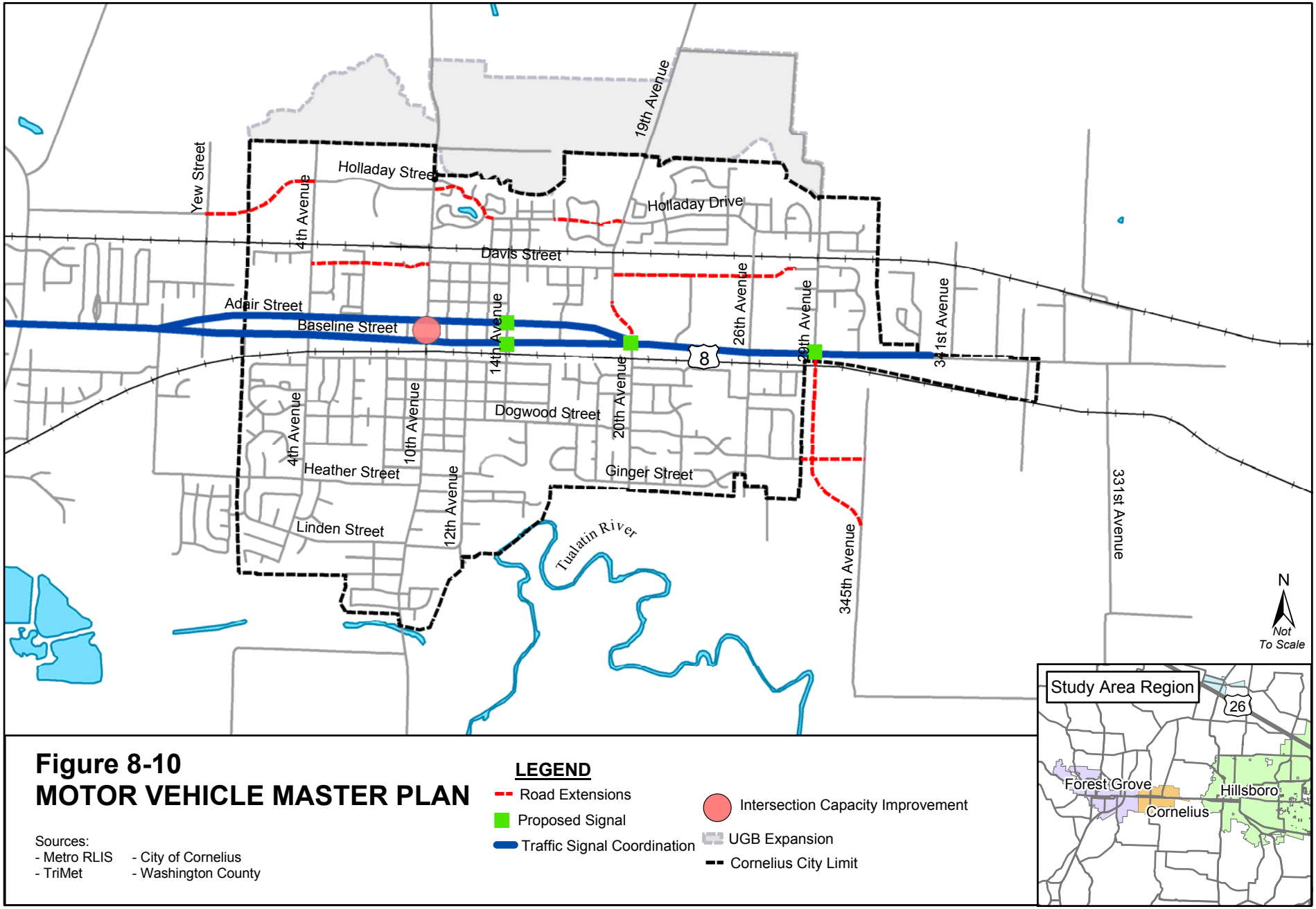


Figure 8-10
MOTOR VEHICLE MASTER PLAN

LEGEND

- Road Extensions
- Proposed Signal
- Traffic Signal Coordination
- Intersection Capacity Improvement
- UGB Expansion
- Cornelius City Limit

Sources:
- Metro RLIS
- TriMet
- City of Cornelius
- Washington County

Table 8-9 summarizes study intersection capacity operations with the recommended Motor Vehicle Master Plan in place. All signalized study intersections operate at LOS C or better and with a v/c less than 0.99. All unsignalized study intersections operate at LOS D or better for the minor street approach.

Table 8-9: 2025 Mitigated Intersection Level of Service (PM Peak Hour)

Intersection	Level of Service	Delay	Volume/ Capacity
Unsignalized Intersections			
Dogwood Street/4th Avenue	A/A	9.4	—
Heather Street/4th Avenue*	A	7.8	0.15
Holladay Street/10th Avenue	A/C	15.0	—
Davis Street/10th Avenue	A/B	14.0	—
Dogwood Street/10th Avenue	A/B	14.3	—
Linden Street/10th Avenue	A/B	12.1	—
Davis Street/19th Avenue	A/D	34.9	—
Dogwood Street 20th Avenue	A/B	10.1	—
TV Highway/331st Avenue	B/C	22.3	—
Signalized Intersections			
Adair Street/4th Avenue	B	8.2	0.72
Baseline Street/4th Avenue	B	8.2	0.69
Adair Street/10th Avenue	B	27.4	0.96
Baseline Street/10th Avenue	B	13.7	0.75
Adair Street/14th Avenue	B	15.9	0.90
Baseline Street/14th Avenue	B	8.5	0.79
Baseline Street/20th Avenue	D	41.0	0.99
TV Highway/26th Avenue	B	14.9	0.64
TV Highway/29th Avenue	C	33.2	0.91

Notes: A/A=major street LOS/minor street LOS
Signalized and all-way stop delay = average vehicle delay in seconds for entire intersection
Unsignalized delay = highest minor street approach delay
*All-way stop control intersection

Motor Vehicle Action Plan

A motor vehicle system action plan project list was created to identify motor vehicle projects that are reasonably expected to be funded by the year 2025, which meets the requirements of the updated Transportation Planning Rule[14]. Table 8-10 shows the action plan which combines projects identified in the RTP Financially Constrained scenario with additional projects that have been identified in the TSP update analysis. The identified local TIF/Developer projects would only occur with development or redevelopement and would not be initiated by the City. The potential funding source serves as a guide for financing options the City should persue for each project. The estimated schedule is based on the RTP time line unless more current information is available.

Table 8-10: Motor Vehicle Action Plan Projects

Location	Improvement	Potential Funding Source	Estimated Schedule	Cost ($1,000s)
Highway 8 (TV Highway) – 10th Avenue	Increase turning radii, add protected turn lanes, and improve pedestrian crossings to support freight access and improve pedestrian and vehicle safety.	ODOT/ Metro	2006-2008	$840
TV Highway at 19th/20th Avenue	Create new intersection by the aligning of 19th Avenue/20th Avenue at Highway 8; improve S. 20th (including RR crossing) to S. Alpine and improve N. 19th to RR crossing north of N. Davis). This project is currently in the design process.	ODOT/ Metro	2005-2007	$3,000
Baseline Street/Adair Street at 14th Avenue	Intersection geometry improvements and conversion of pedestrian signal to full mode signalization at 14th Avenue for improved Main Street District circulation and improved pedestrian safety on Adair and Baseline streets.	ODOT/ Metro	2006-2010	$450
Adair Street and Baseline Street – 10th to 19th Avenue	Complete boulevard design improvements to Baseline, 11th, 12th, 13th, 14th, and 17th Avenues.	ODOT/ Metro	2005-2008	$6,930
Adair Street and Baseline Street – 1st to 10th Avenue	Complete boulevard design improvements	ODOT/ Metro	2006-2010	$3,465
N Davis Street Reconstruction	Reconstruct street to urban standards	Cornelius/ Wash Co	2010-2015	$1,600
Forest Grove Connectivity Improvements	Two-lane improvements parallel to TV Highway, includes sidewalks and bike lanes	WaCo	2011-2020	$1,440
Holladay St Extension*	Construct a new roadway between 4th Avenue and Yew Street	Local TIF/ Developer	-	$1,720
Holladay St Extension*	Construct a new roadway between 10th Avenue and Gray Street	Local TIF/ Developer	-	$880
Holladay St Extension*	Construct a new roadway between Gray Street and 19th Avenue	Local TIF/ Developer	-	$880
Davis St Extension*	Construct a new roadway between 4th Avenue and 10th Avenue	Local TIF/ Developer	-	$1,720

[14] *OAR Chapter 660*, Department of Land Conservation and Development, Division 012, Transportation Planning, adopted on March 15, 2005, effective April, 2005.

Location	Improvement	Potential Funding Source	Estimated Schedule	Cost ($1,000s)
Davis St Extension*	Construct a new roadway between 19th Avenue and 29th Avenue	Local TIF/ Developer	-	$3,000
Dogwood St Extension*	Construct a new roadway between the Cornelius east city limits and 345th Avenue	Local TIF/ Developer	-	$950
29th Avenue Extension*	Construct a new roadway south of TV Highway connecting to 345th Avenue south of the Dogwood Street extension	Local TIF/ Developer	-	$3,000
29th Avenue Signal*	Construct a traffic signal at 29th Avenue/TV Highway	Local TIF/ Developer	-	$250
TV Highway Corridor	Provide traffic coordination from 29th Avenue to Highway 47 in Forest Grove	ODOT/ WaCo	2010-2020	$290
	City of Cornelius Costs			$0
	Other Agencies Costs			$18,265
	Local TIF/Developer Costs			$12,150
	Total Motor Vehicle Project Costs			**$30,415**

* These projects would only occur with development or redevelopement and would not be initiated by the City.

Trucks

Efficient truck movement plays a vital role in the economical movement of raw materials and finished products. The establishment 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. Figure 8-11 shows the recommended designated through truck routes in the TSP study area. The objective of this route designation is to allow these routes to focus on design criteria that are "truck friendly"; i.e. 12-foot travel lanes, longer access spacing, 35-foot (or larger) curb returns, and pavement design that accommodates a larger share of trucks.

Washington County identifies TV Highway, Baseline Street and Adair Street through Cornelius and 10th Avenue outside the City of Cornelius as a freight route. Metro has designated TV Highway, Baseline Street and Adair Street as a Roadway Connector defined as a road that connects freight facilities and freight generation areas to the main roadway route. TV Highway, Baseline Street and Adair Street are not a designated State Freight Route.

The recommended truck route map is consistent with Washington County TSP designations for TV Highway, Baseline Street, Adair Street and 10th Avenue. The truck route map exceeds the Metro RTP designation for TV Highway, Baseline Street and Adair Street.

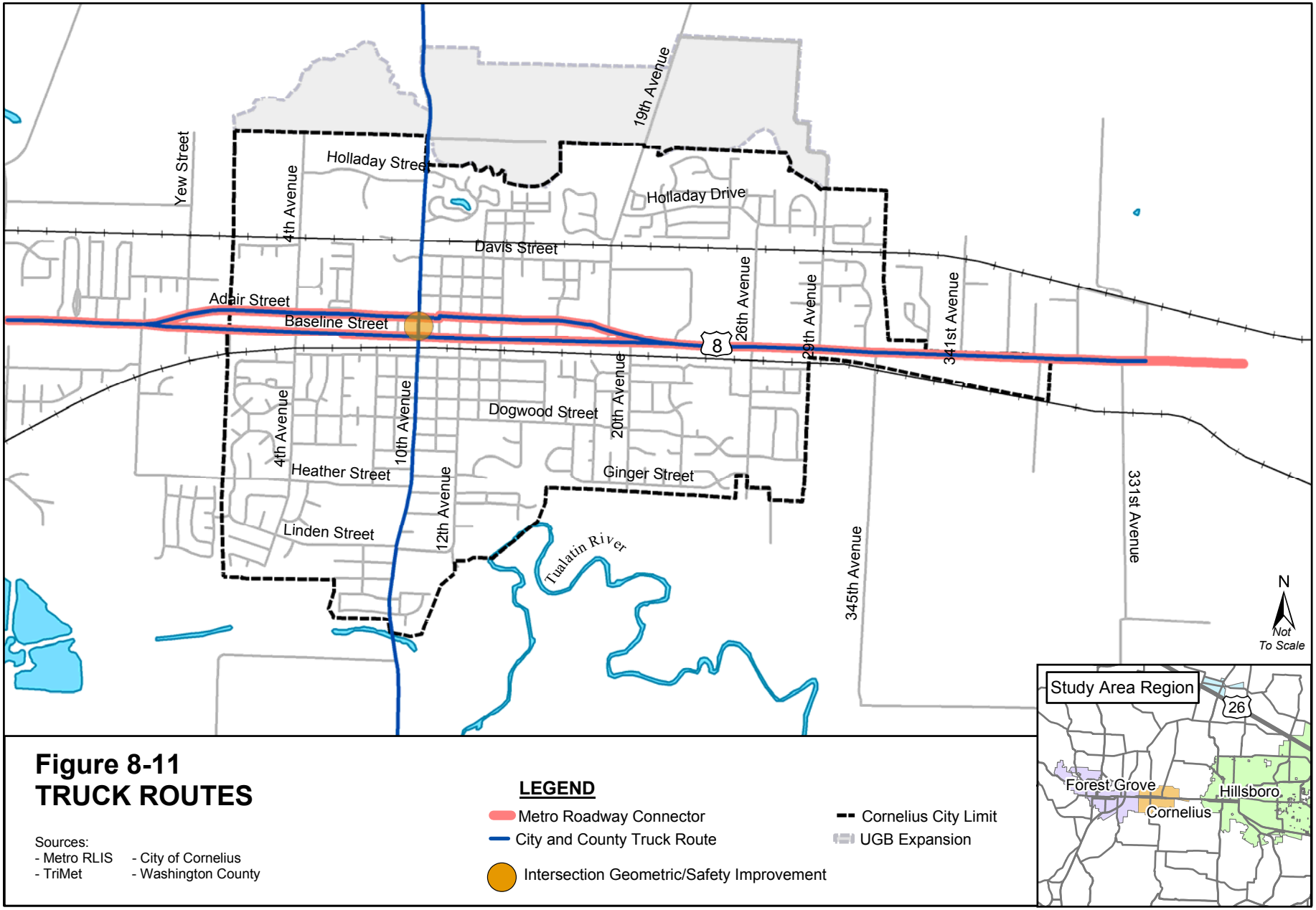


Figure 8-11
TRUCK ROUTES

Sources:
- Metro RLIS
- TriMet
- City of Cornelius
- Washington County

LEGEND

- Metro Roadway Connector
- City and County Truck Route
- Intersection Geometric/Safety Improvement
- Cornelius City Limit
- UGB Expansion

DKS Associates
TRANSPORTATION SOLUTIONS

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 (P&W) has two freight lines that pass through Cornelius, the Westside-Seghers District (FAA) and Forest Grove District (3F) Lines. The FAA line passes through Cornelius one-half block south of TV Highway. The 3F line passes through Cornelius approximately five blocks north of TV Highway and one block north of Davis Street. The volume, length and schedule of the freight trains are not expected to change significantly over the 20 year planning horizon. Figure 9-1 summarizes the Rail Lines and Crossings Plan.

The Cooperative Improvement Agreement (CIA) between the City of Cornelius and ODOT was approved in June 1999. The agreement includes three phases of improvements. The first phase was constructed in 2001. Planned phases 2 and 3 are summarized below:

- Phase 2 – Upon signalization of the intersection of 20th Avenue/TV Highway, which includes flashing lights and gates at 20th Avenue and the grade rail crossing, the City will close the grade rail crossing at 11th Avenue to vehicular traffic. This phase is schedule for construction in the summer of 2005.
- Phase 3 – Upon signalization of the intersection of 14th Avenue/TV Highway (Adair Street and Baseline Street), which includes flashing lights and gates at 14th Avenue and the grade rail crossing, the City will close the grade rail crossing at 12th Avenue to vehicular traffic. This phase has not yet been designed or scheduled for construction.

There are a significant number of public at-grade rail crossings within Cornelius. The CIA plans to upgrade two of the rail crossings with safety features. As vehicle, bicycle and pedestrian volumes increase at the remaining rail crossings, the need for safety controls should be evaluated. The at-grade rail crossing on the 3F line at 10th and 19th Avenue and the FAA line at 10th Avenue should be considered for future safety improvements. Future improvements at the rail crossings will require a coordinated effort between P&W staff, ODOT Rail Division and Cornelius.

ODOT has issued a rail order to close the existing P&W 3F line rail crossing at either 13th Avenue or 14th Avenue in exchange for upgrading the existing P&W 3F line rail crossing at 26th Avenue from private to public ownership. The future rail crossing closure should be studied to determine if and when it is appropriate based on transportation issues such as roadway functional classification, daily traffic volumes, local street network and adjacent land uses.

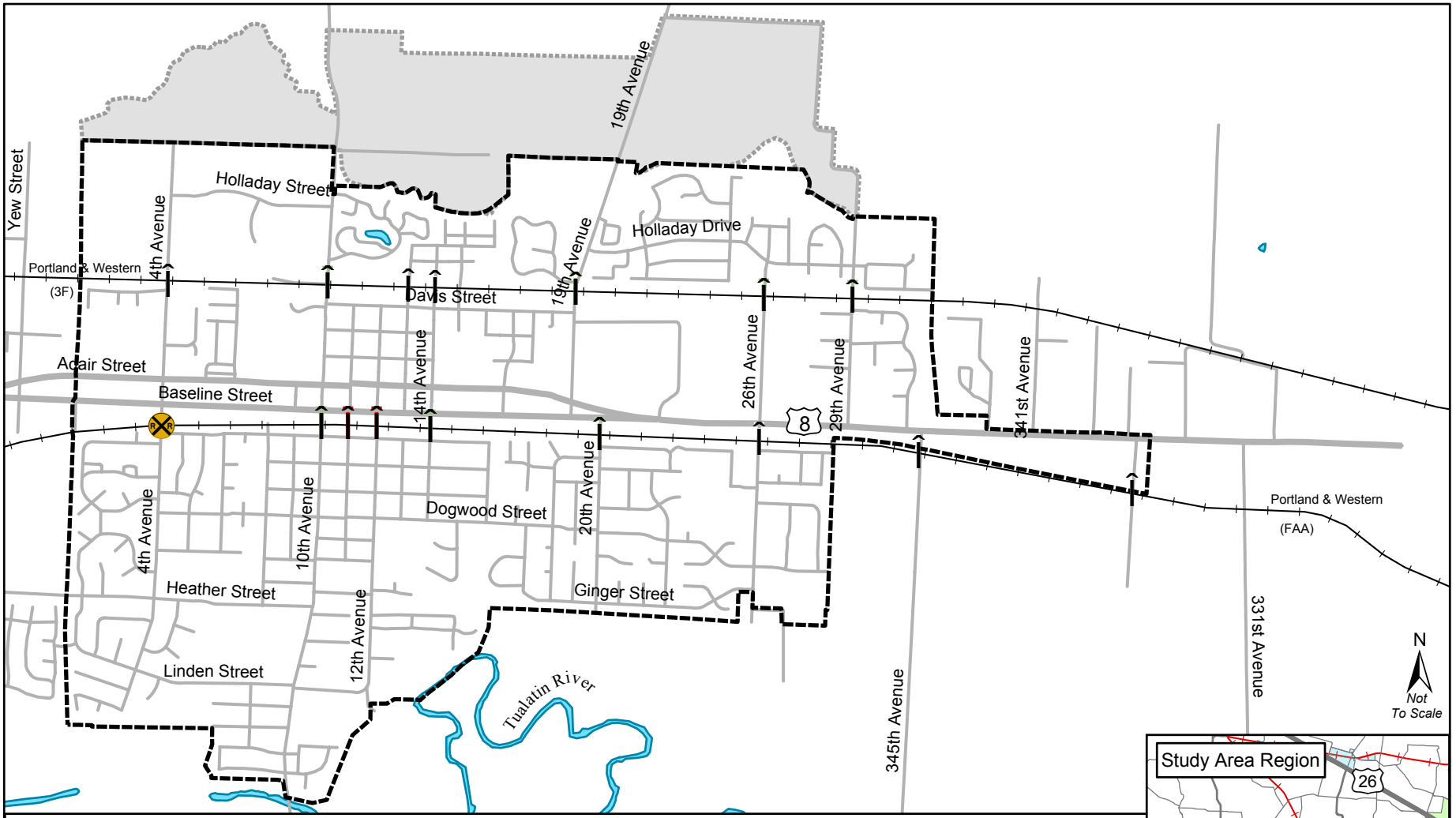


Figure 9-1
RAIL LINES AND CROSSINGS PLAN

LEGEND

Existing Public At Grade Crossings
- Crossbucks
- Gates

Future Public At Grade Crossings
- Rail Crossing Update
- Rail Crossing Closure

- Rail Lines
- Cornelius City Limit
- UGB Expansion

Sources:
- Metro RLIS
- TriMet
- City of Cornelius
- Washington County

A high capacity transit study area is identified in the Transit Master Plan (Figure 7-2) on both rail lines in Cornelius. The existing P&W 3F rail line and FAA rail line are possible locations for commuter rail and light rail 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 utilze the existing rail right-of-way. The potential for these projects will require a coordinated effort between P&W staff, ODOT Rail Division and local jurisductions.

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.

Pipeline

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

10. Financing & Implementation

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, operation 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 two sources to fund construction of its transportation infrastructure as described below. Both collect 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 may be used for any road-related purpose. Cornelius uses it for street operating needs.

Oregon gas taxes are collected as a fixed amount per gallon of gasoline served. Gas tax in Oregon has not increased since 1992 (currently 24 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, so the lack of change since 1992 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 $15 per vehicle per year to $27 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 $385,000 per year in State gas tax and vehicle license fee revenue for streets, bikeways and sidewalks. Essentially all of 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 minimal.

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 2004/2005, the estimated Washington County gas tax revenue for the City of Cornelius is $43,000. Assuming that the current tax will not increase, and since it is not pegged to inflation, the City of Cornelius can expect to receive $860,000 over the next 20 years. These funds have historically been used for roadway maintenance of local streets.

Traffic Impact Fee

The City of Cornelius collects a Traffic Impact Fee (TIF) from developing properties within the City based on the amount of new traffic expected to be generated and the proposed land use. The TIF trip rates (cost per average weekday trip) used by the City of Cornelius are set by Washington County and adjusted annually to account for inflation. Based on forecasted trip growth from 2005 to 2025, the City is expected to collect approximately $746,000 in TIF fees over the next 20 years.

Summary

Under the above funding programs, the City of Cornelius will collect approximately $508,000 for street construction and repair each year, with the previously noted restrictions. Total revenues collected over 20 years would be $9.3 million with the current sources.

Table 10-1 summarizes the current funding sources. If the City spends more than the above revenues collected for transportation purposes, the funding will most likely have to be taken from City reserve funds. Therefore, it is reasonable to expect that adding more capital or maintenance responsibilities to the city will require new or expanded revenue sources.

Table 10-1: Current Transportation Revenues for Cornelius

Funding Category	Annual Amount	Estimated 20 Year Revenues
State Fuel Apportionment & Vehicle License Fee	$385,000	$7,700,000
Washington County Gas Tax	$43,000	$860,000
City Traffic Impact Fee	$80,000*	$746,000
Total Revenues	**$508,000**	**$9,306,000**

Source: City of Cornelius, Adopted Budget, Fiscal Year 2004-2005.
* Based on 2003-2004 fiscal year total.

Projects and Programs

This section presents the recommended projects and programs developed for the City of Cornelius to serve local travel for the coming 20 years. The Pedestrian, Bicycle Transit, and Motor Vehicle projects were identified in the Action Plan for each mode, and represent those projects that have the highest short-term need for implementation to satisfy performance standards, or other policies established for the Cornelius Transportation System Plan. The costs for the remaining motor vehicle projects noted in the Motor Vehicle Master Plan are identified, but these have not been included in the funding needs analysis for the city because the Action Plan is limited to projects most likely to be funded within the planning horizon. Other projects on the Master Plan list require additional funding, and they are expected to be built beyond the 20 year horizon.

Project Cost Estimates

Cost estimates (general, order of magnitude) were developed for the projects identified in the motor vehicle, bicycle, transit, and pedestrian elements. 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[1]. 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.

All cost estimates are based on 2004 dollars. Historical construction costs price index has increased by 2.5 to 2.75 percent per year according to Engineering News Record research[2] . Construction costs have increased 100 percent in the 20 years from 1979 to 1999.

Other Transportation Programs and Services

In addition to the physical system improvements identified in the previous section, the transportation facilities will require on-going operation and maintenance improvements across a variety of areas. These other transportation programs are recommended to respond to the specific policies and needs in maintaining roadway pavement quality, supporting safe routes to schools programs, allocations for implementing neighborhood traffic management, and on-going update and support of related planning documents.

Roadway Maintenance

The annual cost of maintaining the 36 miles of streets within Cornelius was estimated at $640,000, a portion of which is paid for by gas tax revenues from the state. Over 20 years, the City's road

[1] 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.

[2] Engineering News Record Construction Cost Index as reported for the past ten years for 20 cities around the United States. Reference: http://www.enr.com/features/conEco/costIndexes/constIndexHist.asp

maintenance responsibility accounts for $12.8 million, which is the highest cost component of the transportation plan. The actual maintenance costs could vary from this estimate.

School Safety Program

Each school within the city should be evaluated to review the convenience and safety of connections for pedestrians and bicycle travel from the neighborhoods that they serve. A "Safe Route to School" plan identifies key routes for pedestrian and bike circulation around the schools, and suggests needed improvements to traffic controls, crossing management, and on-site circulation that would improve safety for school-aged children. An annual allocation of $5,000 is set aside for this purpose.

Sidewalk Grant Program

A City sidewalk grant program could be developed to provide sidewalks in areas where gaps occur in the system. This would affect primarily older parts of Cornelius such as downtown and historic neighborhoods. An annual allocation of $10,000 is set aside for this purpose.

Neighborhood Traffic Management (NTM)

Specific NTM projects are not defined. These projects will be subject to neighborhood consensus based upon City placement and design criteria. A City-wide NTM program, if desired, should be developed with criteria and policies adopted by the City Council. Speed humps can cost $2,000 to $4,000 each and traffic circles can cost $3,000 to $8,000 each. A speed trailer can cost about $10,000. It is important, where appropriate, that any new development incorporate elements of NTM as part of its on-site mitigation of traffic impacts. Annual allocation of $5,000 is identified for the program development, and implementation of NTM projects.

Cornelius Costs for TSP Action Plans

The costs outlined in the Transportation System Plan to implement the Action Plans for Motor Vehicles, Transit, Bicycles and Pedestrians total $2.9 million, and the recommended transportation operations and maintenance programs would add $13.2 million for a total cost over 20 years of $16.1 million. Refer to Chapter 4 through 9 for details on the individual projects by travel mode. Note that additional projects are listed in the Action Plans that are expected to be funded by other agencies and developers. These non-City costs have not been included in the estimates in Table 10-2, but are identified in the master plans.

Table 10-2: Cornelius Transportation Action Plans Costs over 20 years (2004 Dollars)

Transportation Element	Approximate Cost ($1,000)
System Improvement Projects (Action Plans projects to be funded by City)	
Pedesterian	$1,687
Bicycle	$1,284
Transit	$0
Motor Vehicle	$0
Total Capital Projects	**$2,971**
Operations and Maintenance Programs and Services	
Road Maintenance ($640,000/yr)	$12,800
School Safety Program ($5,000/yr)	$100
Sidewalk Grant Program ($10,000/yr)	$200
Neighborhood Traffic Management ($5,000/yr)	$100
Total Operations and Maintenance Programs	**$13,200**
20 YEAR TOTAL	**$16,171**

The estimated $16.2 million for capital projects and maintenance exceeds the expected 20-year revenue estimate of $9.3 million (see Table 10-1) by approximately $6.9 million. Alternative solutions to address this funding deficit for the Action Plan projects 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.

Within the Portland region, funding for major transportation projects often is brought to a vote of the public for approval. This is usually for a large project or list of projects. Examples of this public funding include the Westside Light Rail Project. Because of the need to gain public approval for transportation funding, it is important to develop a consensus in the community that supports needed transportation improvements. That is the value of the Transportation System Plan. In most communities where time is taken to build a consensus regarding a transportation plan, funding sources can be developed to meet the needs of the community.

Transportation program funding options range from local taxes, assessments, and charges to state and federal appropriations, grants, and loans. All of 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 of its options and understand where its power 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 new 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

Several communities in Oregon have adopted local gas taxes by public vote. The taxes are paid to the city monthly by distributors of fuel. The process for presenting such a tax to voters will need to be consistent with Oregon State law as well as the laws of the City of Cornelius. Table 10-3 summarizes the cities in Oregon that collect a local gas tax.

Table 10-3: Local Gas Taxes in Oregon

City	2004 Population	Vote Passage Date	Tax Rate
Cottage Grove	9,010	2003	3 cents/gallon
Dundee	2,900	2004	2 cents/gallon
Eugene	144,640	2003	3 cents/gallon
Sandy	6,360	2003	1 cent/gallon
Springfield	55,350	2003	3 cents/gallon
Stanfield	1,980	1999	1 cent/gallon
The Dalles	12,410	1986	3 cents/gallon
Tillamook	4,350	1982	1.5 cents/gallon
Woodburn	21,790	1989	1 cent/gallon

Source: League of Oregon Cities, Local Gas Tax Information, May 2005.

A preliminary local gas tax revenue was estimated for Cornelius based on a review of local gas tax programs in other cities in Oregon. Research found the City of Eugene estimates local gas tax revenue of approximately $650,000 annually per one-cent of tax per gallon. This estimate is equivelent to $4.50 per person annually based on the current Eugene population (144,640 people). Therefore, based on the current population of Cornelius (10,150 people), a one-cent per gallon local gas tax could generate between $40,000 to $50,000 annually.

Street Utility Fee Revenue

A number of Oregon cities supplement their street funds with street utility fees. Local cities with adopted street utility fees include Lake Oswego, Wilsonville and Tualatin. Establishing user fees to fund applicable transportation 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.

From a system health perspective, forming a utility 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 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 $100,000 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 that result from construction of applicable improvements. This type of tax increment financing has been used in Oregon since 1960. Uses of the funding include, but are not limited to, transportation. It is tax-increment funded rather than fee funded and the URD could provide for renewal that includes, but is not limited to, transportation projects.

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 meet 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. Approximately $145 million are collected annually in the Portland region for transit.

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 useful 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 (G.O.) bonds to debt finance capital improvement projects. G.O. 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 Plan, and the willingness of the electorate to accept increased taxation for transportation improvements, voter-approved G.O. 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 consider establishing a street utility fee as the backbone of its capital funding approach. Street utility fees can provide a stable source of dedicated revenue useable for transportation system operations and maintenance and/or capital construction. Rate revenues can also secure revenue bond debt if used to finance capital improvements. Street utilities can be formed by Council action, and billed through the City utility billing system.

In addition, the City should actively pursue grant and other special program funding in order to mitigate the costs to its citizens of transportation capital construction.

We estimate that a one-cent per gallon local gas tax and a street utility fee could generate roughly $150,000 per year, or $3 million over the next 20 years, and shown in Table 10-4 below. These additional funds would not be expected to generate sufficient revenues to fully capitalize the Action Plan projects and maintenance programs.

Table 10-4: Recommended New Transportation Funding Sources for Cornelius

Transportation Funding Source	Estimated Additional Annual Revenues
Local Gas Tax	$50,000
Street Utility Fee	$100,000
Annual New Revenues	**$150,000**
20 YEAR TOTAL	**$3,000,000**

The estimated revenue from the City TIF ($746,000) combined with revenue from the recommended new transportation funding sources ($3 million) over the next 20 years would provide adequate funding for the capital project costs identified in the TSP action plans ($2.9 million). However, the estimated $12.8 million for roadway maintenance costs over the next 20-years would be significantly underfunded.

Implementation

Recommended Ordinance Revisions

Regional transportation planning documents should be revised to reflect specific recommendations or transportation projects identified in the Cornelius TSP Update. The Cornelius Development Code should incorporate the recommended changes in order to implement the Cornelius TSP Update. The recommended amendments include:

Metro RTP

- The proposed West Side Trail and 345th Avenue Trail identified in the Pedestrian Master Plan and Bicycle Master Plan should be included on the Regional Pedestrian System map and the Regional Bicycle System map.
- 10th Avenue within the Cornelius city limits should be designated as a Roadway Connector on the Regional Freight System map.
- The Regional Transit Service Strategy map should identify the potential for High Capacity Transit on TV Highway (Baseline Street and Adair Street). The recommended High Capacity Transit study area project on TV Highway and the rail lines should be listed as a North Washington County critical service improvement.
- The Regional Street Design System (Figure 1.4) incorrectly identifies TV Highway as a Regional Boulevard between 8th Avenue and 10th Avenue. This area is outside the adopted Main Street District and Special Transportation Area. The street design designation should be revised to a Regional Street to be consistent with the remainder of TV Highway in Cornelius west of the Main Street District.

Washington County TSP

- The High Capacity Transit Study Area project should be identified on the Washington County Study Area map (Figure 9) and described in the Study Areas section (page 26).

City of Cornelius Development Code

Section 11.30.14 Site Design Review

Pedestrian Connection to Sidewalk

Developments should be responsible for providing a pedestrian connection, without vehicle conflicts, from the site main entrance to the public right-of-way and pedestrian system. Site design approval critia should be developed.

Transit Amenities

A review of the proposed site's propensity to generate transit trips should be required as an approval criteria. Developments above a defined threshold could be required to accommodate and/or construct transit related improvements such as bus shelters, bus turnouts, or connecting pathways.

Transit Supportive Density

In order to promote higher density developments to support high capacity transit, the City should require approval criteria related to public transit. Provisions within the plan may be included for providing for transit if the development proposal is adjacent to an existing or proposed transit route. The code provision should define adjacent as having a bus stop within 500 feet of the property. Approval criteria may include building orientation towards transit facilities and minimum spacing between the building main entrance and the nearest transit stop.

Transportation Impact Study Requirements

The TSP requires local governments to create a process to apply conditions of approval in order to minimize impacts and protect roadways. The Transportation Impact Study (TIS) requirement ensures large developments demonstrate that the project will not create unacceptable congestion. It also enables the City to require mitigation, such as turn lanes or signals, as a condition of approval to ensure roads operate at acceptable levels of service and safety.

- Land divisions that are expected to generate 200 or more daily trips should evaluate the transportation system impacts in a TIS. Such evaluations should be prepared by a professional transportation engineer and paid for by the applicant. The TIS should evaluate the access, circulation and other transportation requirements. The scope of the TIS should be established by the City Engineer to address issues related to a specific development proposal.
- Projects that generate less than 200 daily trip ends may also be required to provide traffic analysis when, in the opinion of the City Engineer, there is a capacity problem and/or safety concern that is caused or is adversely impacted by the development. The City Engineer should determine the scope of this special analysis.
- Trips should be defined by the Institute of Transportation Engineers (ITE), Trip Generation Manual, 7th Edition (or subsequent document updates), or trip generation studies of comparable uses prepared by an engineer and approved by the City.

- Mobility standards to determine what is acceptable or unacceptable operating conditions at intersections should be established. Intersections on state highways should meet current ODOT mobility standards. City street intersections should maintain a LOS of "D" during the PM peak hour of the day. A lesser standard may be accepted for local street approaches or driveway access points that intersect with collector or arterial streets, if these intersections are found to operate safely.
- The TIS should identify traffic impacts attributable to the development and appropriate mitigation measures where a development causes traffic impacts that bring a road below acceptable levels of service, or impacts a road that is already operating below acceptable levels of service, or impacts a road that has a documented safety problem. The developer may be required to implement mitigation measures as a condition of approval.
- Traffic signals should be required with development when traffic signal warrants are met, in conformance with the Highway Capacity Manual and the Manual of Uniform Traffic Control Devices. Before a signal can be installed on a state highway, a traffic signal must obtain approval from the State Highway Engineer.

Section 11.30.24 Subdivisions

The street width requirements should be updated to reflect the street cross-sections recommended in the TSP (Figures 8-4 to 8-7).

Section 11.40.10 Off-Street Parking and Loading

Bicycle Parking

Recommend on-site bicycle parking for retail, office or institutional uses should be conveniently located with respect to the street and building entrance (within 50-feet of an entrance to a building is ideal), but not impede or create a hazard to pedestrians (at least 36 inches between bicycles and other obstructions or buildings).

Residential Parking Districts

Allow the designation of residential parking districts to protect residential areas from spillover parking generated by adjacent commercial, employment, or mixed-use areas, or other uses that generate a high demand for parking.

Section 11.40.17 Parking Lot Design Standards

Require parking lots more than 3 acres in size to provide street-like features along major driveways; including curbs, sidewalks, and street trees or planter strips. Major driveways in new residential and mixed-use areas should meet connectivity standards for full street connections.

The following recommendations would require new sections to the Code.

Access Spacing

The following access standards provide basic measures to reduce vehicle conflicts at intersections, especially driveways on side streets at major intersections.

- Access spacing standards should be developed for City streets. The standards should provide minimum spacing requirements for each roadway functional classification identified in the TSP (Figure 8-3) and applied to new access points (streets or driveways) on City facilities.
- Driveways should not be placed in the influence area of intersections. The influence area is that area where queues of traffic commonly form on the approach to a collector/arterial intersection (typically between 150 to 300 feet). In a case where a project has less than 150 feet of frontage, the site would need to explore potential shared access, or if that were not practical, place driveways as far from the intersection as the frontage would allow (permitting for five feet from the property line). Existing lots or parcels that cannot meet these standards should be limited to one access point per lot.
- Each new access point (street or driveway) should have an access report demonstrating that the street/driveway is safe as designed and meets adequate stacking, site distance, deceleration distance, on-site circulation and deceleration requirements as set by ODOT (including their approach permitting process), Washington County and AASHTO.
- The City may require the closing or consolidation of existing driveways or other vehicle access points, the recording of reciprocal access easements (i.e., for shared driveways), installation of traffic control devices or other mitigation measures as a condition of approval.
- Access to and from off-street parking areas should not permit backing onto a public street, except for single-family dwellings.
- New driveway accesses onto neighborhood or local streets should be at least 25 feet from a curb return, stop bar, or crosswalk at a street intersection.
- A restriction of direct access of new single-family units on arterials and collectors (with an exception process that addresses safety and neighborhood traffic management needs).
- Where possible, new developments should be required to provide "cross-over easements" as a condition to approval, thus insuring shared driveway access points.
- Access to arterials should only be from public roads. When a site that has private access onto a principal arterial is redeveloped, the private access will be eliminated if alternate access exists to the site.

Intelligent Transportation System Projects

In order to support future ITS projects and a local interconnect infrastructure, the City of Cornelius standards should be updated to include the installation of 3-inch conduit during roadway improvement projects on arterials and collectors.