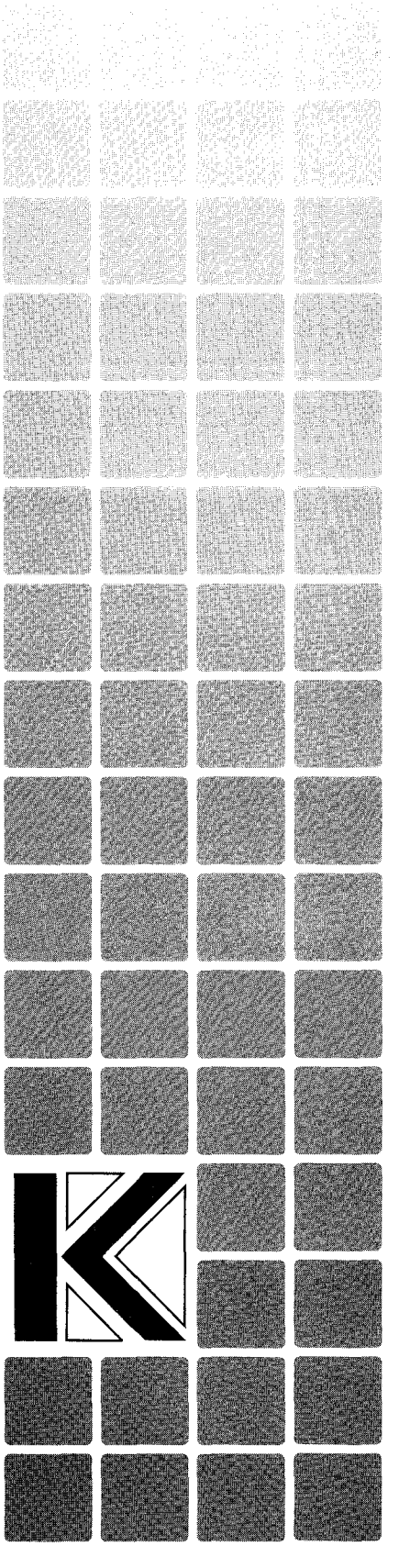
Transportation System Plan

Tualatin Transportation System Plan

Tualatin, Oregon

June 2001



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Transportation Planning/Traffic Engineering

Tualatin
Transportation System Plan

Tualatin, Oregon

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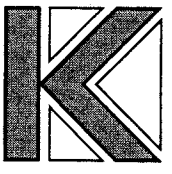
June 2001



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Preface

This project was partially funded by a grant from the Transportation Growth Management (TGM) Program, a joint program of the Oregon Department of Transportation and the Oregon Department of Land Conservation and Development. This document does not necessarily reflect the views or policies of the State of Oregon.

The progress of this plan was guided by the City of Tualatin Management Team, Transportation Advisory Committee (TAC), Tualatin Planning Advisory Committee (TPAC), and Consultant Team identified below.

City of Tualatin Management Team

Jason Tuck	James Jacks, AICP	Mike McKillip, P.E.
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Stephan Lashbrook	Gordon Howard	Roel Lundquist	Storm Smith
City of Wilsonville	*City of West Linn*	*City of Durham*	*T.V. Fire & Rescue*

Victoria Brown
Tualatin Chamber of Commerce

Tualatin Planning Advisory Committee (TPAC)

Jeannie Bierman	Marvin Hamm	Larry Harvey	Gary Lynk
Angela Shibley	Michele Wallace	David Withers	

The Technical Advisory Committee members and Tualatin Planning Advisory Committee members devoted a substantial amount of time and effort to the development of the Tualatin Transportation System Plan (TSP), and their participation was instrumental in the development of the recommendations that are presented in this report. The Consultant Team and Management Team believe that the City of Tualatin's future transportation system will be better because of their commitment.

Consultant Team:

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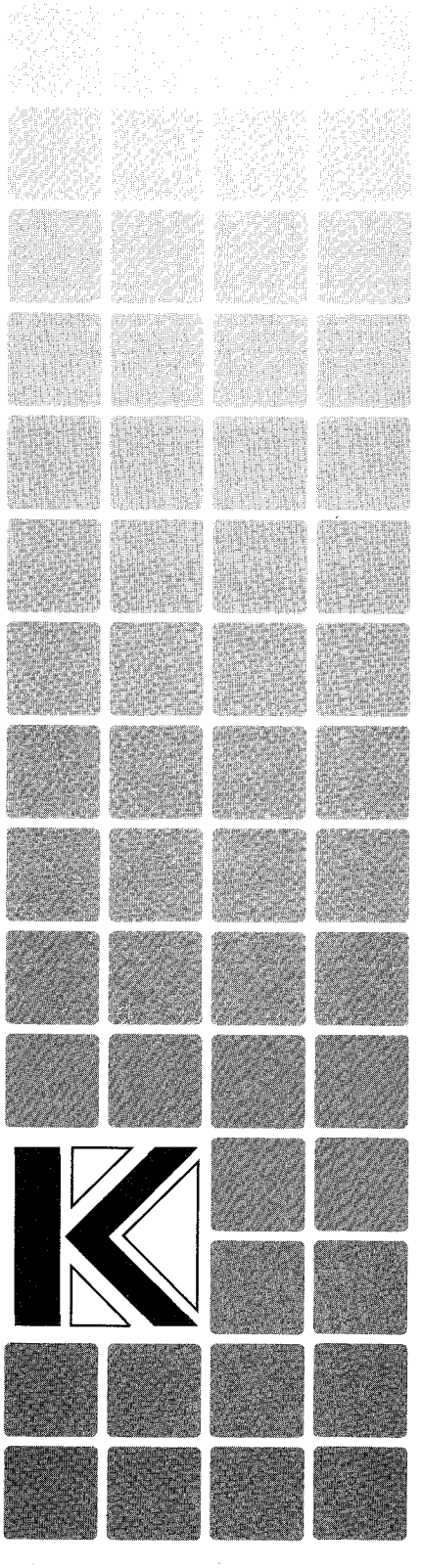


Executive Summary

Executive Summary

OVERVIEW

The City of Tualatin, in conjunction with the Oregon Department of Transportation (ODOT), initiated a study of the City's transportation system in 2000. This transportation system plan (TSP) will guide the management and development of appropriate transportation facilities within Tualatin, incorporating the community's vision, while remaining consistent with state, regional, and other local plans. This report provides the City of Tualatin with the necessary elements to be adopted as the transportation element of the City's comprehensive plan. In addition, this report provides ODOT, Clackamas, and Washington Counties with recommendations that can be incorporated into their respective planning efforts.

The contents of this TSP are guided by Oregon Revised Statute (ORS) 197.712 and the Department of Land Conservation and Development (DLCD) administrative rule known as the Transportation Planning Rule (TPR). These laws and rules require that jurisdictions develop the following:

- a road plan for a network of arterial and collector streets;
- a public transit plan;
- a bicycle and pedestrian plan;
- an air, rail, water, and pipeline plan;
- a transportation financing plan; and
- policies and ordinances for implementing the transportation system plan.

The TPR requires that alternative travel modes be given equal consideration with the automobile, and that reasonable effort be applied to the development and enhancement of the alternative modes in providing the future transportation system. In addition, the TPR requires that local jurisdictions adopt land use and subdivision ordinance amendments to protect transportation facilities and to provide bicycle and pedestrian facilities between residential, commercial, and employment/institutional areas. It is further required that local communities coordinate their respective plans with the applicable county, regional, and state transportation plans.

In addition to addressing the policies and requirements outlined in the statewide Transportation Planning Rule, the Tualatin TSP process focused on compliance and coordination with Metro's Regional Transportation Plan (RTP). Of specific interest are the projects and strategies presented in Chapter 5 of the 2000 RTP: *Growth and the Priority System.*

TSP PROCESS

The Tualatin TSP was developed through a process that, first, identified transportation needs, second, developed and analyzed potential projects addressing those needs and, third, developed a fundable plan that includes the projects that best address Tualatin's needs within the funding expected to be available during the next 20 years. The following steps were involved in this process:

- Reviewing state, regional, and local transportation plans and policies that the Tualatin TSP must either comply with or be consistent with.

- Providing public open houses to provide project information to, and gather feedback from, the public at key points during the TSP development process, establishing project advisory committees, and developing transportation plan goals and objectives.

- Evaluating existing transportation needs.

- Evaluating transportation needs in the year 2020, if growth occurs as expected, but no transportation improvements are made, other than those already funded.

- Developing, modeling, and analyzing three alternatives providing transportation improvement packages intended to address Tualatin's future transportation needs.

- Estimating the revenue available for transportation capital projects through the year 2020, assuming no increase in transportation funding.

- Developing a prioritized, financially constrained, consultant-recommended alternative that includes projects that meet the project's goals and objectives, and that best address future transportation needs within the funding available.

- Modifying the consultant-recommended alternative, based on staff, public, and advisory committee input, to develop the preferred alternative that forms the heart of this TSP.

- Developing a list of unfunded priority projects, in the event that additional transportation funding becomes available in the future.

- Compiling the results of this work into this TSP document, for review and adoption by the Tualatin City Council.

The remainder of this summary describes this process in more detail.

PUBLIC INVOLVEMENT

Two committees guided the planning process: The Tualatin Planning Advisory Committee (TPAC), an existing group that serves the function of the City's planning commission, and the Technical Advisory Committee (TAC). The TPAC served as the citizen advisory committee for the City on the TSP, and was responsible for evaluating the TSP from a policy perspective. This included reviewing the TSP goals and objectives, as well as the transportation evaluation criteria. The TAC was made up of representatives from the surrounding cities and counties, plus the Oregon Department of Transportation, Metro, Tri-Met, and Tualatin Valley Fire & Rescue. The TAC was responsible for reviewing the technical aspects of the TSP.

In addition to the established advisory committees, several public involvement programs were used to inform citizens and businesses in Tualatin of the TSP project goals and process, to obtain information from the community on transportation issues and concerns, to incorporate community feedback into the TSP, and to review TSP products and receive comments. Two key pieces of the public involvement program that directly involved public outreach and input were newsletter

articles and community open houses. Three newsletters were distributed and three open houses were held during the course of the project.

PLAN AND POLICY REVIEW

The TSP is required to be consistent with state, regional, and local plans. Four jurisdictions own the public roadways serving Tualatin: the City of Tualatin, Washington County, Clackamas County, and the Oregon Department of Transportation (ODOT). Metro is the Metropolitan Planning Organization responsible for regional planning and allocation of federal transportation funds, and Tri-Met is the public transportation provider. In order to identify applicable standards and policies, as well as potential inconsistencies, the Tualatin Development Code (including the Tualatin Community Plan and Planning District Standards), and its associated reference plans, such as the Parks Plan and street design standards, were reviewed for compliance and consistency with the following plans and policies:

State/ODOT	Transportation Planning Rule 1999 Oregon Highway Plan 2000-2003 Final Statewide Transportation Improvement Program
Metro	Metro Urban Growth Management Functional Plan, Title 6 Transportation Metro Regional Transportation Plan (RTP), 2000
Tri-Met	Transit Choices for Livability
Clackamas County	Clackamas County Transportation Plan, 1999 Clackamas County Comprehensive Plan, 1992 Clackamas County Bicycle Master Plan, 1996 Clackamas County Pedestrian Master Plan, 1996 Clackamas County Capital Improvement Program, (1998-2003, 1998-2018)
Washington County	Washington County Transportation Plan, 1988 Major Streets Transportation Improvement Program (MSTIP) 3
Neighboring Cities	Tigard Transportation System Plan, 2000 Lake Oswego Transportation System Plan, 1997 Sherwood Transportation System Plan, 1998 West Linn Transportation System Plan, 2000 Durham Comprehensive Plan, 1996 Wilsonville Transportation System Plan, 1991
City of Tualatin	Development Code of the City of Tualatin, including the Tualatin Community Plan (March 1, 2000) Leveton Tax Increment Plan, 1999 The Tualatin Central Urban Renewal Plan, 1998 Capital Improvement Program

Areas where the Tualatin Development Code (TDC) is currently not consistent with portions of these plans are identified in Section 2 of the TSP. The Transportation System Plan chapter (Section

6) of this TSP document, as well as the ordinances that the City of Tualatin will adopt to implement this TSP, serve to correct these inconsistencies.

EXISTING CONDITIONS

The following is a summary of the current condition of the transportation modes serving Tualatin:

- **Pedestrian:** Central Tualatin, areas around schools (with the notable exception of Tualatin Elementary), and newer residential and industrial development generally have good pedestrian facilities. Older roadways in the industrial area, and roadways around the fringes of the city tend to have little or no pedestrian facilities. Sections of Boones Ferry Road, Nyberg Street east of I-5, and I-5 overpasses lack sidewalks on one or both sides. Multiple-use pathways are provided within a number of City parks.
- **Bicycle:** Bicycle attractors, such as schools, parks, retail centers, and public facilities, are generally not well served from the City's residential areas due to a lack of continuous bicycle facilities, and high traffic volumes on many of the City's collector streets. Central Tualatin, for example, lacks bicycle lanes on most internal streets, and on many approach routes. Although residential neighborhoods have a well-connected system of bicycle routes and the industrial area of western Tualatin are generally well-served internally by bicycle facilities, bicycle facilities from these areas to other bicycle attractors have not yet been established.
- **Transit:** Only the central portion of Tualatin, the northeast corner of Tualatin, and the eastern half of the City's industrial area have sufficient population or employment density to support hourly fixed-route transit service. Tri-Met routes only serve 44% of this area, although the combination of Tri-Met and the TMA Shuttle service covers virtually all of this area. Only 49% of Tualatin households live within walking distance of fixed-route transit service. Tri-Met service is oriented around the City's two major park-and-ride lots and good service is provided from these lots to downtown Portland. Approximately two-thirds of all Tri-Met passengers boarding buses in Tualatin do so at the two major park-and-ride lots.
- **Pipelines and Transmission Systems:** Electric transmission lines, natural gas distribution lines, and water lines serve the City. No issues have been identified with any of these facilities.
- **Rail:** The Portland & Western Railroad operates two lines through the City of Tualatin for the movement of freight. Track conditions meet state guidelines. Industrial-zoned land abuts the rail lines, providing opportunities for potential customers to locate next to rail service. Planning is underway to develop a Wilsonville-Beaverton commuter rail line that would have a station in Tualatin. The closest AMTRAK passenger rail stations are located in Portland and Salem.
- **Air:** There are several public general-aviation airports that serve Tualatin. The closest airport is 12 miles south of Tualatin, in Aurora. The closest airport with scheduled passenger service is the Portland International Airport, 25 miles northeast of Tualatin.
- **Marine:** No navigable waterways are located in the vicinity of Tualatin. The closest marine facilities are located 12 miles to the north in Portland, Oregon.

- **Roadways:** Intersections at I-5 interchanges, on Highway 99W, and in Central Tualatin operate at or close to capacity. Four unsignalized intersections currently meet traffic signal warrants. The I-5 and I-205 freeways, Tualatin-Sherwood Road, Boones Ferry Road, Tualatin Road, Martinazzi Avenue, and Avery Street all have sections operating at or near capacity. Crash patterns requiring further investigation were identified at three intersections.
- **Truck Freight Movement:** Traffic congestion on Tualatin-Sherwood Road slows freight movements to and through Tualatin. Sharp corners and residential neighborhoods along parallel routes constrain the use of those routes as alternates to Tualatin-Sherwood Road.

FUTURE TRANSPORTATION NEEDS

Future conditions were evaluated first under the assumption that growth would occur as expected, but that only those transportation projects currently funded would be constructed (a "no-build" scenario). This analysis serves to highlight future problem areas, so that projects can be developed to address those problems. Metro's population and employment forecasts for the year 2020, in combination with Metro's regional traffic forecasting model, were used to evaluate year 2020 transportation conditions under this scenario. Improvements at the I-5/Nyberg Street interchange—a second left-turn lane on the southbound offramp, and bridge widening—were the only new projects included in the no-build scenario.

Under the no-build scenario, most collector and arterial streets in Tualatin will experience congestion along all or parts of their length during the weekday p.m. peak hour. The number of lane-miles of collector and arterial streets operating at or over capacity will increase from 4.5 today to 28.1 in the year 2020, and the number of freeway lane-miles operating at or over capacity will increase from 2.4 to 27.2. Per-capita transit availability will decrease 5% in residential areas and 19% in employment areas, as more people live and work in areas unserved by public transit. Significant gaps will continue to exist in the City's pedestrian and bicycle facilities.

ALTERNATIVES ANALYSIS

With existing and future transportation needs now having been identified, a number of potential projects were developed to address these needs. These projects were packaged into three alternatives that were modeled to determine the effectiveness of each project. Metro's population and employment forecasts were modified by City staff for this analysis, reflecting the redevelopment of the Durham Quarry, and a greater number of industrial jobs than previously forecast. Under the City's forecasts, Tualatin's population will grow by 56% between 2000 and 2020, and the number of jobs will increase by 88%. These figures only account for growth occurring inside the Urban Growth Boundary (UGB); if two former Urban Reserve Areas bordering Tualatin to the east and southwest are brought into the UGB, this growth may increase further. However, state law requires Tualatin's TSP to only address growth that may occur within the existing UGB.

Each alternative builds on the alternative before it, providing an increasing number of projects to address Tualatin's future needs. Alternative #1 provides projects included in the current financially constrained local, regional, and state transportation plans (e.g., the projects most likely to be built within the next 20 years). Alternative #2 provides additional transportation projects that address

needs remaining from Alternative #1, and increases transit service to the levels assumed in the Regional Transportation Plan's priority system. Alternative #3 provides even more projects, and assumes greater employee participation in transportation demand management efforts in the City's industrial areas.

Two general alignments for a future I-5/Highway 99W Connector are evaluated: a "northern alignment" that runs along the edge of the Urban Growth Boundary, connecting to Highway 99W north of Sherwood, and a "southern alignment," outside the UGB, that connects south of Sherwood. Within these two general alignments, several routes and access alternatives are evaluated.

- A four-lane expressway, following the "Norwood Expressway" alignment shown in the Tualatin Community Plan, connecting I-5 to Tualatin-Sherwood Road and Highway 99W in the area between Tualatin and Sherwood (Alternative 1A). The expressway would have an interchange with I-5 south of Norwood Road and at-grade intersections at Martinazzi Avenue, Boones Ferry Road, Grahams Ferry Road, SW 124th Avenue, Tualatin-Sherwood Road, and Highway 99W, consistent with the Tualatin Community Plan.
- The same as above, but without a connection to Martinazzi Avenue (Alternative 2). This option was developed after computer modeling determined that Martinazzi Avenue would become an alternate route to I-5 if a connection was provided.
- A four-lane freeway or toll road running south of Tualatin and Sherwood (Alternative 1B). Interchanges would be located at I-5, Highway 99W, and south of Sherwood's Old Town, consistent with facility modeled for the Regional Transportation Plan.
- A four-lane expressway, connecting I-5 to Tualatin-Sherwood Road at SW 124th Avenue (Alternative 3). At-grade intersections would be located at Boones Ferry and Grahams Ferry Roads; interchanges would be located at I-5 and Tualatin-Sherwood Road. This option was developed after modeling determined that (1) the expressway segment between Tualatin-Sherwood Road and Highway 99W, west of Cipole Road was underused, and (2) more direct access to Tualatin's industrial area was needed to relieve travel demand on Tualatin-Sherwood Road.

The following table summarizes all of the capital projects modeled under each alternative, and provides each project's estimated capital cost. Because Metro's transportation planning model is link-based (evaluating capacity between intersections), some kinds of projects—particularly traffic signals, center turn lanes, bicycle lanes, sidewalks, and safety improvements—cannot be modeled directly because they do not add capacity between intersections. These types of projects were included with each alternative, but were evaluated outside the Metro model, and are not shown in this table.

Project Description	Alts.	Estimated Cost
Wilsonville-Beaverton commuter rail track and signal work, station construction, train sets needed to start service	1,2,3	$75,000,000
Nyberg Interchange (#289) second southbound left-turn lane, bridge widening	1,2,3	$4,000,000
Lower Boones Ferry Road complete three lanes, sidewalks, and bike lanes, Bridgeport Road to Boones Ferry Road	1,2,3	$5,800,000
Tualatin-Sherwood Road widen to five lanes, Teton Avenue to Highway 99W	1,2,3	$25,000,000
SW 124th Avenue construct three-lane road, Leveton Drive to Tualatin-Sherwood Road	1,2,3	$11,650,000
SW 124th Avenue construct three-lane road, Tualatin-Sherwood Road to I-5/Highway 99W Connector	1A, 2	$3,500,000
I-5/99W Connector construct north alignment as an expressway	1A,2,3	$250,000,000
I-5/99W Connector construct south alignment as a freeway or toll road	1B	$250,000,000
Myslony Street extend to connect to Avery Street at Tualatin-Sherwood Road	1,2,3	$1,880,000
Sagert Street extend to SW 95th Place	1,2,3	$75,000
Blake Street realign curves and widen roadway connecting SW 105th and SW 108th Avenues	1,2,3	$860,000
SW 103rd Avenue extend to Grahams Ferry Road	1,2,3	$1,150,000
Iowa Drive extend to Grahams Ferry Road	1,2,3	$1,100,000
New East-West Street new residential collector, connecting SW 108th and SW 112th Avenues north of Helenius Road	1,2,3	$1,100,000
Pacific Drive realign to intersect Highway 99W at SW 124th Avenue, implement access managment	1,2,3	$450,000
Leveton Drive and SW 130th Avenue consturct new streets for industrial access in area west of SW 124th Avenue	1,2,3	$2,100,000
SW 125th Place construct new cul-de-sac for industrial access	1,2,3	$360,000
SW 128th Avenue/Cummins Drive construct new streets for industrial access in area west of SW 124th Avenue	1,2,3	$3,000,000
Herman Road reconstuct pavement; provide three lanes, bike lanes, and sidewalk, SW 108th to SW 118th	1,2,3	$2,700,000
95th Place connect cul-de-sac to Avery Street	2,3	$50,000
95th Place extend north and east from Tualatin-Sherwood Road to SW 90th Avenue	2,3	$500,000
Boones Ferry Road widen bridge; provide three lanes, bike lanes, and sidewalks, Lower Boones to T-S Road	2,3	$7,000,000
Tualatin-Sherwood Road regrade railroad crossing at Boones Ferry Road	2,3	$500,000
Tualatin-Sherwood Road interconnect traffic signals from Boones Ferry Road to Avery Street	2,3	$50,000

Project Description	Alts.	Estimated Cost
Boones Ferry Road interconnect traffic signals from Tualatin-Sherwood Road to Avery Street	2,3	$50,000
Herman Road reconstuct pavement; provide three lanes, bike lanes, and sidewalk, Cipole to SW 118th	2,3	$2,170,000
Herman Road reconstuct pavement; provide three lanes, bike lanes, and sidewalk, SW 108th to Teton	2,3	$920,000
Herman Road reconstuct pavement; provide three lanes, bike lanes, and sidewalk, Teton to Tualatin Road	2,3	$1,700,000
Cipole Road provide three lanes, bike lanes, and sidewalks, Tualatin-Sherwood Road to Highway 99W	2,3	$6,000,000
McEwan Road reconstuct pavement; provide three lanes, bike lanes, and sidewalk, Lower Boones to railroad	2,3	$1,800,000
93rd Avenue reconstruct to city standards, Sagert to Avery	2,3	$150,000
I-205 widening add auxiliary lane in each direction, I-5 to Stafford Road	2,3	$6,100,000
Hall Boulevard extend south across Tualatin River, connecting to Tualatin Road	2,3	$25,000,000
Teton Avenue realign to connect to SW 108th Avenue at Herman Road	2	$2,100,000
I-5/99W Connector reduced northern alignment connecting at SW 124th Avenue	3	<$250,000,000
I-5 widening add auxiliary lane in each direction, I-205 to I-5/Highway 99W Connector	3	$1,900,000
Lower Boones Ferry Road extend west across Tualatin River, connecting to Tualatin Road	3	$14,000,000
SW 65th Avenue extension extend north across Tualatin River, connecting to Childs Road	3	$2,800,000
Boones Ferry Road widen to five lanes, Tualatin-Sherwood to Sagert	3	$3,000,000

Alternative #2 provides the greatest amount of benefit, as measured by a number of indicators, but does not solve all of the identified problems. Under this alternative, the number of lane-miles of collectors and arterial streets operating at or over capacity increases from 4.5 today to 13.4 in 2020, and the number of lane-miles of freeways and expressways operating at or over capacity increases from 2.4 to 5.3. Per-capita transit availability increases nearly 90% in residential areas, and nearly 115% in employment areas. An additional 26.5 miles of pedestrian and bicycle facilities would be constructed. Vehicle-miles traveled on the City's collector street system—an indicator of how much traffic diverts from the arterial and freeway system due to congestion—increases 31%, which is much less than the City's 56% population growth and 88% job growth. However, all of this comes with a substantial price tag: in excess of $380 million in capital projects.

TRANSPORTATION FUNDING

The majority of Tualatin's annual transportation budget is used to operate and maintain the City's roadway system. Only the revenue from system development charges—fees paid by new development to help offset their traffic impacts, totaling about $350,000 annually—is likely to be

available for capital projects. The City also has two special districts—the Central Urban Renewal area and the Leveton Tax Increment District—that generate revenue for transportation and other public works projects within the districts' boundaries. Approximately $23 million of projects are planned to be funded by these two districts during the next 10 years.

The state gas tax, which provides the majority of the state's transportation funding, has not been increased in over six years. In the meantime, the buying power of gas tax revenue has decreased over time, due to inflation. State transportation funding within the Portland metropolitan area is prioritized by Metro; no state highway projects in the vicinity of Tualatin appear in the Regional Transportation Plan's financially constrained program over the next 20 years.

Washington County's capital projects are mainly funded through the property tax-funded Major Streets Transportation Improvement Program (MSTIP). The County is currently preparing MSTIP 4, which may include funding for a Wilsonville-Beaverton commuter rail line. No other Tualatin projects are currently proposed in MSTIP 4, which would run through 2011. Historically, the County has spent an average of $1 million per year on Tualatin projects (in the form of several larger projects); thus, $10 million could be anticipated to be available for County road projects in Tualatin in the 11-20 year timeframe.

Clackamas County's Urban Transportation Plan does not identify any projects on the County's roadways in Tualatin over the next 20 years.

Tri-Met is primarily funded through a payroll tax assessed on employers within its service area. The agency estimates that it will be able to increase service hours by 1.5% annually in the future. However, because increased traffic congestion is increasing bus travel times on routes by up to one minute per trip each year, much of this service increase is used up by the extra service required to maintain existing headways with longer travel times. Much of the remaining revenue is used for service increases to accommodate increased passenger volumes on popular routes. No new routes are anticipated in Tualatin for the foreseeable future.

Federal transportation funds are generally channeled through ODOT. However, Congress can earmark money for specific projects. Money is currently earmarked for environmental reporting for a potential I-5/Highway 99W Connector facility south of Tualatin. It is possible that additional funds could be earmarked for its construction, assuming environmental and state land use policy issues can be addressed, but federal funds would not be expected to cover the full $250 million cost of this facility.

TRANSPORTATION SYSTEM PLAN

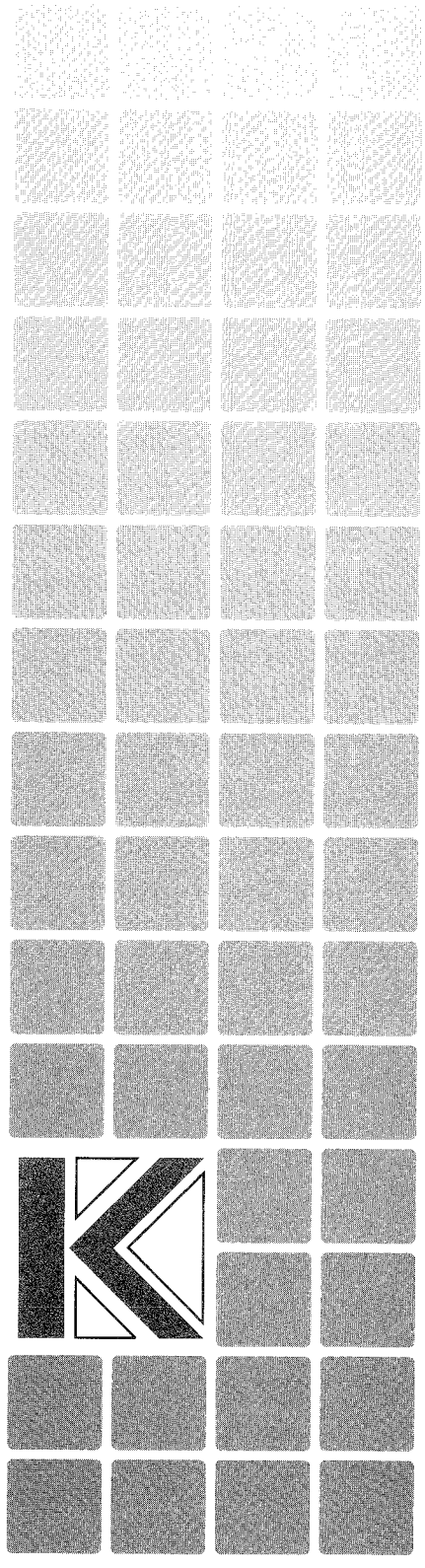
The Transportation System Plan chapter of this document (Section 6) contains the majority of the material that will be adopted as the transportation element of the City's comprehensive plan. The preferred alternative that forms the basis of this plan balances Tualatin's transportation needs with available resources, and prioritizes its projects based on need and when funding is expected to be available.

The TSP chapter includes the following elements:

- transportation goals and objectives;

- a street system plan, including functional classifications for Tualatin's streets, street design standards, recommendations for the I-5/Highway 99W Connector, access management policies, and traffic operations standards;
- a local streets plan, required for compliance with the Regional Transportation Plan, that identifies future street connections into and through undeveloped residential and mixed-use areas;
- pedestrian and bicycle plans that identify the locations of future facilities;
- a transit plan that identifies major transit stops and streets that may have future transit service, potential locations for implementing traffic signal priority for buses, and transit-supportive programs;
- pipeline, air, rail, marine, and freight plans;
- a parking plan, required for compliance with the Transportation Planning Rule; and
- an implementation plan, including a prioritized, financially constrained transportation improvement program, and a list of other priority projects that could be funded if new sources of transportation revenue can be developed.

Two refinement plans are recommended to address issues that were beyond the scope of the project developing this TSP. First, because it is not yet known how the Durham Quarry will redevelop, and because of the need to coordinate roadway locations and standards among three cities, Washington County, and ODOT, a refinement plan is recommended to address transportation needs in the area generally bounded by Upper Boones Ferry Road, SW 72nd Avenue, and Lower Boones Ferry Road, and including the adjacent I-5 interchange area east to SW 65th Avenue. Second, the RTP identifies the Tualatin Town Center as an "area of special concern," because of long-term traffic congestion issues, and lists specific topics for the TSP to address. Because the RTP was finalized after the TSP process began, the work anticipated by the RTP was not included in the TSP work scope and is recommended to be addressed by a refinement plan.



Section 1

Introduction

Introduction

1.1 OVERVIEW

The City of Tualatin, in conjunction with the Oregon Department of Transportation (ODOT), initiated a study of the City's transportation system in 2000. This transportation system plan (TSP) that resulted from the study will guide the management and development of appropriate transportation facilities within Tualatin, incorporating the community's vision, while remaining consistent with state, regional, and other local plans. This report provides the City of Tualatin with the necessary elements to be adopted as the transportation element of the City's comprehensive plan. In addition, this report provides ODOT, Clackamas, and Washington Counties with recommendations that can be incorporated into their respective planning efforts.

State of Oregon planning rules require that the TSP be based on the current comprehensive plan land use map and must also provide a transportation system that accommodates the expected 20-year growth in population and employment that will result from implementation of the land use plan.

The contents of this TSP are guided by Oregon Revised Statute (ORS) 197.712 and the Department of Land Conservation and Development (DLCD) administrative rule known as the Transportation Planning Rule (TPR). These laws and rules require that jurisdictions develop the following:

- a road plan for a network of arterial and collector streets;
- a public transit plan;
- a bicycle and pedestrian plan;
- an air, rail, water, and pipeline plan;
- a transportation financing plan; and
- policies and ordinances for implementing the transportation system plan.

The TPR requires that alternative travel modes be given equal consideration with the automobile, and that reasonable effort be applied to the development and enhancement of the alternative modes in providing the future transportation system. In addition, the TPR requires that local jurisdictions adopt land use and subdivision ordinance amendments to protect transportation facilities and to provide bicycle and pedestrian facilities between residential, commercial, and employment/institutional areas. It is further required that local communities coordinate their respective plans with the applicable county, regional, and state transportation plans.

In addition to addressing the policies and requirements outlined in the statewide Transportation Planning Rule, the Tualatin TSP process focused on compliance and coordination with Metro's Regional Transportation Plan (RTP). Of specific interest are the projects and strategies presented in Chapter 5 of the 2000 RTP: *Growth and the Priority System.*

1.2 STUDY AREA

The City of Tualatin is located at the southern edge of the Portland metropolitan area, lying mostly within Washington County, but with the eastern portion of the City lying within Clackamas County. The City has a 2000 census population of 22,791, representing population growth of 55% since 1990.

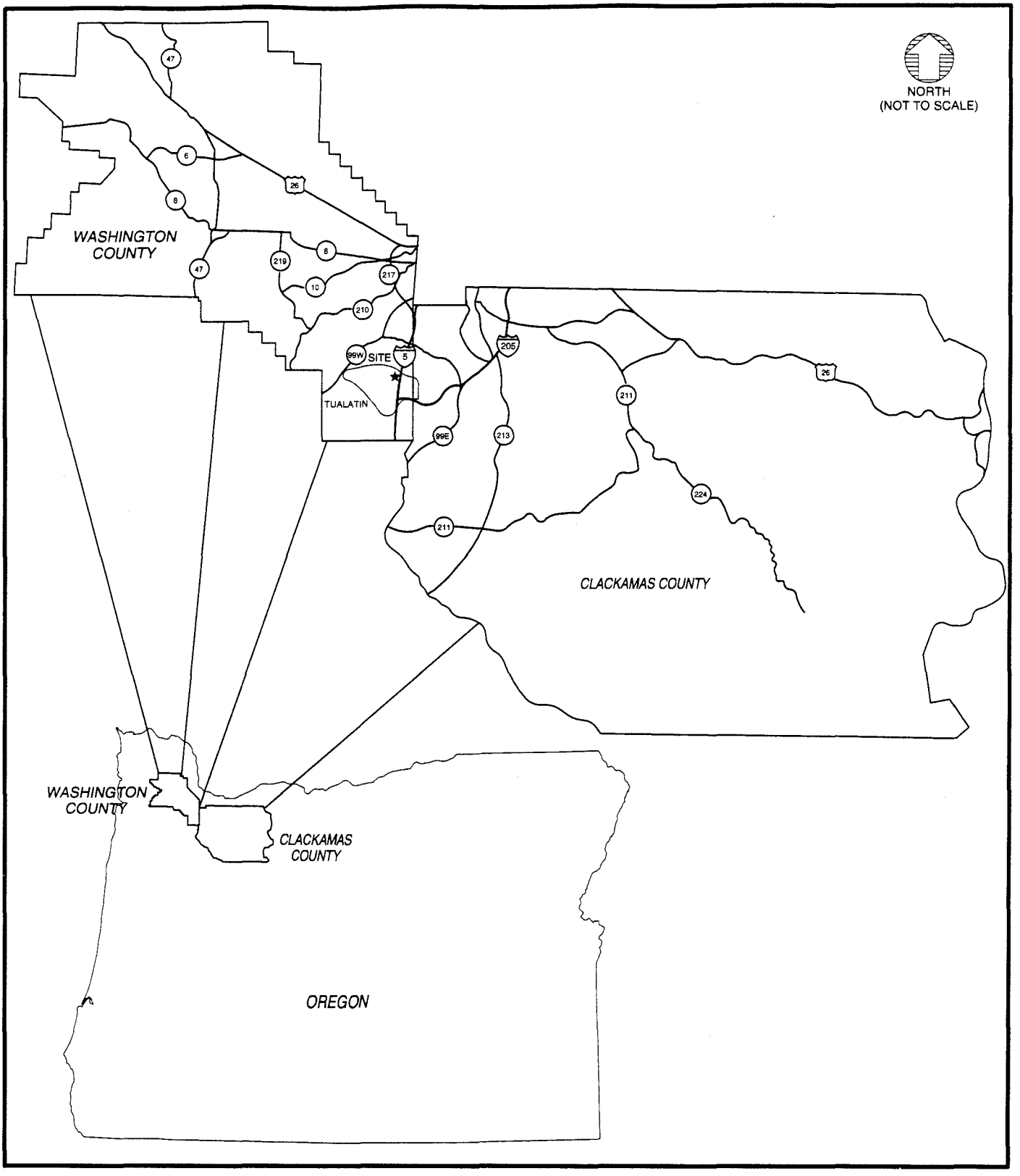
Tualatin, which takes its name from the river that meanders along its northern edge, is the Atfalati Indian word for "lazy." Though the region was settled in the 1850s, Tualatin was not incorporated until 1913. The town was platted in the 1880s after the Portland & Willamette Valley Rail company built rail lines and a depot. It served as a small center of trade, and served the surrounding small communities on a more regular basis than Oregon City or Portland.

Tualatin grew slowly as a small rural town until the mid-1970s, when it quickly developed into a regional employment and residential location within the Portland region. In addition to the residential growth, the city also experienced rapid commercial and industrial development, despite a statewide housing construction slump and recession at the time.

Tualatin's population within its current planning area is expected to continue to grow during the 20-year timeframe addressed by this TSP, although at only half the rate of the past decade. Through the year 2020, Tualatin's population is expected to grow 56%, and the number of jobs is expected to grow by 88%.

Because TSPs are adopted as part of a city's comprehensive plan, Oregon's Transportation Planning Rule limits TSPs to addressing the growth that will occur within the city's Urban Growth Boundary, or in Tualatin's case, its Planning Area Boundary. Two former urban reserve areas are located immediately adjacent to Tualatin (the area around Stafford and Borland Roads, and the area southwest of Tualatin), which hold the potential for accommodating significantly more jobs and residences than accounted for in this TSP's forecasts. If these areas are brought into the Portland Urban Growth Boundary in the future, Tualatin's TSP will need to be updated to account for the additional travel demand that would be generated in those areas.

Figure 1-1 locates Tualatin in relation to the Portland Metropolitan Area.



REGIONAL MAP

	CITY OF TUALATIN, OREGON TRANSPORTATION SYSTEM PLAN JUNE 2001	FIGURE 1-1

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1.3 PUBLIC INVOLVEMENT

The TSP planning process provided the citizens of Tualatin with the opportunity to identify their priorities for future transportation projects within Tualatin. Expressing a community vision of the future in terms of TSP goals and objectives was a central element of the public involvement process. These goals and objectives identified by the community were used as guidelines for developing and evaluating alternatives, selecting a preferred transportation plan, and prioritizing improvements.

Two committees guided the planning process: The Tualatin Planning Advisory Committee (TPAC), and the Technical Advisory Committee (TAC). The TPAC served as the citizen advisory committee for the City on the TSP, and was responsible for evaluating the TSP from a policy perspective. This included reviewing the TSP goals and objectives, as well as the transportation evaluation criteria. The TAC was made up of representatives from the surrounding cities and counties, plus the Oregon Department of Transportation, Metro, Tri-Met, and Tualatin Valley Fire & Rescue. The TAC was responsible for reviewing the technical aspects of the TSP.

The two committees convened at least six times each during the process of developing the draft TSP, including: project kickoff, completion of the existing conditions analysis, presentation of the future conditions and alternatives analyses, and presentation of the draft TSP.

In addition to the established advisory committees, several public involvement programs were used to inform citizens and businesses in Tualatin of the TSP project goals and process, to obtain information from the community on transportation issues and concerns, to incorporate community feedback into the TSP, and to review TSP products and receive comments.

Two key pieces of the public involvement program that directly involved public outreach and input were newsletter articles and community open houses. Three newsletter articles were prepared and distributed by the City within the monthly City Newsletter to provide information on the elements of the TSP. Three community open houses were also held to provide citizens and businesses with the opportunity to review TSP materials and to provide comments to the technical team preparing the TSP. Public notices for the community open houses were provided via the City Newsletter, press releases to local print media, Council TV Access, and the Chamber of Commerce Newsletter.

1.4 TSP ORGANIZATION AND METHODOLOGY

The development of the City of Tualatin's Transportation System Plan began with a review of the local, regional, and statewide plans and policies that guide land use and transportation planning in the City. This plan and policy review is presented in **Section 2** of this plan. Next, an inventory of the existing transportation system was performed. This inventory documented all major transportation-related facilities within the study area, which allowed for an objective assessment of the current system's physical characteristics, operational performance, safety, and general function. The inventory process and the documentation of current transportation conditions are presented in **Section 3** of this report. The findings of the existing conditions analysis were presented to the two TSP committees.

Upon completion of the existing conditions analysis, the focus of the project shifted to forecasting future travel demand and the corresponding long-term future transportation system needs.

Development of long-term (year 2020) transportation system forecasts relied heavily on the City's population growth projections. Based on these projections, and with input from the advisory committees, reasonable assumptions were drawn as to the potential for and location of future development activities. **Section 4** of this report, Future Conditions Analysis, details the development of anticipated long-term future transportation needs within the study area.

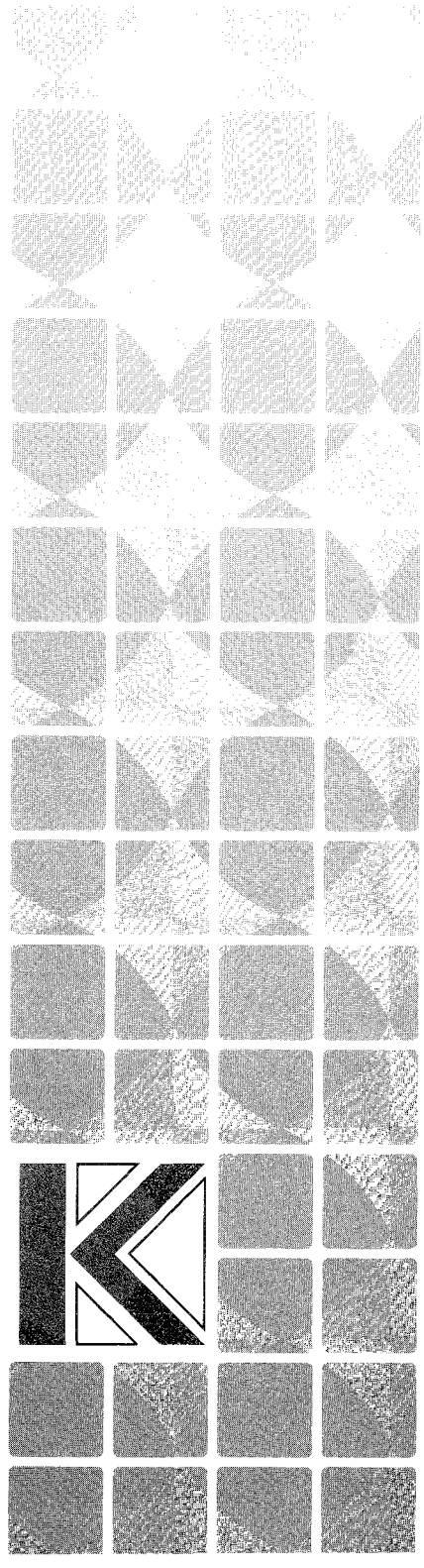
Section 5 of this report, Alternatives Analysis, documents the development and prioritization of alternative measures to mitigate identified safety and capacity deficiencies, as well as projects that would enhance the multi-modal aspects of the City's transportation system. The impact of each of the identified alternatives was considered on the basis of its potential costs and benefits, as well as its conformance with and potential conflicts to the City's transportation system and land uses. Ultimately, based on comments received from the City staff, Tualatin residents, TAC, and TPAC, a preferred plan was developed that reflected a consensus on which elements should be incorporated into the City's long-term transportation system.

Having identified a preferred set of alternatives, the next phase of the planning process involved presenting and refining the individual elements of the TSP through a series of decisions and recommendations. The recommendations identified in **Section 6**, Transportation System Plan, include a Street Plan, a Pedestrian System Plan, and a Bicycle System Plan, and a Transit Plan, as well as plans for other transportation modes serving Tualatin.

Section 7, Transportation Funding Plan, provides an analysis and summary of the alternative funding sources available to finance the identified transportation system improvements.

The recommended modifications presented in **Section 8**, Policies and Land Use Ordinance Modifications, address major land use transportation issues identified during the development of the TSP and reflect the desire to enhance all modes of the transportation system. These ordinances are needed to implement the TSP.

Finally, **Section 9**, Transportation Planning Rule Compliance and Metro Regional Transportation Plan Compliance, lists the requirements of the Oregon Transportation Planning Rule (OAR 660 Division 12) and the RTP and identifies how the City of Tualatin TSP satisfies each criterion.



Section 2

Plan and Policy Review

Plan and Policy Review

2.1 INTRODUCTION

This section summarizes all of the plans and policies at the state, regional, and local level that directly impact transportation planning in the City of Tualatin. Although each document reviewed contains many policies, only the most pertinent policies were chosen to help focus the discussion. The policies outlined within this section provide a policy context for the remainder of the study and new policies considered as part of this study should be consistent with the currently adopted policies listed here.

Each applicable goal, policy and action is either listed verbatim from its source or paraphrased where necessary. An independent conclusion is given after each individual policy. These conclusions are meant to emphasize the most important parts of the policies as they apply to the City of Tualatin's Transportation System Plan. Conclusions also may point out inconsistencies between policies that were considered further during the course of this study.

2.1.1 Documents Reviewed

Four jurisdictions own the public roadways serving Tualatin: the City of Tualatin, Washington County, Clackamas County, and the Oregon Department of Transportation (ODOT). Metro is the Metropolitan Planning Organization responsible for regional planning and allocation of federal transportation funds, and Tri-Met is the public transportation provider. In order to identify applicable standards and policies, as well as potential inconsistencies, the Tualatin Development Code (including the Tualatin Community Plan and Planning District Standards), and its associated reference plans, such as the Parks Plan and street design standards, were reviewed for compliance and consistency with the following plans and policies:

State/ODOT	Transportation Planning Rule 1999 Oregon Highway Plan 2000-2003 Final Statewide Transportation Improvement Program
Metro	Metro Urban Growth Management Functional Plan, Title 6 Transportation Metro Regional Transportation Plan, 2000
Tri-Met	Transit Choices for Livability
Clackamas County	Clackamas County Transportation Plan, 1999 Clackamas County Comprehensive Plan, 1992 Clackamas County Bicycle Master Plan, 1996 Clackamas County Pedestrian Master Plan, 1996 Clackamas County Capital Improvement Program, (1998-2003, 1998-2018)
Washington County	Washington County Transportation Plan, 1988 Major Streets Transportation Improvement Program (MSTIP) 3

Neighboring Cities	Tigard Transportation System Plan, 2000 Lake Oswego Transportation System Plan, 1997 Sherwood Transportation System Plan, 1998 West Linn Transportation System Plan, 2000 Durham Comprehensive Plan, 1996 Wilsonville Transportation System Plan, 1991
City of Tualatin	Development Code of the City of Tualatin, including the Tualatin Community Plan (March 1, 2000) Leveton Tax Increment Plan, 1999 The Tualatin Central Urban Renewal Plan, 1998 Capital Improvement Program

2.2 STATE OF OREGON

2.2.1 Transportation Planning Rule (TPR)

In April 1991, the Land Conservation and Development Commission (LCDC), with the concurrence of ODOT, adopted the Transportation Planning Rule (TPR), OAR 660 Division 12. The TPR requires all local jurisdictions with a population greater than 2,500 to prepare and adopt a Transportation System Plan.

As Tualatin is located within the Portland metropolitan area, the TPR requirements for urban areas with populations exceeding 25,000 apply to Tualatin. Section 9 of the TSP lists the applicable TPR recommendations and requirements that apply to the Tualatin TSP and how this plan has addressed each requirement.

2.2.2 1999 Oregon Highway Plan

The 1999 Oregon Highway Plan (OHP) is one modal element of the Oregon Transportation Plan. The OHP outlines the policies and strategies to guide the Highway Division's operating and fiscal activities. The policies found within the OHP that apply to this TSP include:

- Policy 1A: State Highway Classification System;
- Policy 1B: Land Use and Transportation;
- Policy 1C: State Highway Freight System;
- Policy 1F: Highway Mobility Standards;
- Policy 1G: Major Improvements;
- Policy 2B: Off-System Improvements;
- Policy 2F: Traffic Safety;
- Policy 3A: Classification and Spacing Standards;
- Policy 3B: Medians; and
- Policy 4A: Efficiency of Freight Movement.

Policy 1A: State Highway Classification System. The state highway classification system includes five classifications: Interstate, Statewide, Regional, District, and Local Interest Roads. Additionally, there are four special purpose categories that overlay the basic classifications: special land use areas, statewide freight route, scenic byways, and lifeline routes. There are four state-owned facilities in or adjacent to Tualatin:

- **Interstate 5** is designated as an *Interstate* and is on the National Highway System.
- **Interstate 205** is designated as an *Interstate* and is on the National Highway System.
- **Highway 99W** is designated as a *Statewide Highway* and is on the National Highway System.
- **Beaverton-Tualatin Highway** (Boones Ferry Road) is designated as a *District Highway*.

"Expressways" are a subset of Statewide, Regional and District Highways. As used by ODOT, the designation provides a high level of access control along a highway (long access spacings and limited turning movements), rather than specifying a particular highway design, such as a high-speed multi-lane divided highway. An expressway can be designated as a result of a corridor planning process, ODOT special study, or by action of the Oregon Transportation Commission. No existing state highways in Tualatin are designated as expressways, or are likely candidates for this designation. However, an expressway designation may be appropriate for a future I-5 to 99W connector.

Policy 1B: Land Use and Transportation. This policy recognizes the role of both the State and local governments related to the state highway system and calls for a coordinated approach to land use and transportation planning. Special Transportation Areas (STAs) and Urban Business Areas (UBAs) are included as action items under this policy. Within STAs and UBAs, highways may be managed to provide a greater level of access to businesses and residences than might otherwise be allowed.

Policy 1C: State Highway Freight System. This policy recognizes the need for the efficient movement of freight through the state. According to the OHP the following facilities are designated as freight routes:

- Interstate 5
- Interstate 205
- Highway 99W

Policy 1F: Highway Mobility Standards Access Management Policy. This policy addresses state highway performance expectations for planning and plan implementation or amendment, as well as providing guidance for managing access and traffic control systems. Action 1F.5 states that within transportation system plans, where the volume-to-capacity (v/c) ratio is worse than the identified standards and transportation improvements are not planned, the performance standard for the highway shall be to improve performance as much as feasible and to avoid further degradation of performance. Table 2-1 shows v/c ratios that apply to Tualatin.

TABLE 2-1
MAXIMUM VOLUME-TO-CAPACITY RATIOS FOR TWO HOUR PEAK OPERATING CONDITIONS THROUGH A 20-YEAR HORIZON FOR STATE HIGHWAY SECTIONS WITHIN THE PORTLAND METROPOLITAN AREA

Highway Category	Land Use Type	
	2040 Concept Area	Non-Concept Area
Interstate Highways and Statewide (NHS) Expressways	0.90	0.90
Statewide (NHS) Freight Routes	0.95	0.90
Statewide (NHS) Non-Freight Routes and Regional or District Expressways	1.00	0.95
Regional Highways	1.00	0.95
District/Local Interest Roads	1.00	0.95

Table 1 Notes:

- The volume-to-capacity ratios in the table are for the highest two consecutive hours of weekday traffic volumes. This is calculated by dividing the traffic volume for the average weekly two-hour PM peak by twice the hourly capacity.
- 2040 Concept Areas include the Central City, Regional Centers, Town Centers, Station Communities, and Main Streets identified in Metro's adopted Region 2040 Growth Concept.
- Alternate standards may be developed in corridor plans for Interstate Highways, other freeways and NHS freight routes to provide adequate levels of highway mobility for through travel.

Policy 1G: Major Improvements. This policy emphasizes the state's preference for improving system efficiency and management before adding capacity.

Policy 2B: Off-System Improvements. This policy recognizes that the state may provide financial assistance to local jurisdictions to make improvements to local transportation systems if the improvements would provide a cost-effective means of improving the operations of the state highway system.

Policy 2F: Traffic Safety. This policy emphasizes the state's efforts to improve safety of all uses of the highway system. Action 2F.4 addresses the development and implementation of the Safety Management System to target resources to sites with the most significant safety issues. The intersections of Tualatin-Sherwood Road/Boones Ferry Road, Highway 99W/Cipole Road, Boones Ferry Road/Lower Boones Ferry Road, and Boones Ferry Road/Bridgeport Road were in the top 50% of Washington County's crash locations.

Policy 3A: Classification and Spacing Standards. This policy addresses the location, spacing and type of road and street intersections and approach roads on state highways. It includes standards for each highway classification, including specific standards for Special Transportation Areas (STAs) and Urban Business Areas (UBAs). The adopted standards can be found in Appendix C of the Oregon Highway Plan; generally, the minimum access spacing distance increases as either the highway's importance or posted speed increases. The minimum access spacing is somewhat lower in STAs and UBAs than would otherwise be allowed. STAs and UBAs are established through joint agreements between a city and ODOT; these areas must meet the criteria identified in Action 1B.7, including being identified in the adopted TSP.

Policy 3B: Medians. This policy establishes the state's criteria for the placement of medians. It includes Action 3B.3 which requires the consideration of non-traversable medians for modernization of all urban, multi-lane Statewide (NHS) Highways. This would include Highway 99W. The criteria for consideration include:

- Forecasted average daily traffic greater than 28,000 vehicles per day during the 20-year planning period;
- A higher-than-average accident rate;
- Pedestrian crossing safety issues; and
- Topographic and alignment issues resulting in inadequate left-turn sight distances.

Policy 4A: Efficiency of Freight Movement. This policy emphasizes the need to maintain and improve the efficiency of freight movement on the state highway system. As noted previously, Interstate 5, Interstate 205 and Highway 99W are designated freight routes.

2.2.3 2000-2003 Final Statewide Transportation Improvement Program

The Statewide Transportation Improvement Program (STIP) identifies the transportation projects that the state will fund over the next four-year program. It is updated every two years. The 2000-2003 STIP identifies four projects within Tualatin that will be designed and/or constructed through 2003. In addition, the STIP also funds a variety of ongoing state, regional, and local programs (e.g., the joint ODOT-DLCD Transportation Growth Management program that funded this TSP, Tri-Met enhancement projects, etc.). Additional small projects within Tualatin could be funded through one of these programs, although they would not be specifically called out in the STIP.

Specific design and construction projects in Tualatin funded by the STIP through 2003 consist of:

- I-5/Highway 99W Connector Environmental Report. The federal TEA-21 transportation legislation included a $7 million earmark towards design and construction of a future expressway connection between I-5 and Highway 99W. A total of $469,000 in federal and state matching funds have been allocated to develop the environmental report for the project in 2003.
- I-5/Nyberg Street Southbound Ramp Widening. The southbound ramp will be widened in 2002 to provide an additional turn lane and queue storage. The total project cost, including design, right-of-way acquisition, and construction is $860,000.
- I-5/Nyberg Street Interchange Improvement Design. This project develops final design plans in 2001 for widening the overpass to provide an additional lane, and to add a sidewalk. The project cost is $381,000. The actual construction project has not yet been funded.
- Highway 99W (SW 60th Avenue-Tualatin River). This project, mainly in Tigard and King City, was constructed in the summer of 2000. It included pavement preservation, bridge repair, and safety improvement elements. The STIP allocated $3,792,000 to this project.

2.3 METRO

2.3.1 Metro Regional Framework Plan (RFP)

The Metro Regional Framework Plan (RFP) "is intended to be the document that unites all of Metro's adopted land use planning policies and documents." The RFP was created out of a requirement of the voter-approved Metro Charter. The Charter also required that Metro adopt a Future Vision, which set the direction of planning found in the RFP. In 1995, the Metro Council adopted the 2040 Growth Concept that served to further refine the planning for the region. The Growth Concept is closely tied to the RFP.

While the goals and policies of the RFP are not directly applicable to local plans, they do guide Metro's actions. The transportation related goals and policies are found in Chapter 2 of the RFP and are implemented through the Metro functional plans, the Urban Growth Management Functional Plan and the Regional Transportation Plan.

The RFP is meant to "establish a new framework for planning in the region by linking land use and transportation plan." The policy highlights of Chapter 2 emphasize this new framework through the following:

- Ensuring efficient access to jobs, housing, cultural and recreational opportunities, shopping in and throughout the region and providing transportation facilities that support a balance of jobs and housing.
- Reducing reliance on any single mode of travel and increasing the use of alternative modes, such as transit, bicycling and walking.
- Integrating land use, automobile, bicycle, pedestrian, freight and public transportation needs in regional and local street designs.
- Providing efficient transportation systems that accommodate motor vehicles, public transportation, pedestrian transportation, bicycle transportation and freight movement.
- Reducing vehicle miles of travel per capita and related parking spaces.
- Providing transportation demand management and system management strategies.
- Minimizing impact of urban travel on rural land through use of green corridors.
- Protecting water and air quality and reducing energy consumption.

2.3.2 Urban Growth Management Functional Plan

The Urban Growth Management Functional Plan is one of the documents that implements regional goals and objectives as adopted by the Metro Council. The state legislation that created Metro authorizes Metro "to adopt 'Functional Plans' that could contain specific recommendations and requirements for the cities and counties within Metro's boundaries to amend their comprehensive plans and implementing zoning ordinances." The Urban Growth Management Function Plan, in combination with the Regional Transportation Plan (RTP), are the two functional plans that have specific requirements for local governments.

Title 6: Regional Accessibility. Title 6 of the Urban Growth Management Functional Plan was designed to "reinforce the specific development needs of the individual 2040 Growth Concept design types." The specific requirements of Title 6 have been superceded by the recently adopted Regional Transportation Plan (RTP).

2.3.3 2000 Regional Transportation Plan (RTP)

Local Implementation

The RTP is the second functional plan that implements the Regional Framework Plan. The RTP includes requirements for local implementation. All local plans must demonstrate consistency with the RTP.

Pursuant to Section 6.4.1, specific elements in the 2000 RTP that require city, county and special district compliance or consistency are as follows:

Chapter 1 Consistency with the policies, objectives, motor vehicle level-of-service measure and modal targets, system maps and functional classifications including the following elements of Section 1.3:

- Regional transportation policies 1 through 20 and objectives under those policies
- All system maps (Figures 1.1 through Figure 1.19, including street design, motor vehicle, public transportation, bicycle, pedestrian and freight systems)
- Motor vehicle performance measures (Table 1.2), or alternative performance measures as provided for in Section 6.4.7(1)
- Regional non-SOV modal targets (Table 1.3)

Chapter 2 Consistency with the 2020 population and employment forecast contained in Section 2.1 and 2.3, or alternative forecast as provided for in Section 6.4.9 of this chapter, but only for the purpose of TSP development and analysis

Chapter 6 Compliance with the following elements of the RTP implementation strategy:

- Local implementation requirements contained in Section 6.4
- Project development and refinement planning requirements and guidelines contained in Section 6.7

Section 9 of this TSP demonstrates how these elements have been complied with by the TSP.

RTP Policy Consistency

As noted above, local jurisdictions must be consistent with Regional Transportation Policies and the objectives under those policies. The policies and objectives of the RTP are intended to implement the 2040 Growth Concept. They address economics, livability, safety, efficiency, travel choices and mobility, air and water quality, energy conservation, jobs/housing balance, auto dependence, integrated land uses, demand management, system management, and impacts on rural lands.

RTP System Maps Consistency

As noted above, local jurisdictions are also required to be consistent with the following system maps (RTP Figures 1.1 through 1.19):

- Regional Street Design System;
- Regional Motor Vehicle System;
- Regional Public Transportation System;
- Regional Freight System;
- Regional Bicycle System; and
- Regional Pedestrian System.

Regional Street Design System

The regional street design concepts relating to the City of Tualatin are summarized in Table 2-2.

TABLE 2-2
REGIONAL STREET DESIGN

Street	From	To	Designation
Highway 99W	City Limit	City Limit	Regional Street
Lower Boones Ferry Rd	Eastside I-5	East City Limit	Regional Street
	Westside of I-5	Boones Ferry Road	Urban Road
Bridgeport Rd	Lower Boones Ferry Rd	Upper Boones Ferry Rd	Urban Road
Upper Boones Ferry Rd*	Boones Ferry Rd	North City Limits	Urban Road
Boones Ferry Rd	Upper Boones Ferry Rd	Tualatin River	Regional Street
	Tualatin River	Tualatin-Sherwood Rd	Regional Blvd
	Tualatin-Sherwood Rd	South City Limit	Community Street
Nyberg St	Eastside of I-5	SW 65th Ave	Community Street
	Westside of I-5	Tualatin-Sherwood Rd	Regional Blvd
SW 65th Ave	Nyberg St	Borland Road	Community Street
Borland Road	SW 65th Ave	East City Limit	Community Street
Tualatin Road	Boones Ferry Rd	SW 124th Ave	Urban Road
Tualatin-Sherwood Road	Nyberg St	SW 95th Ave	Regional Blvd
	SW 95th Ave	West City Limit	Urban Road
SW 124th Ave	Highway 99W	Tualatin-Sherwood Rd	Urban Road

* Upper Boones Ferry Road is included herein because it connects parts of the city of Tualatin; however, the street itself is in the City of Durham.

The concept for each of the regional street designs noted above is summarized below:

- Regional Boulevard – mix a significant amount of motor vehicle traffic with public transportation, bicycle and pedestrian travel where dense development is oriented to the street. They may provide: four lanes, low to moderate vehicle speeds, many street connections and some driveways, on-street parking, center medians, high-quality transit service and amenities, substantial pedestrian improvements, and bike lanes or wide outside lanes.
- Regional Street – carry significant vehicle traffic while providing for public transportation, bicycle and pedestrian travel. They may provide: four or more lanes, moderate vehicle speeds, some to many street connections, few driveways, on-street parking, center median, high-quality transit service and amenities, pedestrian improvements, buffered sidewalks and bike lanes or wide outside lanes.
- Community Street – carry vehicle traffic while providing for public transportation, bicycle and pedestrian travel. They may provide: four or fewer lanes, moderate vehicle speeds, some to many street connections, few driveways, on-street parking, center median, high-quality transit service and amenities, pedestrian improvements and bike lanes or wide outside lanes.
- Urban Road – carry significant vehicle traffic while providing for some public transportation, bicycle and pedestrian travel. They may provide: four or more lanes, moderate vehicle speeds, some street connections, few driveways, on-street parking (rarely), center median for access management, transit through service, sidewalks and striped bikeways.

Regional Motor Vehicle System

The regional motor vehicle system functional classification designations as they relate to the City of Tualatin are summarized in Table 2-3.

TABLE 2-3
REGIONAL MOTOR VEHICLE SYSTEM

Street	From	To	Designation
Highway 99W	City Limit	City Limit	Major Arterial
Lower Boones Ferry Rd	Bridgeport Road	East City Limit	Major Arterial
Bridgeport Road	Lower Boones Ferry Rd	Upper Boones Ferry Rd	Major Arterial
Upper Boones Ferry Rd*	Boones Ferry Rd	North City Limits	Minor Arterial
Boones Ferry Rd	South City Limits	Upper Boones Ferry Rd	Minor Arterial
Nyberg St	Tualatin-Sherwood Rd	SW 65th Ave	Minor Arterial
SW 65th Ave	Nyberg St	Borland Road	Minor Arterial
Borland Road	SW 65th Ave	East City Limit	Minor Arterial
Tualatin Road	Boones Ferry Rd	SW 124th Ave	Collector of Regional Significance
Tualatin-Sherwood Road	Nyberg St	West City Limits	Minor Arterial
SW 124th Ave	Highway 99W	Tualatin-Sherwood Rd	Minor Arterial

* Upper Boones Ferry Road is included herein because it connects parts of the city of Tualatin; however, the street itself is in the City of Durham.

The concept for each of the motor vehicle system classifications noted above is summarized below:

- Major Arterial – serve as the primary links to the principal arterial system and provide general mobility for travel within the region. Freight movement should not be restricted on the principal arterial network. The principal and major arterial systems in total should comprise 5 – 10 percent of the motor vehicle system and carry 40 – 65 percent of the total vehicle miles traveled.
- Minor Arterial – complements and supports the principal and major arterial systems, but is primarily oriented toward motor vehicle travel at the community level connecting town centers, corridors, main streets and neighborhoods.
- Collector of Regional Significance – connect the regional arterial system and the local collector system by collecting and distributing neighborhood traffic to arterials.

Regional Public Transportation System

The regional public transportation system network as it relates to the City of Tualatin is summarized in Table 2-4.

TABLE 2-4
REGIONAL PUBLIC TRANSPORTATION SYSTEM

Street	From	To	Designation
Highway 99W	City Limit	City Limit	Regional Bus
Lower Boones Ferry Rd	Bridgeport Rd	East City Limit	Regional Bus
Bridgeport Rd	Lower Boones Ferry Rd	Upper Boones Ferry Rd	Regional Bus
Upper Boones Ferry Rd*	Boones Ferry Rd	North City Limits	Regional Bus
Boones Ferry Rd	Lower Boones Ferry Rd	South City Limit	Regional Bus
Borland Road	SW 65th Ave	East City Limit	Rapid Bus
Tualatin-Sherwood Road	Nyberg St	West City Limit	Regional Bus
Existing Rail Lines	Wilsonville	Beaverton	Commuter Rail
	Sherwood	Lake Oswego	Commuter Rail
I5/I205	East City Limit	Nyberg St	Rapid Bus

* Upper Boones Ferry Road is included herein because it connects parts of the city of Tualatin; however, the street itself is in the City of Durham.

The concept for each of the public transportation classifications noted above is summarized below:

- Commuter Rail – uses existing freight railroad tracks either exclusively or shared with freight use, for passenger service. Service is typically focused on peak commuter periods but can be offered other times of the day when demand exists and where rail capacity is available. The stations are typically located one or more miles apart, depending on the overall route length. Stations offer basic amenities for passengers, bus and LRT transfer opportunities and parking if supported by adjacent land uses.
- Rapid Bus – emulates LRT service in speed, frequency and comfort, serving major transit routes with limited stops.

- Regional Bus – is provided on most major urban streets. This type of bus service operates with maximum frequencies of 15 minutes with conventional stop spacing along the route.

Regional Freight System

The regional freight system as it relates to the City of Tualatin is summarized in Table 2-5.

TABLE 2-5
REGIONAL FREIGHT SYSTEM

Street	From	To	Designation
Highway 99W	City Limit	City Limit	Main roadway route
Tualatin Road	SW 124th Ave	Teton Ave	Road connectors
SW 72nd Ave	Lower Boones Ferry Rd	North City Limit	Road connector
SW 124th Ave	Highway 99W	Tualatin-Sherwood Rod	Road connector - Future
Tualatin-Sherwood Road	Nyberg St	West City Limit	Road connector
Existing Rail Lines	East City Limit	West City Limit	Branch railroad line and spur track
	North City Limit	South City Limit	Branch railroad line and spur track
Other Facilities	Two reload facilities along East/West rail line: - North side of Tualatin -Sherwood Road, west of Teton - 118th Ave		Reload facility
	One reload facility along North/South rail line – Oregon Transfer Company		Reload facility
	On truck terminal on North/South rail line at South city limit – Freight Systems, Inc.		Truck Terminal

The concept for each of the regional freight classifications noted above is summarized below:

- Main Roadway Route – connect major activity centers in the region to other areas in Oregon or states throughout the U.S., Mexico and Canada.
- Road Connectors – connect freight facilities or freight generation areas to the main roadway.
- Branch Railroad Lines – are Non-Class I rail lines, including shortline or branch lines.
- Reload facilities – serve as the primary gateway for freight entering and leaving the region by truck.
- Truck terminal – A facility that serves as a primary gateway for commodities entering/leaving the region by truck. A truck terminal operates only truck-to-truck transfers of commodities.

Regional Bicycle System

The regional bicycle system as it relates to the City of Tualatin is summarized in Table 2-6.

TABLE 2-6
REGIONAL BICYCLE SYSTEM

Street	From	To	Designation
Highway 99W	City Limit	City Limit	Regional Corridor
Lower Boones Ferry Rd	Boones Ferry Rd	East City Limit	Regional Corridor
Upper Boones Ferry Rd*	Boones Ferry Rd	North City Limit	Regional Corridor
Boones Ferry Rd	Upper Boones Ferry Rd	Tualatin River	Regional Corridor
	Tualatin River	Sagert Street	Regional Access
	Sagert Street	South City Limit	Regional Corridor
Sagert Street	Boones Ferry Rd	SW 65th Ave	Regional Corridor
Nyberg St	Eastside of I-5	SW 65th Ave	Regional Access
	Westside of I-5	Tualatin-Sherwood Rd	Regional Blvd
SW 65th Ave	Nyberg St	Sagert Street	Regional Corridor
Borland Road	SW 65th Ave	East City Limit	Regional Corridor
Tualatin Road	Boones Ferry Rd	Teton Ave	Regional Access
	Teton Ave	SW 124th Ave/99W	Community Connector
Teton Ave	Tualatin Rd	Avery Street	Community Connector
Avery Street	Tualatin-Sherwood Rd	Boones Ferry Rd	Community Connector
Tualatin-Sherwood Road	Nyberg St	Teton Ave	Regional Access
	Teton Ave	West City Limit	Regional Corridor
Tualatin River	East City Limit	West City Limit	Regional Corridor - Off-street

* Upper Boones Ferry Road is included herein because it connects parts of the city of Tualatin; however, the street itself is in the City of Durham.

The concept for each of the bicycle system classifications noted above is summarized below:

- Regional Access Bikeway – focuses on accessibility to and within the central city, regional centers and some of the larger town centers.
- Regional Corridor Bikeway – functions as longer routes, which provide point-to-point connectivity between the central city, regional centers and larger town centers.
- Community Connector Bikeway – connects smaller town centers, main streets, station areas, industrial areas and other regional attractions to the regional bikeway system.

Regional Pedestrian System

The regional pedestrian system as it relates to the City of Tualatin is summarized in Table 2-7.

TABLE 2-7
REGIONAL PEDESTRIAN SYSTEM

Street	From	To	Designation
Highway 99W	City Limit	City Limit	Transit/mixed use corridor
Boones Ferry Rd	Sagert Street	Tualatin Road	Transit/mixed use corridor
Tualatin Road	Boones Ferry Rd	Future Hall Blvd Extension	Transit/mixed use corridor
Future Hall Blvd Extension	Tualatin Road	Tualatin River (North City Limit)	Transit/mixed use corridor

The concept for the pedestrian system classification noted above is as follows:

- Transit/mixed use corridor – According to the RTP, Transit/mixed use corridors that are referred to as "corridors" in the 2040 Growth Concept are also high priority areas for pedestrian improvements. Project no. 6069, Hall Boulevard Extension, is proposed for between 2011 and 2020.

RTP Motor Vehicle Performance Measures Consistency

The RTP requires consistency with Table 1.2, Regional Motor Vehicle Performance Measures (shown as Table 2-8), or alternative performance measures as provided for in Section 6.4.7(1). The locations categories noted in the table are from Metro's Region 2040 Growth Concept.

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TABLE 2-8
REGIONAL MOTOR VEHICLE PERFORMANCE MEASURES

Location	Mid Day One-Hour peak			A.M./P.M. Two Hour Peak					
				Preferred Operating Standard		Acceptable Operating Standard		Exceeds Deficiency Threshold	
	Preferred Operating Standard	Acceptable Operating Standard	Exceeds Deficiency Threshold	1st hour	2nd hour	1st hour	2nd hour	1st hour	2nd hour
Central City Regional Centers Town Centers Main Streets Station Communities	C	E	F	E	E	F	E	F	F
Corridors Industrial Areas Intermodal Facilities Employment Areas Inner Neighborhoods Outer Neighborhoods	C	D	E	E	D	E	E	F	E
Highway 99E (1) (from the Central City to Highway 224 interchange)	C	E	F	E	E	F	E	F	F
Other Principal Arterial Routes	C	D	E	E	D	E	E	F	E
Areas of Special Concern	Areas with this designation are planned for mixed-use development, but are also characterized by physical, environmental or other constraints that limit the range of acceptable transportation solutions for addressing a level-of-service need, but where alternative routes for regional through-traffic are provided. Figures (within the RTP) define areas where this designation applies. In these areas, substitute performance measures are allowed by OAR.660.012.0060 (1)(d). Provisions for determining the alternative performance measures are included in Section 6.7.7 of this plan. Adopted performance measures for these areas are detailed in Appendix 3.3 [of the RTP].								

1. Level-of-service is determined by using either the latest edition of the Highway Capacity Manual (Transportation Research Board) or other volume-to-capacity ratio equivalencies as follows: LOS C = 0.8 or better; LOS D = 0.8 to 0.9; LOS E = 0.9 to 1.0; and LOS F =1.0 to 1.1. A copy of the level-of-service tables from the Highway Capacity Manual is shown in Appendix 1.6 [of the RTP].
2. Thresholds shown are for interim purposes only; refinement plans for these corridors are required in Chapter 6 of this plan, and will include a recommended motor vehicle performance policy for each corridor.

RTP Regional Non-SOV Modal Target Consistency

As noted earlier, the RTP requires that comprehensive plans be consistent with the policies, objectives, levels-of-service measures and modal targets of Chapter 1, including the regional non-SOV modal targets (shown in Table 2-9, below). These targets are intended to be goals. In order to be compliant, cities and counties must work toward these targets as they implement the 2040 Growth Concepts at the local level.

TABLE 2-9
2040 REGIONAL NON-SOV MODAL TARGETS

2040 Design Type	Non-SOV Modal target
Central City	60-70%
Regional Centers Town Centers Main Streets Station Communities Corridors	45-55%
Industrial areas Intermodal facilities Employment areas Inner neighborhoods Outer neighborhoods	40-45%

NOTE: The targets apply to trips to and within each 2040 Design Type. The targets reflect conditions appropriate for the year 2040 and are needed to comply with Oregon Transportation Planning Rule objectives to reduce reliance on single-occupancy vehicles.

Chapter 2 - 2020 Population and Employment Forecast:

The RTP requires consistency with the population and employment forecasts in Section 2.1 and 2.3, or alternative forecast as provided for in Section 6.4.9 of the RTP, but only for the purpose of TSP development and analysis. Table 2-10, below, shows the regional forecasts for population and employment. Table 2-11, on the following page, shows the population and employment forecasts for the South Washington County area.

TABLE 2-10
2020 POPULATION AND EMPLOYMENT FORECAST

	1994	2020	Percentage Change
Total Region (four county) (1)			
Population	1,552,673	2,348,945	+51%
Households	599,698	986,207	+64%
Employment	947,647	1,610,956	+70%
Intra Metro UGB (2)			
Population	1,142,463	1,666,636	+46%
Households	453,283	716,150	+58%
Employment	791,410	1,327,939	+68%

1. Includes Clark, Clackamas, Multnomah, and Washington counties
2. Within Metro urban growth boundary (excludes Clark County, Washington and areas of Clackamas, Multnomah, and Washington counties outside the Metro urban growth boundary)

TABLE 2-11
2020 POPULATION AND EMPLOYMENT FORECAST FOR SOUTH WASHINGTON COUNTY

Washington County Sub-area	Population			Employment		
	1994	2020	Increase	1994	2020	Increase
South Washington County	195,111	264,722	69,611 (+36%)	122,156	202,873	80,717 (+66%)

South Washington County includes: Beaverton, Tigard, Lake Oswego, Sherwood, Tualatin, Wilsonville, and Durham

RTP Chapter 6 - Implementation

Chapter 6 outlines the implementation strategy for the RTP. Section 6.2.2. recognizes that some regional TSP requirements will occur only through local implementation of RTP policies.

Section 6.4 Local Implementation of the RTP – This Section outlines the specific requirements for compliance by local governments. Key subsections are addressed below.

6.4.2 Local TSP Development – This section describes the relationship of local TSPs to the RTP and to the project-level planning required in Section 6.7.

6.4.3 Process for Metro Review of Local Plan Amendments, Facility and Service Plans – This section identifies procedures for Metro's review of local plans and plan amendments, and facility plans that affect regional facilities.

6.4.4 Transportation Systems Analysis Required for Local Plan Amendments – This section requires an analysis of transportation and land use strategies when a plan amendment or local study recommends or requires an amendment to the RTP to add significant single occupancy vehicle (SOV) capacity. For the purpose of this section, significant SOV capacity is defined as any increase in general vehicle capacity designed to serve 700 or more additional vehicle trips in one direction in one hour over a length of more than one mile. This section does not apply to plans that incorporate the policies and projects contained in the RTP.

6.4.5 Design Standards for Street Connectivity – The RTP does not provide for the design of local street connectivity, however, the RTP recognizes that local street connectivity impacts regional transportation systems. In response, the RTP outlines the following mapping requirements and design standards:

- Cities and Counties must identify all contiguous areas of vacant and redevelopable parcels of five or more acres planned or zoned for residential or mixed-use development and prepare a conceptual new streets plan map. The map should identify street connections to adjacent areas to demonstrate opportunities to extend and connect to existing streets and right-of-way routes. The map must be adopted as part of the TSP.
- Cities and Counties shall require new residential or mixed-use development that will require construction of new street(s) to provide a street map that:
    - Responds to and expands on the conceptual street plan map
    - Provides full street connections with spacing of no more than 530 feet between connections except where prevented by barriers.

- Provides bike and pedestrian connections on public easements or rights-of-way with spacing of 330 feet when full street connections are not possible.
- Limits the use of cul-de-sacs and other closed-end systems.
- Includes no closed-end streets longer than 200 feet, or with more than 25 dwelling units.
- Includes street cross-sections demonstrating dimensions of right-of-way improvements.

- Street design code language and guidelines must allow for consideration of narrow street design alternatives that feature total right-of-way of no more than 46 feet, including pavement widths of no more than 28 feet, sidewalk widths of at least 5 feet and landscaped pedestrian buffer strips that include street trees.
- For redevelopment of existing land uses that require construction of new streets, local approaches to encourage adequate street connectivity.

6.4.6 Alternative Mode Analysis – This section requires that improvements in non-SOV mode share be used as the key regional measure for assessing transportation system improvements in the central city, regional centers, town centers and station communities. Cities and counties are required to establish non-SOV regional modal targets for all 2040 design types that will be used to guide transportation system improvements. A key component of this analysis will be the establishment of an alternative mode share target (defined as non-single occupancy vehicle person-trips as a percentage of all person-trips for all modes of transportation) in local TSPs for trips into, out of, and within all 2040 Growth Concepts land-use design types within its boundaries. This alternative mode share target may be no less than the regional modal targets for the 2040 Growth Concept land use design types in the RTP.

6.4.7 Motor Vehicle Congestion Analysis – Motor Vehicle Level-of-Service (LOS) is a measurement of congestion as a share of designated motor vehicle capacity of a road. Policies within the RTP establish motor vehicle level-of-service policy for regional facilities which must be incorporated within local comprehensive plan and implementing ordinances. To demonstrate local compliance with this policy, an analysis shall identify when congestion on local roads reaches the "exceeds deficiency threshold" column of Table 1.2 (NOTE: included as Table 2-8, herein). Then the jurisdiction should evaluate the impact of the congestion on regional accessibility. If it appears that the congestion will impact regional transportation, then the jurisdiction should amend transportation plans to be consistent with the identified function and capacity of the road.

6.4.8 Future RTP Refinements Identified through Local TSPs – This section identifies the process through which local TSPs can inform the RTP.

6.4.9 Local 2020 Forecast – Options for Refinement – This section recognizes that local TSPs using the 2020 forecasts may experience different modeling outcomes and identifies acceptable options.

6.4.10 Transit Service Planning – This section requires that cities and counties:

1. Adopt a transit system map, consistent with the transit functional classifications as part of the local TSP.

2. 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).

3. Consider designating pedestrian districts in a comprehensive plan or other implementing land use regulations as a means of meeting or exceeding the requirements of OAR 660-012-0045 (4a-c) and this plan section 6.4.10(2) above.

Pedestrian district designation shall address the following criteria:

- A connected street and pedestrian network, preferably through a local street and pedestrian network plan covering the affected area.
- Designated pedestrian districts should specifically consider, but are not limited to these elements: Transit/pedestrian/bicycle interconnection; parking and access management; sidewalk and accessway location and width; alleys; street tree location and spacing; street crossing and intersection design for pedestrians; street furniture and lighting at a pedestrian scale; and traffic speed. When local transportation system plans are adopted, designated pedestrian districts should be coordinated with the financing program required by the Transportation Planning Rule.

4. Provide for direct and logical pedestrian crossings at transit stops and marked crossings at major transit stops.

5. Consider street designs, which anticipate planned transit stop spacing, location, and facilities (such as shelters, benches, signage, passenger waiting areas) and are consistent with the Creating Livable Streets design guidelines.

Section 6.7 Project Development and Refinement Planning – This section addresses the role of the RTP and the decision to proceed with project development, including specific corridor refinement studies and specific corridor studies.

Section 6.7.4 Specific Corridor Refinements – This section includes design elements that must be considered when specific projects are developed. Specific design elements are identified for the I-5 to 99W connector.

The RTP identifies that an improved regional connection between Highway 99W and I-5 is needed near Tualatin to accommodate regional traffic, and to move it away from the Tualatin, Sherwood and Tigard town centers. This connection will have significant effects on urban form in this rapidly growing area, and the following design considerations should be addressed in a corridor plan:

- Balance improvement plans with impacts on Tualatin and Sherwood town centers and adjacent rural reserves .
- In addition to the northern alignment considered in the Western Bypass Study, examine the benefits of a southern alignment, located along the southern edge of Tualatin and Sherwood, including the accompanying improvements to 99W that would be required with either alignment.
- Identify parallel capacity improvements to Tualatin-Sherwood Road and 99W in Tigard from I-5 to Highway 217 that could be used to phase in, and eventually complement future highway improvements.
- Link urban growth boundary expansion in this area to the corridor plan and examine potential the proposed highway to serve as a "hard edge" in the ultimate urban form of the Sherwood area.
- Develop an access management and connectivity plan for 99W in the Tigard area that balances accessibility needs with physical and economic constraints that limit the ability to expand capacity in this area.
- Consider express, peak-period pricing, and HOV lanes.

Section 6.7.5 Specific Corridor Studies – This section provides specific consideration that must be considered in selected corridor studies, including the study proposed for the Interstate 5 South (Highway 217 to Wilsonville) corridor.

Interstate 5 serves as the major southern access to and from the central city. The route also serves as an important freight corridor, and provides access to Washington County via Highway 217. Projections for this facility indicate that growth in traffic between the Metro region and the Willamette Valley will account for as much as 80 percent of the traffic volume along the southern portion of I-5, in the Tualatin and Wilsonville area. For this reason, the appropriate improvements in this corridor are unclear at this time. However, I-5 serves as a critical gateway for regional travel and commerce, and an acceptable transportation strategy in this corridor has statewide significance. A major corridor study is proposed to address the following issues:

- the effects of peak period congestion in this area on regional freight mobility;
- the ability of inter-city transit service, to/from neighboring cities in the Willamette Valley, including commuter rail, to slow traffic growth in the I-5 corridor ;
- the ability to maintain off-peak freight mobility with capacity improvements;
- the potential for better coordination between the Metro region and valley jurisdictions on land-use policies; and
- the effects of a planned long-term strategy for managing increased travel along I-5 in the Willamette Valley.

In addition, the following design elements should be considered as part of the corridor study:

- peak period pricing and HOV lanes for expanded capacity;
- provide rapid bus service on parallel Barbur route, connecting Wilsonville to the central city;
- provide additional overcrossings in West Portland town center to improve local circulation and interchange access;
- add capacity to parallel arterial routes, including 72nd Avenue, Boones Ferry, Lower Boones Ferry and Carmen Drive;
- add overcrossings in vicinity of Tigard Triangle to improve local circulation; and
- extend commuter rail service from Salem to downtown Portland, Tualatin, and Milwaukie, primarily along existing heavy rail tracks.

Areas of Special Concern

Highway 99W Area of Special Concern

The RTP designates the Highway 99W corridor between Highway 217 and Tualatin Road as a mixed-use corridor in the 2040 Growth Concept. This corridor is also designated as an area of special concern due to existing development patterns and economic constraints that limit adding capacity to address heavy travel demand in this corridor. Local planning studies have found that approximately 50% of the traffic using this corridor is local. The Regional Transportation Plan (RTP) establishes the proposed I-5 to 99W connector as the principal route connecting the Metro region to the 99W corridor outside of the region as an alternative to Highway 99W. Chapter 6 of the RTP addresses the refinement plan for this specific area of concern.

Tualatin Town Center Area of Special Concern

According to the RTP, analysis of travel demand on regional streets in this area shows that several streets continue to exceed the established LOS policies, including Hall Boulevard and Boones Ferry Road.

RTP Alternatives and Projects

The RTP's "2020 Preferred System" includes all of the projects and programs needed to address the impacts of future growth on the regional transportation system, including a new I-5 to 99W Connector. The RTP found that a southern alignment of the I-5 to 99W connector is expected to experience higher traffic volumes than the northern alignment, and the northern alignment is expected to cause significant congestion on 99W in Sherwood. The RTP goes on to recommend an expanded major investment study to further explore I-5 to 99W connector options. The Preferred System also addresses improvements to the Tualatin Town Center and adjacent industrial area. The RTP found that localized congestion is expected to occur in the vicinity of the I-5/Nyberg Road interchange. Hall Boulevard and Boones Ferry Road are also expected to experience significant congestion entering the town center. Rapid bus service on Hall Boulevard is expected to generate good ridership.

The RTP also includes a "2020 Strategic System" which identifies projects and programs based on expected transportation funding shortfalls. The Strategic System includes the following projects listed below that affect the City of Tualatin. The RTP lists all of these projects under the general

heading of "Tualatin Town Center"; however, not all of the projects are located within the town center boundary.

Tualatin Town Center

2000 - 2005

Project #6066 I-5 Interchange Improvement – Widen the Nyberg Road over-crossing to four lanes and widen the southbound off-ramp from I-5 to Nyberg Road to limit congestion and improve traffic flow. This project includes sidewalks along the over-crossing.

Project #6070 Lower Boones Ferry Improvements – Retrofit the street from Boones Ferry Road to Bridgeport to include bike lanes, sidewalks and interconnected traffic signals.

Project #6072 Tualatin Road Improvements – Widen the street from 115th Avenue to Boones Ferry Road to include sidewalks, bike lanes and safer railroad crossings.

Project #6079 Tualatin Town Center Pedestrian Improvements – Retrofit the streets within the town center to include better sidewalks and street crossings, lighting, curb extensions, bus shelters and benches. Streets included in this project are Nyberg Road, Boones Ferry Road, Tualatin Road, Tualatin-Sherwood Road, Sagert Street and intersecting neighborhood streets.

Project #6080 Tualatin River Pedestrian Bridge – Construct a cantilevered pedestrian and bicycle multiuse path on railroad trestle across the Tualatin River from Durham City Park to Tualatin Community Park.

Project #6081 Nyberg Road Pedestrian and Bike Improvements – Retrofit the street from 65th Avenue to I-5 to complete sidewalks and bicycle facilities.

Project #6082 Tualatin Freight Access Plan – Develop an interim freight circulation plan for the Tualatin industrial area to address traffic congestion and freight access issues in the Tualatin-Sherwood Road corridor.

2006 – 2010

Project #6067 Boones Ferry Road Improvements – Widens street to three lanes from Durham Road to Elligsen Road in Wilsonville. This project includes completion of sidewalks and bikeways.

Project #6071 Tualatin-Sherwood Road Improvements – Widen the street to five lanes from 99W to Teton Avenue. This project includes bike lanes, sidewalks and traffic signal modifications at Oregon and Cipole streets.

Project # 6073 124th Avenue Improvements – Construct a new three-lane street from Tualatin Road to Tualatin-Sherwood Road to improve access to the industrial area. This project includes bikeways and sidewalks.

Tualatin Town Center (cont'd.)

2011 – 2020

Project #6069 Hall Boulevard Extension – Construct a two-lane extension of the street from Durham to Tualatin Road. This project crosses the Tualatin River and includes sidewalks and bikeways.

Project #6077 Tualatin-Sherwood Road Bikeway – Retrofit the street from I-5 to Boones Ferry Road to include bike lanes.

Project #6078 Boones Ferry Road-Martinazzi Bike/Ped Path – Construct a new multiuse path for use by bicyclists and pedestrians from Boones Ferry Road to Martinazzi Street.

Regional Trails

2000 – 2005

Project #6007 Fanno Creek Greenway Extension – Plan and design a multi-use path from Tigard to Tualatin.

Regional Highways

2006 - 2010

Project #6005 Tualatin-Sherwood Connector – Construct a four-lane tollway connection from I-5 to 99W. This project would be designed to have limited access. Final alignment of the project will be determined based on recommendations from a study.

Regional Transit

2000 - 2020

Project #6000 Beaverton-Wilsonville Commuter Rail – Provide new peak-hour commuter rail service from Wilsonville to Beaverton.

Project #6003 Tualatin-Portland Commuter Rail Extension Study – Study to extend commuter rail service from Tualatin to Union Station via Lake Oswego and Milwaukie. This project uses existing tracks.

Project #6006 Transit Station and Park-and-Ride Lot Upgrades – Construct, expand and/or upgrade transit stations and park-and-ride lots throughout the subarea, including Tualatin, Washington Square, Sherwood, Lake Oswego, Lake Grove, King City, Murray/Scholls and Wilsonville.

2000 – 2005

Project #6064 Hall Boulevard Frequent Bus – Provide improvements that enhance frequent bus service between Tualatin, Tigard, Beaverton and Sunset transit centers.

2.4 TRI-MET

2.4.1 Transit Choices for Livability

Between 1996 and 1998, Tri-Met's Transit Choices for Livability (TCL) Regional Advisory Committee, composed of representatives of a variety of neighborhood residents, citizen groups, business, and local governments, conducted a series of workshops throughout the Portland region. These workshops were intended to answer three questions:

- What service improvements do residents want implemented during the next 10 years?

- What are the characteristics of community transit: who plans and decides what service should look like, and who operates it?
- How can the region pay for these improvements?

The process identified a number of service improvements within Tualatin. These improvements were categorized into short-term (1-5 year) and mid-term (5-10 year) timeframes, and annual operating costs were estimated for each improvement. These costs do not include capital costs, such as new bus purchases, required to start a particular service. Tri-Met has not yet committed to implementing these improvements. Desired service improvements consisted of the following.

1-5 Years

- **Tualatin-Sherwood.** New service connecting Tualatin and Sherwood ($800,000 annual operating cost).
- **Tualatin-Oregon City.** New service in the I-205 corridor connecting Tualatin and Oregon City ($200,000).
- **Beaverton-Washington Square-Tigard-Tualatin.** Rapid bus or commuter rail service between these communities, with an extension to Wilsonville. ($1,000,000). (Rapid bus service is bus service that emulates light rail service at a lower cost, with long station spacings, transit priority treatments, distinctive vehicles, and improved station amenities.)
- **Highway 99W.** New rapid bus service in the Highway 99W corridor between Sherwood and Portland ($450,000).
- **Amenities.** Shelters, customer information, and pedestrian connections to transit are a high community priority needing short-term attention.

5-10 Years

- **Tualatin-Lake Oswego Neighborhoods.** New service between Tualatin and Lake Oswego via Lake Grove ($385,000).
- **King City-Tigard-Tualatin Neighborhoods.** New local (minibus) service between King City, Tigard, and Tualatin, including Durham Road and Meridian Park Hospital ($385,000).
- **Improve Existing Tri-Met Routes.** Frequency and service span improvements on Routes 36 (South Shore), 37 (North Shore), and 38 (Boones Ferry Road), and on Route 96 (Tualatin I-5) south of downtown Tualatin ($1,300,000; includes improvements on two routes outside Tualatin).

2.5 CLACKAMAS COUNTY

2.5.1 Clackamas County Urban Area Transportation System Plan

The Clackamas County Urban Area Transportation System Plan was adopted in 2000. The Plan describes the County's functional classification for roads. These classifications include the

following: Freeway/Expressway, Major Arterial, Minor Arterial, Collector, and Connector. Clackamas County owns the following roads in the City of Tualatin:

- Borland Road
- SW 65th Avenue (NOTE: in both Clackamas and Washington Counties, but Clackamas defers to Washington County for maintenance)
- Lower Boones Ferry Road, northeast of McEwan Road.

The County Transportation Plan classifies Lower Boones Ferry Road as a Major Arterial and Borland Road as a Minor Arterial. The County Plan describes Major Arterials as carrying local and through traffic to and from destinations outside of local communities and connecting cities and rural centers. They carry moderate-to-heavy volumes and have moderate-to-high speeds. Minor Arterials are described as connecting collectors to higher order roadways. They carry moderate volumes at moderate speeds.

The 20 Year Capital Improvement Needs section of the Transportation Plan does not contain any projects within Tualatin; however, the Planned Bikeway Network section of the Plan does include a proposed bikeway along Borland Road and SW 65th Avenue in Tualatin.

2.5.2 Clackamas County Comprehensive Plan and Map

The current Comprehensive Plan was adopted in 1992, and includes numerous goals and policies, as well as a Plan Map that shows land uses for the unincorporated portions of Clackamas County. The Plan is composed of eleven chapters including transportation. Generally, each chapter includes a list of issues, a summary of findings and conclusions, a list of goals, and a list of policies.

Transportation - Roadways

Goal

Provide for the safe, efficient, convenient and economical movement of vehicles while minimizing environmental degradation and conserving energy.

Policies

3.0 Encourage a relationship between land use and roadways, which decreases average trip length.

16.0 Plan and control access onto roads within the County, for both new and existing uses, and coordinate with the Oregon Department of Transportation for access control on state highways.

26.0 Establish... long range policies for urban arterials.

2.5.3 Clackamas County Bicycle Master Plan, 1996

The Bicycle Master Plan is part of the County Transportation System Plan and updates the County's Comprehensive Plan. The Plan provides policy, planning and implementation direction for bicycle transportation in unincorporated Clackamas County.

A bikeway is defined as any road, path, or way which in some manner is open to bicycle travel, whether it is designated for the exclusive use of bicycles or are shared with other transportation modes.

Goals

- Provide a County-wide safe and convenient network of accessible bikeways integrated with other transportation modes.
- Integrate bicycle facilities into all planning, design, and construction activities.

Objectives and Strategies

1.1 Provide a networked grid of bikeways connecting neighborhoods, transit stops, commercial areas, community centers, schools, parks, libraries, churches, day care centers, employment places, other major destinations, regional bikeways, and other transportation modes.

2.3.3 Coordinate recommended bicycle system needs with roadway improvement projects to take advantage of cost-sharing opportunities.

2.5.4 Clackamas County Pedestrian Master Plan, 1996

The Pedestrian Master Plan is part of the County Transportation System Plan and updates the County's Comprehensive Plan. The purpose of the plan is to focus on promoting walking for transportation purposes in Clackamas County. The vision of the plan is to "create an environment which encourages people to walk in a networked system that facilitates and promotes the enjoyment of walking as a safe and convenient transportation mode."

Goals

1.0 Provide a county-wide safe and convenient network of pedestrian routes and access integrated with other transportation modes.

2.0 Integrate pedestrian facilities into all planning, design, and construction activities.

Objectives and Strategies

1.1 Provide a networked grid of walkways connecting neighborhoods, transit stops, commercial areas, community centers, schools, parks, libraries, churches, day care centers, employment places, other major destinations, regional walkways, and other transportation modes.

1.1.5 Encourage plans to support compact, mixed land use development.

2.3.3 Coordinate recommended pedestrian system needs with roadway improvement projects to take advantage of cost-sharing opportunities.

2.5.5 Clackamas County Capital Improvement Plan (1998-2003, 1998-2018)

Clackamas County's plan consists of a five-year transportation funding program, and a twenty-year long-range transportation plan. No improvements are identified to County roads within Tualatin under either plan. East of Tualatin, the Borland Road/Stafford Road intersection (Wankers Corners) is identified for signalization and left-turn lanes in the five-year future. However, only $500,000 in County System Development Charge funds are committed to this project, leaving an estimated $1,000,000 shortfall. In the twenty-year future, Stafford Road is identified to be reconstructed and widened between I-205 and Rosemont Road, at an estimated cost of nearly $5 million.

2.6 WASHINGTON COUNTY

Washington County owns the following roads in the City of Tualatin:

- Tualatin-Sherwood Road and Nyberg Street west of SW 65th Avenue, except for the I-5 interchange
- Cipole Road
- Lower Boones Ferry Road, southwest of the I-5 interchange
- Bridgeport Road
- McEwan Road
- Norwood Road
- Helenius Road
- Grahams Ferry Road
- SW 108th Avenue (between SW 105th Avenue and Helenius Road)
- Pacific Drive
- SW 65th Avenue (NOTE: in both Clackamas and Washington Counties, but Clackamas defers to Washington County for maintenance)

2.6.1 Washington County Transportation Plan, 1988

Washington County is currently in the process of updating its transportation system plan. The technical work is scheduled to be completed by June 2001. Coordination between that project and the Tualatin TSP planning process has occurred throughout the development of both plans. The County also has an adopted Bicycle Plan, which was prepared with a 1993-95 Transportation Growth Management (TGM) grant and a Pedestrian Plan, which was prepared with a 1995-97 TGM grant. The County is scheduled to update and adopt these plans as part of its current TSP planning effort. In addition the County has received grants for Local Street Design standards and Local Street Connectivity plans and standards. The current Washington County Transportation Plan was completed in 1988. It identified several transportation options for the County based on expected levels of demand and land use patterns.

Roads

The Washington County TSP identified (in 1988) areas in the County that contain decreased levels-of-service. Roads in Tualatin were not identified as roads with decreased levels-of-service until the County reached a "No build" scenario in 2005.

Transit

The TSP identified a proposed park-and-ride lot in Tualatin located off of Avery Street (page 27).

Demand Management

Demand management techniques focus on reducing the number of vehicles on the road. The TSP identified an area just west of Tualatin as a "proposed demand management area" (page 30). The

demand management programs include providing information to employers on ridesharing programs, encouraging varied work hours and providing bicycle and pedestrian facilities (page 30).

Bicycles and Pedestrians

The TSP identified several bicycle route systems in the City of Tualatin. An on-street route was proposed and an off-street route was proposed for the area just west of Tualatin. The on-street route was identified as all streets classified as arterials.

2.6.2 Major Streets Transportation Improvement Program (MSTIP) 3

Washington County's Major Streets Transportation Improvement Program (MSTIP) funds major capital projects within the County. The program is currently in its third round, with projects funded through the 2006-07 fiscal year. The program was originally a serial property tax levy, requiring voter approval for each round of projects. However, as a result of Measure 50, which was passed by Oregon voters in 1998, it is now part of the County's permanent tax rate. Historically, MSTIP projects have been on County facilities, but the next round of projects may include state highway and transit projects, as discussed below.

The MSTIP 3 program includes two projects in Tualatin:

- **Lower Boones Ferry Road**, between Bridgeport Road and Boones Ferry Road. This project, scheduled for 2005, will provide a three-lane cross-section throughout this section of road, sidewalks, bicycle lanes, street lighting, and intersection improvements. The estimated project cost is $5.8 million.
- **Tualatin Road**, between SW 115th Avenue and Boones Ferry Road, was reconstructed in 2000, including center turn lanes, sidewalks, bicycle lanes, street lighting, and some intersection improvements. The estimated project cost was $8 million.

The County is currently considering extending the MSTIP program through the 2010-11 fiscal year. One of the projects proposed to be included is $35 million towards a Wilsonville-Beaverton commuter rail line, with the remaining $40 million coming from state and federal sources. In order to meet a 2002 construction schedule, the County would bond the commuter rail funding, to be paid back from property tax revenue in the 2006-11 timeframe.

The commuter rail line would operate along the north-south Portland & Western railroad line, with stations in Wilsonville, Tualatin (near the Boones Ferry Road/Nyberg Street intersection), Tigard Transit Center, the Washington Square area, and Beaverton Transit Center, where connections to MAX could be made. A small (100-150 space) park-and-ride lot would be provided to serve the Tualatin station. The 1997 Washington County Interurban Rail Final Report estimated 370 daily boardings at Tualatin at start-up, and 470 daily boardings by 2015. For comparison, approximately 417 daily inbound (towards Portland) boardings currently occur at the south Tualatin Park & Ride stop. Travel time from Tualatin to Beaverton is estimated to be approximately 17 minutes.

2.7 NEIGHBORING CITIES

2.7.1 City of Tigard Transportation System Plan, February 2000 (Draft)

The City of Tigard is located north of the City of Tualatin. The cities are connected along several major highways, including I-5 and Highway 99W. The two jurisdictions also share portions of Boones Ferry Road.

Tigard's TSP references the high levels of traffic along Highway 99W—with traffic levels along the southern edge of Tigard reaching 33,000 vehicles per day (page 3-21). Highway 99W is heavily signalized within the City of Tigard, with the majority of the intersections functioning at acceptable levels of service. One intersection, located at Highway 99W and Gaarde Street, towards the southern edge of Tigard is functioning at level of service (LOS) "E", which is generally an unacceptable level-of-service (page 3-22). The TSP identifies Highway 99W as a transportation quandary—Tigard's reliance on Highway 99W as a local road coupled with its increasing levels of traffic and commercial uses create a future demand for the corridor in excess of its current five-lane capacity (page 8-34). The TSP evaluated ten different road improvement options for this corridor, however, no one option was chosen. The majority of the options identified widened Highway 99W to ten lanes in some locations—making it difficult to provide any pedestrian connectivity in the area (page 8-34).

Aside from motor vehicle traffic, Tigard's transportation issues also identify a need for increased pedestrian connectivity and bicycle routes within the City along routes shared by Tualatin. In response to these problems, the TSP identified several potential capital improvement projects to address these needs. These projects include:

- Limited pedestrian projects along Highway 99W;
- An interest in developing bicycle connections to connect to a regional bicycle network by way of Tualatin; and
- Interest in commuter rail and increased bus/transit service as per the Beaverton/Wilsonville Commuter Rail project.

2.7.2 City of Lake Oswego Transportation System Plan, July 1997

The City of Lake Oswego is located northeast of the City of Tualatin. The two cities are connected by I-5 and SW [Lower] Boones Ferry Road (NOTE: referred to as Boones Ferry Road in the Lake Oswego TSP). Lake Oswego completed a revision to their Transportation System Plan in 1997. The TSP mentions one option for increased shuttle service to the Tualatin Park-and-Ride (p. 3-23).

2.7.3 City of Sherwood Transportation System Plan, April 1998 (Draft)

The City of Sherwood is located west of the City of Tualatin. Several main roadways are shared by the cities; these include Tualatin-Sherwood Road and Pacific Highway (99W). In its TSP, the City of Sherwood cites statistics which note that expected job growth along Highway 99W and Tualatin-Sherwood Road would increase traffic along these major routes (p. 2-4).

The Sherwood TSP includes the following recommended improvements (p. 5-7 to 5-8):

- Widen Tualatin-Sherwood Road from three lanes to five from Borchers to the east UGB.
- Widen Highway 99W to six lanes the entire length from the northeast UGB to the southwest UGB.
- Add parallel capacity to Highway 99W and increase local city circulation.
- Improve vertical alignment and width, and add pedestrian and bicycle facilities on Cipole Road from the UGB to Tualatin-Sherwood Road.

There are two providers of intercity fixed-route transit in Sherwood at the present time—YAMCO and Tri-Met. The TSP noted that Tri-Met is researching the option of providing intercity bus services between Sherwood and Tualatin (p. 2-12).

2.7.4 City of West Linn Transportation System Plan, April 2000 (Final)

The City of West Linn is located northeast of Tualatin. Interstate 205 and Borland Road are the primary roads that connect the two jurisdictions. In the Assessment of Need section of its TSP, the City notes that "Forecasts for I-205 show a 70 percent increase in traffic volumes during the peak afternoon hour compared to today's volumes," with spillover occurring onto Borland Road and Willamette Falls Drive. The report identifies several improvements to I-205 that would not impact traffic within the City of Tualatin.

2.7.5 City of Durham Comprehensive Plan, 1995 (Adopted)

The City of Durham is located north of the City of Tualatin. It is connected to Tualatin by SW Boones Ferry Road, which splits into Upper and Lower Boones Ferry Roads. Upper Boones Ferry Road continues north through Durham to the City of Tigard while Lower Boones Ferry Road heads northeast to connect with SW 72nd Street and the Bridgeport/I-5 intersection. These roads are the only arterials within Durham and are largely dependent on the plans of other agencies.

The City has not completed a TSP; therefore, the City's Comprehensive Plan has been used to gauge the City's transportation policies. The Plan notes both Tualatin and Tigard are "substantial traffic generators." The Plan also notes that both Tigard and Tualatin have adopted land use plans "... which will require substantial improvement to accommodate the anticipated traffic. In order to alleviate traffic pressure on Upper Boones Ferry Road, a unified transportation network should be developed for the area." (p. 35). The Plan further notes that existing transportation facilities would require extensive upgrading in order to accommodate the anticipated traffic (p. 35) and that these upgrades would most likely occur on Lower Boones Ferry Road.

The City of Durham has also expressed concern regarding a consistent classification of Bridgeport Road. Currently, Tualatin classifies Bridgeport Road as a Minor Arterial and Durham's Comprehensive Plan classifies it as a Major Collector. Washington County, who owns the facility, classifies it a Major Arterial. Durham's Major Collector criteria reference a design that would accommodate up to 12,000 vehicle trips per day with speeds between 25 and 35 miles per hour. Durham's cross-section for a Major Collector fits in a 60-foot right-of-way, with a paved width of 42 feet and 6-foot sidewalks abutting the curb on both sides. Bridgeport Road has been developed to its planned cross-sectional width in Durham.

2.7.6 City of Wilsonville Transportation System Plan (Ongoing)

The City of Wilsonville is located south of Tualatin. The City has been involved in a multi-year TSP planning process. Key issues include the impact of siting a new state correctional facility at Day Road, studying a possible interchange at Boeckman Road, and evaluating the impacts of the Highway 99 Bypass Road.

2.8 CITY OF TUALATIN

2.8.1 Tualatin Development Code

The Tualatin Development Code is divided into three parts: the Community Plan, the Urban Renewal Plan, and the Planning District Standards. The current transportation policies and standards are summarized below.

2.8.2 Tualatin Community Plan

Chapters 1, 3, 4, 7, 9 and 11 of the Tualatin Community Plan include transportation-related definitions, background information and policies. These are summarized below.

Chapter 1—Definitions

There are two definitions included in this Chapter that are particularly pertinent to transportation:

> Multi-Mode Transportation: A mix of transportation forms usually integrated as a system.
>
> Transportation Mode: A form of transportation such as the automobile mode, bus mode, light rail mode, etc.

Chapter 3—Technical Memoranda. Section 3.080 Public Facilities and Services (1) Transportation

This section of the Community Plan summarizes the transportation planning work done for the preparation of the Community Plan in the 1970s. A major street inventory was completed for the preparation of the Community Plan, which identified the number of travel lanes, right-of-way width on major streets, and street capacity using levels of service "A" to "F". At that time, the only street with significant capacity deficiencies was Nyberg Street. Tri-Met served the City of Tualatin with two bus lines (#37 and #38) and expected to have several additional public transportation options including express bus service and light rail transit by 1990. An employee survey indicated that 90% of all employees drove to and from work and only about 12% of those working in Tualatin lived in Tualatin.

Chapter 4—Community Growth

Section 4.030, Buildable Lands Development Constraints, identified traffic congestion as a constraint to development of vacant/buildable lands. It is suggested that it is likely that Tualatin will be dependent upon the automobile as its major form of transportation in the year 2000. A traffic analysis completed as a part of the planning process indicated that the "...City could not accommodate all the traffic generated by full development of the planning area, particularly in the Nyberg Street Corridor connected to the interstate freeways."

In Chapter 4, Community Growth, the City suggests that "Traffic congestion and the ease of providing water and sewer services will constrain the amount and direction of growth within the planning area." Additionally, several of the City's General Growth Objectives (Section 4.050) establish objectives, which discuss transportation policies for the City. Objective 16 of the City's General Growth Objectives encourages energy conservation by arranging land uses in a manner compatible with public transportation objectives. Objective 18 states that the Plan will "Fully develop the industrial area located in Washington County west of the City only when adequate transportation facilities are available and the area has been annexed to the City and served with water and sewer service." Objective 20 states that the City will work with Washington County to study the methods available for providing transportation and utility services to the area west of the City which would be designated as a special study area.

Chapter 7—Manufacturing Planning Districts

Chapter 7 notes that Tualatin's access to regional and local transportation road systems (including Interstate 5, Interstate 205, and Highway 217, as well as two railroads, the Burlington Northern and the Southern Pacific) have created a favorable environment for industrial development.

Recent trends have been to develop more inexpensive land within Washington County outside of the boundaries of Tualatin. This will affect Tualatin's future industrial development, as the traffic from these developments must use the City's Nyberg Street/Tualatin Sherwood Road corridor to reach Interstate 5. "As stated in the Transportation Plan, additional transportation access must be developed to minimize the effect of industrial development west of Tualatin." The City suggests that development of the I-5/Norwood Road interchange would minimize this traffic.

Additional industrial growth west of the City could eventually place the City's roadway system at capacity before it has developed its proportionate share of industrial land, making it difficult to develop the remainder of the City's land. Areas west of the City within Washington County are slated to become part of the City of Tualatin if the transportation access issues can be solved.

Industrial traffic in Tualatin's central industrial area must travel through downtown or on Cipole Road to travel from southern to northern industrial areas. To alleviate this, the Transportation Plan proposes a new north-south corridor through the central industrial area in the 102nd and 104th corridor. The City has also created local improvement districts.

The Industrial Planning Area is served by Pacific Highway (Highway 99W) as a direct route to Portland. It is also connected directly by Tualatin-Sherwood Road, and indirectly by Tualatin Road and Herman Road, to Interstate 5 with direct ties to the east via Interstate 205. It also contains rail access from two railroad lines.

An objective of the Industrial Planning Area is to "... Fully develop the Western Industrial District, providing full transportation, sewer and water services prior to or as development occurs." A second objective is to improve traffic access to the Western Industrial District from the Interstate 5 freeway through a new interchange at Norwood Road or a suitable and adequate alternative. Additional objectives to improve transportation for the District include: construction of a north/south major arterial street between Tualatin Road and Tualatin-Sherwood Road in the 124th Avenue alignment to serve the industrial area; rebuild the Tualatin Road/Pacific Highway to serve the industrial area; and provide truck routes for industrial traffic that provide for efficient movement of goods while protecting the quality of residential areas.

Chapter 9—Plan Map

Chapter 9 includes the Plan Map classification of planning district boundaries and descriptions of the land uses in each plan area. One relevant section of the Tualatin Design Type Boundaries for transportation issues includes a definition for Rural Reserves and Green Corridors. The City recognizes that these corridors, as described in the Metro 2040 Growth Concepts, are critical to interurban connectivity. Section 9.025 states that if the City, at some future date, annexes an area that includes a green corridor, it will take steps to do the following:

- Allow access to the green corridor in a controlled manner to maintain the function, capacity and level-of-service to the transportation facility and to enhance safety and minimize development pressures on rural reserve areas.
- Provide appropriate vegetative screening and buffering of adjacent development and limit signage in such a way as to maintain the rural character of the green corridor.

Chapter 11—Transportation

This Chapter was amended in 1993 to address amendment to the "Tualatin Public Facilities Plans, Transportation" section and the requirements of the State's Transportation Planning Rule. This updated noted the following transportation issues:

- poor access from I-5 and I-205 to the industrial areas located in the western part of Tualatin and farther west in the Sherwood area;
- poor north/south access through the western portion of the City's industrial area;
- poorly designed streets and inadequate street rights-of-way for street improvements;
- heavy truck traffic in certain residential areas;
- a lack of transit service both to downtown Portland and to Westside suburban locations;
- a lack of bike and pedestrian connections; and
- a lack of funding to help alleviate these problems.

The Transportation Chapter goes on to address some of the possible explanations for these transportation problems. It establishes general assumptions about development, transit service, transportation facilities, travel patterns and demand that were used to guide the transportation planning effort. Section 11.030 of Transportation Chapter establishes thirty-six objectives for Transportation Plan. These address the City's desire to "...provide a system of streets, pedestrian and bicycle facilities, and other forms of transportation which will link the community, and will safely, efficiently, and economically move vehicles, pedestrians, and bicyclists to and through the area when it is fully urbanized," as well as a number of other objectives.

Section 11.050 establishes the following general Functional Street Classifications within the City of Tualatin: Freeway, Expressway, Arterial Street, Collector Street (major and minor), Local Street (residential and commercial/industrial), Cul-de-Sac Street, and Truck Routes. Section 11.060 goes on to establish standards for each of the street classifications noted above that address function, design, carrying capacity, and access. Specific standards are also provided for sidewalks and intersection and driveway sight distances. Sidewalk widths range from six feet on residential collectors to ten feet on commercial arterials. The City's current functional classification map can be found later in this TSP as Figure 3-10.

The street classifications are defined as follows:

Arterial Street. The primary function of an arterial street is to provide for the movement of vehicular traffic movement between areas and across portion of a city or region, direct service to principal generators, and connect to the freeway-expressway system. A secondary function is the provision of direct access to abutting land. Typical regulations for these streets address standards for parking, turning movements, entrances, exits, curb uses as well as access control. Traffic volumes generally range between 5,000 and 35,000 vehicles per weekday.

Collector Street. The primary function of a collector street is to conduct traffic between arterial streets, activity centers and neighborhoods. It is a principal traffic carrier within a neighborhood and also provides access to abutting land. The average weekday volume may range between 2,000 and 8,000 vehicles per day. Collector streets consist of Major Collectors and Minor Collectors.

Local Street. The primary function of a local street is to provide access to abutting land. These streets serve local traffic movements and are not intended to accommodate through traffic. The traffic volumes would be less than 1,200 vehicles per weekday in residential area. Local streets include: Local Residential Streets and Local Commercial Industrial Streets.

Cul-de-Sac Street. The primary function of a cul-de-sac is as a local street, providing access to abutting land. It is not a through street and contains a turnaround. The traffic volume for this street should be less than 200 vehicles per weekday in residential areas.

Table 2-12 compares the existing City of Tualatin street classification with the street classifications assigned to the same facility by neighboring jurisdictions. This table is intended to identify potential conflicts between the existing City of Tualatin street classifications and those of neighboring jurisdictions for the same facility. Major streets that enter the City of Tualatin from neighboring jurisdictions are noted, together with the current City of Tualatin classification at the city limit as well as that of the abutting jurisdiction. While some streets change classifications along their length, only the classification at the point of contact is noted.

Section 11.070 establishes truck standards and includes a truck route map. The intent of the map is to reduce the impact of truck traffic in residential neighborhoods. A section 11.080 address transit standards and specifies that transit street intersections be designed to handle transit vehicle movements. The Street Plan (Section 11.090) is based on traffic volume forecasts for "build out" that were made on the basis of the expected population and employment for that time period. As a result of development in accordance with the land use element of the Community Plan. Metro's Regional Street Design Classifications from Title 6 of the Urban Grown Management Functional Plan are also identified on a map.

Section 11.100 makes specific findings and recommendations for the proposed Norwood Expressway (I-5 to Highway 99W Connector), noting that the "... plan clearly identifies the need for the creation of a new freeway interchange and better access to the industrial areas." Section 11.110 makes specific findings and recommendations for the following Arterial Streets: Lower Boones Ferry Road, Boones Ferry Road, Nyberg Street, 65th Avenue, Borland Road, Tualatin-Sherwood Road, Martinazzi Avenue, Bridgeport Road, 124th Avenue (proposed arterial), and Pacific Highway (99W).

TABLE 2-12
CITY OF TUALATIN AND NEIGHBORING JURISDICTIONS MAJOR STREET CLASSIFICATIONS

Street Name	Current City of Tualatin Classification (*)	Abutting Jurisdiction	Classification Abutting Jurisdiction	Differing Classification
Tualatin-Sherwood Road	Major Arterial	Sherwood	Major Arterial	
Cipole Road (length)	Major Collector	Sherwood	Minor Arterial	X
Pacific Highway (99W)	Major Arterial	Sherwood	Major Arterial	
		Tigard	Principal Arterial	
		Durham	Minor Arterial	X
SW Lower Boones Ferry Road	Major Arterial	Durham	Major Arterial	
	Major Arterial	Lake Oswego	Major Arterial	
SW Boones Ferry Road	Major Arterial Road	Washington County	Minor Arterial	X
	Major Arterial	Durham	Major Arterial	
Borland Road	Minor Collector	Clackamas County	Minor Arterial	
I-205 (East Portland Freeway)	Freeway	Clackamas County	Freeway/ Expressway	
SW 65th Avenue	Minor Collector	Clackamas County	Collector	
SW Bridgeport Road	Major Arterial	Durham	Major Collector	X

* Information from Tualatin Development Code Chapter 11, Map 11-2 (reproduced as Figure 2-1 above)

The City recently adopted amendments to the Comprehensive Plan and Development Code to establish a new mixed-use area at the site of the existing Durham Quarry. As part of this effort, the City amended Section 11.110 (8) to establish street standards for Bridgeport Road, which are appropriate for the proposed level of development. In addition to impacts on Bridgeport Road, the redevelopment of the Durham Quarry site is expected to affect other transportation facilities. For example, Interchange #290 on I-5 (Lake Oswego/Durham Exit) will be upgraded as part of the Durham Quarry redevelopment. Tri-Met's park-and-ride lot will be affected by the interchange reconfiguration. The County, Tualatin and Tigard have been working with ODOT, Tri-Met and the City of Durham on these issues.

Section 11.120 makes specific findings and recommendations for the following Major Collector Streets: 65th Avenue (from Borland Road to Sagert Street), McEwan Road, Sagert Street (east of Boones Ferry Road), Avery Street (west of Boones Ferry Road), 105th Avenue (from Avery Street to Paulina Drive), Teton Avenue (from Tualatin Road to Avery Street), Tualatin Road, Herman

Section 11.160 addresses the location of future traffic signals and the traffic volumes that may necessitate their installation.

Section 11.200 addresses bikeways and includes subsections on bike paths (including their proposed location), bike lanes, shared roadways and bikeway implementation priorities. Section 11.300 addresses pedestrian paths and identifies proposed locations, noting that they are generally located within the City's designated greenways, but may located elsewhere to provide access between

residential, commercial, public, and semi-public uses. Section 11.400 addresses public transportation and establishes the goal of every citizen being within a two to three block walk of a bus line. Section 11.500 addresses air quality and notes that automobile transportation is the City's major contribution to air quality problems within the Portland-Vancouver Interstate Air Quality Maintenance Area.

2.8.3 Urban Renewal Plan

Chapter 30—Tualatin Urban Renewal Plan

This brief chapter adopts the Central Urban Renewal Plan and Leveton Tax Increment Plan into the Tualatin Community Plan and incorporates them by reference into the Tualatin Development Code. (NOTE: see discussion of urban renewal plans following the overview of the Development Code.)

2.8.4 Development Code - Planning District Standards

Chapters 31, 36, 40, 71, 72, 73, 74, and 75 of the Tualatin Development Code include transportation-related definitions, background information and requirements. These are summarized below.

Chapter 31—General Provisions

The General Provisions section of the Tualatin Code, Chapter 31, lists several definitions that pertain to the transportation/public facilities policies. These include the following: Alley, Bike (Bicycle) Facilities, Bike (Bicycle) Lane, Bike (Bicycle) Path, Bikeway, Cul-de-sac, and Street.

Chapter 36 (Subdividing, Partitioning, and Property Line Adjustment Standards and Procedures)

Section 36.080 lists standards for approval of streets and ways. These standards help to insure compliance with Chapter 74, Public Improvement Requirements, Public Works Construction Code. These standards do not include requirements for connectivity or other regional transportation issues.

Chapter 40 (Low Density Residential Planning District) through Chapter 62 (Manufacturing Park Planning District)

Each of the planning districts includes a section on access. In general these sections establish the access requirements for lots created within the district. They also require lots and tract comply with other sections of the Code, including Natural Areas and Stormwater Quality Control Facilities, Parks and Recreation Master Plan and the Surface Water Management Ordinance.

Chapter 71—Wetlands Protection District (WPD)

Section 71.090(3) generally provides that where access to property in the Wetlands Protection District is blocked by a Wetlands Protection Area, alternative public access shall be coordinated and supported by the City of Tualatin, subject to the Tualatin Transportation Plan.

Chapter 72—Greenway Protection Overlay District (GPO) and Natural Areas

Section 72.060 address development restrictions in Greenways and Natural Areas. A number of uses are permitted within the areas regulated by the Overlay District provided they are designed to minimize intrusion into the riparian area, including:

- Public bicycle or pedestrian ways (subject to the provisions of TDC 72.070).
- Public streets, including bridges, when part of a City approved transportation plan

Chapter 73—Community Design Standards

This chapter includes findings, objectives and standards that address transportation issues. Section 73.020 includes the objective to "...encourage site planning and development to incorporate bikeways, pedestrian facilities...." Section 73.055 provides for restrictions and conditions through the architectural review process, including dedication or reservation of land for bicycle or pedestrian paths. This section also requires off-site improvements of public utility facilities where necessary to assure adequate capacity. Section 73.130 establishes standards for accessways. Section 73.150 establishes objectives for all commercial, industrial, public and semi-public projects, including providing vehicular connections to adjoining sites. Section 73.160 establishes standards to accomplish the objectives in Section 77.150 including requirements for connectivity through the site. Section 73.400 provides standards for vehicular and pedestrian ingress and egress from private property to the public street system.

Chapter 74—Public Improvement Requirements

This Chapter provides standards for minimum street right-of-way widths, future street extensions and street improvements. Section 74.210 creates flexible requirements for right-of-way widths. The right-of-way width must accommodate any necessary mitigation for development. Section 74.410, Future Street Extensions provides that: "Streets shall be extended to the proposed development site boundary where necessary to give access to adjoining land, provide access for emergency vehicles and provide for pedestrian, bicycle and vehicle circulation." These standards also propose to minimize cul-de-sacs and circuitous routes. Street location and widths should consider existing and planned areas and streets should provide for the continuation of existing streets and conform to an existing street plan as well as limit the length of cul-de-sacs to 200 feet and limit the number of dwellings the cul-de-sac can support to 25 units.

Section 74.420, Street Improvements describe how an applicant is responsible for improvements to any adjacent or proposed street in order to bring the street in conformance with the City's Transportation Plan and the Public Works Construction code. The standards for these improvements help to insure a smooth transition between new improvements or extensions and existing right-of-way. Street improvements shall include curbs, sidewalks, storm drainage, street signs and street trees. The street improvements should be in compliance with Oregon Department of Transportation as well as Tri-Met, Washington County or Clackamas County. According to Section 74.420, when a proposed development abuts a bikeway or pedestrian path, the applicant may be required to construct improvements or an extension.

Section 74.430, Streets, Modifications of Requirements in cases of Unusual Conditions allows for modification of street improvements by the City Engineer if the proposed improvements would cause a hazard or would be impractical, or would be detrimental to the City. Lastly, Section 74.440,

Streets, Traffic Study Required, discusses how the City Engineer may require a traffic study to be provided by the applicant as part of the development review process.

Section 74.460, Accessways in Residential and Commercial Subdivisions and Partitions. This section describes how subdivisions are required to connect to publicly owned land for public use (such as schools or parks); adjoining arterial or collector streets.

Chapter 75—Access Management on Arterial Streets

Chapter 75, Access Management, provides some solutions for access and safety on roads classified as arterials. Chapter 75 defines certain roads as arterials for access management purposes. Some of the arterials designated in Chapter 75 differ from arterials defined in Chapter 11. The section defines an approval process and appeal provision for gaining access on to an arterial (as defined above). This process includes submitting materials to the City Engineer, with the City Engineer drafting an approval, rejection or approval with conditions. This section contains standards that may limit access gained from existing driveways and street intersections by street medians or other barriers. Additional standards include the following: new public street intersections along arterials should be constructed to have a minimum spacing of ½ mile; if a site has access from both an arterial and a local street, the local street access should be used; interim access from a site to the arterial may be allowed by the City Engineer; exceptions to the arterial standards may be granted by the City Engineer. This section also includes a map that illustrates the location of new streets designed to minimize the need for direct access onto an arterial. These alignments of new streets may be altered by the City Engineer if geographic or topographic constraints exist.

2.8.5 Leveton Tax Increment Plan

This Plan was most recently amended in 1999. Its purpose is " ... to facilitate the full industrial development of the district by removing blighting influences and by providing public improvements." Transportation access is identified as a major issue in the Leveton sector. The Plan finds that access to freeways is underdeveloped and that several roads do not meet industrial width standards. The Plan includes the following goal and objectives for traffic and transportation:

> "Goal 3: Improved Traffic and Transportation. To improve traffic access to Interstate 5 and Pacific Highway 99W and within the project area.
>
> Objective a. Construct road and intersection improvements as necessary to provide adequate access to and within the District, including SW 124th Avenue from SW Tualatin-Sherwood Road to SW Tualatin Road.
>
> Objective b. Provide bike paths as appropriate within the District.
>
> Objective c. Provide shared driveways and limited access to arterial streets, as called for in the Tualatin Access Management Plan."

The Plan outlines a number of road and street improvements, including the following:

- widen SW Tualatin Road and SW Herman Road;
- design and construct SW 124th Avenue to connect SW Tualatin-Sherwood Road and SW Tualatin Road;

- reconstruct the SW 124th Avenue/Pacific Highway/SW Tualatin Road intersection;
- widen SW 108th Avenue; and
- construct local access roads: SW Leveton Drive, SW 118th Avenue, and an access road into the quarry area located in western Tualatin.

2.8.6 The Tualatin Central Urban Renewal Plan

The urban renewal district was established in 1975 to address issues of blight and deterioration. Among the identified conditions was "... the traffic congestion and railroad/motor vehicle conflicts and the public safety hazards resulting there from..." The plan was last amended in 1998. It includes goals and objectives for improved traffic and transportation including:

> Goal 5: Transportation. To provide transportation access and circulation which is supportive of central area development.
>
> Goal 6: Pedestrian and Bikeways. To develop a pedestrian/bicycle system linking the Urban Renewal Area to residential areas, parks, natural areas, and to link the business district on the south side of Boones Ferry Road to the future business district on the north side of Boones Ferry Road.
>
> Goal 7: Transit. To support the development of the metropolitan transportation system (Tri-Met) in order to provide alternative transportation modes for the residential and employment population of the Urban Renewal Area.

The Urban Renewal Plan identifies road and street improvements within the district, which are called for in the Transportation Element.

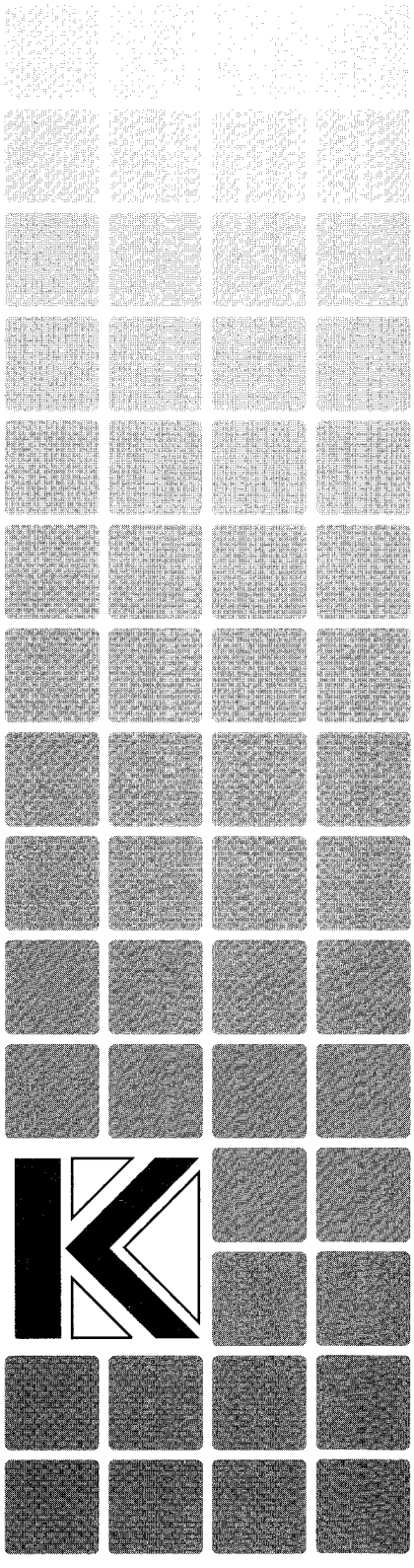
2.8.7 City of Tualatin Capital Improvement Plan

The City of Tualatin has five-year plans covering both road operating costs (e.g., pavement maintenance), and capital improvements (e.g., new signals). The former is funded by state and county gas taxes and road utility fees; the latter is funded by system development charges and transfers from the road operating fund. In addition, some projects are funded by the urban renewal districts described above. Capital projects programmed through the 2005-06 fiscal year consist of the following:

TABLE 2-13
TUALATIN CAPITAL IMPROVEMENT PLAN PROJECTS, 2000-2006

Project Type	00/01	01/02	02/03	03/04	04/05	05/06
Sewer	Koch Sewer Line	Koch Sewer Line	Nyberg Trunk Replace	Nyberg Trunk Replacement	Upsize sewer-Martinazzi Sq	Install in Killarney Lane
	Bluff-Cipole Phase 4	Replace in LBFR east of I5 (McEwan)	Upsize sewer in LBFR	Replace sewer east of Trailer Park		
	Aspen Place Sewer Relocate	Upsize sewer pipe between Herman & 118th	TS Road Sewer Replacement			
Water	Koch Water Line	A2 Reservoir - right-of-way/design	Replace WL in Hazelfern	A1 Reservoir Repainting	Replace 12" in BFR	Killarney Lane AC Line Replacement

Project Type	00/01	01/02	02/03	03/04	04/05	05/06
	Blake Street Waterline Martinazzi/65th Waterline BFR Bridge Waterline	Replace WL in Bridgeport		B3 Reservoir		
Storm Drainage	Wetland Area Planning WQ Ponds Tachi Court Storm Drainage Pascuzzi Channel	Wetland Area Planning WQ Pond Inventory/Eval Cipole Road - Culverts Culvert-Herman Rd west of 108th Storm fix on Teton along RR tracks Master Plan Update	Culvert-Herman Rd west of 108th WQ Ponds Culvert@ Ibach Street	WQ Ponds	WQ Ponds	
Road Road	TS Westbound Left Turn to BFR Restrict Driveways on Mart/BFR Widen Martinazzi Avenue Grahams Ferry/Ibach Intersection I-5/Nyberg Interchange	Nyberg/65th Signal	Martinazzi/Sagert Signal	Lower BFR (MSTIP) 65th/Sagert Signal	Avery/Teton Signal	TS/124th Signal
Urban Renewal	Clock Bell Tower Ped Xing on BFR Community Sign 124th Leveton-Herman Leveton Wetlands Tual-Sherwood Rd Landscaping	BFR-Mart to Tualatin--design 124th Avenue to SW Mysiony Lot C Slurry Seal	BFR-TS to Tualatin--design Lot H Slurry Seal	BFR-TS to Tualatin 124th to 99W Turn Lane	124th Avenue--design Lot G--design BFR-Mart to LBFR--design	Lot G 124th Avenue to Tualatin-Sherwood BFR-Mart to LBFR
Park		Restrooms @ Jurgens Park				



Section 3

Existing Conditions

Existing Conditions

3.1 INTRODUCTION

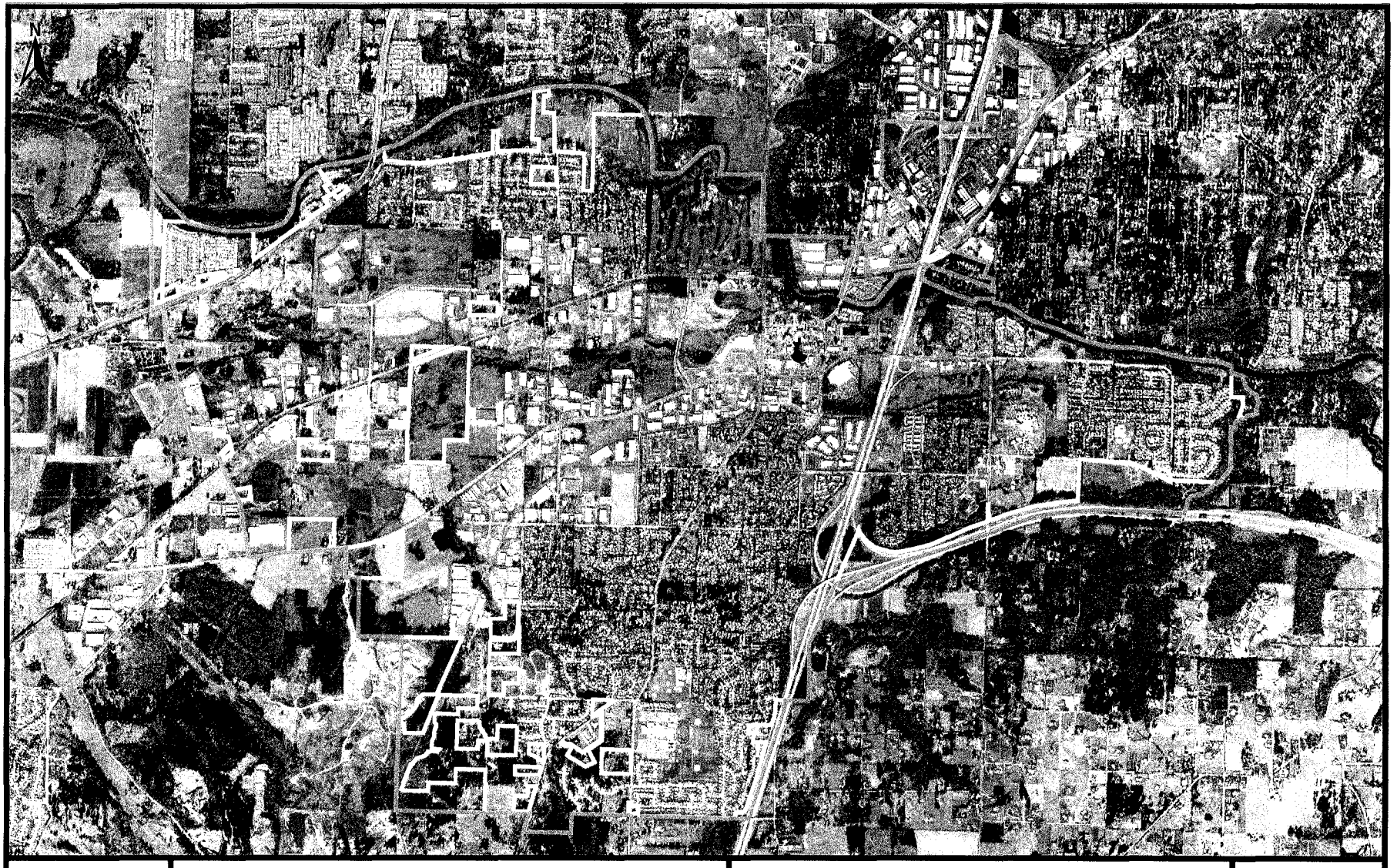
The development of this transportation system plan (TSP) began with an assessment of current land use and transportation system conditions. This section describes the existing condition of the City's transportation system, including highway, pedestrian, bicycle, transit, rail, air, water, freight movement, and pipeline/transmission transportation modes, in terms of each mode's current performance and needs. This section provides an inventory of existing facilities and serves as a baseline against which future conditions can be compared.

3.2 STUDY AREA AND LAND USE

Figure 3-1 presents a 1997 aerial photo of Tualatin and its immediate vicinity, with the current city limits and planning area boundary superimposed. Areas outside the city limits, but within the planning area boundary are areas that would be expected to be annexed into the City at some point within the next 20 years, and are covered in the City's comprehensive plan (the Tualatin Community Plan). Figure 3-2 presents a street map of the same area. Some streets shown may be private or unimproved. The base mapping is intended to provide a reference for locating various features of Tualatin's transportation system, not to indicate the condition or public status of a particular roadway.

The study area for the TSP generally consists of the area within the planning area boundary, although in some instances areas outside the study area are also addressed, where transportation issues extend beyond the City. Based on the requirements of Oregon's Transportation Planning Rule, only the more important streets within the study area—those designated as collectors and arterials—and intersections of these streets are generally addressed. However, local street issues, such as street connectivity, or safety issues, are also discussed where appropriate.

Tualatin's planning area boundary encompasses approximately 8.60 square miles. Of this area, approximately 7.68 square miles, or 89%, has already been incorporated into the City. Figure 3-1 shows that a number of incorporated parcels in the western, industrial, part of Tualatin have yet to develop. Section 4, Needs Assessment, presents a more extensive analysis of Tualatin's development potential, and also discusses urban reserve areas adjacent to Tualatin. However, because of the requirements of Oregon's Transportation Planning Rule, the TSP only considers those areas currently within the City's planning area boundary (i.e., those areas currently covered by the City's comprehensive plan) when making assumptions about where Tualatin will grow in the next 20 years.



FIGURE

3-1

TUALATIN TRANSPORTATION SYSTEM PLAN

Existing Conditions

Aerial Photo

Tualatin Planning Area

Tualatin City Limits

1" = 3,000 feet

SOURCES:
City of Tualatin
Metro

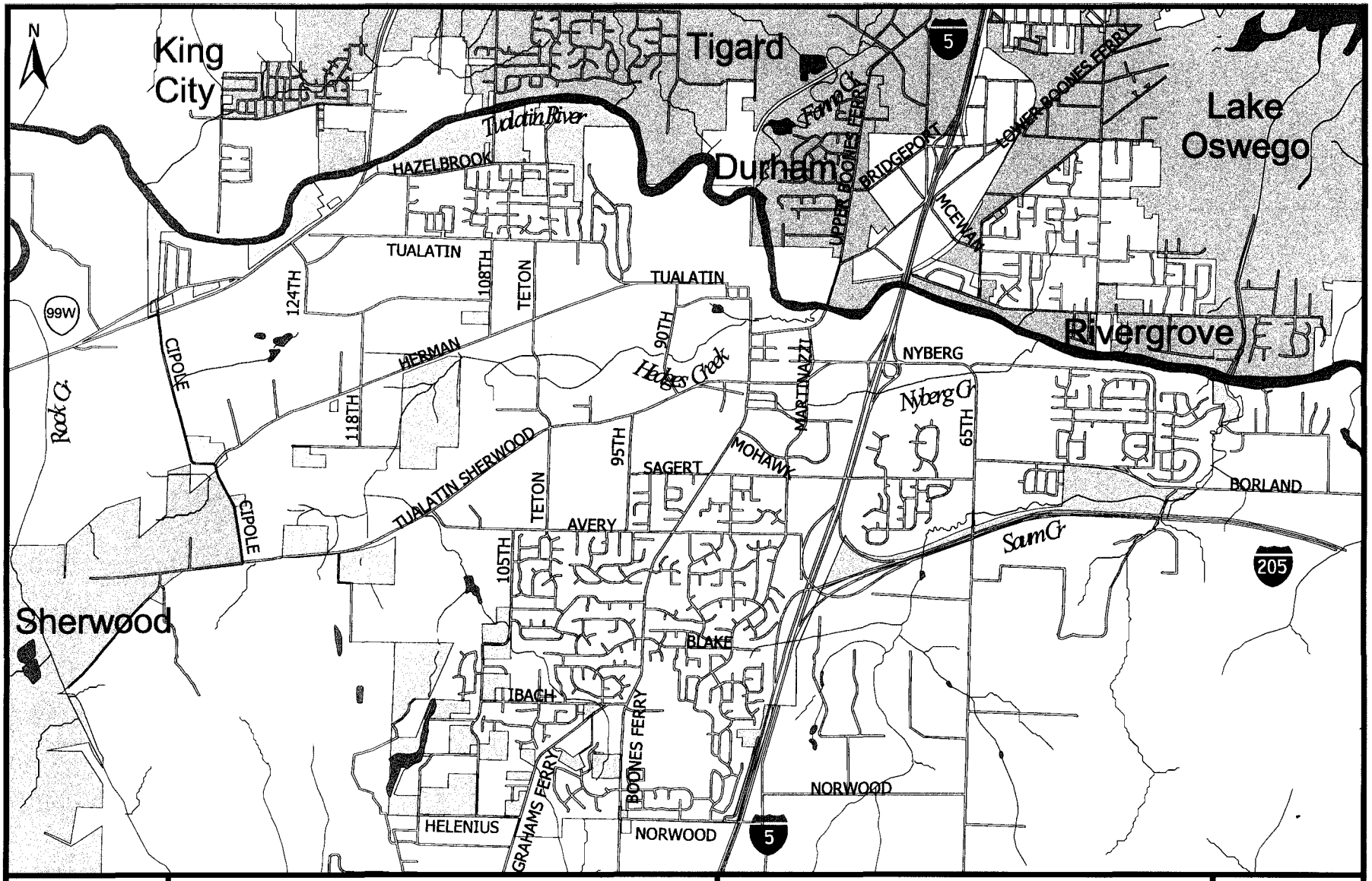


FIGURE 3-2

TUALATIN TRANSPORTATION SYSTEM PLAN

Existing Conditions

Study Area

Rivers, Lakes, and Ponds
Creeks
City of Tualatin
Tualatin Planning Area
Other Cities

1" = 3,000 feet

SOURCES:
City of Tualatin
Metro

3.3 TRANSPORTATION MODES AND FACILITIES

The City of Tualatin's transportation system provides facilities serving many different transportation modes. Each of these modes is identified and discussed in the following sections.

3.3.1 Pedestrian

Pedestrian facilities serve a variety of needs. These include:

- Relatively short trips (under a mile) to major pedestrian attractors, such as schools, parks and open spaces, retail centers, churches, and public facilities, such as libraries, recreation centers, and community centers.
- Recreational trips—for example, jogging or hiking—and circulation within parklands.
- Access to transit (generally trips under ¼ mile to bus stops).
- Commute trips, where mixed-use development is provided, and people choose to live near where they work.

Continuous pedestrian facilities should connect neighborhoods and employment areas to nearby pedestrian attractors, be integrated with transit stops, and separate pedestrians from vehicular traffic. In addition to providing sidewalks along major roadways, opportunities need to be provided at reasonable intervals for pedestrians to cross roadways, as well. This latter goal often requires trade-offs between the automobile and pedestrian modes.

Persons with disabilities, persons with strollers, and many other types of pedestrians, desire sidewalk facilities with minimal grades and even surfaces. Wheelchair users require ramps at intersections, while persons with visual impairments require tactile information, such as a textured pavement surface, to help them navigate.

Figure 3-3 depicts the locations of sidewalks along collector and arterial streets within Tualatin, as well as the locations of off-street pathways. Except in the Tualatin Commons area of central Tualatin, all off-street pathways are shared with bicycles. For reference, the locations of a number of potential pedestrian generators are also shown, including schools, parks, commercial areas, the library, and the hospital.

Significant gaps in the sidewalk network—where no dedicated pedestrian facilities exist, or where sidewalks are only provided along one side of a street (potentially forcing pedestrians to cross the same street twice)—include the following locations:

- the Sagert Street and Norwood Road overpasses across I-5;
- Boones Ferry Road, near Tualatin Elementary School, Little Woodrose Nature Park, and south of Tualatin High School;
- Upper Boones Ferry Road, within the City of Durham, connecting sections of Tualatin; and
- Nyberg Street between I-5 and SW 65th Avenue.

Sidewalks were intentionally left off of Tualatin Road and Herman Road on the side adjacent to the railroad tracks, to discourage pedestrians from walking on or across the tracks.

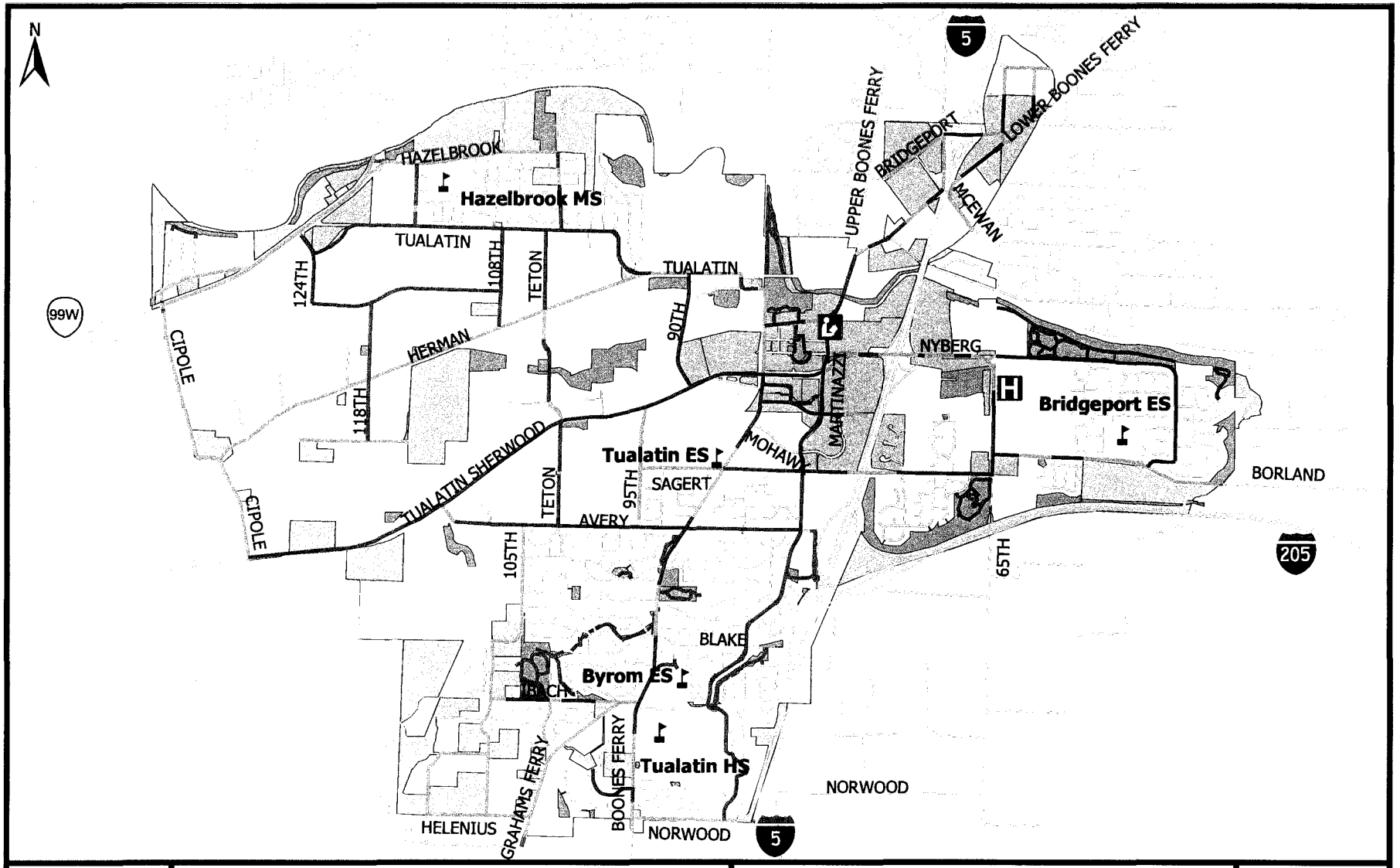


FIGURE 3-3

TUALATIN TRANSPORTATION SYSTEM PLAN
Existing Conditions

Pedestrian Facilities

Hospital
Library
Schools
Off-Street Paths
No Sidewalks

Parks and Open Space
Commercial Zoning
City of Tualatin
Tualatin Planning Area

Sidewalks
both sides
one side

1" = 3,000 feet

SOURCES:
City of Tualatin
Metro

Collector and arterial streets without sidewalks for a majority of their length include:

- Highway 99W;
- Cipole Road;
- SW 105th Avenue;
- Grahams Ferry Road;
- Helenius Road;
- Bridgeport Road; and
- Herman Road.

Figure 3-3 also shows areas of good sidewalk coverage. Central Tualatin is generally well-covered by a sidewalk network, although a few streets only have sidewalks on one side of the street. Most schools, other than Tualatin Elementary School, also have good sidewalk connections, relative to the amount of traffic on adjacent roadways. Newer residential and industrial areas also have good pedestrian facilities, reflecting city policies that require new development to provide adequate sidewalk facilities.

3.3.2 Bicycle

Bicycle facilities also serve a variety of trips. These include:

- trips to major attractors, such as schools, parks and open spaces, retail centers, and public facilities, such as libraries, recreation centers, and community centers, where secure (and preferably covered) bicycle parking is available;
- commute trips, where changing and showering facilities are provided at the workplace;
- recreational trips; and
- access to transit, where bicycle storage facilities are available at the stop, or where space is available on bus-mounted bicycle racks.

As this list suggests, supporting bicycling as a viable alternative to the automobile requires more than simply providing bicycle lanes. Support facilities, such as secure parking and worksite changing facilities, are also needed before the bicycle trip will be considered.

Bicycle lanes should be provided on major streets where automobile traffic speeds are significantly higher than bicycle speeds. Bicycle lanes should connect residential neighborhoods to schools, retail centers, and employment areas. However, allowing bicycle traffic to mix with automobile traffic is acceptable where the average daily traffic (ADT) on a roadway is less than 3,000 vehicles per day, according to the Oregon Bicycle and Pedestrian Plan (Oregon Department of Transportation, 1995). Generally, most collectors and arterials in Tualatin carry in excess of 3,000 ADT.

Providing bike lanes on local streets is appropriate where the volume of bicyclists is high, automobile volumes are high, automobile speeds are higher than 25 miles per hour, or poor sight distance exists. Streets leading to schools, for example, may have high volumes of bicyclists. Other bicycle lanes may take the form of a multi-use path—shared with pedestrians—in areas where no street connection currently exists.

Figure 3-4 depicts the locations of bicycle lanes along collector and arterial streets within Tualatin, designated bicycle routes where bicycles share their lane with motorized vehicles, and off-street pathways that are shared with pedestrians. For reference, the locations of a number of potential bicycle attractors are also shown, including schools, parks, commercial areas, the library, and the hospital. It can be seen from Figure 3-4 that where bicycle lanes are provided, they are generally provided along both sides of the street.

Significant gaps in the bicycle lane network, where bicycle lanes have been provided in some sections, but not others, include the following locations:

- Boones Ferry Road, between Tualatin Road and just north of Grahams Ferry Road.
- Avery Street east of Boones Ferry Road.
- Martinazzi Avenue south of Avery Street and north of Warm Springs Street. The section south of Avery Street is a shared-roadway bicycle route, but traffic volumes exceed ODOT guidelines for bicycles sharing a street.
- Tualatin-Sherwood Road and Nyberg Street between SW 65th and 90th Avenues.
- Lower Boones Ferry Road south of the Tualatin Park & Ride.
- Teton Avenue between Tualatin-Sherwood Road and Herman Road. This is also a shared-roadway bicycle route, but traffic volumes significantly exceed ODOT guidelines and the street is also a truck route.

Other major roadways with significant traffic volumes or high vehicular speeds, but no bicycle lanes, include:

- SW 65th Avenue;
- Bridgeport Road;
- Upper Boones Ferry Road, in the City of Durham, connecting portions of Tualatin;
- Hazelbrook Road;
- Herman Road;
- Jurgens Avenue;
- Cipole Road;
- Grahams Ferry Road; and
- Borland Road.

Tualatin has established a network of bicycle routes along lower-volume through streets within residential neighborhoods, and is establishing a good internal network of bicycle lanes in the industrial area of western Tualatin. In general, though, these areas are not well-connected to each other and other bicycle attractors, because of a lack of continuous bicycle facilities. Central Tualatin, for example, lacks bicycle lanes on most streets and on many approach routes. Most schools lack bicycle lanes on at least one adjacent through street with significant traffic volumes.

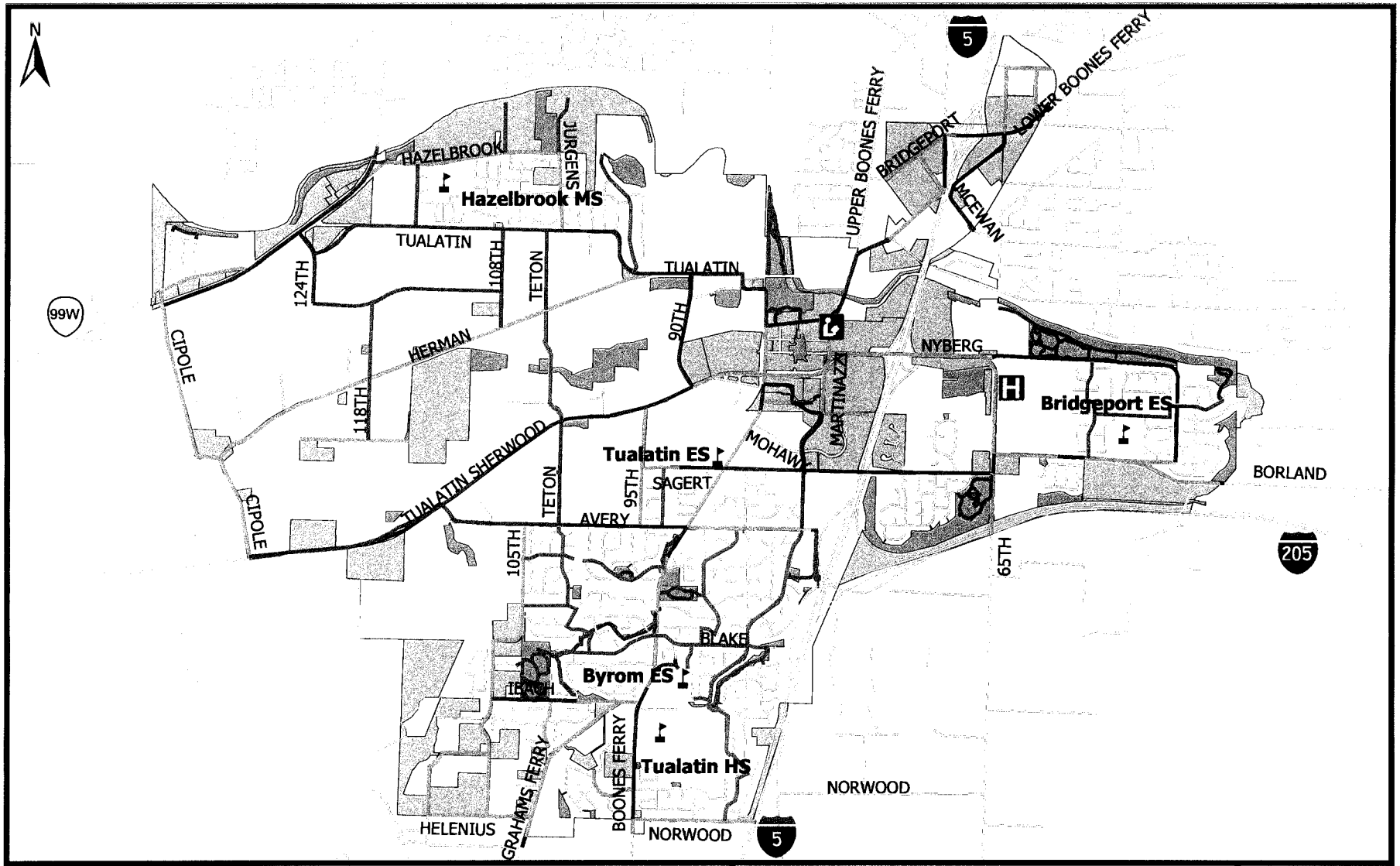


FIGURE 3-4

TUALATIN TRANSPORTATION SYSTEM PLAN
Existing Conditions

Bicycle Facilities

Hospital
Library
Schools
Multi-Use Paths
Bicycle Routes
No Bike Facilities

Parks and Open Space
Commercial Zoning
City of Tualatin
Tualatin Planning Area
Bicycle Lanes
both sides
one side

1" = 3,000 feet

SOURCES:
City of Tualatin
Metro

3.3.3 Public Transportation

Existing public transportation service includes fixed-route bus service operated by Tri-Met and the City of Wilsonville, commute shuttle service provided through the Tualatin Transportation Management Association (TMA), specialized transportation for user groups such as senior citizens and persons with disabilities, and school buses operated by the Tigard-Tualatin School District #23J and other local districts (Sherwood, West Linn/Wilsonville, and Lake Oswego). Each of these providers is discussed in this section.

Fixed Route Transit

Tri-Met

Service Description

The primary fixed-route transit provider in Tualatin is Tri-Met, which provides service to most of the Portland metropolitan area. Service is provided along two main north-south corridors: Boones Ferry Road and Highway 99W, with no direct east-west connection provided between the two corridors. Figure 3-5 shows the locations of Tri-Met stops, routes, and park-and-ride lots serving Tualatin. Figure 3-5 also shows inbound (towards downtown Portland) boarding volumes at all Tri-Met stops, based on Tri-Met's Spring 2000 passenger census. The area served by each stop is also shown, based on a ¼-mile air distance from the stop, following the guidelines of the Transit Capacity and Quality of Service Manual (TCQSM), and adjusted for major barriers such as freeways and the Tualatin River. Finally, Figure 3-5 shows the City's "transit-supportive areas" (TSAs), which are the areas of the City with sufficient population or employment density to be able to support fixed-route transit service. For this analysis, TSAs have been defined at the transportation analysis zone (TAZ) level, with adjustments made to account for developed multi-family housing, and zoning (i.e., jobs were only assigned to locations zoned for uses generating employment, or where large institutional uses were located in a residential zone).

The following Tri-Met routes serve Tualatin:

- Route 12, *Barbur Blvd.*, which runs along Highway 99W and Barbur Boulevard from Sherwood to downtown Portland via Tigard and southwest Portland. It continues as Route 12, Sandy, to the Portland International Airport. Service is provided seven days a week, at 10-minute headways during peak periods, and 60-minute headways at most other times.
- Route 36, *South Shore,* runs between the Mohawk Park & Ride lot and downtown Lake Oswego along the south side of Oswego Lake, with a few trips continuing to downtown Portland via Macadam Avenue. Service is provided during weekday peak hours only, at 30-60 minute headways.
- Route 37, *North Shore,* runs between the Mohawk Park & Ride lot and downtown Lake Oswego along the north side of Oswego Lake. Service is provided weekdays only, with 10 eastbound trips and 13 westbound trips.
- Route 38, *Boones Ferry Road,* runs between the Tualatin Park & Ride lot and downtown Portland via Kruse Way and the Mountain Park district of Lake Oswego.

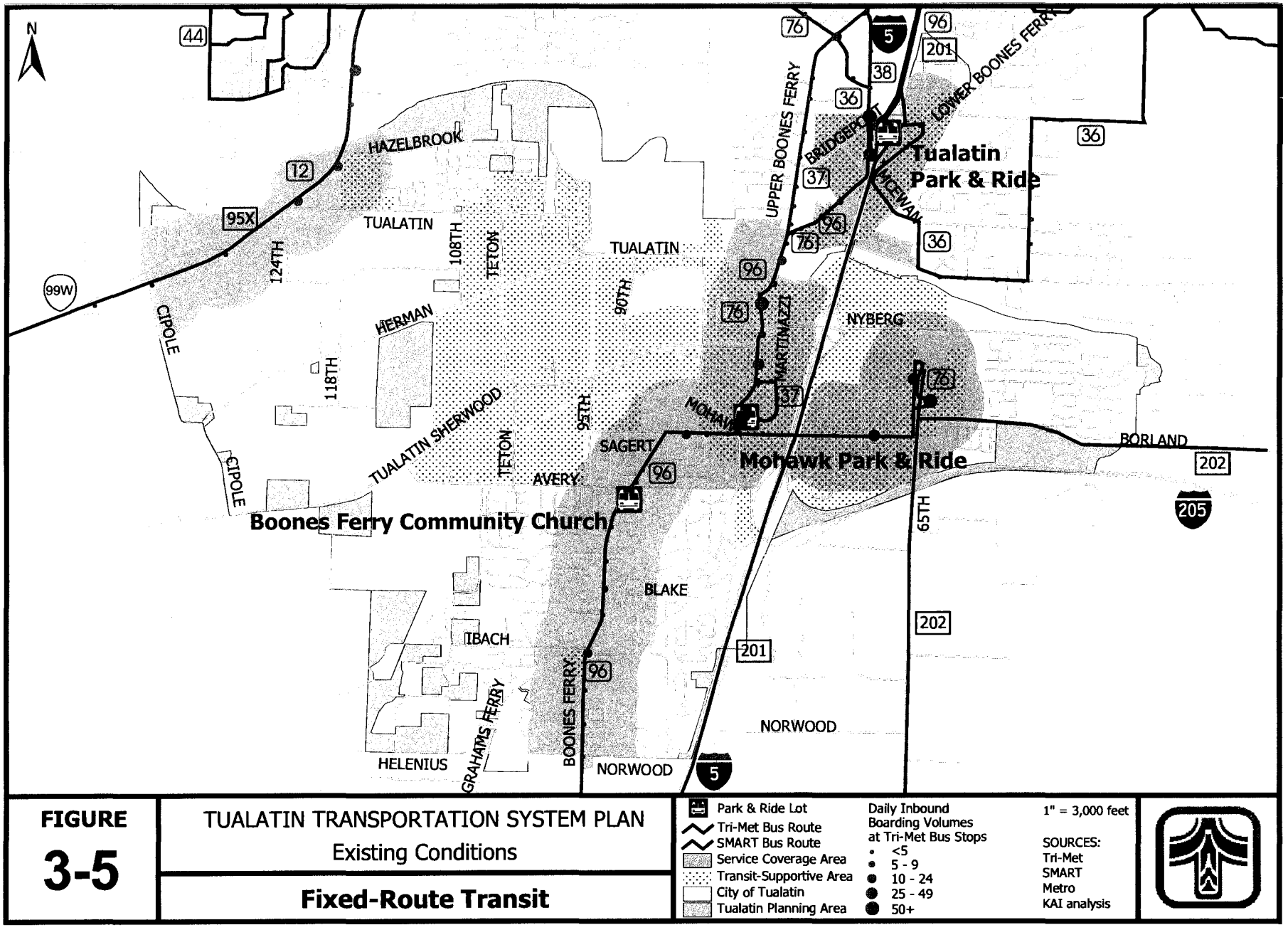


FIGURE 3-5

TUALATIN TRANSPORTATION SYSTEM PLAN
Existing Conditions

Fixed-Route Transit

Park & Ride Lot
Tri-Met Bus Route
SMART Bus Route
Service Coverage Area
Transit-Supportive Area
City of Tualatin
Tualatin Planning Area

Daily Inbound Boarding Volumes at Tri-Met Bus Stops
- <5
- 5 - 9
- 10 - 24
- 25 - 49
- 50+

1" = 3,000 feet

SOURCES:
Tri-Met
SMART
Metro
KAI analysis

- Route 76, *Beaverton-Tualatin,* runs between Meridian Park Hospital and downtown Beaverton via downtown Tigard and Washington Square. Service is provided seven days a week, at 30-minute headways weekdays and Saturday, and 60-minute headways on Sunday.
- Route 95X, *Tigard I-5 Express,* provides five weekday peak period, peak direction trips between Sherwood and downtown Portland, via Highway 99W and I-5.
- Route 96, *Tualatin I-5,* provides peak period service between the Mohawk Park & Ride and downtown Portland, running express on I-5 between the Tualatin Park & Ride and downtown. Some trips originate at Boones Ferry and Commerce Circle in Wilsonville, where connections can be made to the City of Wilsonville's SMART bus service. Peak-hour headways are 5-10 minutes north of Mohawk Park & Ride, and 10-15 minutes south of Mohawk Park & Ride.

Transit Availability

The TCQSM can be used to assess transit quality of service from the passenger's point-of-view, based on several factors relating to the availability of transit service and the comfort and convenience of transit service. These factors, such as service frequency, are graded on an "A" (best) to "F" (worst) level-of-service (LOS) scale, which is described in detail in Appendix "A". Many of the quality of service measures are best applied on an origin-destination basis, as more than one transit route may serve a particular pair of origins and destinations, and some routes may only operate during peak hours only, but provide good service at those times.

Tables 3-1 through 3-3 provide levels-of-service related to transit availability. Table 3-1 provides service frequency LOS from the Tualatin Park & Ride—the portion of the City with the best transit service—to selected destinations in the Portland area. Table 3-2 provides hours of service LOS from the park-and-ride to the same destinations, measuring the number of hours during the day when service is available to a particular destination. Table 3-3 measures service coverage LOS for the entire city, based on the percentage of the City's transit-supportive areas served by transit. Percentages of population and jobs served by both Tri-Met and the Tualatin TMA Shuttle are also shown.

An alternative way to measure availability is to use Florida's Transit Level-of-Service (TLOS) Indicator, which measures the percentage of time that an area receives transit service, under the philosophy that any given bus only provides access to the transit mode for a limited period of time (e.g., 5 minutes). Imagine, for instance, that one had a device attached to one's automobile that allowed the car to start at the top of the hour and for five minutes afterwards. Only during those five minutes would one have access to one's car and be able to travel someplace else. Hourly transit service works like that, and the TLOS Indicator measures just how much of the time during an hour or a day that one can start a trip by transit.

TLOS Indicator values can be converted into equivalent TCQSM-based LOS values for availability, based on the combination of service frequency and hours of service. Both types of measures are shown in Figure 3-6. The TLOS Indicator is useful for measuring relative differences in transit service: for example, an area with a TLOS value of 20% has twice as much service during the day as an area with a TLOS value of 10%. A TLOS value of 100% is nearly impossible to achieve, as it requires frequent service 24 hours a day. As shown in Figure 3-6, a daily TLOS value of roughly 40% or more can be considered to be excellent service.

Because residential densities in Tualatin are not great enough over a large enough area to support fixed-route transit service, Tri-Met's service is designed around two major park-and-ride lots (Mohawk and Tualatin), with relatively frequent service provided from those locations. Major non-industrial attractors, such as central Tualatin and the hospital, are also served, but only 49% of Tualatin households receive transit service within walking distance. The best service, in terms of opportunities to travel by transit, is provided to downtown Portland and the areas served by the MAX light rail line. The Kruse Way corridor and Wilsonville have the least number of travel opportunities from Central Tualatin.

TABLE 3-1
SERVICE FREQUENCY LOS FROM THE TUALATIN PARK & RIDE

Destination	Weekday Peak	Weekday Midday	Weekday Evening	Saturday	Sunday
Downtown Portland	A	D	E	D	D
Lloyd Center	A	D	E	D	D
Portland Airport	C	D	E	D	D
Beaverton	A	D	E	D	E
Intel-Jones Farm	B	E	F	F	F
PCC-Sylvania	D	D	E	D	E
Lake Oswego	D	D	E	D	E
Oregon City	D	D	E	D	E
Washington Square	D	D	E	D	E
Tigard	D	D	E	D	E
Wilsonville	D	E	F	F	F
Sherwood	D	E	E	E	E
Kruse Way	D	F	F	F	F

TABLE 3-2
HOURS OF SERVICE LOS FROM THE TUALATIN PARK & RIDE

Destination	Weekday	Saturday	Sunday
Downtown Portland	C	C	E
Lloyd Center	C	C	E
Portland Airport	C	C	E
Beaverton	C	C	E
Intel-Jones Farm	C	F	F
PCC-Sylvania	C	C	E
Lake Oswego	C	C	E
Oregon City	C	C	E
Washington Square	C	C	E
Tigard	C	C	E
Wilsonville	D	F	F
Sherwood	C	C	E
Kruse Way	E	F	F

TABLE 3-3
SERVICE COVERAGE LOS—CITY OF TUALATIN

	Tri-Met	Tri-Met + TMA
Percentage of city area served	35%	62%
Percentage of households served	49%	56%
Percentage of jobs served	42%	82%
Percentage of transit-supportive area (TSA) served	44%	86%
Service Coverage LOS (% TSA served)	**F**	**B**

Tualatin's industrial area is not served by Tri-Met, as can be seen from Figures 3-5 and 3-6; however, the Tualatin TMA provides commute service to member companies within this area. Between the combination of Tri-Met and the TMA, all of the high-density employment areas and 82% of all jobs have the opportunity for at least commute service, although not all employers choose to participate in the TMA. Because of the lack of supporting land uses (e.g., restaurants, day care, banking, etc.) within the industrial area, employees in this area who would like to run errands at lunchtime need to have a car available, because transit—no matter how good the service—would not be able to take people from their job sites to where these services are provided and back within an hour.

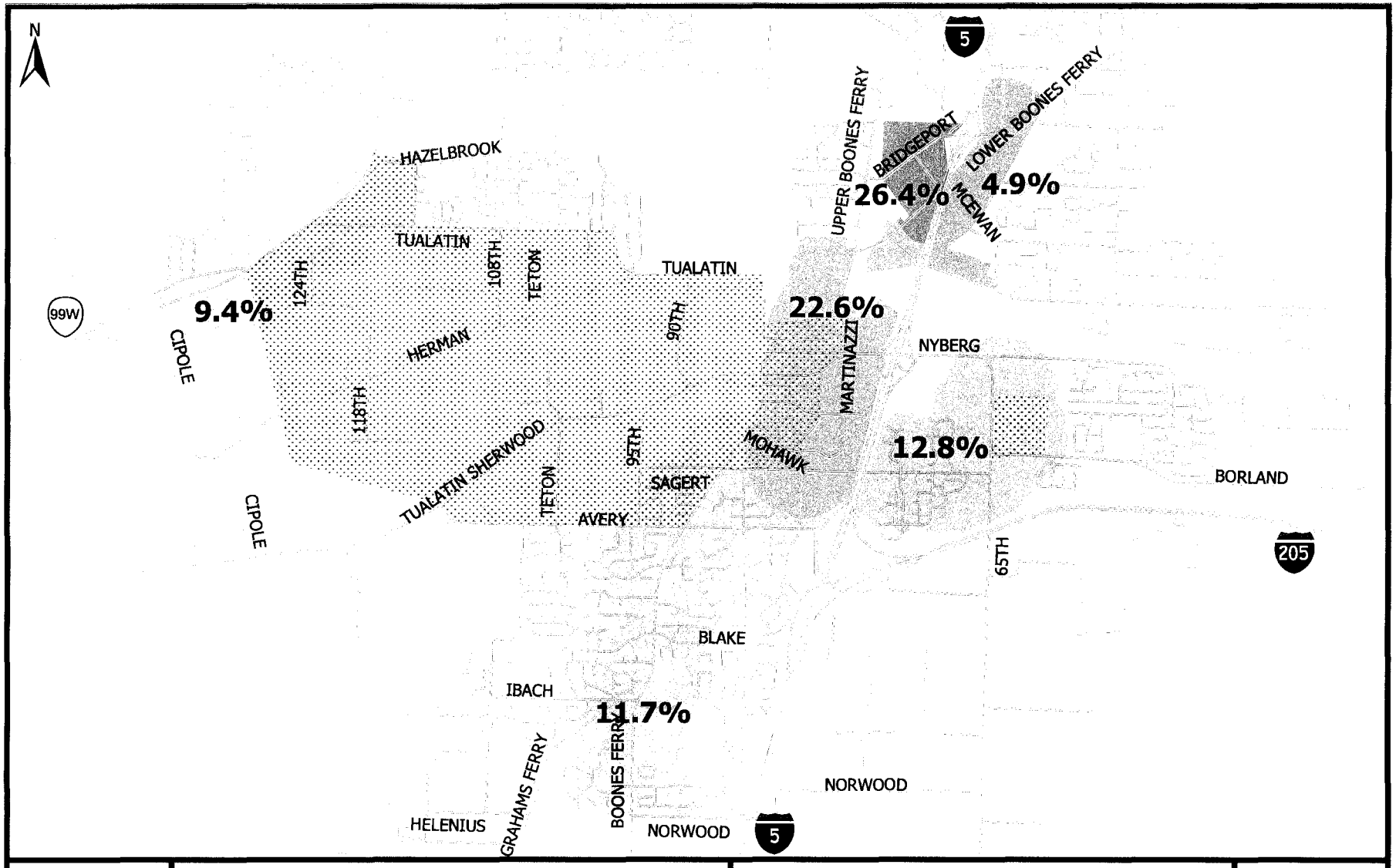


FIGURE 3-6

TUALATIN TRANSPORTATION SYSTEM PLAN
Existing Conditions

Availability LOS/TMA Service Area

TMA Service Area

Weekday Transit Availability LOS
- B (23.6 - 39.5%)
- C (14.6 - 23.5%)
- D (8.4% - 14.5%)
- E (1.4 - 8.3%)
- F (<1.4%)

##.#% TLOS Indicator Value

1" = 3,000 feet

SOURCES:
Tualatin TMA
KAI analysis

Transit Convenience

Transit availability is only half of the transit picture. Even where transit service is available, the time required to make a trip (due to indirect routing, the need to transfer, and/or a large number of stops) may not be convenient for passengers. Table 3-4 presents travel times during the a.m. peak hour by transit from the Tualatin Park & Ride to selected locations in the Portland metro area (e.g., commute trips out of Tualatin), and from these locations to the Highway 99W corridor (e.g., commute trips into Tualatin). Travel times from central Tualatin are 4 minutes longer than times from the Tualatin Park & Ride to all destinations, except to Wilsonville, which takes 10 minutes longer, and to Lake Oswego, which takes 5 minutes less. Stated times are travel and transfer times only, and do not include time spent traveling to a bus stop, or waiting for a bus at the stop.

TABLE 3-4
AM PEAK HOUR TRANSIT TRAVEL TIMES (MINUTES) FOR SELECTED TRIPS

Location	From Tualatin P&R	To Highway 99W Corridor
Downtown Portland	24	44
Lloyd Center	42	59
Portland Airport	72	86
Beaverton	39	44
Hillsboro	68	75
PCC-Sylvania	40	45
Lake Oswego	24	56
Oregon City	48	83
Washington Square	21	28
Tigard	11	11
Wilsonville	23	91
Sherwood	40	9
Kruse Way	14	55

As can be seen from Table 3-4, travel to the Highway 99W corridor takes a long time from almost anywhere in the Portland area, except from Tigard and Sherwood. Travelers from the central part of Tualatin can reach a greater number of destinations in under 45 minutes, but still have to endure out-of-direction travel to get to some destinations, particularly Sherwood, Oregon City, and Lake Oswego (during off-peak hours). On a positive note, travel times to downtown Portland and Tigard from central Tualatin are competitive with the automobile.

The fastest transit trip to Beaverton and locations along the Westside MAX line is via Route 76, which takes 39 minutes to travel between the Tualatin Park & Ride and the Beaverton Transit Center, but only operates every half-hour. Alternatively, passengers can use Route 96, transferring to MAX in downtown Portland; this routing operates every 6-10 minutes during the a.m. peak period, but takes 10 minutes longer for the overall trip.

Park-and-Ride Lots

Tri-Met provides three park & ride lots in Tualatin, as shown in Figure 3-5:

- Tualatin Park & Ride, at the I-5/Lower Boones Ferry Road interchange, with a total of 385 parking spaces in two lots north and south of Lower Boones Ferry Road. This lot is at capacity. Field observations in the area found approximately 50-55 vehicles parked on street in the area that appeared to be associated with the park-and-ride.
- Mohawk Park & Ride, at the northeast corner of Mohawk Street and Martinazzi Avenue. This lot has a total of 220 spaces, about half of which are currently used, based on field observations.
- Boones Ferry Community Church, at 20500 SW Boones Ferry Road, with 20 spaces, almost all of which are unused.

Ridership

The stops with greatest number of daily boarding riders (inbound, towards Portland) are:

- Tualatin Park & Ride (south lot): 419
- Tualatin Park & Ride (north lot): 174
- Mohawk Park & Ride: 162
- Tualatin City Center/Library: 121
- Meridian Park Hospital: 65

No other stop had a daily boarding volume of 35 riders or more, which is Tri-Met's threshold for warranting a shelter. The three major park-and-ride stops collectively board 68% of all inbound passengers traveling from Tualatin.

South Metro Area Rapid Transit (SMART)

The City of Wilsonville has operated its own bus system since 1989, following the City's withdrawal from the Tri-Met service area. Service is provided both within the City, and to popular commuter destinations outside the City. Currently, two routes stop in Tualatin, as shown in Figure 3-5:

- Route 201, Barbur, runs between downtown Wilsonville and the Barbur Transit Center in southwest Portland via I-5, with a stop at the Tualatin Park & Ride. Service is provided weekdays only, at 30-60 minute headways.
- Route 202, Oregon City, runs between downtown Wilsonville and downtown Oregon City via SW 65th Avenue, Borland Road, and I-205, with a stop at the Meridian Park Hospital. Service is provided weekday peak periods only, with five daily round trips.

Local transit funding is obtained from a 0.3% payroll tax within the City of Wilsonville. The service operates fare-free.

Link

The Chehalem Valley Senior Citizens Council operates Link, which provides one round-trip per day between McMinnville, Lafayette, Dayton, Dundee, Newberg, and Sherwood to Meridian Park Hospital. The bus is currently scheduled to arrive at the hospital at 6:35 a.m., and to depart at 6:10 p.m. The fare is $2 from the hospital to Sherwood, Newberg, or Dundee, and $3 to other points southwest of Dundee.

TMA Shuttle

The Tualatin Chamber of Commerce and the Tualatin Transportation Management Association operate the TMA shuttle, providing member worksites with commute-hour service. One morning trip operates from the downtown Portland transit mall to Tualatin, followed by two circuits of Tualatin, within the areas shown in Figure 3-6. Three circuits are made in the afternoon, connecting to Tri-Met service returning to downtown Portland. The shuttle costs are borne by the member businesses of the TMA, and passengers ride for free. Drop-offs can be made anywhere within the TMA service area, but pick-ups are only made at designated locations (member businesses). A given location will have 4-6 stops a day. If this service were to be included on Figure 3-6, the TLOS Indicator values for TMA service areas not served by Tri-Met would range from 1.4-2.1%, depending on the number of daily stops. Areas served by both Tri-Met and the TMA would increase from 0-2.1%, depending on how Tri-Met bus arrivals correspond to TMA shuttle arrivals.

The TMA leases the 15-passenger vehicle used for the service, hires the driver, and pays for the insurance and administrative costs of the service. The vehicle is not currently wheelchair-accessible, although the TMA would like to find a vehicle that is. September 2000 ridership averaged 36 riders per day, but ranged between about 33 and 50 riders, and has increased from 24 riders per day in June 2000.

The TMA also provides carpool and vanpool ride-matching services, and can help employers find vanpool vehicles. It conducts transportation fairs for member businesses, and serves as an outlet for Tri-Met's PASSport program, which provides annual transit passes to member business employees at substantial discounts. The TMA also is working with Tri-Met, with grant funding from the Federal Transit Administration, to coordinate the Job Access program for Tualatin, which is intended to provide transportation to lower-income workers who must travel to and from work during hours when regular transit service is not offered.

According to TMA staff, the TMA has lobbied Tri-Met to institute service along Tualatin-Sherwood Road to serve part of the industrial area. Congestion along Tualatin-Sherwood Road is also an issue to the TMA, as they feel that a lot of the shuttle's time is wasted sitting in congested traffic along this road.

Special Needs Transportation

Passengers who are not able to use the regular Tri-Met service due to a mental or physical disability are served by Tri-Met's LIFT program. Door-to-door service is provided within ¾ mile of Tri-Met routes, which covers most existing residential areas within the City of Tualatin, but not all worksites in the industrial area. Service is available seven days a week during the hours regular Tri-Met service operates, generally from 4:30 a.m. to 2:30 a.m. A fare of $1.30 is charged. Reservations are required to book trips; reservations can be made up to 14 days in advance, but no later than 5 p.m. the day before the trip is to be made.

Clackamas County provides the Transportation Reaching People (TRP) Program, which provides volunteer drivers for eligible passengers. To be eligible, a person must be a resident of Clackamas County who is unable to receive assistance from other transportation resources, and who is 60 years of age or older, physically or mentally disabled, or a resident of a rural area. Transportation is usually available weekdays between 8 a.m. and 5 p.m., with limited service sometimes available evenings and weekends.

School Buses

School buses are also a form of public transportation, although one with a restricted clientele. The Tigard-Tualatin School District operates buses within Tualatin and nearby areas, taking children to and from schools located around the City, if they live too far away to be able to walk to school. Neighboring school districts—Sherwood, West Linn/Wilsonville, and Lake Oswego—also operate school buses in Tualatin.

3.3.4 Pipeline and Transmission System

Power Transmission System

The Bonneville Power Administration (BPA) is the federal organization that regulates and distributes power throughout the Pacific Northwest. Columbia River hydroelectric sources provide 80 percent of BPA's power. The rest comes from coal mines, the Hanford nuclear plant in Washington, cogeneration, and non-utility sources such as privately owned windmills. There are no BPA transmission lines or substations in Tualatin.

Portland General Electric (PGE) provides electric power to the Portland metropolitan area from eight hydroelectric plants (on the Willamette, Clackamas, Deschutes, and Bull Run Rivers) and five thermal plants (in Oregon, Washington, and Montana) with a total power generation capacity of 2,022 megawatts. Its service area covers 3,170 square miles and 45 percent of Oregon's population. Two substations are located in Tualatin: the Tualatin substation near the Avery Street/SW 105th Avenue intersection, and the Meridian substation located near the Borland Road/Sagert Street intersection. Figure 3-7 shows the location of major PGE transmission lines and substations serving Tualatin.

Pipeline Transmission System

Natural Gas

The utility that provides natural gas throughout the Pacific Northwest is Northwest Natural Gas (NNG). NNG obtains its natural gas from the Northwest Pipeline, via NNG gate stations and high-pressure transmission lines. Surplus natural gas is purchased in the summer, when demand and prices are low, to supplement the winter supply.

No gate stations or storage facilities are currently located within Tualatin, nor are new ones planned for the area. The high-pressure transmission lines in Tualatin are located along Boones Ferry Road, Avery Street, Cipole Road, and Herman Road. Natural gas is transmitted to Tualatin from the high-pressure line via smaller mains. There are no natural gas supply restrictions in Tualatin because the compressibility of natural gas means that pipeline capacities are highly variable. Tualatin residents who live on a street where a natural gas distribution line already exists can be easily connected to that distribution line.

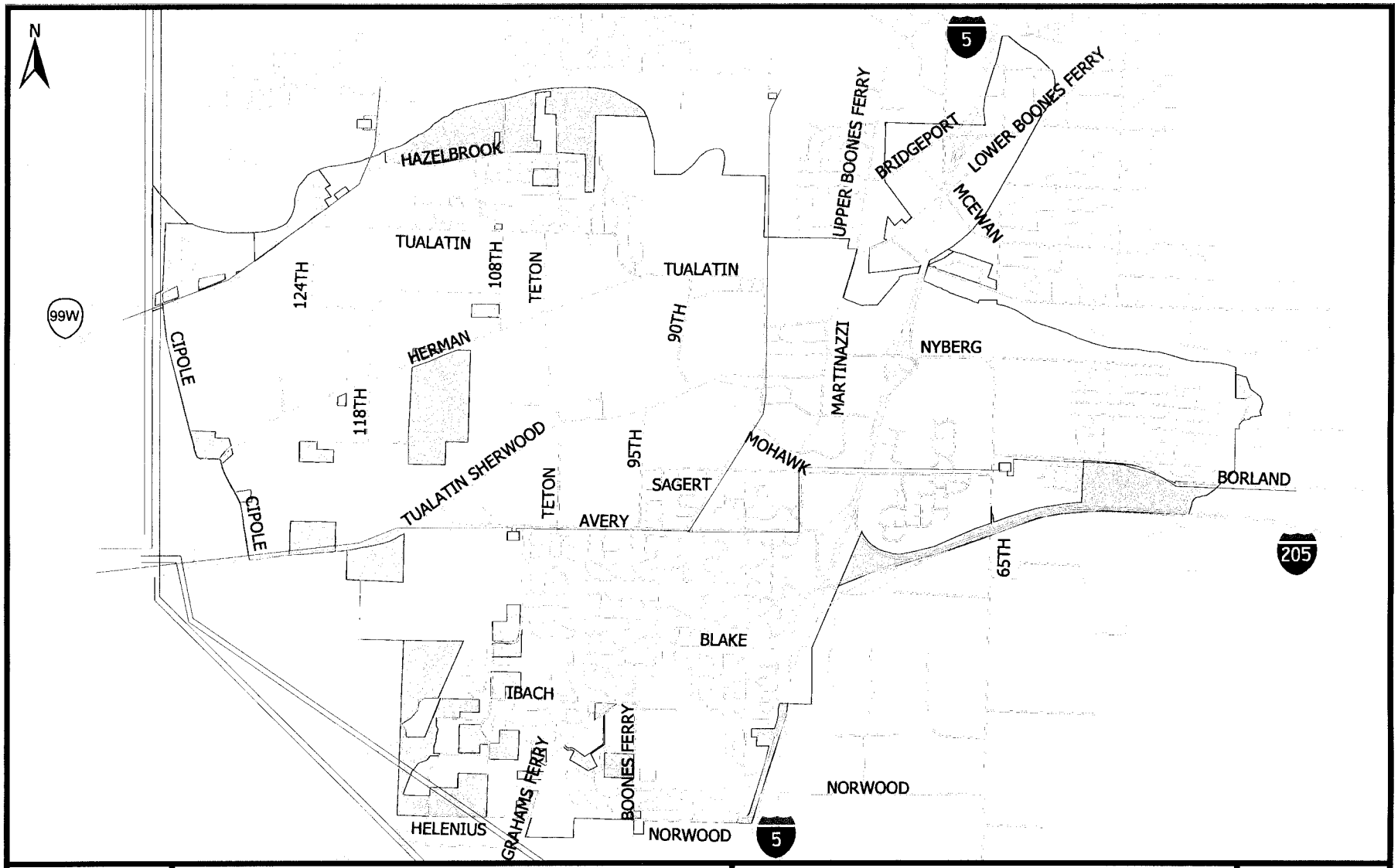


FIGURE 3-7

TUALATIN TRANSPORTATION SYSTEM PLAN
Existing Conditions

Power Transmission

PGE High-Voltage Transmission Lines
PGE Substations
City of Tualatin
Tualatin Planning Area

1" = 3,000 feet

SOURCE:
PGE

Water

Tualatin operates its own water distribution system. The water source for the city is the Portland Bull Run Watershed. The water supply capacity from this source is 10.8 million gallons per day (MGD) with average current utilization at 4.0 MGD.

3.3.5 Rail

Lines and Operators

The Portland & Western Railroad (PNWR), formed in 1995, is a short-line operator headquartered in Albany, OR that provides rail service to Tualatin, on lines leased from the Union Pacific Railroad. The PNWR is a sister railroad to the Willamette & Pacific Railroad (WPRR) and share a common local management, as well as a common owner, the Connecticut-based Genesee & Wyoming Railroad. The PNWR and WPRR combined operate approximately 447 miles of track in the Willamette Valley, with branches to the coast serving Toledo and Astoria. Rail freight originating in the western Willamette Valley is carried on WPRR tracks as far as Newberg, and on PNWR tracks the rest of the way into Portland, where it may be switched to a larger railroad or to another mode.

The PNWR currently operates two lines in Tualatin, a north-south line and an east-west line. Figure 3-8 shows the location of these lines. The figure also shows the locations of grade crossings along the lines, and the type of control used at these crossings.

Two public street crossings are currently ungated: SW 118th Avenue and SW 124th Avenue, near their intersections with Herman Road. The City has filed an application with the ODOT Rail Division to gate the SW 124th Avenue crossing, as part of the City project to extend SW 124th Avenue. ODOT, the City, and the railroad agreed not to gate the SW 118th Avenue crossing at the time the street was widened; it will be gated if the SW 118th Avenue/Herman Road intersection is signalized in the future.

The Federal Railroad Administration has established six track classes, which set maximum speeds for freight and passenger trains, based on the track condition. The north-south tracks are classified as Class 2, which limits freight trains to 25 mph and passenger trains to 30 mph. The east-west tracks are classified as Class 3, which permits 40-mph freight operations and 60-mph passenger operations.

Both lines are currently used for freight movement. The east-west line currently has one train operating daily in each direction, while the north-south line currently has two trains operating daily in each direction. The lines pass through or adjacent to Tualatin's industrial area, providing the potential for shipping freight to and from businesses by rail.

Sections of the rail lines run adjacent to some of Tualatin's busier roadways, including Boones Ferry Road and Tualatin Road, as well as the intersections along these roadways. Consequently, the passage of a train across a grade crossing can have significant impacts on the operations of adjacent intersections. In addition, because establishing new grade crossings is generally discouraged, the rail lines present a constraint to developing street connectivity in central Tualatin.

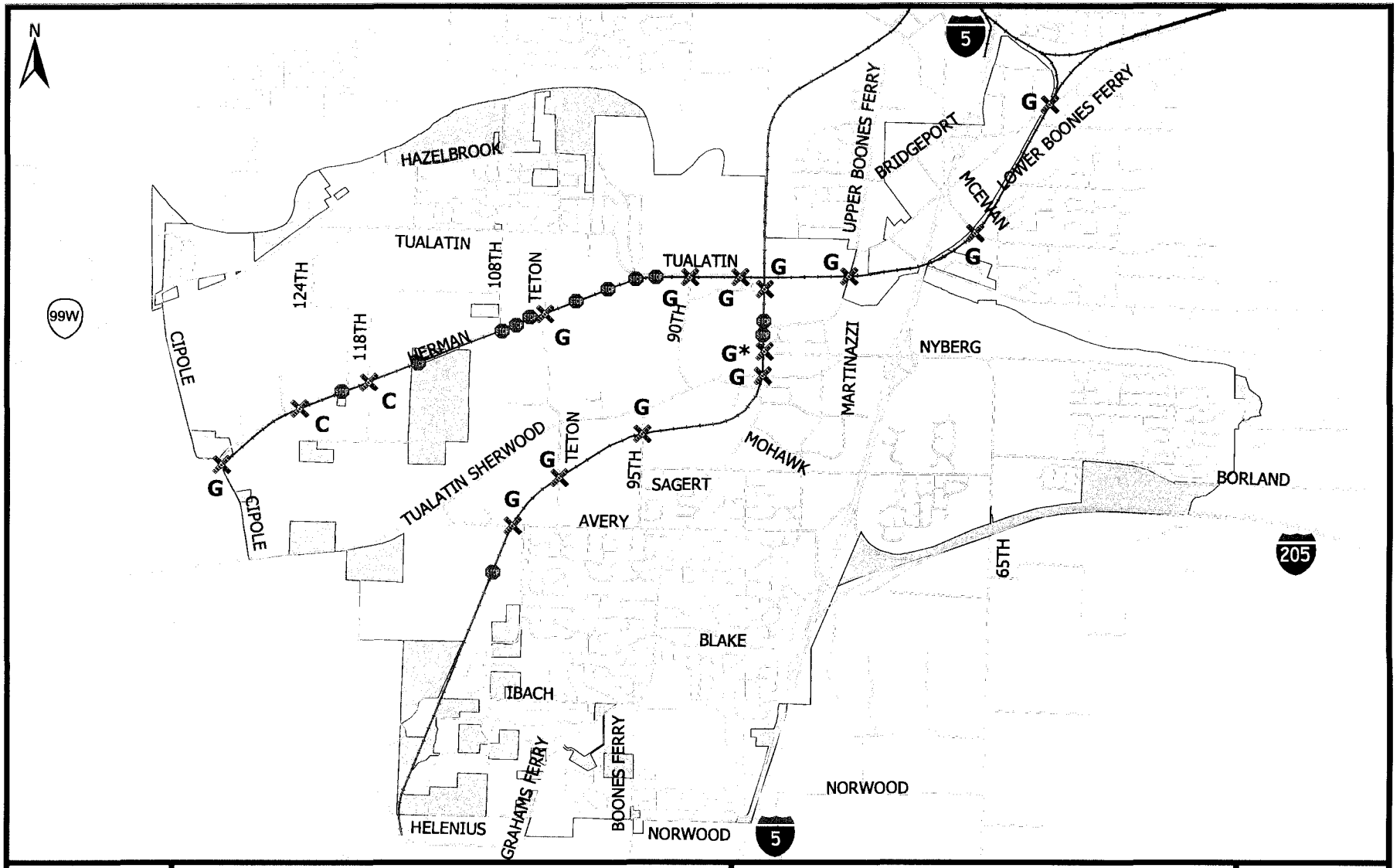


FIGURE 3-8

TUALATIN TRANSPORTATION SYSTEM PLAN
Existing Conditions

Railroads

Railroads
City of Tualatin
Tualatin Planning Area

SOURCES:
Metro
KAI field survey

1" = 3,000 feet

Railroad Crossings
Public/Semi-Public
G Gated
G* Gated, Semi-Public
C Crossbucks only
Private, Stop-Controlled

Passenger Rail Service

Currently, the nearest passenger rail service is located in Portland and Salem and is operated by AMTRAK. From Portland, service is provided four times daily north to Seattle (with service partially funded by Washington State), with next-day rail and same-day bus connections to and from Vancouver, B.C.; and east once a day to Chicago via Spokane, Fargo, and Minneapolis. Service is provided south once a day from Portland and Salem to Sacramento, Oakland/San Francisco, and Los Angeles. Two additional rail trips per day and three bus trips per day are provided between Portland and Eugene, with stops in Salem and Albany.

Oregon has studied the possibility of implementing high-speed rail between Eugene and Portland, continuing future high-speed service from Vancouver, B.C. and Seattle. To date, the Oregon Legislature has been much less willing than Washington's to appropriate funds to develop this service. The recent passage of Initiative 695 in Washington has resulted in substantial cuts in transportation funding, including the high-speed rail program. If high-speed service is eventually implemented, the trains would stop at the same stations as the current AMTRAK service and thus would be no more convenient to Tualatin than existing service.

Both PNWR lines have been looked at as potential commuter rail lines with stations in Tualatin; this topic will be discussed further in the plans and policies section.

Performance

The following goals from the 1992 Oregon Transportation Plan are relevant to Tualatin:

- Branch rail lines within Oregon should be maintained to allow a minimum speed of operation of 25 miles per hour whenever upgrading can be achieved with a favorable benefit-cost ratio.
- Priority rights of way should be preserved for potential public use or ownership when abandonment proceedings are initiated (e.g., corridors where there are future alternative uses, especially near expanding urban areas).

As Class 2 and 3 tracks, the Portland and Western Railroad lines serving Tualatin meet the 25-mph goal, and the lines are active.

3.3.6 Air

There are no airports located within the City of Tualatin. However, there are a number of airports located within thirty miles of Tualatin.

The closest public general aviation airport is located approximately 12 miles south of Tualatin in Aurora. The Aurora State Airport is owned and operated by ODOT. It has one paved 5,000-foot runway and averages 175 daily operations. Approximately 55% of the operations are transient general aviation, and 36% are local general aviation. Approximately 235 aircraft are based at the airport.

A larger general aviation airport is located approximately 22 miles northwest of Tualatin, in Hillsboro. The Hillsboro Airport serves approximately 200,000 operations annually. It is owned by the Port of Portland and has two paved runways (6,600 feet and 4,000 feet). There are three fixed-

base operators at the airport, and the airport provides all the facilities to support jet- and propeller-driven aircraft and helicopters.

The nearest airport with scheduled passenger service is the Portland International Airport, located approximately 25 miles northeast of Tualatin. This airport is also owned by the Port of Portland and has three runways (7,000 feet, 8,000 feet, and 11,000 feet). The Portland International Airport serves more than 13.7 million passengers and 270,000 tons of cargo annually.

Performance

The proximity of the Portland International Airport to Tualatin satisfies the level-of-service goals for air service contained in the 1992 Oregon Transportation Plan. As several general aviation facilities are also located nearby, it can be said that Tualatin has good access to the air mode.

3.3.7 Marine

No navigable waterways are located within the City of Tualatin. The closest marine facilities are located 12 miles to the north in Portland.

Ferries were once used to cross the Tualatin River, but have long since been replaced by bridges across the river. The river provides opportunities for recreational boating, such as canoeing and kayaking.

3.3.8 Roadways

Ownership

Four jurisdictions own the public roadways serving Tualatin: the City of Tualatin, Washington County, Clackamas County, and the Oregon Department of Transportation (ODOT). The jurisdiction owning a particular road has the following responsibilities for that road:

- Determining the road's functional classification, which sets the roadway's role in the transportation system and its design features, such as width, right-of-way, operational and access standards, and the types of pedestrian and bicycle facilities provided.
- Maintenance and construction.
- Approving construction and access permits.

From the City's perspective, having other agencies own some of the roadways within the City requires coordination to ensure that projects are constructed as needed to benefit the transportation system as a whole. Typically, county and state facilities carry a greater proportion of regional and statewide traffic than city facilities, and having county and state ownership of these facilities allows the costs of these facilities to be spread over a larger group of users than just residents of Tualatin. On the other hand, when improvements are needed to county and state facilities, those agencies' project priorities, design standards, and/or funding abilities may not match those of the City. This can leave the City in the position of either (1) adopting needed projects into the TSP that it cannot force other jurisdictions to construct, or (2) locally funding part or all of the cost of improvements to regional and statewide facilities in order to construct them according to the City's priorities.

Figure 3-9 shows the ownership of the City's collector and arterial system.

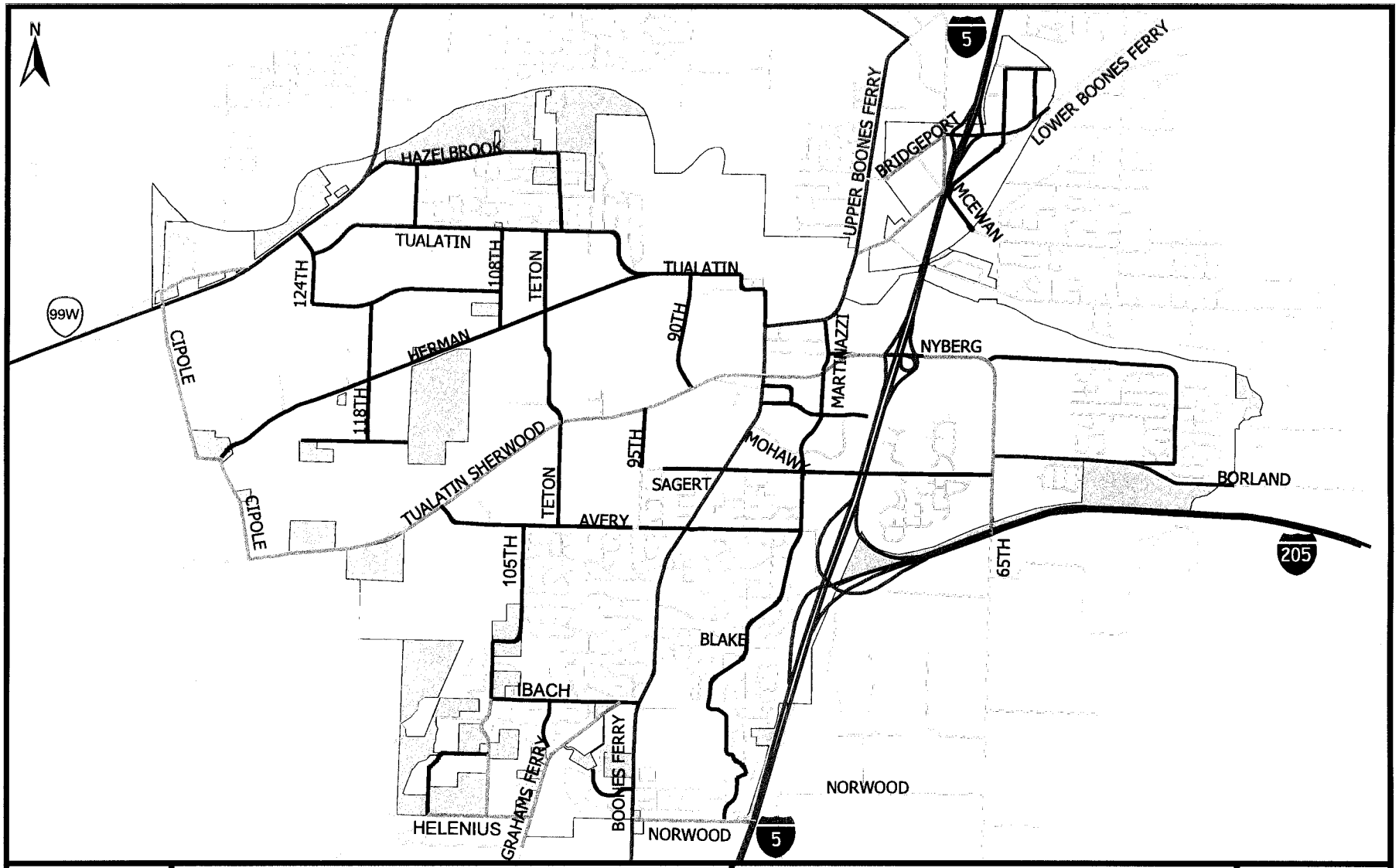


FIGURE 3-9

TUALATIN TRANSPORTATION SYSTEM PLAN
Existing Conditions

Road Ownership

Road Ownership
- City of Tualatin
- Clackamas County
- Washington County
- ODOT

City of Tualatin
Tualatin Planning Area

1" = 3,000 feet

SOURCE:
City of Tualatin

ODOT owns the following roadways and associated interchanges:

- **Interstate 5** is a six-lane facility adjacent to Tualatin, with auxiliary lanes north of the I-205 interchange. I-5 is the main north-south route along the West Coast, running from the Canadian border south of Vancouver, B.C. through Seattle, Portland, Eugene, Medford, Sacramento, and Los Angeles to the Mexican border south of San Diego. Locally, it is the main route from Tualatin into downtown Portland. Two interchanges serve Tualatin: the Lower Boones Ferry Road interchange #290 (signed "Lake Oswego/Durham") and the Nyberg Street interchange #289.
- **Interstate 205** is a four-lane facility in the vicinity of Tualatin. I-205 serves as an eastern bypass of the central portion of the Portland metro area, and provides access to the Portland Airport and I-84.
- **Highway 99W** is a four-lane divided highway through most of its relatively short section through Tualatin. Highway 99W connects the Portland area to Newberg, McMinnville, and the central Oregon coast. Tourist traffic headed for Yamhill County wineries, the Grande Ronde casino, and Lincoln City via Highway 99W greatly increased during the 1990s. The highway experiences congestion through the City of Tigard, which encourages traffic to find alternate routes to and from I-5, particularly using Tualatin-Sherwood Road.
- **Beaverton-Tualatin Highway** is a state highway that predates the construction of I-5 and Highway 217, which it parallels. The highway follows Boones Ferry Road through Tualatin, connecting south to Wilsonville, and north to Tigard and southern Beaverton via Hall Boulevard.

Washington County owns the following roads:

- Tualatin-Sherwood Road and Nyberg Street west of SW 65th Avenue, except for the I-5 interchange;
- Cipole Road;
- Lower Boones Ferry Road, from Boones Ferry Road to Bridgeport Road (the section adjacent to the park-and-ride is on ODOT land, but Washington County maintains it);
- Bridgeport Road;
- Norwood Road;
- Helenius Road;
- Grahams Ferry Road;
- SW 108th Avenue (between Ibach Street and Helenius Road);
- Pacific Drive; and
- SW 65th Avenue south of Nyberg Street (located on the Washington-Clackamas county line; Washington County maintains the road).

Clackamas County owns the following roads:

- Borland Road;
- Lower Boones Ferry Road, northeast of McEwan Road; and
- SW 65th Avenue south of Nyberg Street (located on the Washington-Clackamas county line; Washington County maintains the road).

All other public roadways not listed above are owned by the City of Tualatin.

Functional Classification

A roadway's *functional classification* determines its role in the transportation system, as well as its width, right-of-way dedications, driveway (access) spacing requirements, types of pedestrian and bicycle facilities provided, and so on. The City of Tualatin has established a hierarchy of roadways, consisting of arterial, collector, and local streets. This functional classification system, as applied to existing roadways, is depicted in simplified form in Figure 3-10. Design and access management standards associated with functional classes were discussed in the plans and policies section.

Arterials represent the highest class of city street. These roadways are intended to serve higher volumes of traffic, particularly through traffic, at higher speeds. They also serve truck movements and should emphasize traffic movement over local land access. Arterial streets in Tualatin consist of Highway 99W, Tualatin-Sherwood Road, Boones Ferry Road, SW 124th Avenue, Martinazzi Avenue adjacent to the Tualatin Commons, and portions of Nyberg Street, SW 65th Avenue, and Borland Road. Tualatin has established two levels of arterials, major and minor.

Collectors represent the intermediate class. As their name suggests, these roadways collect traffic from the local street system and distribute it to the arterial street system. These roadways provide both a traffic movement and land access function, and should provide extended continuous stretches of roadway to facilitate traffic circulation through the City. Tualatin has established three levels of collectors: major, minor, and residential, some of which have sub-categories with different design standards. The residential collector category has only been applied to a few streets in the southwest corner of Tualatin; other similar streets are classified as minor collectors. A number of through streets that perform a residential or neighborhood collector function (e.g., Blake Street) currently are classified as local streets.

Local streets are the lowest classification. Their primary purpose is to provide local land access and to carry locally generated traffic at relatively low speeds to the collector street system. Local streets should provide pedestrian and bicycle connectivity through neighborhoods, but should be designed so as not encourage cut-through vehicular traffic. Tualatin has also established a *local commercial/industrial* category for local streets that provide local truck access, but that are not intended to serve through truck traffic.

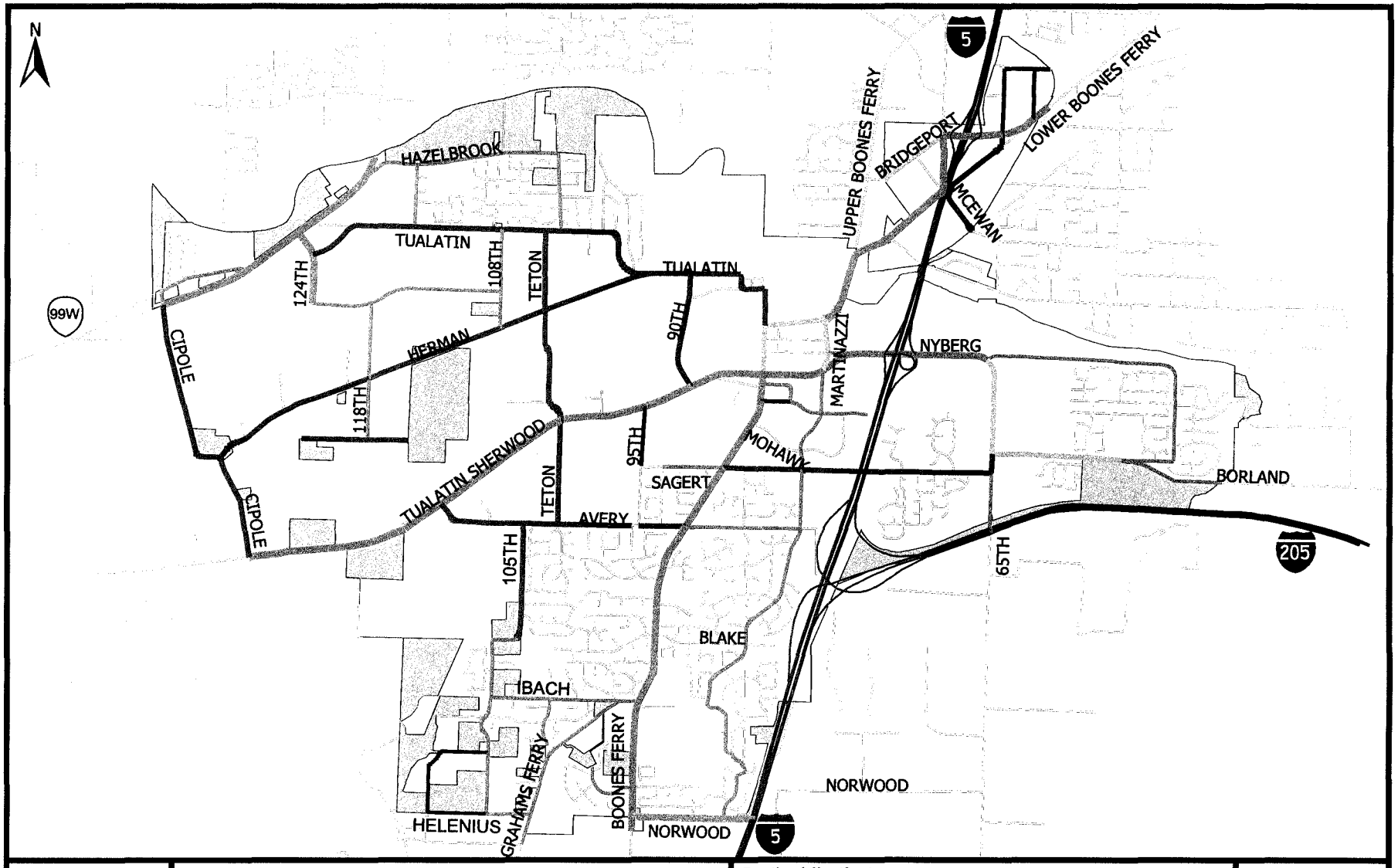


FIGURE 3-10

TUALATIN TRANSPORTATION SYSTEM PLAN
Existing Conditions

Existing Functional Classification

Functional Classification
- Freeway
- Ramp
- Expressway
- Major Arterial
- Minor Arterial
- Major Collector
- Minor Collector
- Residential Collector
- Local Commercial/Industrial

City of Tualatin
Tualatin Planning Area

1" = 3,000 feet

SOURCE: City of Tualatin

The other two City functional classifications apply to controlled-access facilities: *freeway* (I-5 and I-205) and *expressway*. The latter designation has been applied to a future roadway connecting I-5 and Highway 99W. This facility, called the "Norwood Expressway" in the Tualatin Community Plan, and the I-5/Highway 99W Connector in the RTP, is addressed further later in this TSP. Although not currently designed as an expressway, Norwood Road is shown as an expressway on Figure 3-10 because the City has not created an interim designation for the roadway.

ODOT applies a similar system to its highways, particularly concerning roadway operating standards and access standards. ODOT's categories, from highest to lowest, are Interstate, Statewide, Regional, and District highways; these were discussed in the plans and policies section.

Traffic Operations

Traffic volume counts were obtained for intersections of collectors and arterial roadways within Tualatin, covering the weekday p.m. peak period (4-6 p.m.), which is when traffic volumes are highest on area roadways. Historical data up to one year old were used, where available, and new counts were conducted in June and September 2000 for those intersections where previous count data were not available. These counts, in combination with ODOT traffic volume data on the state highway system, were used to evaluate the existing operations of roadways and intersections within the City of Tualatin.

Roadways

Figure 3-11 presents weekday p.m. peak hour traffic volumes (total of both directions) for the City's arterial and collector roadway system, derived from traffic volumes observed entering and exiting intersections adjacent to each street segment.

Tualatin's Development Code suggests daily volumes of 5,000-35,000 for arterial streets, and 2,000-8,000 for collector streets. Applying the rule-of-thumb that daily volumes are approximately ten times weekday p.m. peak hour volumes, the following collector streets are carrying more traffic than anticipated by the Development Code:

- Tualatin Road, between Herman Road and Boones Ferry Road (12,500-13,500 daily trips)
- Avery Street, between Teton Street and Boones Ferry Road (11,000)
- Sagert Street, between Boones Ferry Road and Martinazzi Avenue (8,000)
- Sagert Street, between Martinazzi Avenue and SW 65th Avenue (10,500)
- Borland Road, east of Wilke Road (9,500)
- Martinazzi Avenue, between Sagert Street and Tualatin-Sherwood Road (14,500-16,000)
- McEwan Road, south of Boones Ferry Road (10,500)

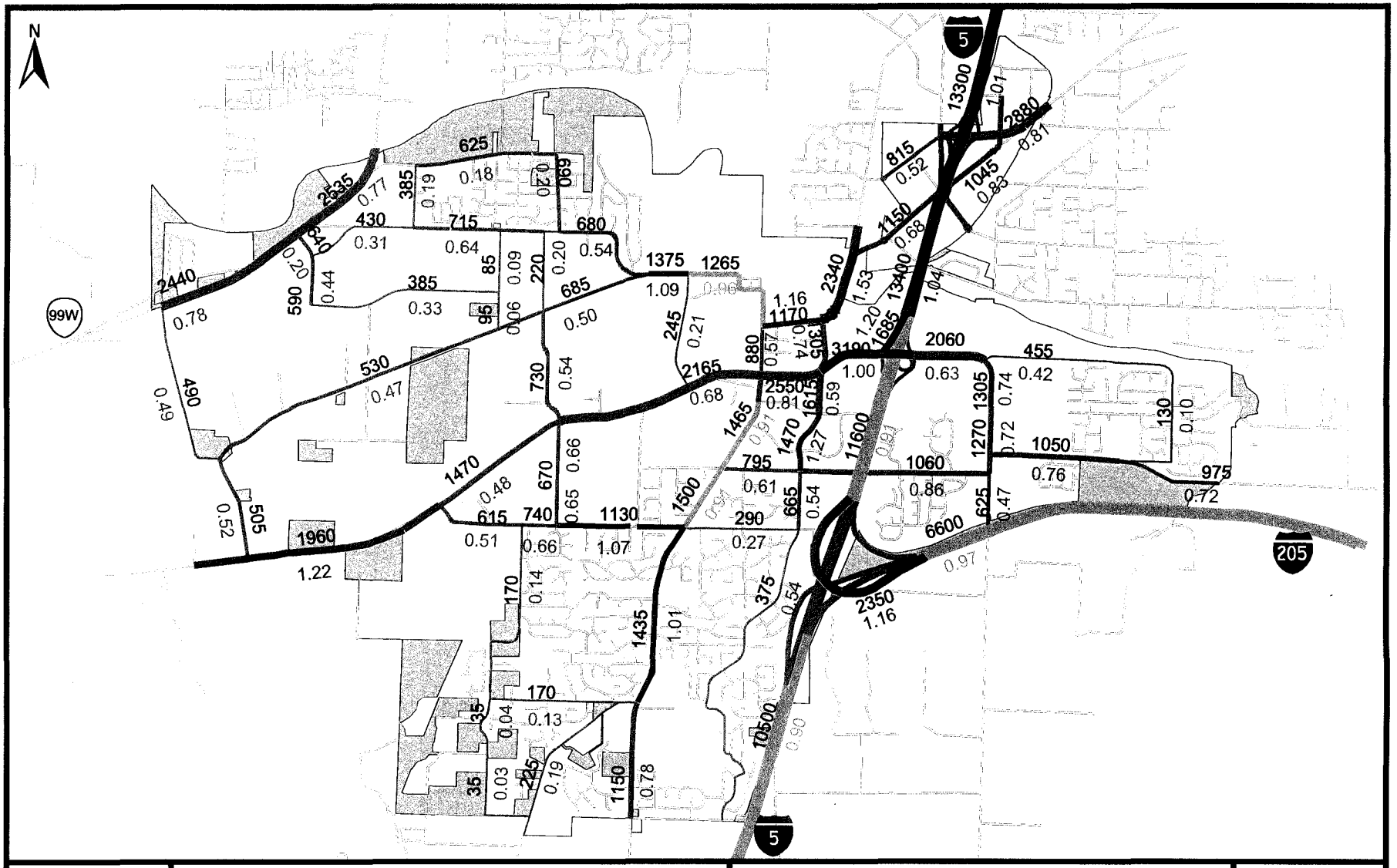


FIGURE 3-11

TUALATIN TRANSPORTATION SYSTEM PLAN
Existing Conditions

2000 Roadway PM Peak Hour Volumes

Under Capacity	Near Capacity	At Capacity	PM Peak Hour Volume
			1 - 500
			501 - 1000
			1001 - 1500
			1501 - 2000
			>2000

Total Two-Way Volume
#.## Critical Direction v/c Ratio
City of Tualatin
Tualatin Planning Area

1" = 3,000 feet

SOURCE: KAI analysis

Figure 3-11 also presents volume-to-capacity ratios for the critical direction of each street segment, indicating the percentage of that segment's capacity that is currently being used. For example, a v/c ratio of 0.50 indicates that half of a street's capacity is being used. The volumes used to calculate these ratios were based on the traffic counts discussed above. Roadway capacities were based on the capacities used in Metro's transportation planning model, as follows:

- collectors: 700 vehicles/lane/hour;
- arterials: 900 vehicles/lane/hour;
- freeway auxiliary lanes: 1,200 vehicles/lane/hour;
- freeway ramps: 1,400 vehicles/lane/hour; and
- freeway through lanes: 2,000 vehicles/lane/hour.

Roadways are shown on Figure 3-11 as being "under capacity" (v/c < 0.90), "near capacity" (v/c between 0.90 and 1.00), and "at capacity" (v/c >= 1.00). By definition, a roadway's volume cannot exceed its capacity; where Figure 3-11 shows v/c ratios greater than 1.00, the planning-level capacities used by the Metro model are underestimating the roadway's actual capacity.

Two caveats are in order about Figure 3-11. First, the volumes shown reflect the number of vehicles that were actually able to pass through a road segment during the weekday p.m. peak hour, rather than the number of vehicles that desired to use it. Conditions outside a particular road segment may meter the number of vehicles that can enter a corridor, or can produce queues that back into a road segment. The Tualatin-Sherwood Road corridor is an example of this. The traffic signal on the southbound I-5 ramps at Nyberg Street meters the number of vehicles that can enter the corridor; the effects are a queue on the ramp and fewer vehicles traveling on Nyberg Street than if the right turn could flow freely. Traffic signals in Sherwood operate at capacity, which often causes a queue to spill back into Tualatin, preventing as many vehicles from passing through any given congested section of Tualatin-Sherwood Road as could if the signals did not operate at capacity. As a result, drivers perceive congestion throughout the corridor, even though portions of it are capable of carrying more traffic if the bottlenecks located elsewhere were removed.

Second, a number of factors (e.g., traffic signal timing, the presence or absence of turn lanes, the length of the weaving area between freeway ramps, etc.) help determine a roadway's actual capacity. Of these factors, traffic signal timing is the most important, because a roadway's capacity is directly proportional to the percentage of time a green traffic signal indication is provided to that roadway at each intersection. Consequently, depending on signal timing, the actual per lane capacity of an arterial could range from less than 600 vehicles per hour per lane to over 1,000 vehicles per hour per lane.

Because planning-level capacities were used, conditions indicated on Figure 3-11 may not exactly match actual conditions on the roadways. For example, the southbound through lanes of I-5 generally operate near capacity, rather than at capacity. However, for the purposes of this analysis—to identify roadways at or near capacity—the planning capacities used are sufficient. Further, in order to provide an apples-to-apples comparison with year 2020 traffic volumes derived from the Metro model, the capacities used are necessary.

Figure 3-11 indicates the following roadway segments are at or near capacity during the weekday p.m. peak hour:

- The Tualatin-Sherwood Road/Nyberg Street corridor between Cipole Road and Avery Street, and between Martinazzi Avenue and the I-5 interchange.
- Boones Ferry Road, between Warm Springs Street and Ibach Street, and on the Tualatin River bridge.
- Tualatin Road, between Boones Ferry Road and Herman Road.
- Martinazzi Avenue, between Warm Springs Street and Sagert Street.

Again, the actual effects of congestion (queues of vehicles) may or may not be observed in these segments, depending on conditions at specific traffic signals. For example, vehicle queues currently develop along Tualatin-Sherwood Road/ Nyberg Street at Boones Ferry Road (eastbound) and the I-5 southbound ramps (westbound), indicating that these are current constraint points for the roadway. If these intersections alone were to be improved, the constraint point would simply shift to the intersection along the roadway with the next lowest capacity. As a result, when looking to address congestion problems, it is important to not only look at intersection capacity, but also the capacity of an extended section of roadway. It is equally important to look at opportunities to shift demand away from the congested roadway (as opposed to providing more capacity), through providing alternative parallel routes, or by shifting trips to alternate modes or alternate times of day.

Intersections

Traffic operations at intersections can be described using "levels of service" (LOS), representing ranges in the average amount of delay that motorists experience when passing through the intersection. LOS is measured on an "A" (best) to "F" (worst) scale. At signalized and all-way stop intersections, LOS is based on the average amount of delay experienced by all vehicles entering the intersection. At two-way stop intersections, LOS is based on the average amount of delay experienced by the worst movement at the intersection, typically a left turn from the stop-controlled street. LOS "D", representing no more than 55 seconds of average delay, is generally considered to be acceptable at signalized intersections. LOS "E", representing no more than 50 seconds of average delay, is generally considered to be acceptable at unsignalized intersections. Appendix "B" provides a complete description of roadway LOS and notes that the LOS thresholds are different for signalized and all-way stop intersections than for other types of intersections.

ODOT uses a different criterion for intersections under its jurisdiction, based on the highway's classification and the intersection's volume-to-capacity (v/c) ratio (the percentage of an intersection's or movement's capacity that is being used—a v/c of 0.50 indicates, for example, that half of the capacity is used). The following standards apply to state highways within Tualatin:

- Interstate highways within Metro UGB (I-5 north of I-205): 0.90
- Interstate highways outside Metro UGB (I-5 south of I-205, and I-205): 0.70
- Interchange ramp terminals: 0.85 (0.90 if ramp queues do not affect freeway operations, if most of the area within the interchange influence area is already developed, and if ODOT access standards are met, to the extent possible, within the interchange influence area). The 0.85 v/c standard currently applies to both Tualatin interchanges because other traffic signals are located within ¼ mile of both interchanges.
- Highway 99W: 0.90 (statewide freight route inside Metro UGB)

- Boones Ferry Road: 1.00 (Tualatin Town Center area [central Tualatin]), 0.95 (remainder of Tualatin)

In addition, any intersection operating over capacity should be considered to be operating unacceptably, even if other LOS standards are met, as queues will develop that can cause operational problems at adjacent intersections.

Level-of-service analyses were performed at each of the study intersections, using the procedures stated in the 1997 Highway Capacity Manual. As noted previously, based on Oregon's Transportation Planning Rule standards for TSPs, only intersections of collectors and arterials were studied. Some Tualatin intersections that are signalized (e.g., Kmart-Fred Meyer/Nyberg Street) have local or private streets as the cross street and therefore were not studied.

Figure 3-12 shows the intersection traffic control and existing weekday p.m. peak hour LOS at the study intersections. Following traffic engineering terminology, unsignalized intersections that are not all-way stops are referred to as "two-way stops", even if the intersection is a "T" intersection with only one approach stopped. Appendix "C" provides detailed delay and v/c ratio information for each study intersection.

The following intersections currently do not meet one or more of the traffic operations criteria described above:

- Teton Avenue/Avery Street (v/c > 1)
- Boones Ferry Road/Avery Street (v/c > 1)
- Sagert Street/SW 65th Avenue (LOS "F", v/c > 1)
- Nyberg Street/SW 65th Avenue (LOS "F")
- Nyberg Street/I-5 Southbound Ramps (v/c > 0.85)
- Tualatin Road/Boones Ferry Road (LOS "E", v/c > 1)
- Boones Ferry Road/I-5 Northbound and Southbound Ramps (v/c > 0.85)
- Boones Ferry Road/SW 65th Avenue/McEwan Road (LOS "E", v/c >1)

The unsignalized intersections that did not meet one of these standards, or were close to not meeting a standard, were evaluated to see if traffic signal warrants were met. The major volume-related warrants presented in the Manual on Uniform Traffic Control Devices (Warrants 1, 2, and 11) were evaluated. At a minimum, at least one warrant must be met before a traffic signal can be considered; however, meeting a warrant does not necessarily mean a traffic signal is the best solution. Table 3-5 presents the results.

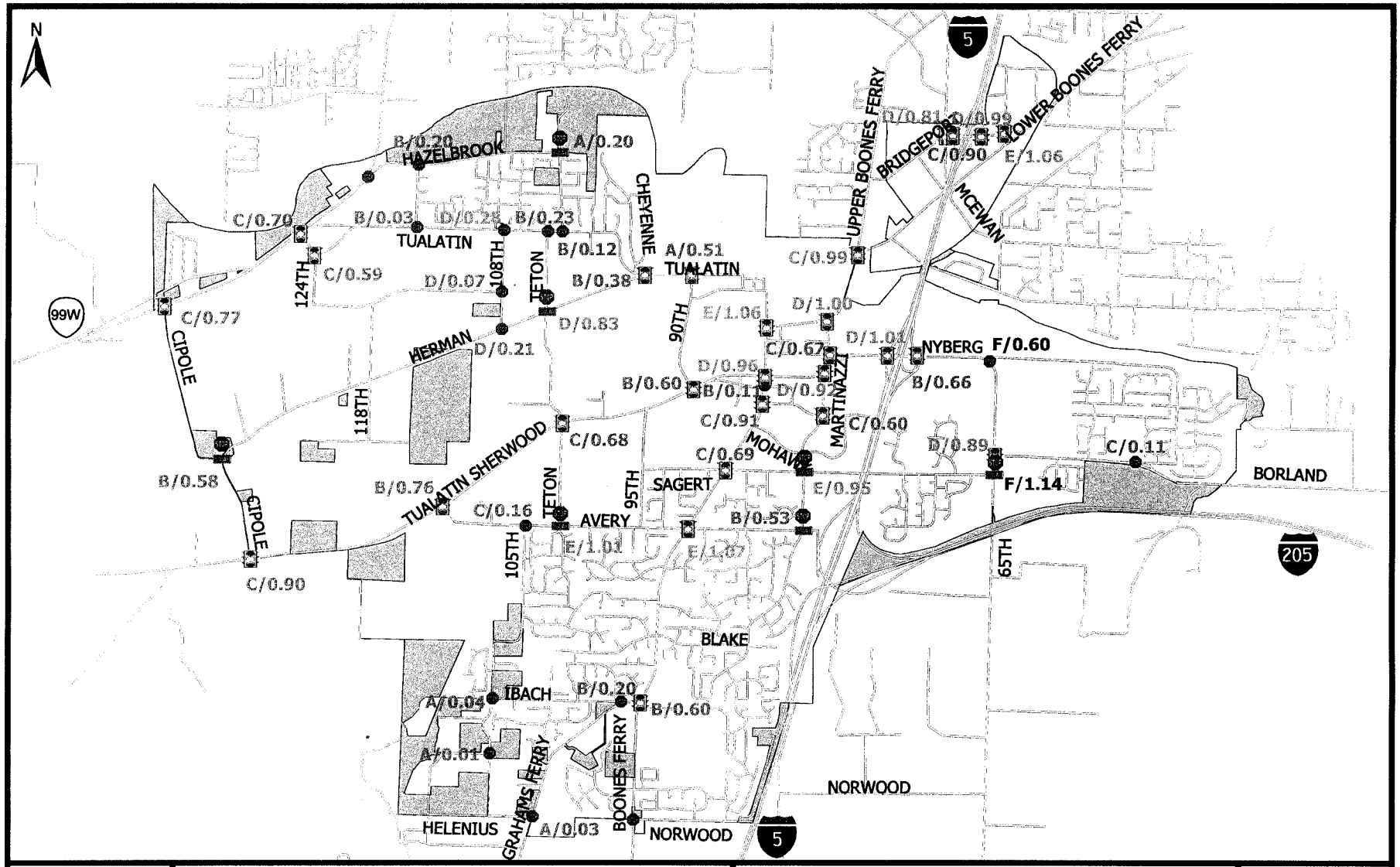


FIGURE 3-12

TUALATIN TRANSPORTATION SYSTEM PLAN
Existing Conditions

Intersection Level of Service

Study Intersection Control
- Traffic Signal
- All-Way Stop
- 1 or 2-Way Stop
- Other Traffic Signal

City of Tualatin
Tualatin Planning Area

X/#.## Level of Service/ v/c Ratio

1" = 3,000 feet

SOURCE: KAI analysis

TABLE 3-5
TRAFFIC SIGNAL WARRANT RESULTS

Intersection	Warrant 1: Minimum Vehicular Volume	Warrant 2: Interruption of Continuous Traffic	Warrant 11: Peak Hour Volume
Avery Street/Teton Avenue	Yes	No	Yes
Sagert Street/Martinazzi Avenue	Yes	Yes	Yes
Sagert Street/65th Avenue	Yes	No	Yes
Nyberg Street/65th Avenue	No	Yes	Yes

Traffic Safety

To determine whether safety deficiencies or potential conflict points may exist at major intersections, crash data for the City of Tualatin were examined. The data for the study intersections were obtained from ODOT for the period January 1, 1995 through December 31, 1999. Figure 3-13 indicates crash rates at study intersections. Detailed crash rate data are provided in Appendix "C".

Crash rates for intersections are expressed in reported crashes per million entering vehicles (MEV). Because some crashes may not be reported by motorists, or because the property damage limit was not exceeded, not all crashes that occur at an intersection may show up in the data. As a rule of thumb, a crash rate higher than 1.0 crashes/MEV indicates a safety issue requiring further analysis. As shown in Figure 3-13, the intersection of Boones Ferry Road/Tonka Avenue has a crash rate in excess of one crash per million entering vehicles. Virtually all of the reported crashes at this intersection (47 of 48) involved left turns from Boones Ferry Road onto Tonka Avenue. This intersection was recently mitigated through the construction of a median on Boones Ferry Road to prevent southbound left turns.

A number of other intersections have relatively high total numbers of crashes, although their overall crash rate is not particularly high, due to the high volume of vehicles using these intersections. These are:

- **Avery Street/Boones Ferry Road:** Rear-end collisions on the Boones Ferry approaches (9 southbound and 6 northbound) were the cause of 15 of 25 crashes occurring at this intersection.
- **Highway 99W/Cipole Road:** There were 20 reported crashes at this intersection in five years, with no apparent pattern to the crashes.
- **Boones Ferry Road/Martinazzi Avenue:** Eight of eleven crashes involved rear-end collisions, which were distributed evenly among the three legs of the intersection.
- **Sagert Street/Martinazzi Avenue:** Seven of eleven crashes involved running a stop sign or failing to yield the right-of-way at this all-way stop. Crashes were distributed among all approaches.
- **Lower Boones Ferry Road/Interstate-5 Northbound Ramp:** 36 of the 40 reported crashes at this intersection involved read end collisions. Of these collisions, 25 occurred along the interstate off-ramp.

- **Nyberg Street/Interstate-5 Northbound Ramp:** 13 of the reported 14 crashes involved vehicles making a left-turn from the off-ramp onto Nyberg Street. In every instance, drivers were cited for disregarding the traffic signal.
- **Nyberg Street/Interstate-5 Southbound Ramp:** 25 of the 60 reported crashes involved rear end collisions occurring along the interstate off-ramp.
- **Tualatin Sherwood Road/Martinazzi Avenue:** There were a total of 35 reported crashes at this intersection in five years, with no apparent pattern to the crashes.
- **Tualatin Sherwood Road/Boones Ferry Road:** 23 of the reported 41 crashes at this intersection involved rear-end collisions. The majority of these collisions occurred along the east and west Tualatin-Sherwood Road approaches, where the highest traffic volumes exist.
- **Tualatin Sherwood Road/Teton Avenue:** 15 of the 25 reported crashes at this intersection involved rear-end collisions along the east and west approaches of Tualatin-Sherwood Road.

Another way to assess intersection crash history is using the Safety Priority Indexing System (SPIS), which weights the number of crashes and their severity to prioritize safety improvements. The Washington County 1996-1998 (SPIS) list indicates that the intersections of Tualatin Sherwood Road/Martinazzi Avenue, Nyberg/SW 65th Avenue, Tualatin Sherwood/Boones Ferry Road, Highway 99W/Cipole Road, Tualatin Sherwood/Teton Avenue, Boones Ferry Road/Lower Boones Ferry Road, Tualatin Sherwood Road/Cipole Road, Tualatin Sherwood Road/SW 90th Avenue, and Boones Ferry Road/Bridgeport Road were in the top 50% of SPIS locations on Washington County owned or maintained roadways in Tualatin. These locations are identified on Figure 3-13. Because the County's SPIS list is based on earlier years than the crash data discussed above, some intersections that currently have low crash rates still show up on the SPIS list. Also, the County includes the top 50% of all County collector/arterial intersections on its list, without setting a minimum threshold for the number of crashes or the crash rate.

3.3.9 Truck Freight Transportation

Figure 3-14 shows the designated truck routes within the City of Tualatin. Note that some of these roadways, such as the Norwood Expressway and SW 124th Avenue south of Tualatin-Sherwood Road, are future roadways that do not exist yet. Truck routes that stop without connecting to other routes (i.e., Tualatin Road, Herman Road, Avery Street, and SW 105th Avenue) are intended to provide truck access to industrial uses along those roads, but not to provide for through truck movements. The first two routes are not continuous because of the multiple 90-degree turns on Tualatin Road that trucks need to negotiate; the other two routes are not continuous because they would extend into residential neighborhoods. Triple trailers are not allowed on Tualatin streets. No other truck weight or size restrictions were identified in the City.

Truck freight movements in Tualatin involve shipments both to and from locations in the City, and shipments that pass through the City, particularly along Tualatin-Sherwood Road. Figure 3-15 shows p.m. peak hour truck volumes on truck routes within Tualatin. Both types of freight movements rely in large part on access from I-5 and Tualatin-Sherwood Road, as the alternative route from I-5 via Boones Ferry Road involves negotiating a number of sharp turns. Congestion that occurs on Tualatin-Sherwood Road produces delays in getting freight to its destination.

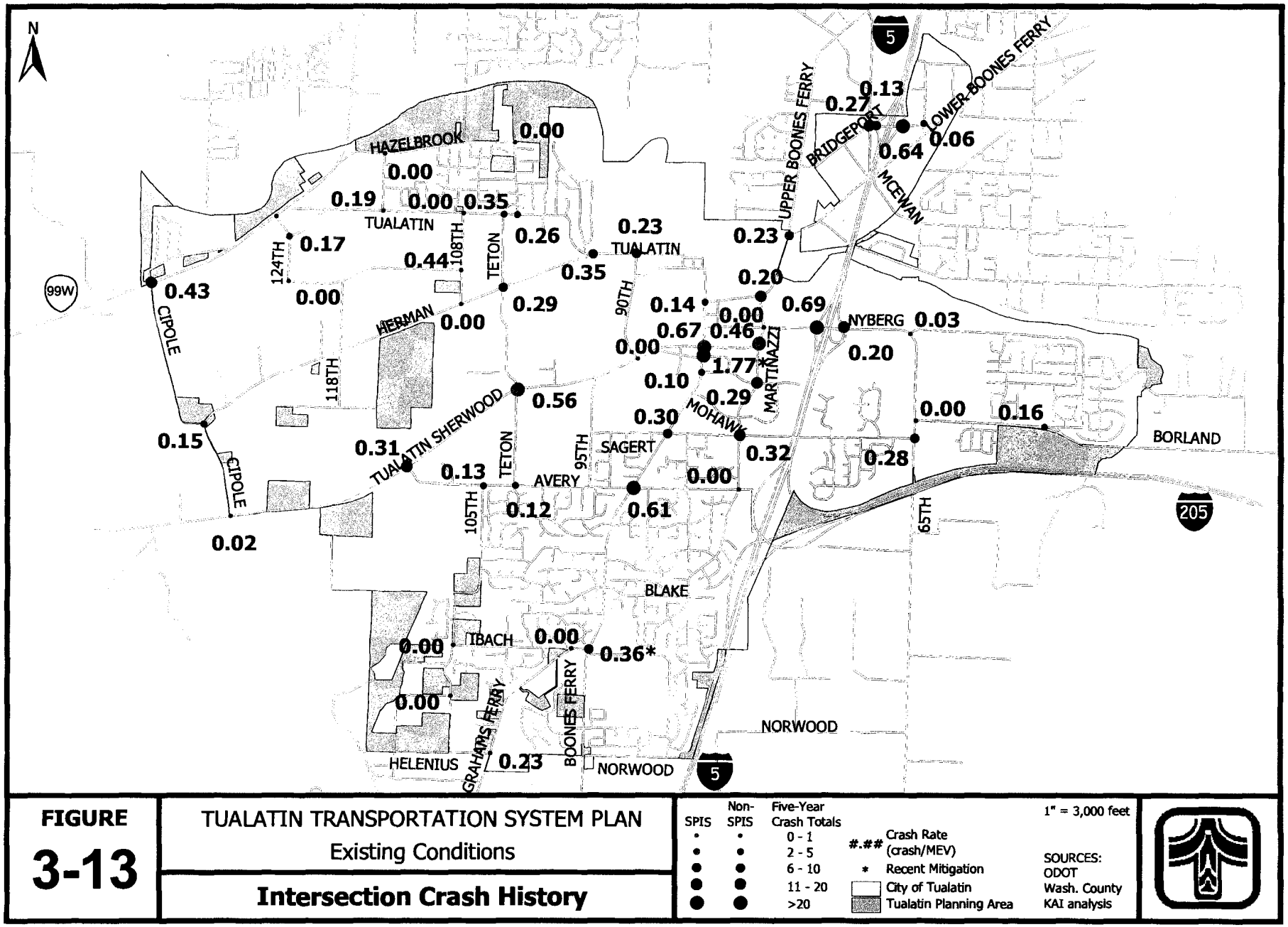


FIGURE 3-13

TUALATIN TRANSPORTATION SYSTEM PLAN

Existing Conditions

Intersection Crash History

SPIS	Non-SPIS	Five-Year Crash Totals
•	•	0 - 1
●	●	2 - 5
●	●	6 - 10
●	●	11 - 20
●	●	>20

#.## Crash Rate (crash/MEV)

* Recent Mitigation

City of Tualatin

Tualatin Planning Area

1" = 3,000 feet

SOURCES:
ODOT
Wash. County
KAI analysis

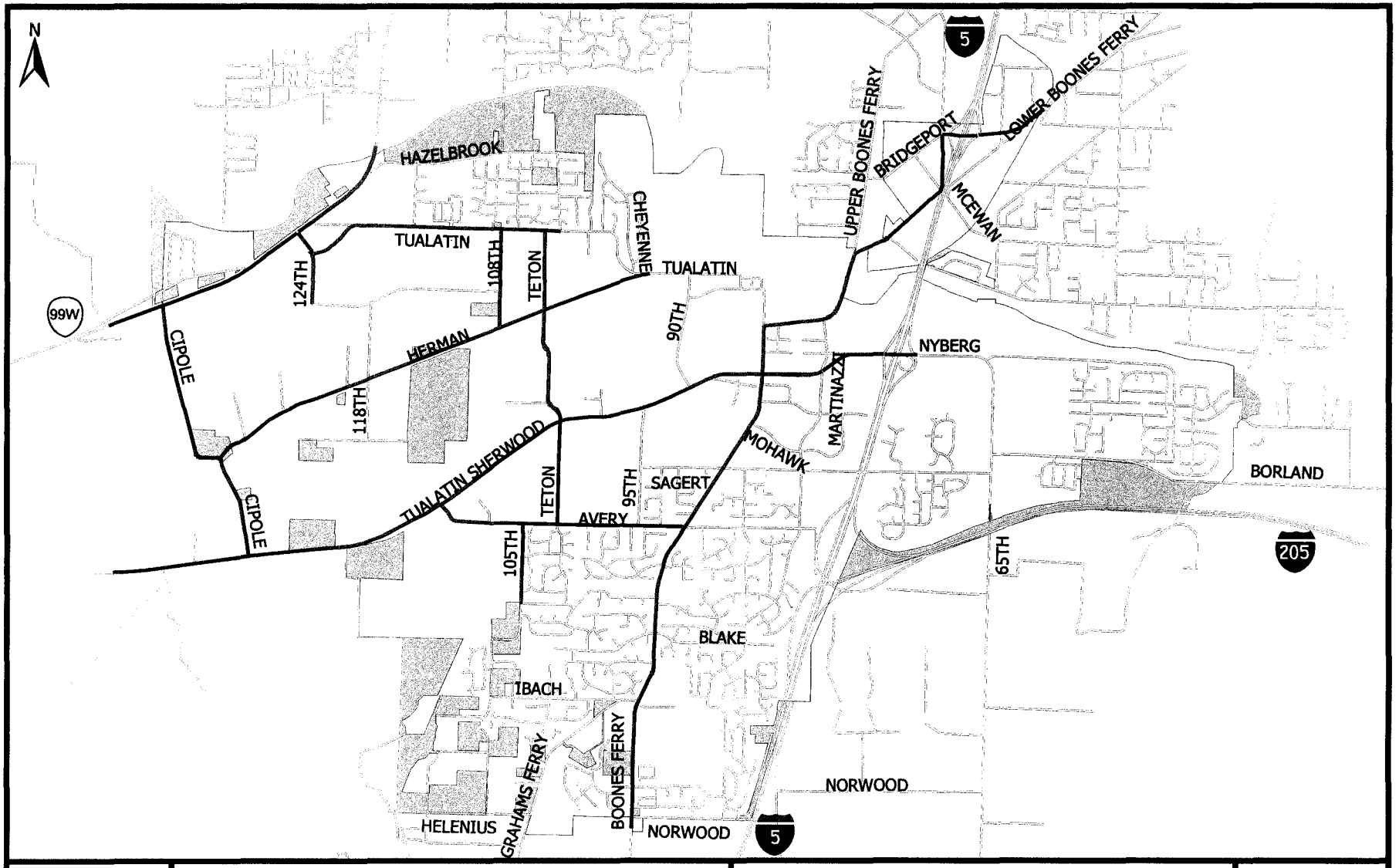


FIGURE 3-14

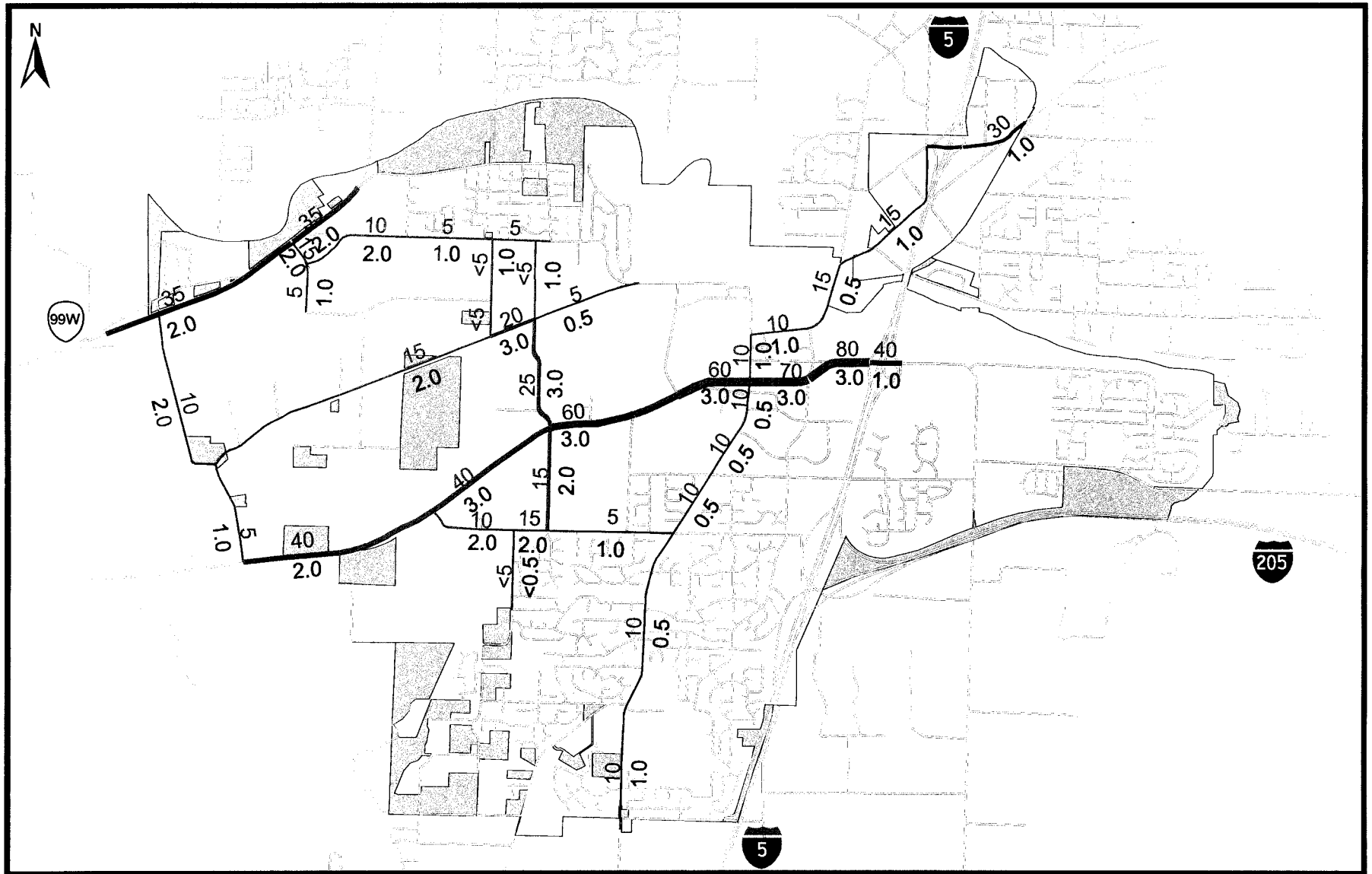
TUALATIN TRANSPORTATION SYSTEM PLAN
Existing Conditions

Truck Routes

Truck Routes
City of Tualatin
Tualatin Planning Area

1" = 3,000 feet

SOURCES:
City of Tualatin



FIGURE

3-15

TUALATIN TRANSPORTATION SYSTEM PLAN

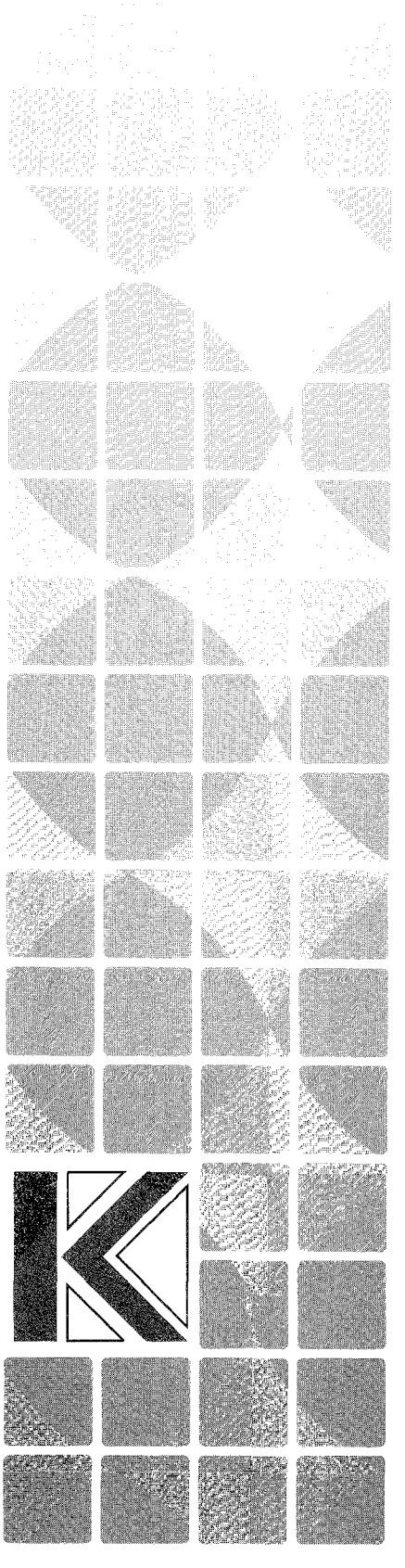
Existing Conditions

2000 PM Peak Hour Truck Volumes

3.4 SUMMARY OF EXISTING CONDITIONS

- **Pedestrian:** Central Tualatin and newer residential and industrial development generally have good pedestrian facilities. Older roadways in the industrial area, and roadways around the fringes of the city tend to have little or no pedestrian facilities. Sections of Boones Ferry Road, particularly around Tualatin Elementary School, Nyberg Street east of I-5, and I-5 overpasses lack sidewalks on one or both sides. Multiple-use pathways are provided within a number of City parks.
- **Bicycle:** Bicycle attractors, such as schools, parks, retail centers, and public facilities, are generally not well served from the City's residential areas due to a lack of continuous bicycle facilities. Central Tualatin, for example, lacks bicycle lanes on most internal streets, and on many approach routes. Although residential neighborhoods have a well-connected system of bicycle routes and the industrial area of western Tualatin are generally well-served internally by bicycle facilities, bicycle facilities from these areas to other bicycle attractors have not been established.
- **Transit:** Only the central portion of Tualatin, the northeast corner of Tualatin, and the eastern half of the City's industrial area have sufficient population or employment density to support hourly fixed-route transit service. Tri-Met routes only serve 44% of this area, although the combination of Tri-Met and the TMA Shuttle service covers virtually all of this area. Only 49% of Tualatin households live within walking distance of fixed-route transit service. Tri-Met service is oriented around the City's two major park-and-ride lots. Approximately two-thirds of all Tri-Met passengers boarding buses in Tualatin do so at these park-and-ride lots.
- **Pipelines and Transmission Systems:** Electric transmission lines, natural gas distribution lines, and water lines serve the City. No issues have been identified with any of these facilities.
- **Rail:** The Portland & Western Railroad operates two lines through the City of Tualatin for the movement of freight. Track conditions meet state guidelines. Industrial-zoned land abuts the rail lines, providing opportunities for potential customers to locate next to rail service. Planning is underway to develop a Wilsonville-Beaverton commuter rail line that would have a station in Tualatin. The closest AMTRAK passenger rail stations are located in Portland and Salem.
- **Air:** There are several public general-aviation airports that serve Tualatin. The closest airport is 12 miles south of Tualatin, in Aurora. The closest airport with scheduled passenger service is the Portland International Airport, 25 miles northeast of Tualatin.
- **Marine:** No navigable waterways are located in the vicinity of Tualatin. The closest marine facilities are located 12 miles to the north in Portland, Oregon.
- **Roadways:** Intersections at I-5 interchanges, on Highway 99W, and in Central Tualatin operate at or close to capacity. Four unsignalized intersections currently meet traffic signal warrants. The I-5 and I-205 freeways, Tualatin-Sherwood Road, Boones Ferry Road, Tualatin Road, Martinazzi Avenue, and Avery Street all have sections operating at or near capacity.

- **Truck Freight Movement:** Traffic congestion on Tualatin-Sherwood Road slows freight movements to and through Tualatin. Sharp corners and residential neighborhoods along parallel routes constrain the use of alternate routes to Tualatin-Sherwood Road.



Section 4

Future Transportation Needs

Future Transportation Needs

4.1 INTRODUCTION

This section presents the initial population growth forecast for Tualatin through the year 2020 and the transportation needs that will result if no improvements are made to the City's transportation system in the meantime, based on Metro's forecasting efforts. Late in the TSP process, the City updated this forecast to account for more jobs in the western industrial area, and redevelopment of the Durham Quarry into a mixed-use development. The updated forecast was used for the alternatives analysis, and is described in the next section.

This section is organized into two main halves, followed by a brief summary of land use, growth, and TSP content issues identified though the future needs analysis. The first half (Future Transportation Demand) presents growth forecasts for the City of Tualatin and the region, and the impacts of that growth on the City's roadway system. The second half (Transportation Modes and Facilities) presents a list of needs by mode, based on (1) the technical analysis presented in the three technical memoranda, (2) input received through the project's public involvement process, and (3) compliance with the Regional Transportation Plan.

4.2 FUTURE TRANSPORTATION DEMAND

4.2.1 Growth Forecasts

Future transportation demand within the City of Tualatin was estimated based on data from Metro's urban area traffic forecast model. For the purposes of the model, the Portland metropolitan area is divided into a number of traffic analysis zones (TAZs), which are intended to represent areas that contain similar land uses and access similar roadways. For example, downtown Tualatin is a TAZ, and the area bounded by 65th Avenue, I-205, the Tualatin River, and Stafford Road is a TAZ.

Metro currently uses 1994 household and employment (retail and "other") data as its base, and has developed year 2020 household and employment forecasts, which include estimates of future households and employment in areas that are former urban reserves outside the urban growth boundary. Table 4-1 presents Metro's population and employment data for both 1994 and 2020 for TAZs wholly or partially within the City of Tualatin.

Figures 4-1 and 4-2 depict TAZ locations and indicate the amount of household and employment growth forecast for each TAZ, based on the Metro data. Figure 4-3 shows the current community plan designations for the various sections of Tualatin. A comparison of Figure 4-1, Figure 4-2, Figure 4-3, and Table 4-1 shows that the Metro model currently assigns households to some TAZs currently planned exclusively as industrial (e.g., TAZ 364), and that significant amounts of employment are shown in areas currently planned as residential (e.g., TAZ 373). (It should be noted that residential zones may contain schools, churches, and similar institutions as conditional uses that will generate some employment.)

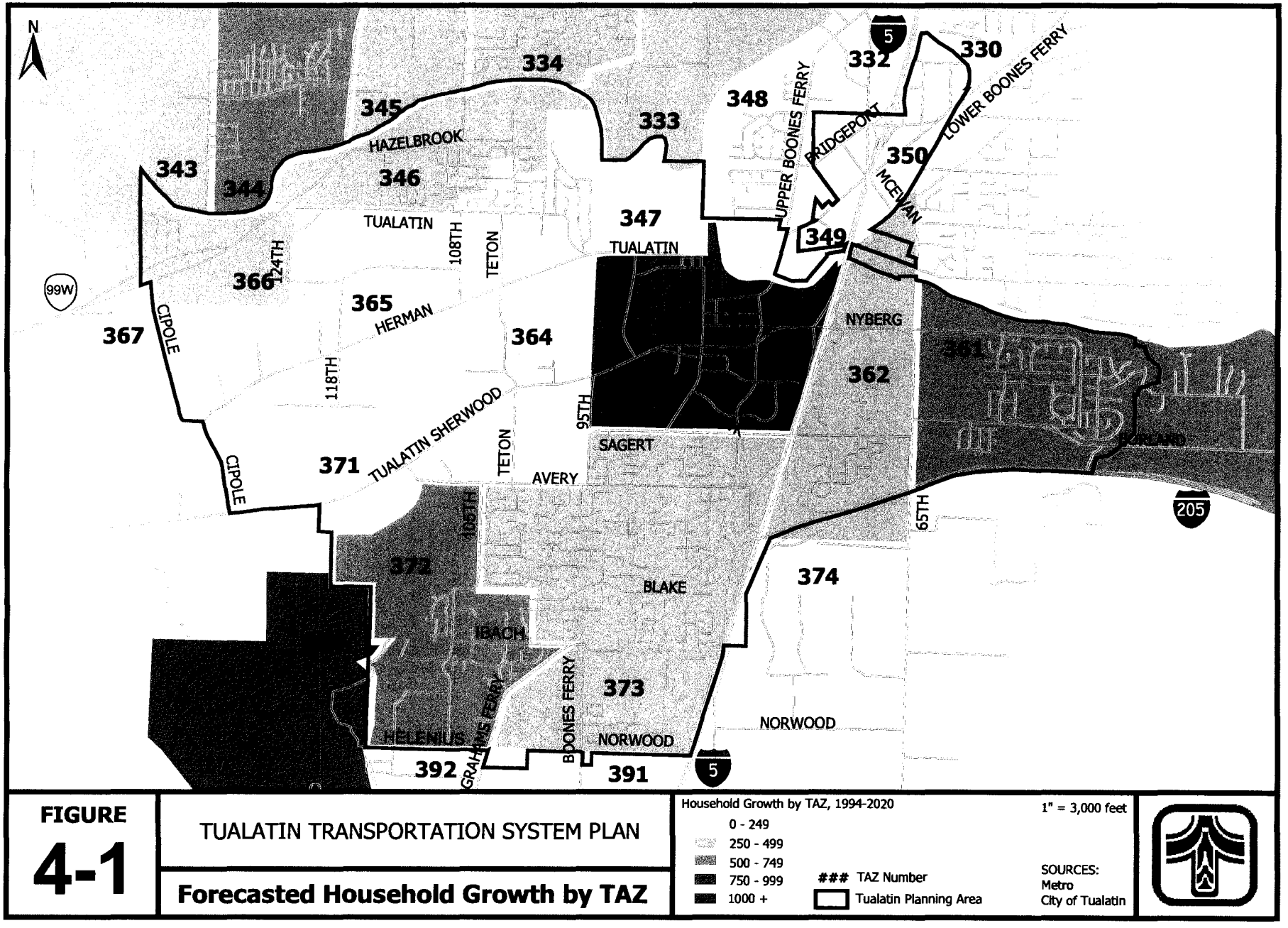


FIGURE 4-1

TUALATIN TRANSPORTATION SYSTEM PLAN

Forecasted Household Growth by TAZ

Household Growth by TAZ, 1994-2020

- 0 - 249
- 250 - 499
- 500 - 749
- 750 - 999
- 1000 +

TAZ Number

Tualatin Planning Area

1" = 3,000 feet

SOURCES:
Metro
City of Tualatin

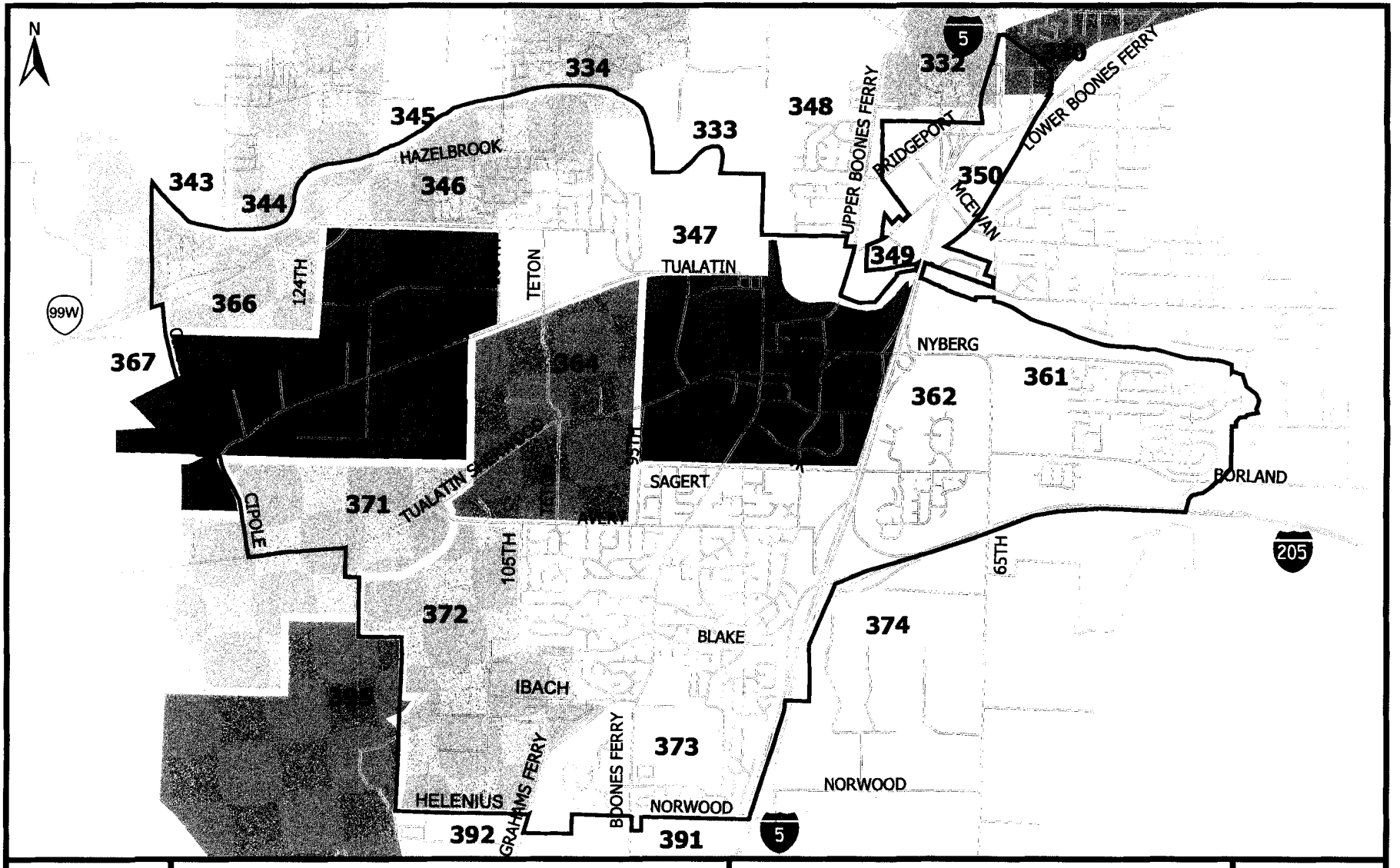


FIGURE 4-2

TUALATIN TRANSPORTATION SYSTEM PLAN

Forecasted Employment Growth by TAZ

Employment Growth by TAZ, 1994-2020

- 0 - 499
- 500 - 999
- 1000 - 1999
- 2000 - 2999
- 3000 +

TAZ Number

Tualatin Planning Area

1" = 3,000 feet

SOURCES:
City of Tualatin
Metro

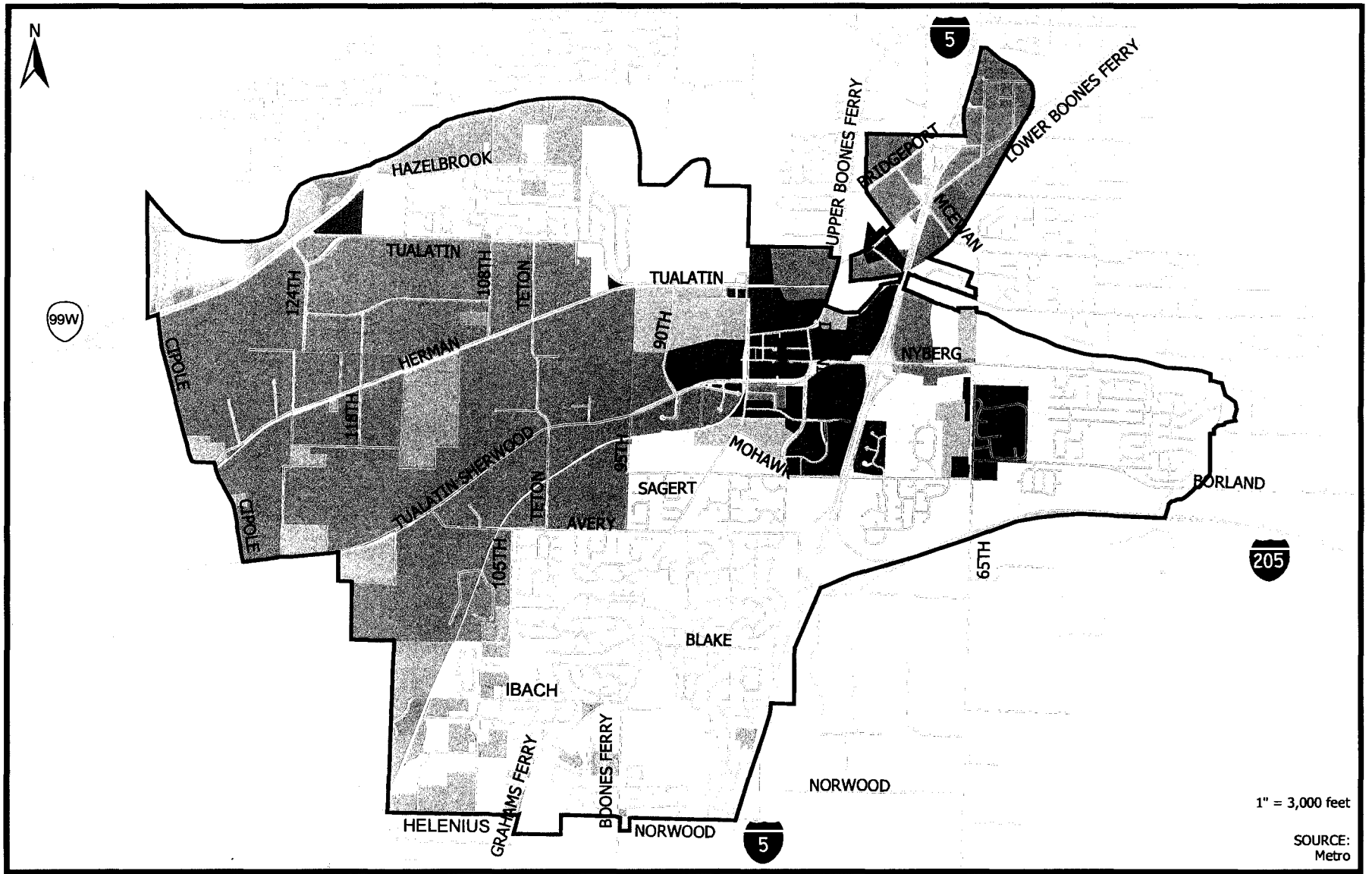


FIGURE 4-3

TUALATIN TRANSPORTATION SYSTEM PLAN

Community Plan Map

Plan Designations

- Central Commercial
- General Commercial
- Neighborhood Commercial
- Office Commercial
- Agricultural or Forestry
- Industrial Area
- Heavy Industrial
- Light Industrial
- Mixed Use Industrial
- Multi Family (low density)
- Multi Family (medium density)
- Multi Family (high density)
- Multi Family (highest density)
- Mixed Use (low density)
- Mixed Use (low density)
- Mixed Use (high density)
- Public Facilities
- Parks & Open Spaces
- Rural Residential or Future Urban
- Tualatin Planning Area
- Single Family (lowest density)
- Single Family (low density)
- Single Family (low-medium density)
- Single Family (medium density)
- Single Family (medium-high density)
- Single Family (high density)
- Single Family (highest density)

TABLE 4-1
METRO POPULATION AND EMPLOYMENT FORECASTS FOR TUALATIN

	1994			2020			Growth, 1994-2020	
TAZ	HH	Retail	Other	HH	Retail	Other	Households	Employment
330	381	79	999	493	530	2115	112	1567
332	11	485	4869	82	541	5745	71	932
333	634	24	169	994	38	487	359	332
334	1921	44	232	2356	336	442	434	502
343	181	0	18	661	0	353	479	335
344	2353	97	501	2853	264	1085	500	751
345	745	399	134	1022	494	219	276	180
346	506	8	50	990	59	617	483	618
347	334	0	1199	365	0	1204	31	5
348	258	24	970	470	36	1350	212	392
349	88	490	856	216	394	1130	128	178
350	9	724	479	2	706	709	17	212
361	938	82	390	1593	102	742	655	372
362	1391	61	1090	1864	88	1507	473	444
363	854	1614	3498	2291	1753	5819	1437	2460
364	181	48	2974	181	74	4299	0	1351
365	19	25	1493	19	76	5285	0	3843
366	154	35	170	516	35	870	362	700
367	30	0	38	40	0	138	10	100
371	9	0	375	17	0	1344	8	969
372	180	51	834	826	59	1510	647	684
373	2582	6	574	2991	65	826	409	311
374	142	0	115	149	0	127	7	12
391	47	15	1961	47	28	2368	0	420
392	47	0	6	106	0	43	59	37
395	50	0	191	949	0	1395	899	1204

NOTE: HH = households, Retail = retail employment, Other = non-retail employment
Values shown in **bold** are City of Tualatin estimates that are different from Metro estimates

4.2.2 Model Process

Washington County's calibrated version of the Metro emme/2 forecasting model was used to develop the 2020 weekday p.m. peak hour forecasts. This model has been refined by Washington County to best reflect conditions in incorporated and unincorporated areas throughout the County, while maintaining consistency with the overall regional model. The travel forecasting model assigns future traffic to the transportation system based on the level of household and employment growth in each TAZ. Trips are assigned to the transportation system based on the minimum time path; this reflects the fact that travelers will seek the shortest path through the system and may choose to divert their path to avoid congestion during peak periods.

The transportation model produces 2020 traffic forecasts for the two-hour peak period. For the purposes of this analysis, it was necessary to convert these two-hour forecasts to single one-hour p.m. peak forecasts. A factor of 55 percent was applied to the two-hour peak volumes to estimate p.m. peak hour traffic volumes, based on input from Metro staff.

In order to assess future "no-build" conditions, the existing transportation network was modified slightly to reflect a single improvement that is pending. The "no-build" scenario consists of 2020 forecasted traffic volumes placed on the existing roadway system, with no capacity improvements other than those currently programmed. That improvement involves the addition of a lane on the I-5 southbound off-ramp to Nyberg Road; in addition, a third eastbound through lane would be added on the Nyberg Road overcrossing of I-5.

4.2.3 Traffic Volume Forecasts

Year 2020 traffic volume forecasts for intersection turning movements and street segments were derived from a combination of existing turning movement counts, and base and future year model forecasts, using the procedure described in National Cooperative Highway Research Program (NCHRP) Report 255[1]. The NCHRP 255 process works as follows:

- Actual turning movement volumes and patterns are used as a starting point. For example, a particular movement at an intersection might have 50 vehicles per hour.
- The percentage change in the model's traffic volumes for a movement between the model's base and future years is calculated. For example, if the model's base year volume is 25 vehicles per hour and the future year volume is 75 vehicles per hour, the movement's volume triples during that time. Tripling the actual volumes would result in 150 vehicles per hour.
- The numerical change in the model's traffic volumes is also calculated. In the example, the model's volume for the movement increased by 50 vehicles per hour, from 25 to 75. Increasing the actual volumes by 50 vehicles per hour results in a total of 100 vehicles per hour.
- The results obtained from the two methods, percentage and numerical change, are averaged to obtain the traffic volume used as the future year forecast. In this example, 150 and 100 would be averaged to obtain a movement volume of 125 vehicles per hour.

This process was applied to all of the study intersections in Tualatin that exist in the base year model. Occasionally, the NCHRP 255 process produced unreasonable results for a particular movement. In general, this occurred when the existing model volume was extremely small, resulting in a 30- or 40-fold increase in volumes from existing to future years. When this occurred, the model's unadjusted future volume was used, rather than the adjusted volume.

---

[1]Metro's travel demand forecasting model, emme/2, estimates travel times based on a formula that derives travel speeds on a roadway segment from the segment's demand volumes and capacity. Intersection operations (and delays) are not modeled within emme/2. As a result, the model's turning movements generally should not be relied upon by themselves. To compensate, the NCHRP 255 process is a technique that modifies existing intersection turning patterns based on traffic growth modeled on the intersection approaches. Although there are other ways to develop future volumes, the NCHRP 255 process was chosen because it is the process adopted by ODOT.

For those intersections that did not exist in 1994, or were not included in Metro's base year model for other reasons, growth factors were estimated for each intersection approach based on the growth calculated for other nearby intersections that are included in the base year model. In addition, where intersections are closely spaced, with little or no opportunity for access between the intersections, traffic volumes were balanced between the two intersections.

4.2.4 Year 2020 Roadway Capacity Deficiencies

Figure 4-4 shows two-way p.m. peak hour traffic demands on segments of arterials and collectors within Tualatin, and the demand-to-capacity ratio for the critical direction along each segment. It is important to keep in mind that these figures are *demands*, indicating a motorist's desire to travel along a particular roadway, rather than *volumes* (emme/2, the travel demand forecasting model used by Metro, reports *demands* to use a roadway rather than *volumes*). This is an important distinction, because a roadway can only serve a traffic volume corresponding to its capacity. Where traffic demands exceed a roadway's capacity, only a volume equal to that roadway's capacity would actually travel along that roadway; the remaining vehicles would accumulate as a queue that would extend back from the point where demand first exceeded capacity. For example, the demand to use the southbound I-5 off-ramp at Nyberg Street during the weekday p.m. peak period currently exceeds the ramp's capacity, and as a result, a queue develops that can extend back onto the freeway.

If no improvements are made to Tualatin roadways, other than the Nyberg interchange project described above, and if growth occurs as assumed in the Metro model, the following sections of roadways will exceed their capacity by the year 2020:

- Tualatin-Sherwood Road (west city limits to Nyberg Street)
- Nyberg Street (Tualatin-Sherwood Road to 65th Avenue)
- 65th Avenue (Nyberg Street to south city limits)
- Borland Road (65th Avenue to east city limits)
- Sagert Street (Boones Ferry Road to 65th Avenue)
- Boones Ferry Road (Upper/Lower Boones Ferry Road to Tualatin Road and Tualatin-Sherwood Road to south city limits)
- Ibach Street (Boones Ferry Road to Grahams Ferry Road)
- Avery Street (Boones Ferry Road to Tualatin-Sherwood Road)
- Cipole Road (Highway 99W to Herman Road)
- Herman Road (Cipole Road to Tualatin Road)
- Tualatin Road (Herman Road to Boones Ferry Road)
- Highway 99W (west city limits to north city limits)

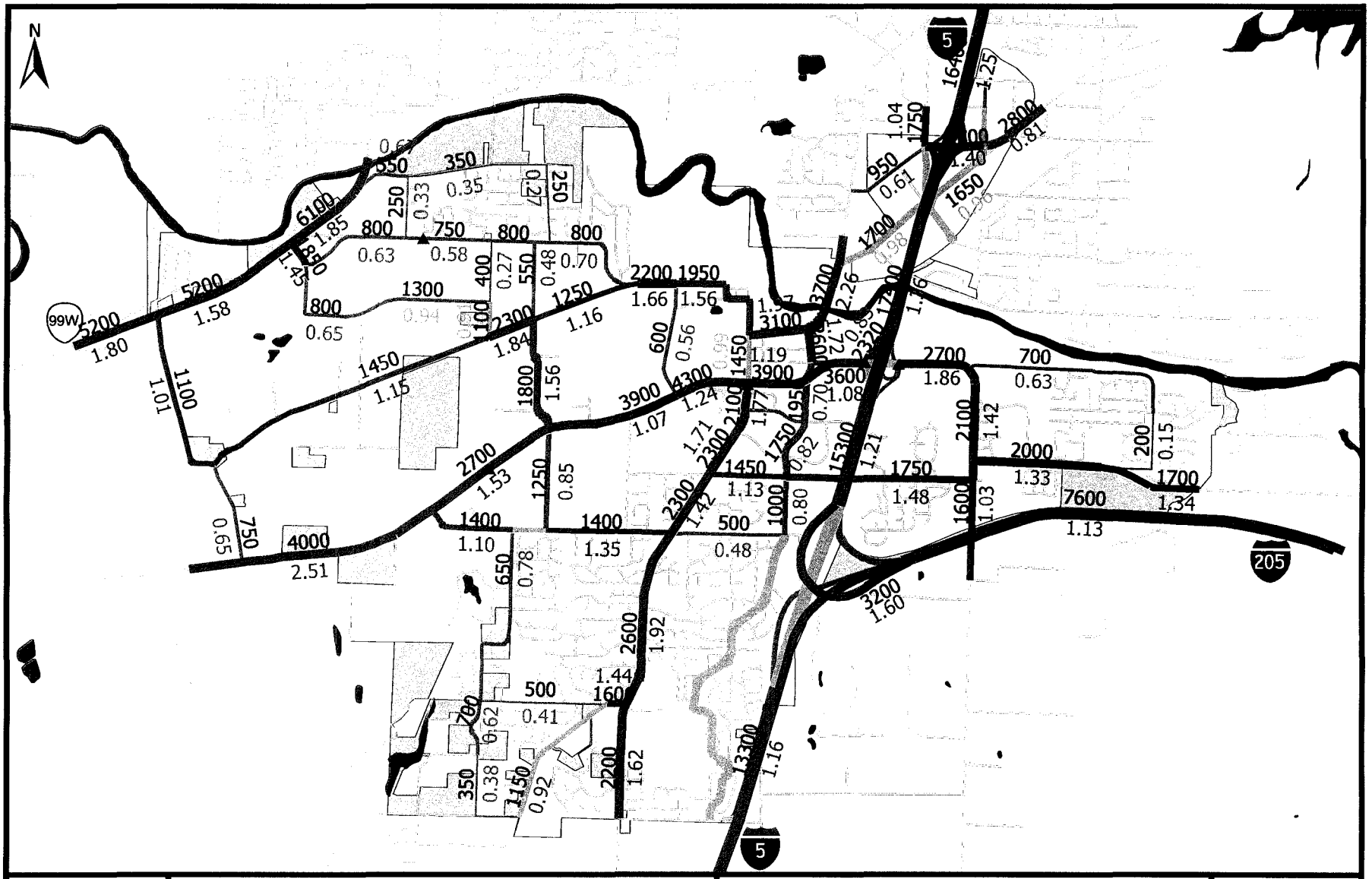


FIGURE 4-4

TUALATIN TRANSPORTATION SYSTEM PLAN

Roadway Needs

- 124th Avenue (Highway 99W to Tualatin Road)
- 72nd Avenue (Lower Boones Ferry Road to north city limits)
- Lower Boones Ferry Road (72nd Avenue to McEwan Road)
- Martinazzi Avenue (Boones Ferry Road to Nyberg Street)
- I-5 (north city limits to south city limits, except within the I-205 interchange)
- I-205 (I-5 to east city limits)
- Teton Avenue (Herman Road to Tualatin-Sherwood Road)

Figure 4-5 shows the level-of-service and demand-to-capacity ratio for the study intersections. This information is also provided in tabular form in Appendix "D". The following intersections will exceed City or ODOT standards during the p.m. peak hour by the year 2020, under a no-build scenario:

- All major intersections along Tualatin-Sherwood Road
- All major intersections along Boones Ferry Road and Lower Boones Ferry Road
- All major intersections along Martinazzi Avenue between Sagert Street and Boones Ferry Road, except Warm Springs Street
- All major intersections along Highway 99W
- All major intersections along Avery Street, Sagert Street, 65th Avenue, and Borland Road, and Teton Avenue
- Southbound I-5 Ramp/Nyberg Street
- 108th/Herman
- 108th/Leveton
- 108th/Tualatin
- 124th/Tualatin
- Grahams Ferry/Helenius
- Grahams Ferry/Ibach

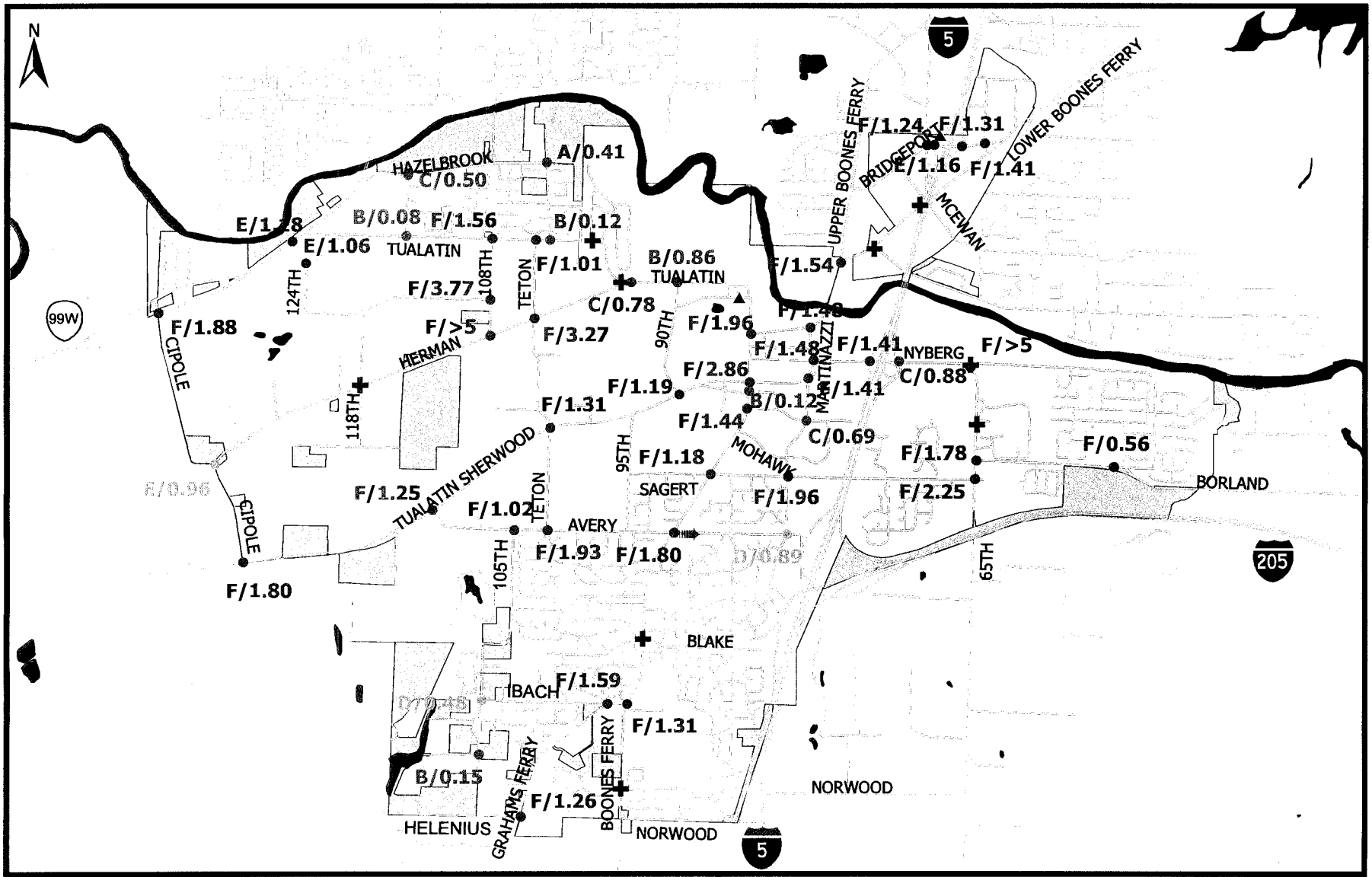


FIGURE 4-5

TUALATIN TRANSPORTATION SYSTEM PLAN

Intersection Needs

Intersection Comments
- Safety/Left Turns
- Geometry
- Speed
- City of Tualatin
- Tualatin Planning Area

Study Intersection
- Over Capacity
- Near Capacity
- Under Capacity

1" = 3,000 feet

SOURCE: KAI analysis

4.3 TRANSPORTATION MODES AND FACILITIES

4.3.1 Pedestrian

The technical analysis and public comments identified the following types of pedestrian needs, the locations of which are shown in Figure 4-6:

- gaps in the existing sidewalk network;
- pedestrian crossing locations perceived to be unsafe; and
- areas requiring additional street lighting at night.

Section 3 of the TSP (Existing Conditions) identified the sections of arterials and collectors that lack sidewalks on one or both sides. As current City policies require all new development to provide adequate sidewalk facilities, some of these sections will be completed as development occurs. Consequently, the sidewalk focus in the alternatives analysis phase of the TSP development will be on completing short gaps in the existing sidewalk system, identifying and prioritizing longer sidewalk gaps in already-developed areas, and continuing the expansion of the City's off-street pathway network.

Sidewalk gaps that were specifically raised as issues by the public at the open house, or by the TAC, TPAC, or City Council earlier in the TSP process consist of the following:

- **Nyberg Street east of I-5, and SW 65th Avenue.** Pedestrians traveling between the apartments south of the Nyberg Street/SW 65th Avenue intersection and the 7-Eleven store west of the intersection have no sidewalk across the Nyberg Creek bridge immediately south of the intersection, nor at the intersection itself. Nyberg Street east of the I-5 interchange also lacks sidewalks on both sides of the street.
- **Areas around Tualatin Elementary and Tualatin High Schools.** Sections of Boones Ferry Road and Sagert Street lack sidewalks on one or both sides of the street in the schools' vicinity.
- **Local streets in the Apache Bluff neighborhood** (including Killarney Lane)
- **Improved pedestrian facilities across I-5.**
- **Borland Road.**
- **Connections across the Tualatin River to Tigard,** particularly to Cook Park and via SW 108th Avenue
- **Paved connection from the south end of 95th Avenue to Avery Street.**

The Tualatin Town Center area is designated as a Pedestrian District in the Regional Transportation Plan. The Pedestrian Plan in Section 6 of the TSP assesses pedestrian connections within and to this area, particularly in light of the high-traffic-volume streets that pass through this area. The Transit Plan assesses pedestrian access to transit stops, including a future commuter rail station.

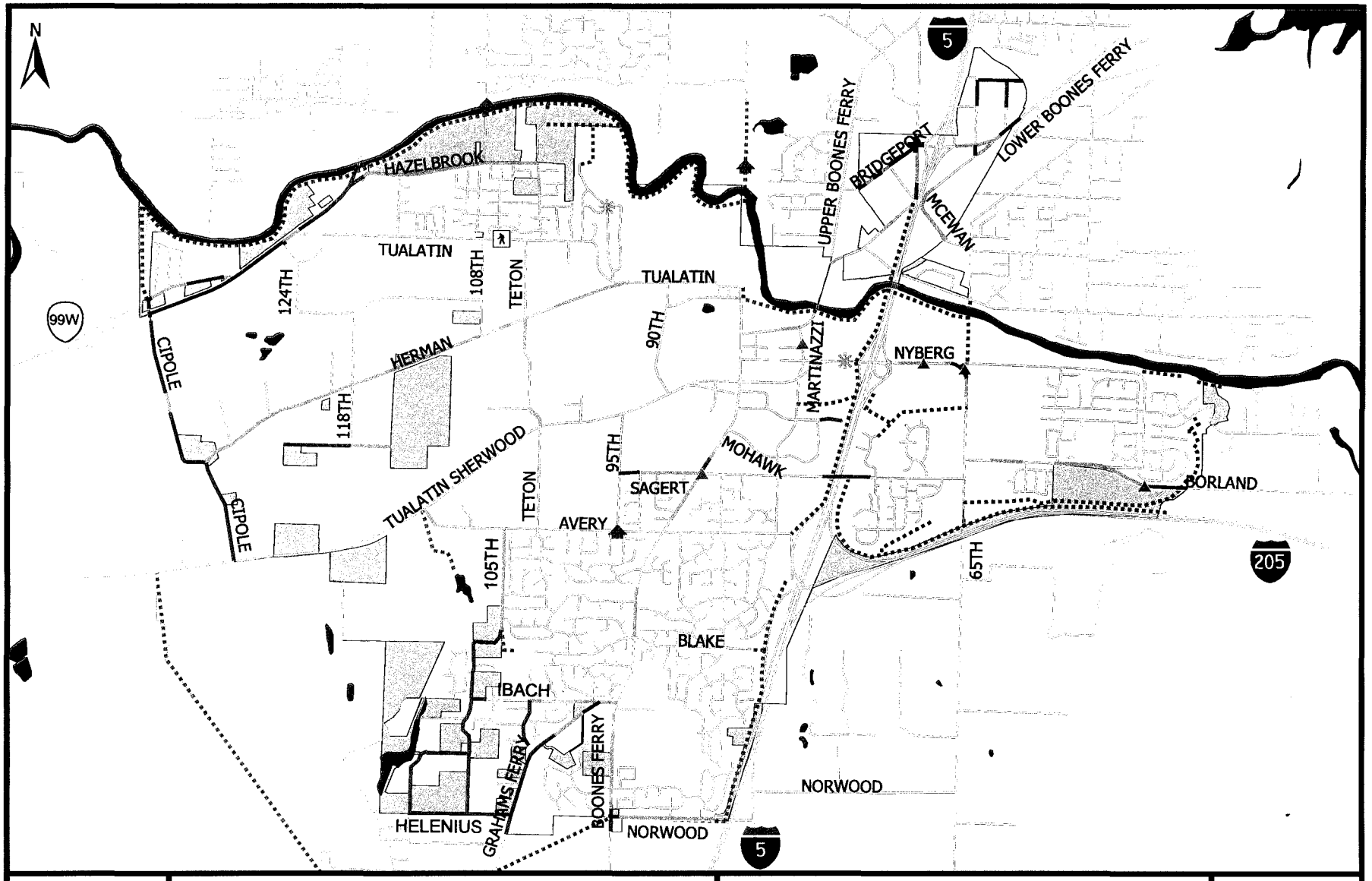


FIGURE 4-6

TUALATIN TRANSPORTATION SYSTEM PLAN

Pedestrian Needs

Sidewalk Needs
- Both sides
- One side
- Pathway corridor

City of Tualatin
Tualatin Planning Area

Pedestrian Issue Comments
- Connection
- Sidewalks
- Sidewalks & Lighting
- Pedestrian Signing
- Pedestrian Crossing

1" = 3,000 feet

SOURCE: KAI analysis

All high-volume arterial streets (e.g., Tualatin-Sherwood Road and Boones Ferry Road) need to be examined closely in terms of the adequacy of pedestrian crossings. Street crossing issues specifically called out from the public involvement process include:

- Providing wheelchair ramps at corners, making sure both sides of a crossing have ramps.
- Improving pedestrian crossing signing in general, and particularly along Tualatin Road.
- Pedestrian overpass on Tualatin-Sherwood Road, and overpasses at other congested city intersections.

Improved street lighting was raised as a pedestrian issue for the sections of Tualatin-Sherwood Road and Nyberg Street between Martinazzi Avenue and the I-5 interchange.

4.3.2 Bicycle

Improved bicycle facilities were the primary bicycle need identified by both the technical analysis and public comment. Figure 4-7 identifies areas of bicycle needs within Tualatin. Specific areas of concern expressed by the public, TAC, TPAC, or City Council include the following:

- **Boones Ferry Road** – This road provides an important north-south route through Tualatin, but lacks bicycle lanes on one or both sides of the road for most of the section between Tualatin Road and Ibach Street.
- **Martinazzi Street** – The section in the downtown area is not wide enough to accommodate bicycles comfortably.
- **Borland Road** – Both the need to upgrade the section located within the City, and the need to develop a regional bicycle route to West Linn.
- **Improved lighting on Nyberg Street between the Kmart driveway and I-5.**
- **Providing a bicycle connection across the Tualatin River to Cook Park in Tigard.** There is also a section of 108th Avenue that should be connected across the Tualatin River with a pedestrian/bicycle bridge.
- **Providing a paved bicycle connection between Avery Street and 95th Avenue.**

The RTP identifies the following Tualatin streets as part of the regional bikeway system:

- **Tualatin-Sherwood Road**
- **Nyberg Street**
- **SW 65th Avenue**
- **Borland Road**
- **Boones Ferry, Lower Boones Ferry, and Upper Boones Ferry Roads.**
- **Tualatin Road**
- **Avery Street**
- **Teton Street**

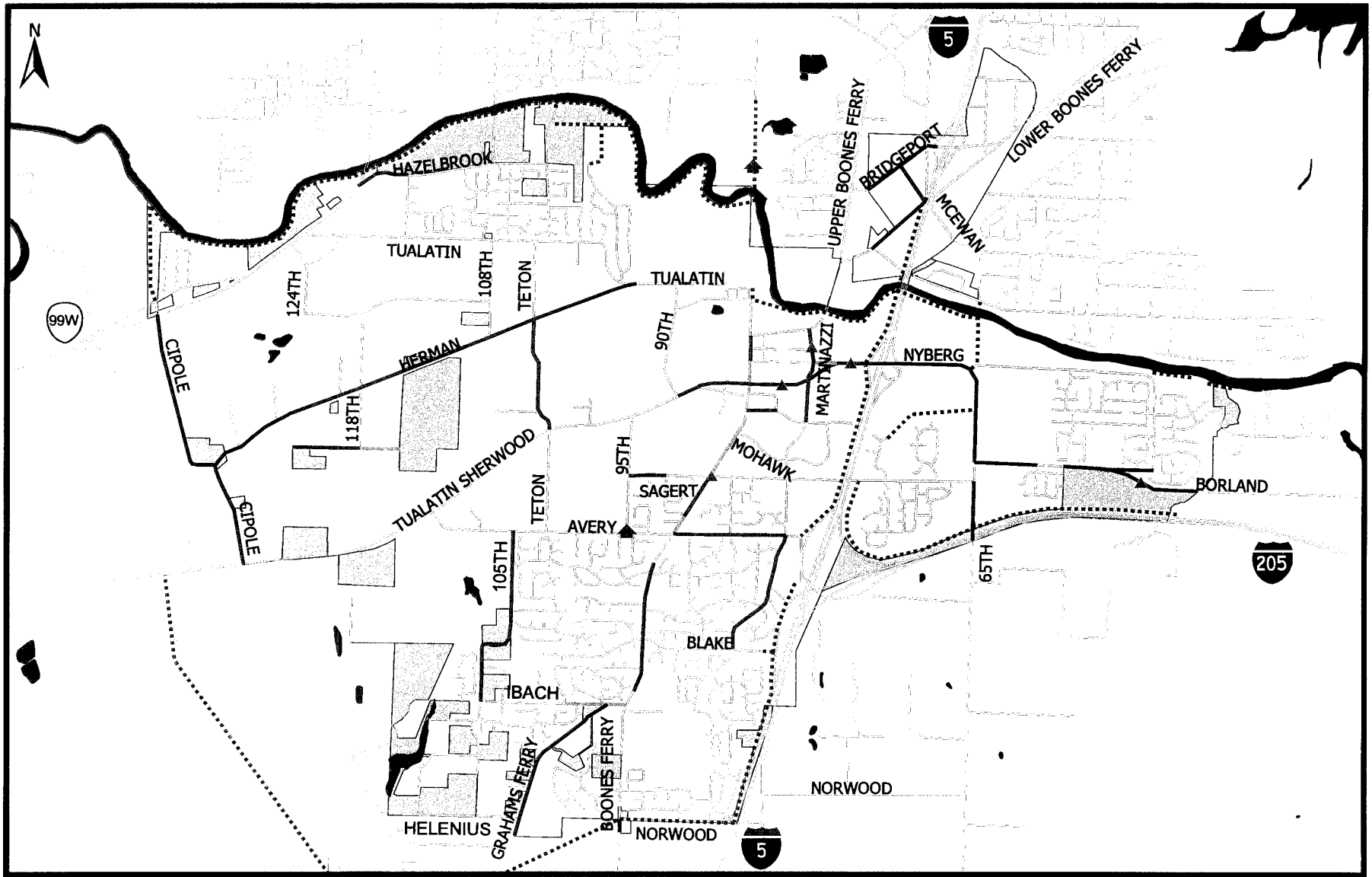


FIGURE 4-7

TUALATIN TRANSPORTATION SYSTEM PLAN

Bicycle Needs

Bicycle Lanes
- Both sides
- One side
- Bikeway corridor

Bicycle Issue Comments
- Connection
- Environment

City of Tualatin
Tualatin Planning Area

1" = 3,000 feet

SOURCES:
KAI analysis

With the exception of the last three roadways in the list, the majority of these regional bikeways lack continuous bicycle lanes. The RTP also includes a multi-use pathway along the Tualatin River as part of the regional bikeway system. This pathway is shown in the current Comprehensive Plan and should be carried forward into the new TSP.

4.3.3 Public Transportation

Providing new fixed-route transit service where service is not currently offered, particularly in the industrial area and the northwest section of the City, was the focus of many of the transit-related comments. Specific issues consisted of:

- **Route 96 extension to the Lloyd District.** Passengers bound for the Lloyd District must transfer to MAX in downtown Portland. The 95X express route along Highway 99W (as well as the old 91X from Hillsboro and Beaverton) provides direct service to the Lloyd District, which is more convenient for passengers.
- **Route 96 re-routing on Barbur Boulevard.** A commenter felt that Tri-Met's current proposal to run Route 96 along Barbur Boulevard between Capitol Highway and downtown, rather than I-5, with limited stops along the way, would decrease ridership. It should be noted that Tri-Met and the City of Portland are implementing transit priority measures along Barbur Boulevard intended to speed bus operations. Tri-Met subsequently dropped this proposal, as a result of their public involvement efforts.
- **Saturday service on Route 96.**
- **Increased service into Portland from South Tualatin.**
- **New east-west transit services:** A number of commenters requested service connecting east and west Tualatin, serving the industrial area, and along Tualatin-Sherwood Road.
- **Service between Tualatin and West Linn.**
- **Commuter rail.** Comments were received on the need for this service to help relieve highway congestion, as well as on the potential for added congestion in downtown Tualatin in the station vicinity.
- **Better evening bus service.**
- **More dependable transit service.**
- **Capacity problems at the Tualatin Park-and-Ride lot.**
- **Intermodal connectivity:** How can connections between modes be facilitated?
- **Light rail from Tualatin to Portland.**

By the year 2020, the amount of Tualatin that can support hourly fixed-route transit service is expected to grow by approximately 86% within the Tualatin Planning boundary. Figure 4-8 shows the locations of these "transit-supportive areas" (a detailed description of "transit supportive areas" is provided in Section 3, Existing Conditions).

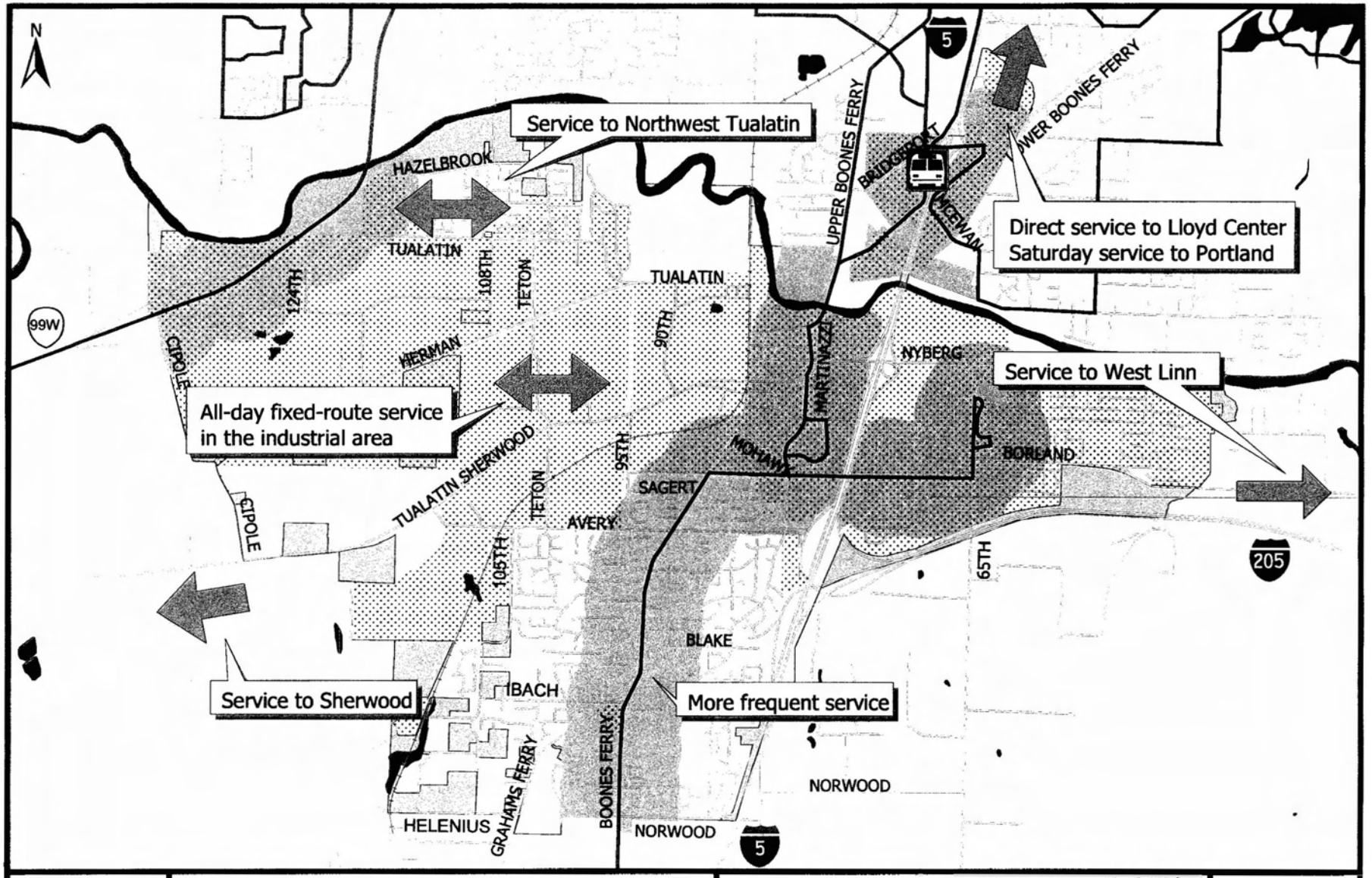


FIGURE 4-8

TUALATIN TRANSPORTATION SYSTEM PLAN

Transit Needs

2000 Bus Routes
2000 Service Coverage Area
2020 Transit-Supportive Area
City of Tualatin
Tualatin Planning Area

Transit Comments
Commuter Rail
Park & Ride capacity
Service needs

1" = 3,000 feet

SOURCE: KAI analysis

The RTP's Regional Transit Service Strategy calls for the following services by the year 2020:

- **Commuter rail** between Wilsonville and Beaverton, with a stop in downtown Tualatin. A Wilsonville-Tualatin-Lake Oswego-Milwaukie-Portland route is shown for study, but not for implementation.
- **Rapid bus service** (high speed, limited stop, service at least every 15 minutes) from the Tualatin Park-and-Ride north to Tigard and east along I-205.
- **Frequent bus service** (local service at least every 10 minutes incorporating transit priority measures to improve speeds) from the hospital to the Mohawk Park-and-Ride, downtown, and Tualatin Park-and-Ride, north to Tigard.
- **Regional bus service** (local service at least every 15 minutes) along Boones Ferry Road, Tualatin-Sherwood Road, and Highway 99W.
- **Community bus service** (service every 30 minutes or longer, depending on demand) along Tualatin Road.

Although providing these services is not the City's responsibility, the TSP can address actions the City can take to support this service. These actions could include transit-supportive street design standards that provide room for shelters and other transit amenities, improving corner radii at intersections, and supporting transit priority measures such as traffic signal priority.

The downtown commuter rail station presents several additional issues, including how to re-route buses to feed the station (some intersections cannot currently be negotiated by buses due to tight corner radii and traffic congestion exists on current approach routes), how to facilitate pedestrian crossings of Boones Ferry Road, and how to transfer passengers between a future McMinnville-Newberg-Portland commuter rail line and a Wilsonville-Beaverton line.

4.3.4 Rail

The two rail lines serving Tualatin currently meet state goals for operating speeds and are used by a total of three trains operating daily in each direction. Potential future issues associated with the rail mode include the following:

- The need for double-tracking sections of the north-south line, if commuter rail service is started.
- The opportunity to remove private grade crossings along both lines, by providing alternative access to parcels via the public street system.
- The impact that additional passenger and/or freight trains will have on grade crossings in Tualatin, particularly on Tualatin-Sherwood Road at Boones Ferry Road.

4.3.5 Air

There are no airports located within the Tualatin Planning Area. However, several general aviation airports and Portland International Airport are located within a 30-mile radius of Tualatin. Public and private transportation services are available to transport people between Tualatin and Portland International Airport.

4.3.6 Marine

No navigable waterways are located within the Tualatin Planning Area.

4.3.7 Pipeline and Transmission Systems

No deficiencies with electrical, natural gas, or water distribution systems were identified. The City should work with the region and appropriate public and private utilities to ensure adequate supplies of electricity, natural gas, and water can continue to be provided in the future.

4.3.8 Roadways

Future roadway and intersection capacity needs were identified earlier in this memorandum. This section discusses specific roadway-related issues raised by the public, City Council, TAC, and/or TPAC. Figures 4-4 and 4-5 depict the locations of those comments that apply to a particular location (as opposed to the entire length of a roadway).

Roadway and Intersection Capacity

- Signal coordination has already been tried on Tualatin-Sherwood Road in order to improve east-west movement. What more can be done?
- How can residential and business access be maintained when downtown Tualatin shuts down for an hour each day due to congestion?
- The Boones Ferry/Tualatin-Sherwood signal meters traffic on Tualatin-Sherwood Road. Should this function be moved to Avery?
- Adding more capacity to Tualatin-Sherwood will encourage more traffic to divert from Highway 99W.
- If Highway 99W were to bypass Sherwood, what would be the impact on Tualatin?
- What will be the impacts of future growth on the Stafford interchange area?
- ODOT has an interest in preserving the function of state roadways (I-5, I-205, Highway 99W, and Boones Ferry Road).
- Traffic queues currently extend from the southbound I-5 off-ramp at Nyberg Street onto the freeway, particularly from the left-turn movement.
- The northbound I-5 off-ramp at Nyberg Street is congested during the morning rush hour.
- Emergency evacuation needs.
- Traffic congestion issues to the north, along the Highway 99W, Upper Boones Ferry Road, and Durham Road corridors.
- Congestion at the Avery Street/Teton Avenue intersection.
- Turns into and out of the medical offices on the west side of SW 65th Avenue can be difficult to make.
- The library/city hall intersection with Martinazzi Avenue is congested, as is the Martinazzi/Boones Ferry intersection.

- Left turns to and from Nyberg Street at SW 65th Avenue are difficult to make.

Traffic Circulation

- What would the benefit and neighborhood impacts be of connecting 95th Avenue to Avery Street?
- If Tualatin-Sherwood Road cannot be improved, should circulation across Tualatin-Sherwood Road be improved, instead?
- How can internal and external street connectivity issues be addressed, given barriers such as the Tualatin River, I-5, and the railroad tracks?
- Is urban renewal money set aside for the Tualatin Loop Road currently shown in the comprehensive plan better spent on improvements at the Nyberg interchange?
- Keep traffic moving fairly steadily on main roads so there is less incentive to cut through neighborhoods.

Roadway Standards and Access Management

- The City of Durham has an interest in the future operation of Lower Boones Ferry Road and Bridgeport Road and would like to see Tualatin's, Durham's, and Washington County's functional classifications and roadway standards for these roadways to be functionally the same.
- Tualatin should address access management strategies along Highway 99W.

Safety

- The Blake Street-Alsea Drive/Boones Ferry Road intersection has accident potential because it only has a flashing light and there is no way to stop traffic along Boones Ferry Road. The intersection is "horrible."
- Sight distance issues at the Iowa Street/Boones Ferry Road intersection.
- Paint traffic lanes more often, or provide permanent reflectors. It is very hard to see lane striping after dark or when raining.
- Left turns out of Cheyenne onto Tualatin Road are not safe because of the intersection's proximity to the Tualatin Road/Herman Road. One never knows if a westbound vehicle on Tualatin Road will stop at the intersection to continue onto Herman or will make the right turn onto Tualatin. People making the westbound turn to continue on Tualatin Road don't look for pedestrians or pedestrians.
- A fence blocks motorists' view of oncoming traffic on Tualatin Road from Chippewa.
- It is hard to turn left from SW 118th Avenue onto Herman Road when shift changes occur in the industrial area.
- More curve warning signs are needed on Tualatin Road where it makes a series of curves adjacent to where the railroad tracks cross. The 35-mph speed limit is too high, as one cannot drive the curves that fast and because of the nearby park.
- People drive into buses that pull out from stops.

- The sports center driveway and the Childs Road intersection on Lower Boones Ferry Road are well used and poorly lit at night, creating a safety hazard.
- Left turns that are made into a restaurant on Lower Boones Ferry south of the park-and-ride lot can be hazardous because they occur just after the sharp bend in the road.
- Traffic cuts through Avery Street east of Boones Ferry Road at high speed, as people try to avoid congestion in downtown Tualatin.

Truck Freight Transportation

Freight-related issues can be divided into three main areas: local freight access, through freight movements, and public perception of trucks contributing to congestion. Tualatin's industrial area can only be accessed by truck along two main corridors: Tualatin-Sherwood Road to Teton Avenue or Cipole Road, and Highway 99W to SW 124th Avenue. The completion of the Myslony Street and SW 124th Avenue extensions south to Tualatin-Sherwood Road, as shown in the current comprehensive plan, will improve truck access and circulation in the western portion of the industrial area. However, access from the east would still be limited to Tualatin-Sherwood Road from I-5, and trucks would still have to cope with congestion along Tualatin-Sherwood Road.

Through truck traffic between Portland and points to the southwest has the choice of either taking Highway 99W through Tigard, or taking Tualatin-Sherwood Road. Both routes experience congestion, which leads to increased travel times and freight shipping costs. Expediting through truck traffic is a regional and state issue, but any solution will impact Tualatin.

Specific comments relating to truck freight issues were as follows:

- Heavy truck traffic on Tualatin-Sherwood Road contributes to congestion.
- Traffic congestion along Tualatin-Sherwood Road is a major concern for area businesses, both in terms of freight movement and employee access.
- Both local and through freight movements within Tualatin should be addressed.

4.4 LAND USE, GROWTH, AND TSP CONTENT

Some of the comments received through the TSP process addressed land use and growth issues in general, rather than their impacts on a particular mode. Other comments have addressed topics that the commenter would like to see addressed by the TSP. These comments are summarized briefly in this section.

4.4.1 Land Use and Growth

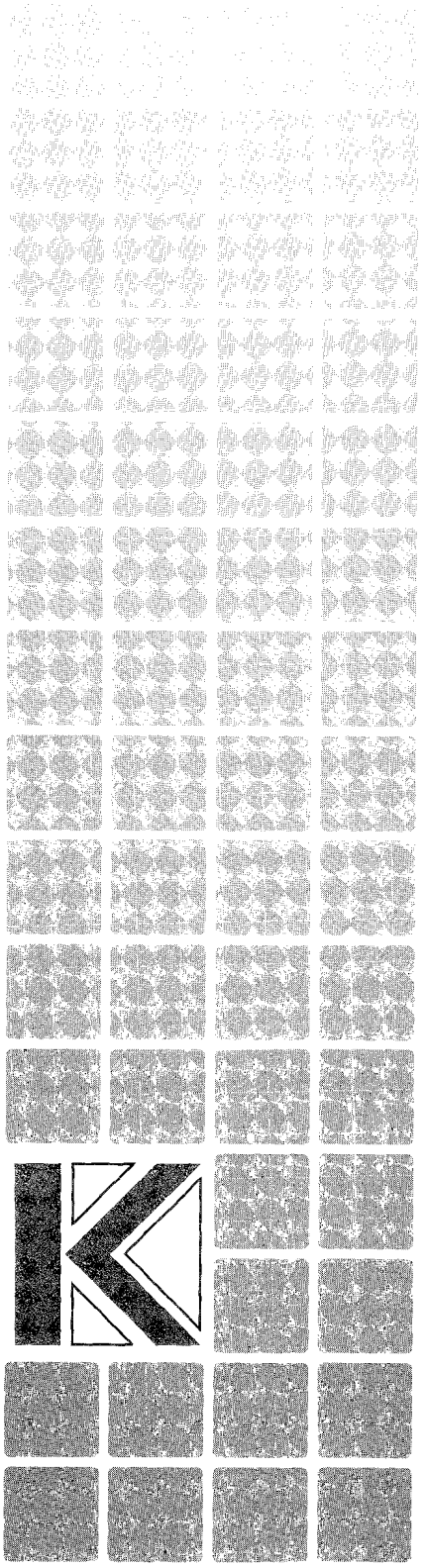
Land use and growth comments include:

- New industrial areas should have ample land for roads so they can be made into four lanes when needed without tearing buildings down.
- Urban expansion east along Borland Road should not occur until I-205 is expanded by two lanes. If and when this expansion occurs, what other transportation system improvements will be needed?
- What will be the impacts of industrial and prison development in Wilsonville?
- How will growth in Tigard impact Tualatin?
- What transportation improvements will be needed associated with the Durham Quarry?
- How will the region pay for the transportation impacts of regional growth on Tualatin facilities?

4.4.2 TSP Content

The following comments addressed topics desired to be addressed by the TSP:

- Examine the impacts of lowering the City's level-of-service standards to the levels shown in the RTP, and the trade-offs between congestion and cost.
- The need for a transit plan, including designated transit streets. Investigate the possibility of expanded transit services and park-and-ride lots.
- Examine potential connections for an I-5/Highway 99W connector both north of Sherwood (staying within the UGB) and south of Sherwood (running outside the UGB), and examine the connector's ability to relieve traffic on Tualatin-Sherwood Road. The TSP will not provide the final answer, but will need to provide a placeholder that can be filled in at a later date.
- Coordinate with the ongoing Washington County and Tigard TSP processes.
- Investigate the potential for a Special Transportation Area designation on Boones Ferry Road.
- Incorporate National Fire Protection Agency (NFPA) 17-10 fire response time standards into the TSP.
- The financing section of the TSP should be carefully addressed, due to shrinking transportation funding mechanisms.



Section 5

Alternatives Analysis

Alternatives Analysis

5.1 INTRODUCTION

The previous section on future conditions identified transportation system deficiencies that will develop in Tualatin over the next 20 years if no improvements are made to the system as Tualatin grows. Attention now turns to ways of addressing these deficiencies. There is often more than one way to solve these deficiencies and not all potential solutions involve road construction–for example, focusing growth in a different direction may keep a problem from occurring.

This section presents the transportation improvement alternatives that could be implemented to mitigate the existing and future transportation deficiencies. As each potential project was developed, consideration was given to how a multi-modal approach could be taken. Thus, while the primary impetus for a given mitigation alternative may center on increasing vehicular capacity, provision of appropriate bicycle, pedestrian, and transit facilities was given equal consideration.

5.2 ALTERNATIVES DEVELOPMENT

Based on input from staff, the TAC, and the TPAC, three sets of alternatives were developed for evaluation. These alternatives differ in the amount of growth assumed, the number and types of transportation capital projects assumed, and the level of transit service assumed:

- **Alternative #1** provides projects included in current financially constrained local, regional, and state transportation plans.
- **Alternative #2** provides additional roadway projects that address needs remaining from Alternative #1, and increases transit service to the levels assumed in the RTP priority system.
- **Alternative #3** builds on Alternative #2, addressing remaining needs and assuming greater employee participation in transportation demand management efforts in the City's industrial areas.

In addition to the three formal alternatives described above, three more alternatives were modeled prior to TSP adoption in order to answer questions that arose during the Alternatives Analysis review process. These alternatives are referred to as Alternatives #4, #5, and #6 and they include certain elements from each of the previous alternatives. The remainder of this section describes in general the assumptions used in each alternative.

5.2.1 Growth Assumptions

The alternatives were developed using the revised growth forecasts developed by the City of Tualatin for the transportation analysis zones (TAZs) within the Tualatin Planning Area, reflecting greater numbers of jobs than previously assumed in the western industrial area, and redevelopment of the Durham Quarry as a mixed-use development. Table 5-1 shows the population and employment estimates that were used for the three alternatives. Bold numbers indicate estimates that differ from the Metro forecasts shown in Table 4-1 that were used for the future needs analysis.

TABLE 5-1
TUALATIN POPULATION AND EMPLOYMENT FORECASTS

TAZ	1994			2020			Growth, 1994-2020	
	HH	Retail	Other	HH	Retail	Other	Households	Employment
330	381	79	999	493	530	2115	112	1567
332	11	485	4869	82	541	5745	71	932
333	634	24	169	994	38	487	359	332
334	1921	44	232	2356	336	442	434	502
343	181	0	18	661	0	353	479	335
344	2353	97	501	2853	264	1085	500	751
345	745	399	134	1022	494	219	276	180
346	506	8	50	990	59	617	483	618
347	334	0	1199	365	0	1204	31	5
348	258	24	970	470	36	1350	212	392
349	**88**	**490**	**856**	**216**	**962**	**2070**	**128**	**1686**
350	9	724	479	27	706	709	17	212
361	938	82	390	1593	102	742	655	372
362	1391	61	1090	1864	88	1507	473	444
363	854	1614	3498	2291	1753	5819	1437	2460
364	**181**	**48**	**2974**	**0**	**74**	**4299**	**-181**	**1351**
365	**19**	**25**	**1493**	**0**	**76**	**10152**	**-19**	**8710**
366	154	35	170	516	35	870	362	700
367	30	0	38	40	0	138	10	100
371	9	0	375	17	0	1344	8	969
372	**180**	**51**	**834**	**826**	**0**	**1510**	**646**	**625**
373	**2582**	**6**	**574**	**2991**	**0**	**826**	**409**	**246**
374	142	0	115	149	0	127	7	12
391	47	15	1961	47	28	2368	0	420
392	47	0	6	106	0	43	59	37
395	50	0	191	949	0	1395	899	1204

NOTE: HH = households, Retail = retail employment, Other = non-retail employment
Values shown in **bold** are City of Tualatin estimates that are different from Metro estimates.

Figures 5-1 and 5-2 illustrate the relative amount of population and employment growth assumed for the three alternatives.

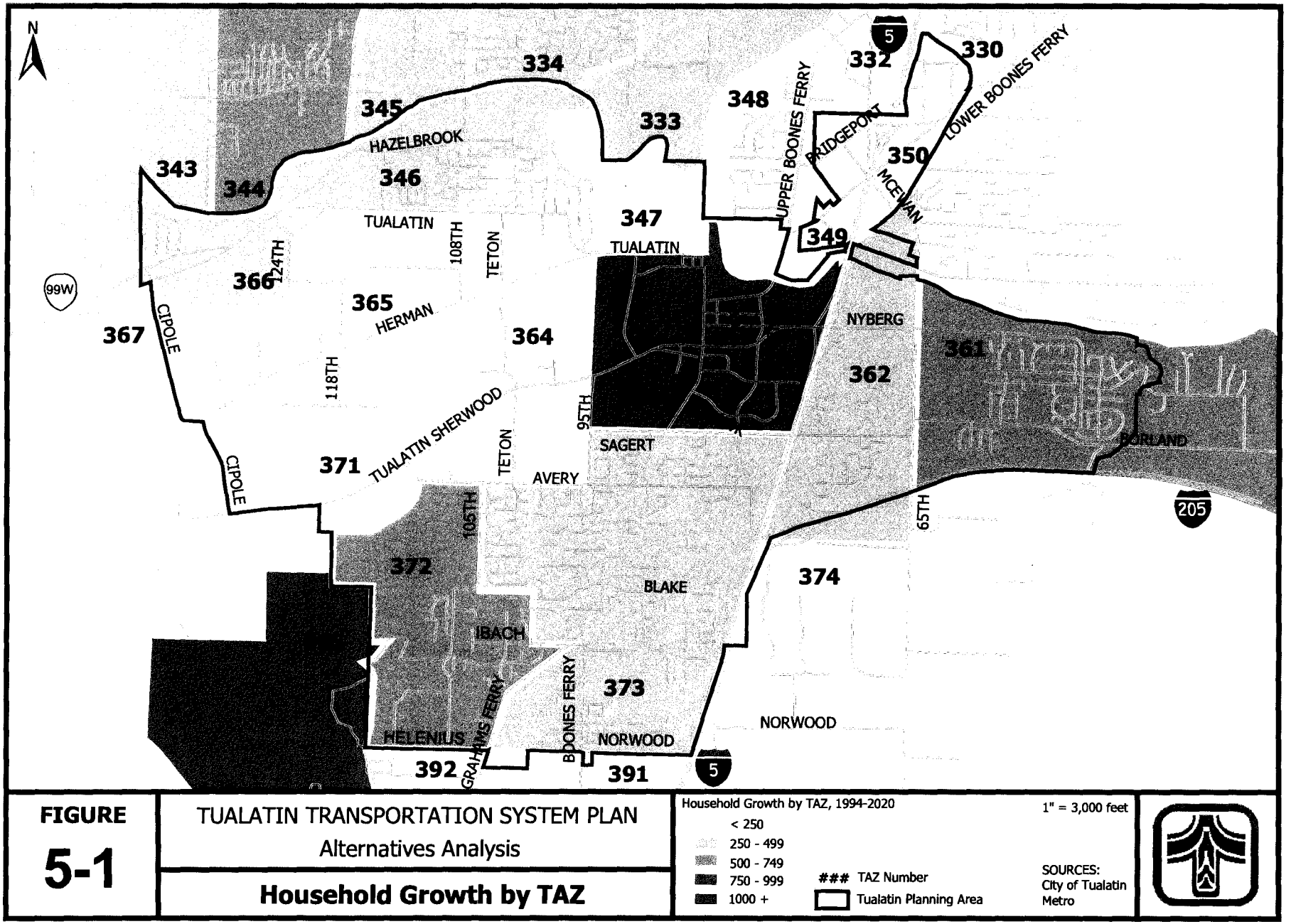


FIGURE 5-1

TUALATIN TRANSPORTATION SYSTEM PLAN
Alternatives Analysis

Household Growth by TAZ

Household Growth by TAZ, 1994-2020
- < 250
- 250 - 499
- 500 - 749
- 750 - 999
- 1000 +

TAZ Number
Tualatin Planning Area

1" = 3,000 feet

SOURCES:
City of Tualatin
Metro

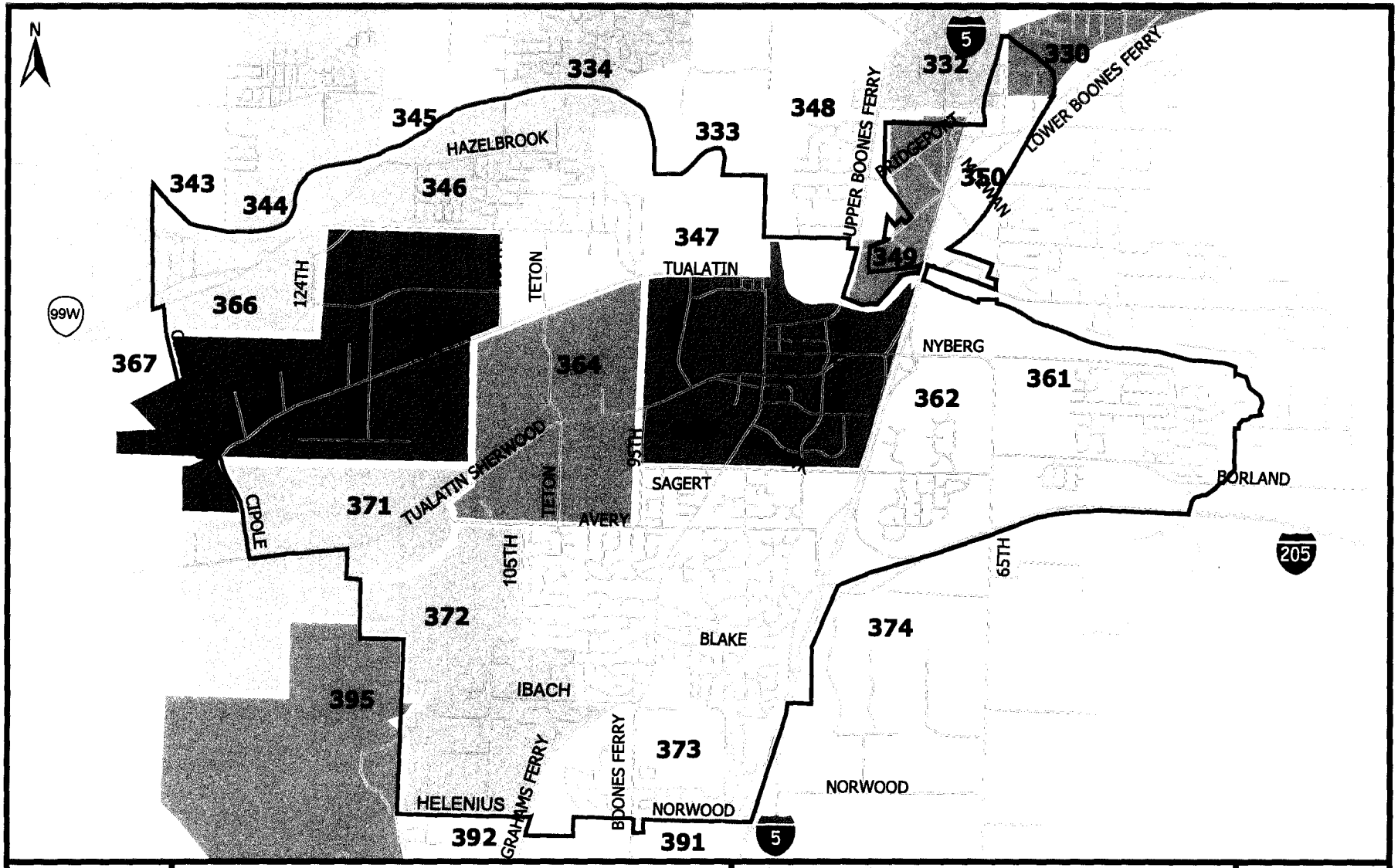


FIGURE 5-2

TUALATIN TRANSPORTATION SYSTEM PLAN
Alternatives Analysis

Job Growth by TAZ

Employment Growth by TAZ, 1994-2020
0 - 499
501 - 999
1000 - 1999
2000 - 2999
3000 +
TAZ Number
Tualatin Planning Area

1" = 3,000 feet

SOURCES:
City of Tualatin
Metro

Under the new RTP process, the City's growth forecasts must be approved by the Washington County Coordinating Transportation Advisory Committee and Metro's Transportation Policy Alternatives Committee before they can be incorporated into the City's TSP. The City obtained Metro staff approval of the revised forecasts prior to beginning the alternatives modeling; committee approval was obtained on March 29 and March 30, 2001, respectively.

5.2.2 Transit/TDM Assumptions

The Metro RTP financially constrained model includes the following capital projects:

- light rail extensions to Milwaukie and Vancouver;
- Central City Streetcar extension to the North Macadam area; and
- Wilsonville-Beaverton commuter rail.

In terms of transit operations, the financially constrained 2020 transit network modeled in Alternative #1 starts with the existing bus and rail system, and increases service 1.5% per year according to the following order of priority:

1. Increased service to maintain headways (as congestion increases, travel times increase, and more buses are needed to service a route at a given headway). This service is required to maintain current transit mode share, by keeping service at the same headways as today.

2. Increased service to accommodate forecast peak hour demand (the more popular routes require more service in order to avoid on-board crowding). This service is also required to maintain current transit mode share—as more people move into an area, the number of bus riders increases, even if the percentage of trips made by transit does not. However, the increased frequencies may also attract new riders. In Tualatin, Routes 12 and 96 are assumed to require increased service.

3. Provide service on light rail extensions, Central City Streetcar, and Wilsonville-Beaverton commuter rail. Once the infrastructure is in place, service needs to be provided. The financially constrained model assumes this service.

4. Provide new routes with new service coverage. No new bus routes were identified in the Tualatin area.

Alternatives #2 and #3 include the service increases used in Alternative #1, and provide additional transit service in Tualatin (new routes and expanded service frequency), up to the levels assumed in the RTP. Specific projects consist of:

- Half-hourly bus service along Tualatin-Sherwood Road to Sherwood.
- Half-hourly bus service along Tualatin Road, passing through the industrial area along Leveton Drive, and ending in King City (more frequent service around shift-change times).
- Half-hourly bus service along Boones Ferry Road north to Lake Oswego.

- Fifteen-minute service north to Tigard and Washington Square, and east to the hospital, West Linn, and Oregon City.

New transit service is assumed in Alternative #2 to reduce peak hour auto trip generation by 10% in TAZs that are mainly areas of employment (corresponding to average trip reductions observed by members of the Westside Transportation Alliance elsewhere in Washington County), and 5% in TAZs that are mainly residential. In areas where transit service currently exists, increased service frequencies are assumed to reduce peak hour auto trips by 2%. Alternative #3 uses the same assumptions as Alternative #2, except that a reduction of 15% is used in TAZs covering employment areas, representing greater levels of employee participation in transportation demand management efforts.

5.2.3 Roadway Project Assumptions Used in Modeling

Alternative #1 builds from the Metro RTP financially constrained model. Projects within Tualatin that are included in the financially constrained model are listed in Appendix "E". Alternative #1 also includes all projects shown in the current versions of the Tualatin Community Plan and Leveton Tax Increment Plan; these are also listed in Appendix "E". (Information on the Boones Ferry Road widening project in the Central Urban Renewal District Plan was received too late for inclusion in Alternative #1 and was included in Alternative #2, instead.) Finally, Alternative #1 includes two possible alignments for an I-5/Highway 99W connector: (1) a northern expressway alignment as shown in the Tualatin Community Plan, and (2) a southern freeway alignment as shown in the RTP priority model.

Alternative #2 provides additional projects to address capacity needs remaining after Alternative #1, including constructing an extension of Hall Boulevard across the Tualatin River. A northern expressway alignment was used, as the City's TSP will need to show an alignment within the Urban Growth Boundary. A complete project list is provided later in this memorandum, in the section evaluating Alternative #2.

Alternative #3 builds on Alternative #2, providing additional projects to address remaining needs, including constructing an extension of Lower Boones Ferry Road across the Tualatin River. A modified northern expressway alignment was used, connecting to Tualatin-Sherwood Road at SW 124th Avenue, rather than west of Cipole Road. A complete project list is provided in the section evaluating Alternative #3.

5.2.4 Non-Capacity Projects

Each alternative includes bicycle, pedestrian, and roadway safety improvements that cannot be reflected in the transportation planning model. Alternative #1 includes the bicycle and pedestrian projects needed to implement the Regional Bicycle System and the Regional Pedestrian System. Alternatives #2 and #3 include additional projects to complete bicycle and pedestrian facilities along the City's collector and arterial streets. Alternatives #2 and #3 also include safety projects to address safety needs identified during the TSP process.

5.3 EVALUATION CRITERIA

Qualitative evaluation criteria were developed based on the TSP goals. Two goals—accessibility and system preservation—are more policy-oriented and therefore are not rated for a particular

project. For the remaining goals, each project is rated based on whether it has a positive (●), neutral (○), or negative (◉) impact relative to that goal, as shown in Table 5-2. It should be kept in mind when considering the public perception ratings that these are based solely on the questionnaires returned from the ten participants attending the second open house.

TABLE 5-2
PROJECT EVALUATION CRITERIA

Goal	Rating	Meaning
Mobility	●	Improves transportation options, or connectivity within a mode
	○	Does not change transportation options or connectivity
	◉	Reduces transportation options, or connectivity within a mode
Livability	●	Reduces neighborhood traffic impacts
	○	Does not change neighborhood traffic impacts
	◉	Increases neighborhood traffic impacts
Coordination	●	Included as part of other local, regional, and/or state plans
	○	Not mentioned in, but not inconsistent with, other plans
	◉	Inconsistent with local, regional, and/or state plans
Public Transportation	●	Improves transit quality of service
	○	Does not affect transit quality of service
	◉	Worsens transit quality of service
Ped/Bike	●	Improves the pedestrian and/or bicycle environment
	○	Does not affect the ped/bike environment, or has mixed impacts
	◉	Worsens the pedestrian and/or bicycle environment
Environment	●	Enhances parks, wetlands, or other environmentally sensitive areas
	○	Does not impact environmentally sensitive areas
	◉	Impacts environmentally sensitive areas
Capacity	●	Project improves a facility's capacity
	○	Project does not significantly change a facility's capacity
	◉	Project decreases a facility's capacity
Safety	●	Improves safety
	○	Does not significantly change a facility's safety
	◉	Decreases safety
Public Perception	●	Most open house participants ranked project as a priority
	○	Not ranked on most open house questionnaires, or mixed results
	◉	Most open house participants did not want this project
	N/A	Open house participants were not asked about this project

The accessibility and system preservation goals relate to City policies, rather than specific projects, and therefore are not rated.

Each alternative is also evaluated as a whole, based on the goals and associated performance measures listed below. Only those goals that could be associated with a quantitative performance measure were included in this portion of the evaluation.

- Capacity: lane-miles of congestion on collectors and arterials, and on freeways.
- Public Transportation: transit level of service (TLOS) indicator value (the percentage of time during the day that transit service is available on average in Tualatin).
- Pedestrian/Bicycle: miles of new facilities.
- Livability: peak hour vehicle-miles of travel on collectors (a surrogate for the level of neighborhood cut-through traffic).
- Funding: total cost of the alternative's capital projects (operations costs are not included).

Except where otherwise noted, project cost estimates listed are those developed by the plan (i.e., the RTP) where the project was originally shown. Cost estimates developed by the TSP project team are noted specifically for a given project. Costs shown are planning-level estimates that are based on standard construction costs, with allowances provided for unknowns such as right-of-way costs, engineering costs, etc.

5.4 EVALUATION OF ALTERNATIVE #1

5.4.1 Alternative Description

Alternative #1 implements the projects contained in existing plans and policies; in particular, the financially constrained RTP, the Tualatin Community Plan, the Central Urban Renewal District Plan, and the Leveton Tax Increment District Plan. As the Tualatin Community Plan's transportation maps do not call out specific on-street pedestrian and bicycle projects, only those pedestrian and bicycle projects shown in other plans are included in Alternative #1 (projects to complete the City's on-street pedestrian and bicycle system are included in Alternative #2). Transit service is kept at existing levels, except for service increases to accommodate ridership growth on Routes 12 and 96, service increases to maintain existing headways as traffic congestion increases, and the development of a Wilsonville-Beaverton commuter rail line.

Two options are evaluated for the I-5/Highway 99W connector: the north expressway alignment given in the Tualatin Community Plan, and the south freeway alignment shown in Metro's priority RTP model.

5.4.2 Project Descriptions

Figure 5-3 shows the locations of the projects included in Alternative #1.

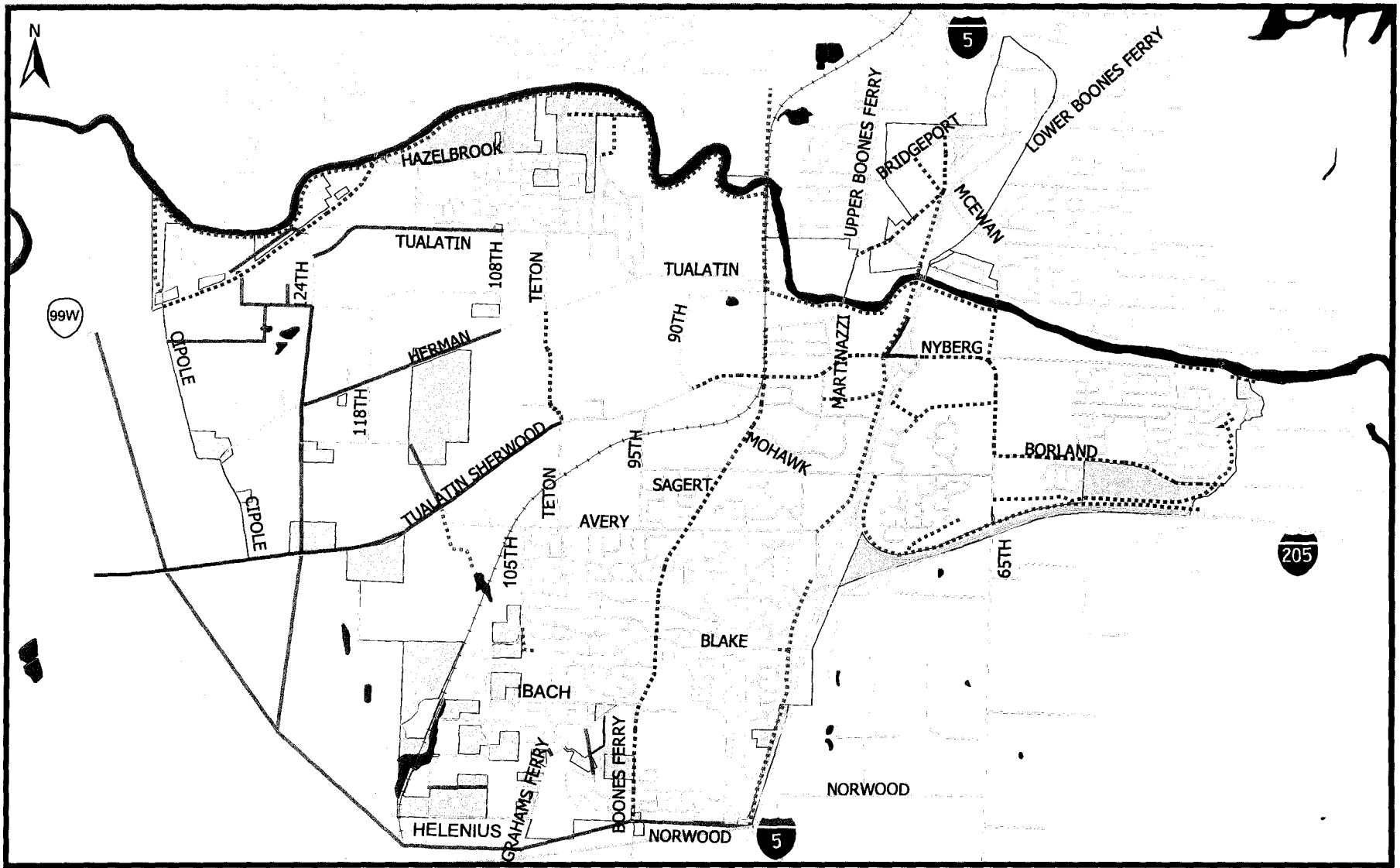


FIGURE 5-3

TUALATIN TRANSPORTATION SYSTEM PLAN
Alternatives Analysis

Alternative 1 Projects

	RTP	TCP	LTIP
New/Expanded Roadway	~	~	~
Bike/Ped Improvement	···	···	
Alt. 1B only			
Commuter Rail	~		

Water
City of Tualatin
Tualatin Planning Area

1" = 3,000 feet

SOURCES:
City of Tualatin
Metro

I-5 Nyberg Interchange (#289) Improvements

This project increases the interchange's capacity by adding a second left-turn lane to the southbound off-ramp, and widens the overcrossing to accommodate an additional lane in each direction. This project is included in the RTP. The City may amend its Central Urban Renewal District Plan to provide the funds for a local match for this project.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
○	○	●	○	○	○	●	○	N/A	$4,000,000

Lower Boones Ferry Road Improvements

This Washington County MSTIP 3 project improves Lower Boones Ferry Road between Bridgeport Road and Upper Boones Ferry Road, providing bicycle lanes, sidewalks, and signal interconnection.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
○	○	●	○	●	○	○	●	N/A	$5,800,000

Tualatin-Sherwood Road Improvements

Tualatin-Sherwood Road would be widened to five lanes from Teton Avenue in Tualatin to Highway 99W in Sherwood. This project includes replacing the existing bike lanes and sidewalks, and making traffic signal modifications at Oregon and Cipole Streets. This project is included in the RTP.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
○	●	●	○	○	○	●	○	N/A	$25,000,000*

*includes project costs outside Tualatin

SW 124th Avenue—Northern Segment

SW 124th Avenue would be extended as a three-lane roadway from Leveton Drive south to Tualatin-Sherwood Road, providing improved access to the industrial area. The project would include bike lanes and sidewalks. This project is shown in the RTP, the Tualatin Community Plan, and the Leveton Tax Increment District Plan.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
●	●	●	○	●	●	●	○	○	$10,000,000

SW 124th Avenue—Southern Segment

SW 124th Avenue would be extended south from Tualatin-Sherwood Road to the I-5/Highway 99W connector (north alignment), providing an alternate truck route into the industrial area that would avoid downtown Tualatin. Under the south alignment of the connector, the RTP model shows access to the connector only from Sherwood, and this roadway would not be built. The roadway would be constructed with three lanes initially, with right-of-way reserved for future expansion to five lanes. Sidewalks and bike lanes would be included. This project is shown in the Tualatin Community Plan, but is located outside the urban growth boundary.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
●	●	○	○	●	●	●	○	N/A	$3,500,000†

†project team estimate

I-5/Highway 99W Connector (North Alignment)

A new four-lane divided expressway would lead from a new I-5 interchange at Norwood Road west to connect with Highway 99W north of Sherwood, skirting the edge of the current Urban Growth Boundary. Signalized intersections would be located at Boones Ferry Road, Grahams Ferry Road, SW 124th Avenue, and Tualatin-Sherwood Road, as identified in the Tualatin Community Plan. A separate pedestrian and bicycle pathway would be constructed on the north side of the expressway. Some of the I-5/I-205 interchange ramps would also need to be modified, because of the proximity of the two interchanges.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
●	●	●	○	●	●	●	○	N/A	$250,000,000*

*includes project costs outside Tualatin

I-5/Highway 99W Connector (South Alignment)

A new four-lane freeway or toll road would lead from a new I-5 interchange south of Norwood Road west to connect with Highway 99W south of Sherwood. The entire route would be located outside the current Urban Growth Boundary. One interchange would be located midway along the route, primarily serving Sherwood. Some of the I-5/I-205 interchange ramps would also need to be modified, because of the proximity of the two interchanges. This project is shown as an RTP priority project, but not as a financially constrained project.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
●	●	○	○	○	●	●	○	●	$250,000,000*

*includes project costs outside Tualatin

Myslony Street Extension

Myslony Street would be extended east, then south from its present terminus to connect into the Tualatin-Sherwood Road/Avery Street intersection. The street would be constructed with three lanes, plus bike lanes and sidewalks. This project is shown in the Tualatin Community Plan.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
●	●	●	○	●	●	●	○	N/A	$1,880,000

Sagert Street Extension

Sagert Street would be extended to SW 95th Place. The extension would include two travel lanes, parking lanes, and sidewalks. This project is shown in the Tualatin Community Plan.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
●	●	●	○	●	○	○	○	○	$75,000

Blake Street Realignment

The double 90-degree curve on Blake Street, connecting SW 105th and SW 108th Avenues, would be smoothed, and the street would be widened. Recent development constrains the amount of curve smoothing that can occur, and an existing garden center and wooded area would be impacted. This project is shown in the Tualatin Community Plan.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
○	○	●	○	●	●	○	●	N/A	$860,000

SW 103rd Avenue Extension

SW 103rd Avenue would be extended to connect to Grahams Ferry Road. The roadway would have two travel lanes, parking lanes, and sidewalks. This project is shown in the Tualatin Community Plan.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
●	○	●	○	●	○	○	○	N/A	$1,150,000†

†project team estimate

Iowa Drive Extension

Iowa Drive would be extended to connect to Grahams Ferry Road. The roadway would have two travel lanes, parking lanes, and sidewalks. This project is shown in the Tualatin Community Plan.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
●	○	●	○	●	○	○	○	N/A	$1,100,000

New East-West Street

A new east-west street would be built in southwest Tualatin, connecting SW 108th and SW 112th Avenues. The roadway would have two travel lanes, parking lanes, and sidewalks. This project is shown in the Tualatin Community Plan.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
●	○	●	○	●	○	○	○	●	$1,100,000

Pacific Drive Realignment/Highway 99W Access Management

Pacific Drive would be realigned and extended to connect to Highway 99W at the SW 124th Avenue intersection. The roadway would have two travel lanes, parking lanes, and sidewalks. As the alignment is shown in the Tualatin Community Plan, property impacts could occur on the west side of Highway 99W, where the realignment would occur. Existing driveways onto Highway 99W would be closed or restricted, and access taken from Pacific Drive.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
●	●	●	○	●	○	○	●	N/A	$450,000

Leveton Drive Extension/SW 130th Avenue

Leveton Drive would be extended east from SW 124th Avenue, turning north and becoming SW 130th Avenue before intersecting Highway 99W, providing access to undeveloped industrial land in the northwest corner of Tualatin. The roadway would be constructed with three lanes and sidewalks. The project is shown in the Tualatin Community Plan and the Leveton Tax Increment Plan. If Pacific Drive were to be realigned, as described in a previous project, and other accesses on Highway 99W closed, a SW 130th Avenue connection would meet ODOT access spacing standards. However, because of the high traffic volumes and high speeds on this section of Highway 99W, turning movements might need to be restricted to right-in, right-out only to avoid safety

problems. The City desires a traffic signal at Highway 99W in order to provide full access, which would require a deviation from ODOT's signal spacing standards.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
●	○	●	○	●	○	●	○	N/A	$2,100,000

SW 125th Place

A new north-south cul-de-sac street, SW 125th Place, would be constructed north from the Leveton Drive Extension, providing industrial access. The roadway would have three lanes, bike lanes, and sidewalks. The project is shown in the Tualatin Community Plan.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
○	○	●	○	●	○	●	○	N/A	$360,000

SW 128th Avenue/Cummins Street

A new north-south street, SW 128th Avenue would be constructed south from the Leveton Drive Extension, turning west and becoming Cummins Street, extending to Cipole Road and providing access to undeveloped industrial land in northwest Tualatin. The roadway would have three lanes and sidewalks. The project is shown in the Tualatin Community Plan.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
●	○	●	○	●	○	●	○	N/A	$1,500,000

Herman Road Widening, SW 108th-SW 118th Avenues

Herman Road would be widened between SW 108th and SW 118th Avenues to provide standard-width travel lanes, a center turn lane, bicycle lanes, landscape strips, and sidewalks. The project is shown in the Leveton Tax Increment Plan.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
○	○	●	○	●	○	●	●	N/A	$3,750,000

Wilsonville-Beaverton Commuter Rail

Peak hour commuter rail service would be started along the rail line between Wilsonville and Beaverton, connecting to light rail at the Beaverton Transit Center. A station and small (100-150 space) park-and-ride lot would be located in downtown Tualatin west of Boones Ferry Road, between Tualatin-Sherwood Road and Seneca Street. This project is shown in the RTP and is being considered for inclusion in Washington County's MSTIP 4.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
●	○	●	●	○	○	●	○	●	$75,000,000

Boones Ferry Road Pedestrian Improvements, Sagert Street to Tualatin Road

Sidewalks would be constructed on both sides of Boones Ferry Road south of Tualatin-Sherwood Road, where not already present, a total of approximately 3,450 feet of sidewalks. Sidewalks would only be constructed on the east side north of Tualatin-Sherwood Road because of the proximity of

the railroad tracks. This segment is part of the RTP Regional Pedestrian System. The section north of Tualatin-Sherwood Road is also part of a Central Urban Renewal District project.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
●	○	●	●	●	○	○	●	○	$325,000†

†project team estimate

Highway 99W Pedestrian Improvements

Sidewalks would be constructed along both sides of Highway 99W for its entire length in Tualatin, a total of approximately 11,250 feet of sidewalk. This roadway is part of the RTP Regional Pedestrian System.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
●	○	●	○	●	○	○	●	N/A	$1,100,000†

†project team estimate

Hall Boulevard Ped/Bike Bridge

A multi-use pathway would be constructed on the side of the existing railroad bridge leading north over the Tualatin River towards Tigard, connecting with Hall Boulevard. This project is part of the RTP, and a ped/bike bridge in this vicinity is also shown in the Tualatin Community Plan.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
●	○	●	○	●	○	○	○	N/A	$1,000,000

SW 108th Avenue Ped/Bike Bridge

A new pedestrian and bicycle bridge would be constructed over the Tualatin River into Tigard, along the SW 108th Avenue alignment. This project is shown in the Tualatin Community Plan.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
●	○	●	○	●	○	○	○	○	$450,000†

†project team estimate

SW 65th Avenue Bridge

A new pedestrian and bicycle bridge would be constructed over the Tualatin River into Rivergrove, along the SW 65th Avenue alignment. This project is shown in the Tualatin Community Plan.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
●	○	●	○	●	○	○	○	○	$450,000†

†project team estimate

Boones Ferry Road Bike Lanes

Bicycle lanes would be completed along Boones Ferry Road between Tualatin Road and the south city limits, a total of approximately 12,600 feet. Boones Ferry Road is part of the RTP's Regional Bicycle System.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
●	○	●	○	●	○	○	●	●	$2,100,000†

†project team estimate

Nyberg Street Bike Lanes, Tualatin-Sherwood Road to SW 65th Avenue

Bicycle lanes would be constructed along Nyberg Street between Tualatin-Sherwood Road and SW 65th Avenue, a total of approximately 6,300 feet. This segment of Nyberg Street is part of the RTP's Regional Bicycle System.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
●	○	●	○	●	○	○	●	○	$850,000†

†project team estimate

SW 65th Avenue Bike Lanes, Nyberg Street to Borland Road

Bicycle lanes would be constructed along SW 65th Avenue between Nyberg Street and Borland Road, a total of approximately 4,200 feet. This segment of SW 65th Avenue is part of the RTP's Regional Bicycle System.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
●	○	●	○	●	○	○	●	N/A	$700,000†

†project team estimate

Borland Road Bike Lanes

Bicycle lanes would be constructed along Borland Road between SW 65th Avenue and the east city limits, a total of approximately 9,300 feet. This segment of SW Borland Road is part of the RTP's Regional Bicycle System.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
●	○	●	○	●	○	○	●	●	$1,500,000†

†project team estimate

Teton Avenue Bike Lanes, Herman Road to Tualatin-Sherwood Road

Bicycle lanes would be constructed along Teton Avenue between Herman Road and Tualatin-Sherwood Road, a total of approximately 5,400 feet. This segment of Teton Avenue is part of the RTP's Regional Bicycle System.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
●	○	●	○	●	○	○	●	●	$750,000†

†project team estimate

Tualatin-Sherwood Road Bike Lanes, SW 90th Avenue to Nyberg Street

Bicycle lanes would be completed along Tualatin-Sherwood Road east of SW 90th Avenue, a total of approximately 7,800 feet. This segment of Tualatin-Sherwood Road is part of the RTP's Regional Bicycle System.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
●	○	●	○	●	○	○	●	○	$330,000†

†project team estimate

Tualatin River Pathway, Highway 99W to East City Limits

A multiple-use pathway would be constructed along the south side of the Tualatin River between Highway 99W and the east city limits, connecting to Borland Road, a total of approximately 21,500 feet. This facility is part of the RTP's Regional Bicycle System and is also shown in Tualatin Community Plan, except for the connection to Borland Road.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
●	○	●	○	●	○	○	○	○	$1,800,000†

†project team estimate

Tualatin River Pathway, West Segment

A multiple-use pathway would be constructed along the south side of the Tualatin River between Highway 99W and the west city limits, connecting to Pacific Drive at Cipole Road, a total of approximately 8,500 feet. This facility is shown in the Tualatin Community Plan.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
●	○	●	○	●	○	○	○	○	$700,000†

†project team estimate

Tualatin River Pathway Connectors

Three multiple-use pathways would be constructed in north Tualatin from Jurgens Avenue and Cheyenne Way, connecting to the Tualatin River Pathway, for a total of approximately 3,000 feet of pathways. These pathways are shown in the Tualatin Community Plan.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
●	○	●	○	●	○	○	○	○	$250,000†

†project team estimate

I-5 Pathway

A multiple-use pathway would be constructed along the west side of I-5 from Lower Boones Ferry Road to Norwood Road, including a new bridge over the Tualatin River and a connection to the east end of Blake Street, totaling approximately 14,000 feet in length. This pathway is shown in the Tualatin Community Plan.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
●	○	●	○	●	○	○	○	●	$1,400,000†

†project team estimate

I-205 Pathway

A multiple-use pathway would be constructed along the north side of I-205 from Sagert Street to the east city limits, a total of approximately 9,000 feet. This pathway is shown in the Tualatin Community Plan.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
●	○	●	○	●	○	○	○	●	$875,000†

†project team estimate

Nyberg Creek Pathways

A 2,100-foot multiple-use pathway would be constructed between the north end of SW 72nd Avenue (north of Sagert Street) and SW 65th Avenue (in the vicinity of the hospital), totaling approximately 14,000 feet in length. This pathway is shown in the Tualatin Community Plan.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
●	○	●	○	●	○	○	○	N/A	$170,000†

†project team estimate

Pedestrian Trails

This project would construct the remainder of the City's pedestrian trail system, as shown in the Tualatin Community Plan, consisting of six sections in various locations around the City, totaling approximately 13,000 feet in length.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
○	○	●	○	●	○	○	○	●	$625,000†

†project team estimate

5.4.3 Modeling Results

As described in section 5.4.1, two options were evaluated under Alternative #1. The first option (Alternative #1A) modeled the I-5/Highway 99W connector as a northern, expressway alignment, while the second option (Alternative #1B) modeled the I-5/Highway 99W connector as a southern, freeway or tollway alignment. The segment of SW 124th Avenue south of Tualatin-Sherwood Road was included in Alternative #1A but not Alternative #1B, because the southern alignment modeled for the RTP does not include an interchange at SW 124th Avenue (the lone intermediate interchange is located farther west, serving Sherwood's Old Town). All other projects listed above were included in both alternatives.

A qualitative description of the modeling results from these two options is presented below. Traffic demand volumes and demand-to-capacity ratios (the number of vehicles desiring to use a roadway during the peak hour, divided by the roadway's capacity) for the two alternatives are shown in Figures 5-4 and 5-5.

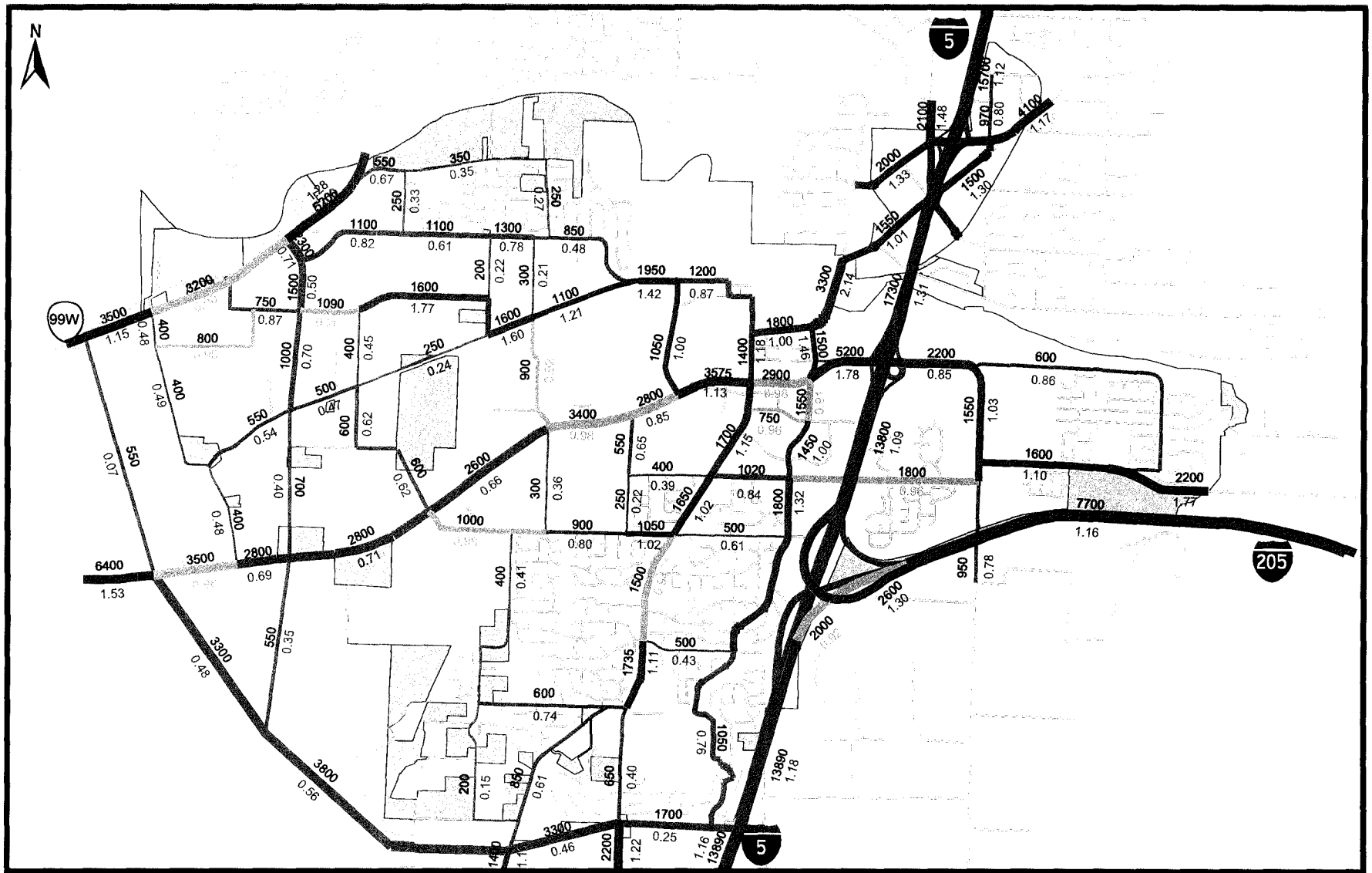


FIGURE 5-4

TUALATIN TRANSPORTATION SYSTEM PLAN

Alternatives Analysis

Alternative 1A 2020 PM Volumes

Alternative #1A

Of all the transportation projects listed under Alternative #1A, the I-5/Highway 99W connector (north alignment) is the only project of regional significance to the City of Tualatin and the surrounding communities. The remaining projects constitute improvements that are expected to have more localized capacity and street connectivity impacts to the City. A description of these impacts and the remaining transportation conditions are described below:

- A northern alignment of the I-5/Highway 99W connector will distribute a significant number of east/west vehicle trips. However, the modeling results indicate that the majority of these trips will not utilize the entire expressway, but will be concentrated on a smaller segment between Boones Ferry Road in the east and Tualatin-Sherwood Road in the west. These trips appear to be originating in or south of Wilsonville and traveling to Sherwood or points further northwest in Washington County.
- The combination of widening Tualatin-Sherwood Road to five lanes west of Teton Avenue and providing an alternate route in the form of the I-5/Highway 99W connector (north alignment) produces significantly better operations on Tualatin-Sherwood Road than under the no-build scenario. However, congestion in central Tualatin, between SW 90th Avenue and I-5, as well as west of the I-5/Highway 99W connector, will create backups similar to those experienced today.
- A northern alignment of the I-5/Highway 99W connector provides an alternative to Highway 99W between Tigard and Sherwood, through Tualatin. Peak hour demand on Highway 99W west of SW 124th Avenue drops from 5200 vehicles (total of both directions) under the no-build scenario (Figure 4-4) to 3200 under Alternative #1A, despite the added traffic from Tualatin's western industrial area that was assumed under Alternative #1A. Despite this reduction in demand, Highway 99W will still operate near or over capacity during the p.m. peak hour in 2020.
- A connection to Martinazzi Avenue to the I-5/Highway 99W connector (north alignment) was modeled, based on the description of allowed access points to the Norwood Expressway given in Chapter 75 of the Tualatin Development Code. The model results indicate that if this connection were to be provided, Martinazzi Avenue south of Sagert Street would experience traffic demands inappropriate for a local street, as travelers would use it as an alternate to I-5. Such a connection would also not meet ODOT access spacing standards for interchange areas, because of the short distance between I-5 and Martinazzi Avenue along the I-5/Highway 99W connector.
- Growth in the industrial sector of Tualatin will impact roadways connecting to Highway 99W and the I-5/Nyberg interchange. Traffic increases on Leveton Drive, 108th Avenue, the eastern portion of Herman Road, and the future Cummins Street are forecast to grow close to or beyond these roads' design capacity by the year 2020.
- Traffic demands on I-205 are expected to exceed capacity, particularly on the southbound to eastbound interchange ramp at I-5. As a result of this congestion, the model indicates that parallel facilities such as Borland Road, Sagert Street, and Nyberg Lane are projected to become over-utilized as travelers seek alternative routes.
- The redevelopment of the Durham Quarry is expected to generate high traffic volumes and periods of congestion along Bridgeport Road between Upper Boones Ferry Road and Lower Boones Ferry Road.

- Boones Ferry Road between Ibach Street and Tualatin-Sherwood Road is forecast to continue to near or over capacity despite the transportation improvements in other locations under Alternative #1A.
- The SW 124th Avenue extension between Tualatin-Sherwood Road and the I-5/Highway 99W connector (north alignment) is projected to be underutilized. Also, the segment of the I-5/Highway 99W connector between Tualatin-Sherwood Road and Highway 99W is projected to be underutilized.

Alternative #1B

In contrast to Alternative #1A, Alternative #1B includes an alignment of the I-5/Highway 99W connector that would take a more southwesterly route, connecting to Highway 99W south of the City of Sherwood. Consistent with the RTP model, the I-5/Highway 99W connector (south alignment) was modeled as a freeway or tollway, with a single interchange serving Sherwood. Under this alternative I-5/Highway 99W connector alignment, traffic demands on Tualatin-area freeways would not significantly change. However, some arterial and collector roadways within Tualatin would experience a significant increase in vehicular traffic, compared to Alternative #1A. A qualitative description of the impacts of this alternative is provided below.

- Traffic demand for the southern alignment of the I-5/Highway 99W connector is about 70% of that for the northern alignment. The majority of this traffic consists of traffic between the Portland metropolitan area, Sherwood, and points southwest of Sherwood along Highways 99W and 18. The southern alignment relieves a significant amount of traffic (1900 vehicles) from the section of Tualatin-Sherwood Road exiting Tualatin, leading to Sherwood.
- Traffic volumes along Tualatin-Sherwood Road are generally higher, and traffic operations are generally worse, under Alternative #1B, compared to Alternative #1A. This indicates that Tualatin-Sherwood Road is serving traffic destined for western Tualatin, Sherwood, and points north and west of Sherwood. The model reflects the extra travel distance and time associated with using the I-5/Highway 99W connector (south alignment), and shifts traffic back to Tualatin-Sherwood Road.
- The southern alignment of the I-5/Highway 99W reduces demand on Highway 99W through Tualatin even more than does Alternative #1A, resulting in a nearly 50% decrease in traffic west of SW 124th Avenue, compared to the no-build alternative. However, Highway 99W north of Tualatin will still operate over capacity.
- Without a connection to the I-5/Highway 99W connector, Martinazzi Avenue south of Sagert Street experiences traffic volumes typical for a local street.
- The southern alignment of the I-5/Highway 99W connector, which provides no connection to western Tualatin, does not serve north-south traffic heading to and from Wilsonville. As a result, Boones Ferry Road experiences higher traffic volumes than under Alternative #1A, and the Ibach Street-SW 108th Avenue-Blake Street-SW 105th Avenue-Avery Street route becomes congested with through traffic. Access patterns to the western industrial area show more traffic, and more congestion, on the streets on the east side of the area.

All other conditions described for Alternative #1A remain essentially the same under Alternative #1B.

5.4.4 Intersection Needs

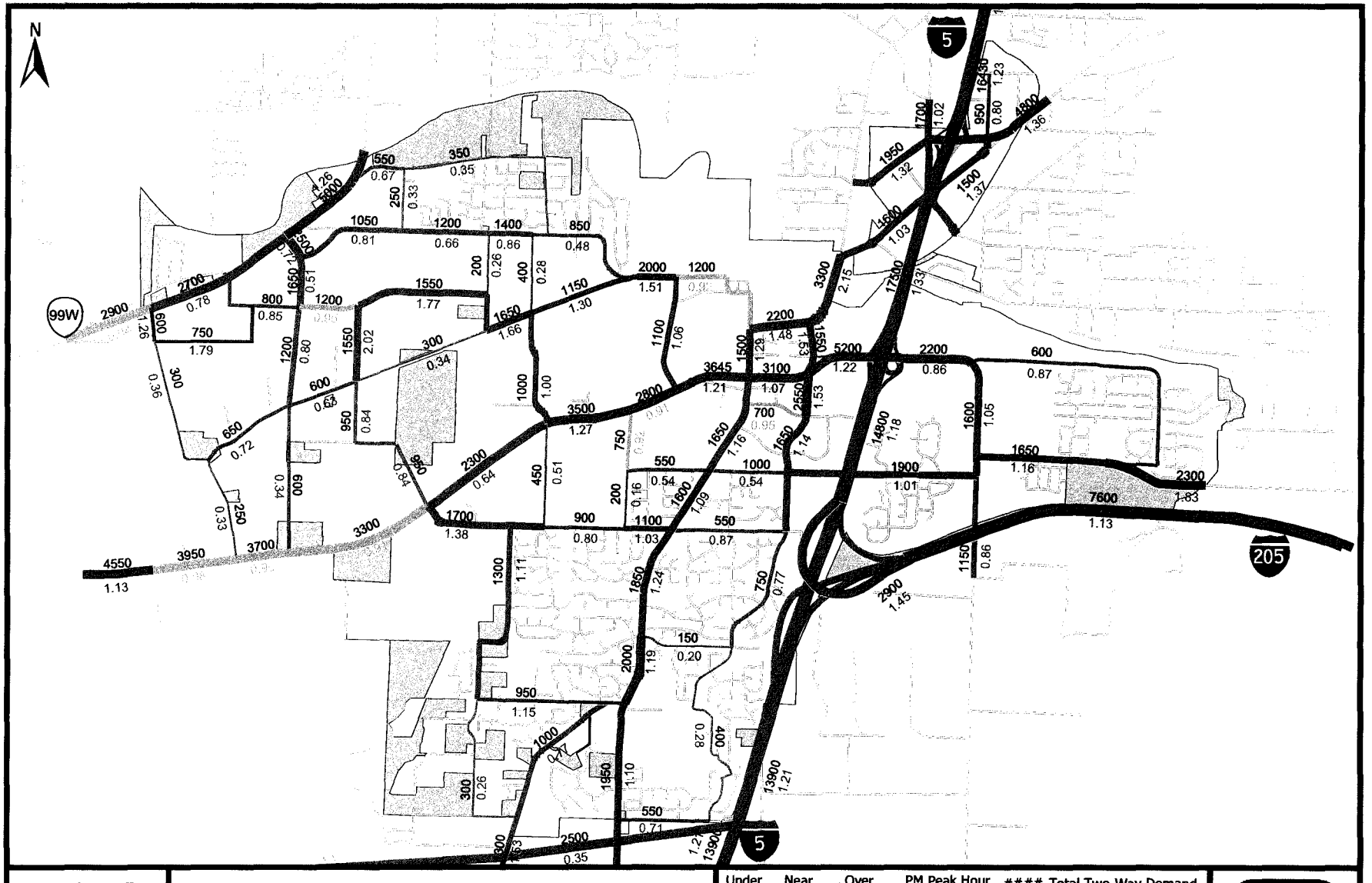
The approach demand-to-capacity ratios at intersections of collectors and arterials were evaluated to determine if there might be a need for improvements to the intersection. Actual intersection operations were not performed at these intersections. As the number of legs of an intersection operating over capacity increases, the more significant the scale of the improvements needed (and the greater the cost) to correct the problem. Intersections with three or more legs over capacity will likely be significant bottlenecks that will create congestion spilling back to adjacent intersections; intersections with one or two legs over capacity will have problems on the affected legs, but are less likely to affect neighboring intersections. Typical corrective actions would be to signalize intersections that are not already signalized, and to add additional capacity through the use of additional through and/or turn lanes. The preferred alterative incorporated in the TSP addresses intersection projects in more detail.

TABLE 5-3
ESTIMATED NUMBER OF INTERSECTIONS REQUIRING IMPROVEMENTS: ALTERNATIVE 1

Alternative	All Legs	3 of 4 legs	2 legs	1 leg
1A	6	2	15	16
1B	8	3	23	9

Intersections with three or more legs operating over capacity are listed below:

- Boones Ferry Road/Tualatin-Sherwood Road;
- Boones Ferry Road/Martinazzi Avenue;
- Boones Ferry Road/Upper Boones Ferry Road/Lower Boones Ferry Road;
- Lower Boones Ferry Road/Bridgeport Road/SW 78th Avenue;
- Lower Boones Ferry Road/McEwan Road;
- Borland Road/SW 65th Avenue;
- Nyberg Street/I-5 southbound ramp (Alt. #1A only);
- Lower Boones Ferry Road/I-5 northbound ramp (Alt. #1A only);
- Tualatin-Sherwood Road/Martinazzi Avenue (Alt. #1B only);
- Teton Avenue/Herman Road (Alt. #1B only);
- Ibach Street/Boones Ferry Road (Alt. #1B only);
- SW 105th Avenue/Avery Street (Alt. #1B only); and
- Boones Ferry Road/Avery Street (Alt. #1B only).



FIGURE

5-5

TUALATIN TRANSPORTATION SYSTEM PLAN

Alternatives Analysis

Alternative 1B 2020 PM Volumes

5.4.5 Access Management Needs

Research has shown that the safety of two-way left-turn lanes (TWLTLs) diminishes as traffic volumes increase, and many jurisdictions have adopted policies to replace TWLTLs with raised medians when daily traffic volumes exceed 20,000-25,000 (corresponding to a p.m. peak hour volume of 2000-2500). For the purposes of this memo, an ADT of 24,000 vehicles (a p.m. peak hour volume of 2400 vehicles) has been used as the threshold to identify road segments where access control may be required by the year 2020 for safety reasons. Access control could include installing medians where driveways currently exist, or continuing to prohibit driveway access where no driveways currently exist. These segments include:

- Tualatin-Sherwood Road;
- Nyberg Street, between Tualatin-Sherwood Road and I-5;
- Martinazzi Avenue, between Warm Springs Street and Tualatin-Sherwood Road;
- Boones Ferry Road, north of Martinazzi Avenue;
- Highway 99W; and
- Lower Boones Ferry Road, northeast of I-5.

5.5 EVALUATION OF ALTERNATIVE #2

5.5.1 Alternative #2 Description

Alternative #2 implements the following projects:

- Additional roadway capacity projects to address capacity needs remaining from Alternative #1.
- Projects identified in the City's November 2000 Transportation Projects Prioritization Report that were not part of Alternative #1 (i.e., are not in the financially constrained RTP, Tualatin Community Plan, Central Urban Renewal District Plan, and/or Leveton Tax Increment Plan).
- Sidewalk, bicycle lane, and pathway projects to complete the pedestrian and bicycle system along the City's collector and arterial streets.
- Safety projects identified through the TSP process.
- Transit service improvements as described in Section 5.2.2. The resulting coverage areas are shown in Figure 5-6. This figure also shows transit level of service (TLOS) values, indicating the percentage of time a person has access to transit over the course of a day. Comparing these values to the values given in Figure 3-6 indicates how much transit service increases in an area: if a TLOS value doubles, transit service is available twice as much in that area as before.

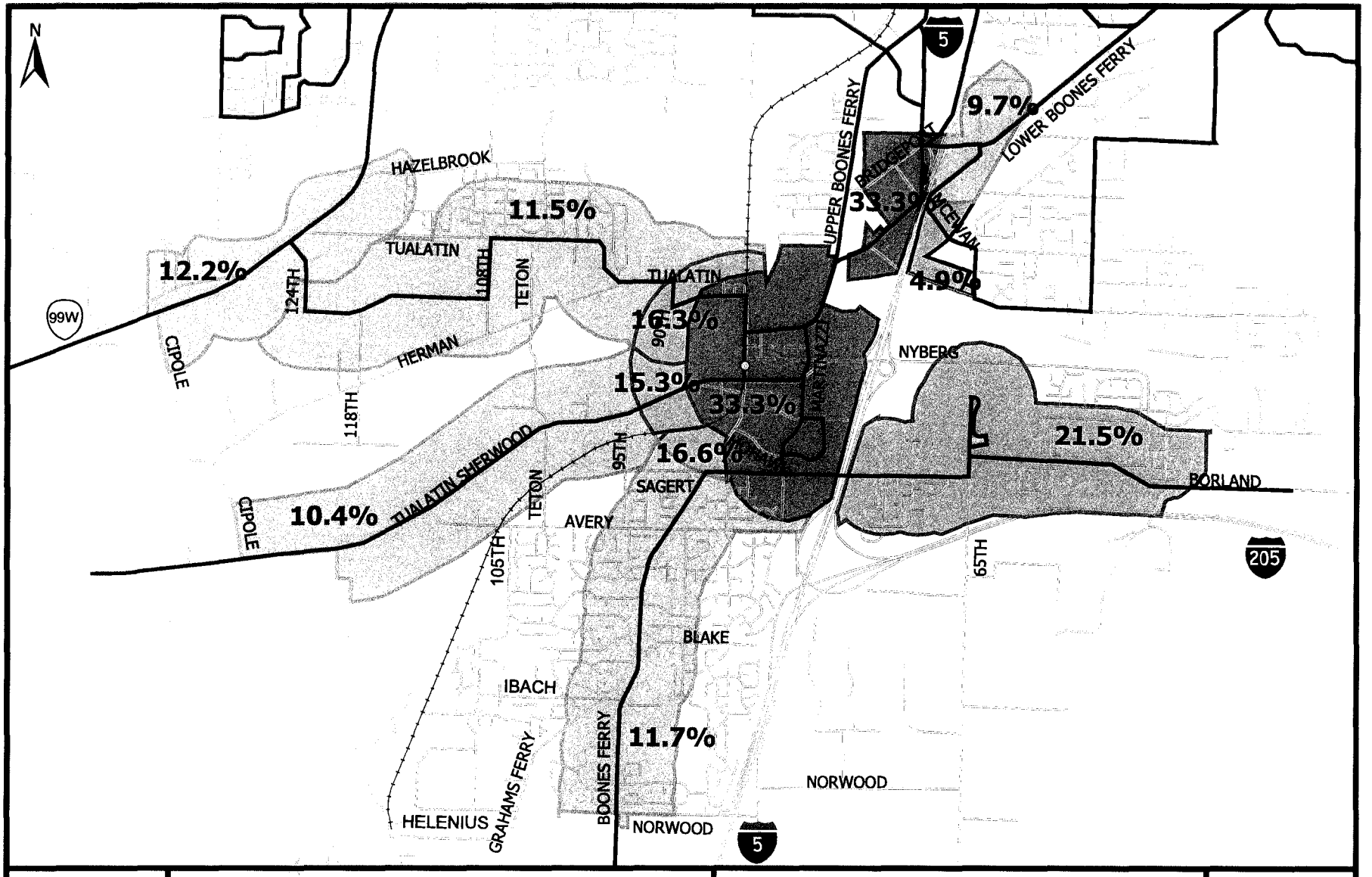


FIGURE 5-6

TUALATIN TRANSPORTATION SYSTEM PLAN
Alternatives Analysis

Alternatives 2 & 3 Transit Service

2020 Weekday Transit Availability LOS
- B (23.6 - 39.5%)
- C (14.6 - 23.5%)
- D (8.4% - 14.5%)
- E (1.4 - 8.3%)
- F (<1.4%)

##.#% TLOS Indicator Value
Commuter Rail Station
Commuter Rail Line
Tri-Met Bus Routes

1" = 3,000 feet

SOURCE:
KAI analysis

- The north alignment of the I-5/Highway 99W connector. Because the TSP must show an alignment within the Urban Growth Boundary to comply with Oregon's Transportation Planning Rule, the south alignment is not modeled further. However, the results of Alternative #1B have been carried forward into the TSP to provide guidance for future planning work that could allow the I-5/Highway 99W connector to be located outside the UGB, via a state goals exception process. Based on the results of Alternative #1A, Martinazzi Avenue was disconnected from the I-5/Highway 99W connector for Alternative #2.
- The same growth as used in Alternative #1.

5.5.2 Alternative #2 Project Descriptions

Figure 5-7 shows the locations of the additional projects studied under Alternative #2. A description of each of these projects is provided below.

SW 95th Place Connection to Avery

SW 95th Place currently ends in a cul-de-sac just north of Avery Street. This project would connect the two streets. This project is shown in the November 2000 Transportation Projects Prioritization Report.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
●	○	○	○	●	○	○	○	N/A	$50,000

SW 95th Place Extension to SW 90th Avenue

SW 95th Place would be extended north and east from Tualatin-Sherwood Road to intersect SW 90th Avenue. In combination with the SW 95th Place connection to Avery Street, this project would provide a new north-south route across Tualatin-Sherwood Road. This project is shown in the November 2000 Transportation Projects Prioritization Report.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
●	○	○	○	●	○	○	○	●	$500,000

Boones Ferry Road Widening

Boones Ferry Road would be widened between Lower Boones Ferry Road and Tualatin-Sherwood Road, including the Tualatin River Bridge. Pedestrian facilities would be completed and bicycle lanes widened or constructed. Turn lanes at the Martinazzi Avenue intersection would be lengthened to provide more storage, and the Tualatin Road signal would be upgraded. This project is shown in the November 2000 Transportation Projects Prioritization Report and the Central Urban Renewal District Plan.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
○	●	●	●	●	○	●	●	●	$5,313,000*

*includes $1,100,000 to place utilities underground between Martinazzi Avenue and Tualatin-Sherwood Road

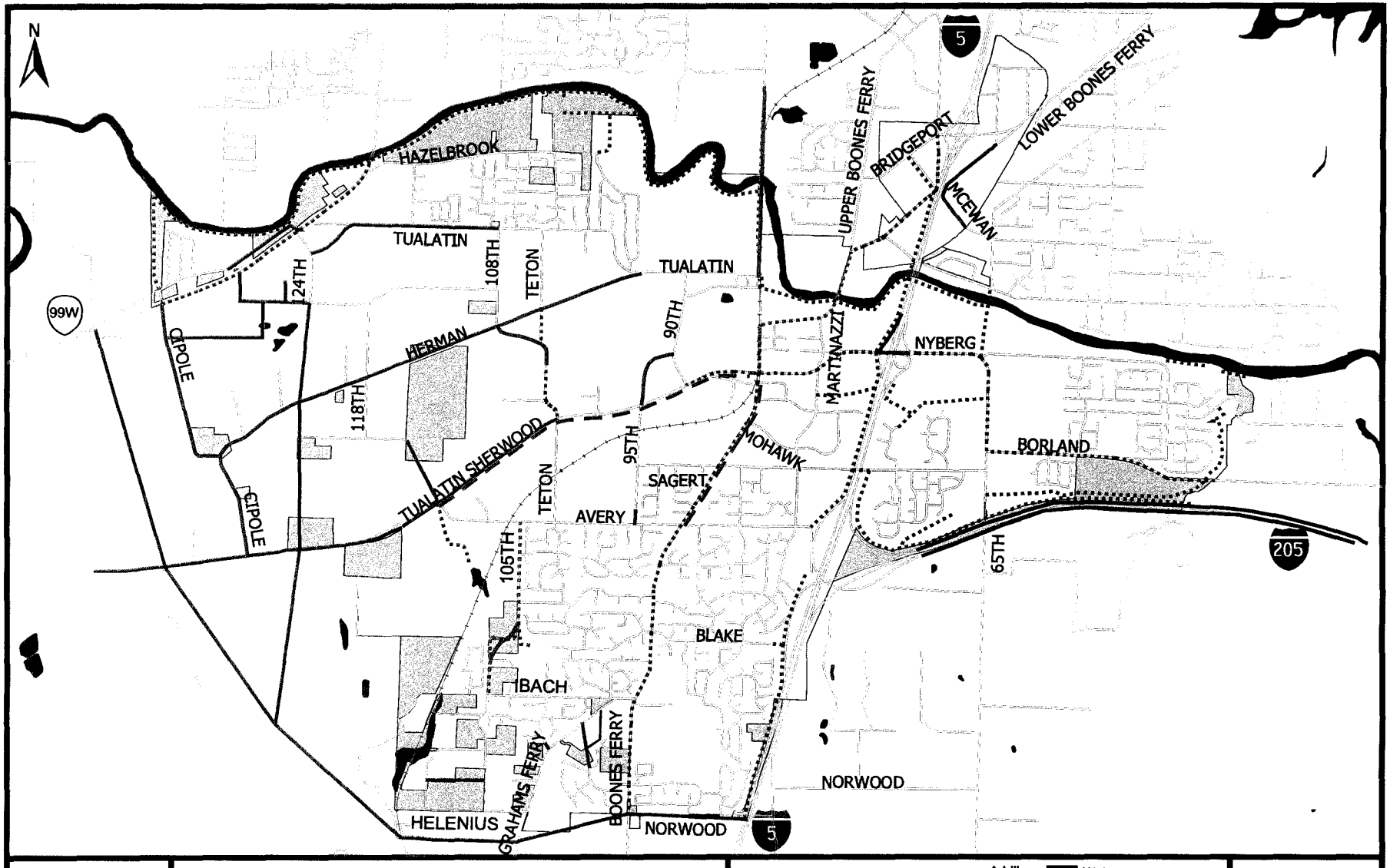


FIGURE 5-7

TUALATIN TRANSPORTATION SYSTEM PLAN
Alternatives Analysis

Alternative 2 Projects

	Alt. 1	TPPR	Add'l. Projects
New/Expanded Roadway	~	~	~
Bike/Ped Improvement	⋯	⋯	⋯
Signal Interconnect		/	/
Commuter Rail	~		

Water
City of Tualatin
Tualatin Planning Area

1" = 3,000 feet

SOURCES:
City of Tualatin
KAI Analysis

Tualatin-Sherwood Road Railroad Crossing Improvement

The railroad crossing on Tualatin-Sherwood Road at Boones Ferry Road would be improved by re-grading Tualatin-Sherwood Road for 500 feet on either side of the tracks to bring the road grade up to the top of the existing tracks. A concrete crossing would also be installed. This project would provide a smoother crossing, allowing vehicles to cross the tracks at higher speeds, thus increasing the capacity of the adjacent Boones Ferry Road intersection. This project is shown in the November 2000 Transportation Projects Prioritization Report.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
○	○	○	○	○	○	●	●	N/A	$500,000

Tualatin-Sherwood Road Signal Interconnect

The existing interconnected signal system on Tualatin-Sherwood Road would be extended from Boones Ferry Road to Avery Street. This project is shown in the November 2000 Transportation Projects Prioritization Report.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
○	●	○	○	○	○	●	○	N/A	$50,000

Boones Ferry Road Signal Interconnect

The existing interconnected signal system on Boones Ferry Road would be extended from Tualatin-Sherwood Road to Avery Street. This project is shown in the November 2000 Transportation Projects Prioritization Report.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
○	●	○	○	○	○	●	○	N/A	$50,000

Herman Road Widening, Cipole Road-SW 118th Avenue

Herman Road would be widened between Cipole Road and SW 118th Avenue to provide standard-width travel lanes, a center turn lane, bicycle lanes, landscape strips, and sidewalks. This project is shown in the November 2000 Transportation Projects Prioritization Report.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
○	○	○	○	●	○	●	●	N/A	$2,170,000

Herman Road Widening, SW 108th Avenue-Teton Avenue

Herman Road would be widened between SW 108th and Teton Avenues to provide standard-width travel lanes, a center turn lane, bicycle lanes, landscape strips, and sidewalks. This project is shown in the November 2000 Transportation Projects Prioritization Report.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
○	○	○	○	●	○	○	●	N/A	$707,000

Herman Road Widening, Teton Avenue-Tualatin Road

Herman Road would be widened between Teton Avenue and Tualatin Road to provide standard-width travel lanes, a center turn lane, bicycle lanes, landscape strips, and sidewalks. This project is shown in the November 2000 Transportation Projects Prioritization Report.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
○	○	○	○	●	○	○	●	N/A	$1,700,000

Cipole Road Widening

Cipole Road would be widened between Tualatin-Sherwood Road and Highway 99W to provide standard-width travel lanes, a center turn lane, bicycle lanes, landscape strips, and sidewalks. This project is shown in the November 2000 Transportation Projects Prioritization Report.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
○	○	○	○	●	○	●	●	N/A	$6,000,000

McEwan Road Reconstruction

McEwan Road would be reconstructed between the railroad crossing and SW 65th Avenue to provide standard-width travel lanes, a center turn lane, bicycle lanes, landscape strips, and sidewalks. This project is shown in the November 2000 Transportation Projects Prioritization Report.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
○	○	○	○	●	○	●	●	N/A	$1,800,000

SW 93rd Avenue

SW 93rd Avenue would be completed between Sagert and Avery Streets, including travel lanes with shared bicycle use, landscape strips, and sidewalks. This project is shown in the November 2000 Transportation Projects Prioritization Report.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
●	○	○	○	●	○	○	○	N/A	$150,000

I-205 Widening, I-5 to Stafford Road

I-205 would be widened to include an auxiliary lane in each direction between the I-5 interchange and Stafford Road. This project is a capacity improvement identified from the Alternative #1A modeling results. This segment is part of a project contained in the RTP's priority system. It is recognized that constructing only this segment, rather than all of I-205 to Oregon City, would simply move the bottleneck to Stafford Road, but even this would improve overall travel times and alleviate the backup that currently spills back onto I-5 southbound.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
○	●	●	○	○	○	●	●	○	$6,100,000*†

*includes project costs outside of Tualatin
†project team estimate

Hall Boulevard Extension

Hall Boulevard would be extended from its present terminus north of the Tualatin River to Tualatin Road on the south side of the river. This project was identified from the Alternative #1A modeling results; the project also appears in the RTP's priority system.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
●	●	●	●	●	●	○	○	●	$25,000,000

Teton Avenue Realignment

Teton Avenue would be realigned to connect to SW 108th Avenue, providing more direct access to the industrial area from Tualatin-Sherwood Road and reducing or eliminating the need for a traffic signal at the Teton Avenue/Herman Road intersection. This project was identified from the Alternative #1A modeling results.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
●	●	○	○	●	○	●	●	N/A	$2,100,000†

†project team estimate

Sagert Street I-5 Overpass Pedestrian Improvements

This project would construct sidewalks on Sagert Street where it crosses I-5, and provide screening on the overpass. The sidewalk portion of this project is shown in the November 2000 Transportation Projects Prioritization Report.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
○	○	○	○	●	○	○	●	N/A	$33,500†

†project team estimate

105th Avenue Sidewalks

This project would construct sidewalks on the west side of 105th Avenue south of Avery Street to the city limits. This project is shown in the November 2000 Transportation Projects Prioritization Report.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
○	○	○	○	●	○	○	●	N/A	$84,000

5.5.3 Modeling Results

As described previously, Alternative #2 is based on Alternative #1A, and adds those projects that are listed in the November 2000 Transportation Projects Prioritization Report and were not already included in Alternative #1A, as well as several additional projects that were identified from the Alternative #1 modeling results. The resulting year 2020 p.m. peak hour traffic demand volumes and demand-to-capacity ratios are shown in Figure 5-8. A qualitative description of the modeling results is provided below.

- The capacity improvement to I-205, coupled with the I-5/Highway 99W connector (north alignment) has a positive impact on the overall traffic volumes within the City of

Tualatin, particularly on Tualatin-Sherwood Road where traffic volumes have been significantly reduced along some stretches. This reduction in traffic volumes can be attributed to the "pass-through" traffic that desires to get to places both east and west of the City, but now has an alternate route.

- The I-5/Highway 99W connector (north alignment) is projected to serve a high volume of east/west traffic between Tualatin-Sherwood Road and I-5.
- The extension of Hall Boulevard across the Tualatin River reduces traffic demand on Boones Ferry Road, Bridgeport Road, and Lower Boones Ferry Road. However, the projected demand on the Hall Boulevard extension will be above its capacity.
- Traffic volumes on I-5, particularly south of the I-205 interchange, will increase, causing the facility to operate above capacity.
- New transit service to the industrial sectors of Tualatin produces a small decrease in vehicle trips. Some of the area's roadways, including Leveton Drive, SW 108th Avenue, and portions of SW 124th Avenue, will still operate above capacity.
- Traffic volumes on Nyberg Street and SW 65th Avenue will be reduced as a result of the increased capacity on I-205. However, volumes on Borland Road and Sagert Street will increase and operate above capacity.

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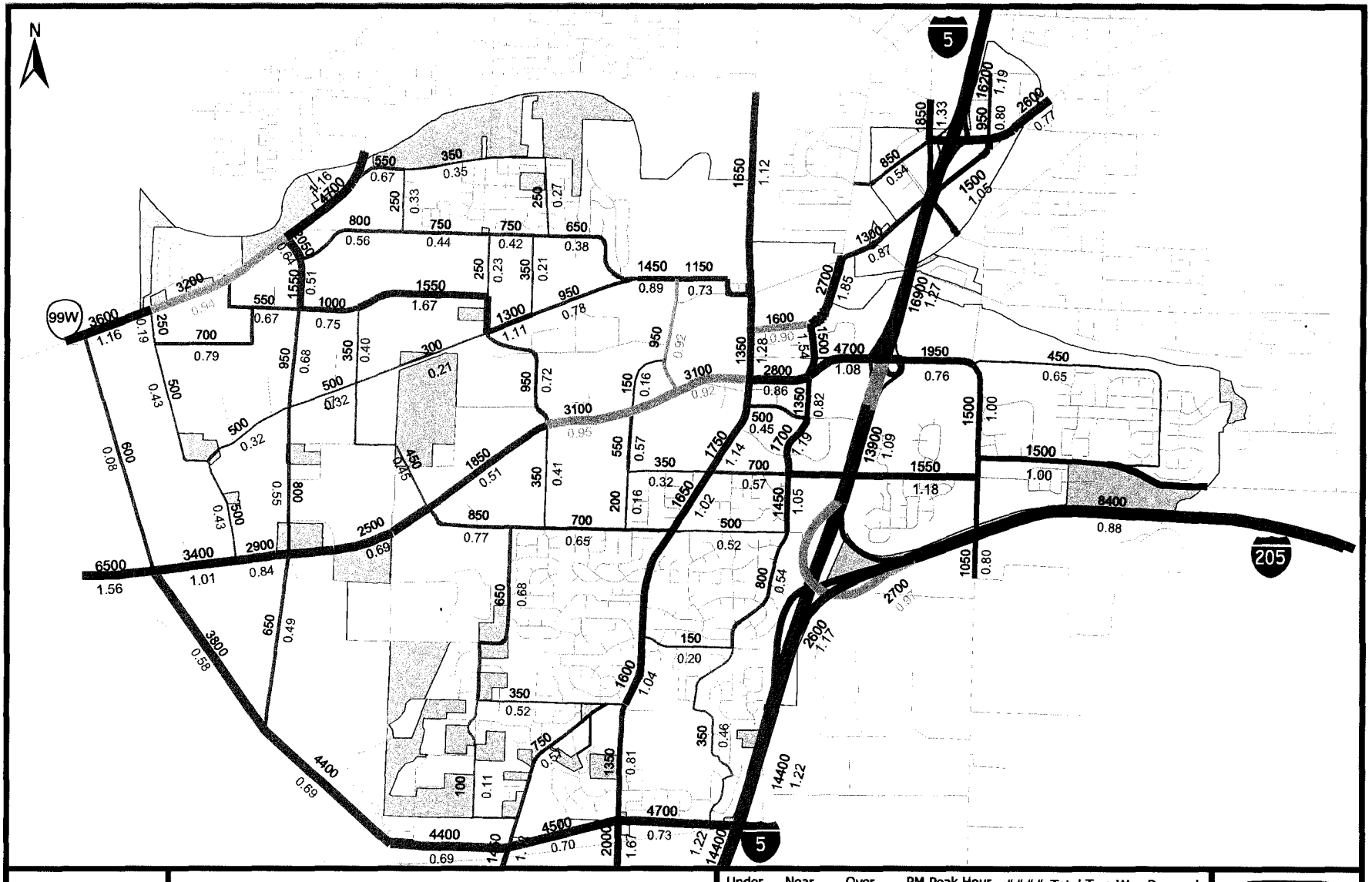


FIGURE

5-8

TUALATIN TRANSPORTATION SYSTEM PLAN

Alternatives Analysis

Alternative 2 2020 PM Volumes

5.6 EVALUATION OF ALTERNATIVE #3

5.6.1 Alternative #3 Description

Alternative #3 implements the following:

- Additional roadway capacity projects to address capacity needs remaining from Alternative #2.
- Based on the results of Alternative 2, Teton Ave. was restored to its existing alignment.
- An additional 5% auto trip reduction in the industrial zones (for a total of 15%), reflecting additional Transportation Demand Management efforts by local employers and the TMA.
- The north alignment of the I-5/Highway 99W connector was modified to run closer to the urban growth boundary, connecting to Tualatin-Sherwood Road at SW 124th Avenue, and including one interchange at Grahams Ferry Road.
- The same growth as used in Alternative #1.

5.6.2 Alternative #3 Project Descriptions

Figure 5-9 shows the locations of the additional projects studied under Alternative #3. A description of each of these projects is provided below.

I-5/Highway 99W Connector (modified north alignment)

The results of the previous alternatives revealed that the majority of trips on this facility used the segment between Tualatin-Sherwood Road and I-5. The segment between Tualatin-Sherwood Road and Highway 99W appeared underutilized. Also, the TAC desired to run the connector closer to the urban growth boundary. To test whether existing, parallel roadways (Cipole Road and SW 124th Avenue) could accommodate the demand, the I-5/Highway 99W connector was realigned so that the western end of this facility terminates at the Tualatin-Sherwood Road/SW 124th Avenue intersection. Also, the roadway was upgraded to a limited-access facility by removing all of the intersections with the exception of one intermediate interchange at Grahams Ferry Road.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
●	●	●	○	●	●	●	○	N/A	<$250,000,000

I-5 Widening, I-205 to I-5/Highway 99W connector

I-5 would be widened to include an auxiliary lane in each direction between the I-205 interchange and the I-5/Highway 99W connector interchange, to add capacity to accommodate traffic traveling between I-205 and the connector. This project is a capacity improvement identified from the Alternative #2 modeling results.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
○	●	○	○	○	○	●	○	○	$1,900,000[†]

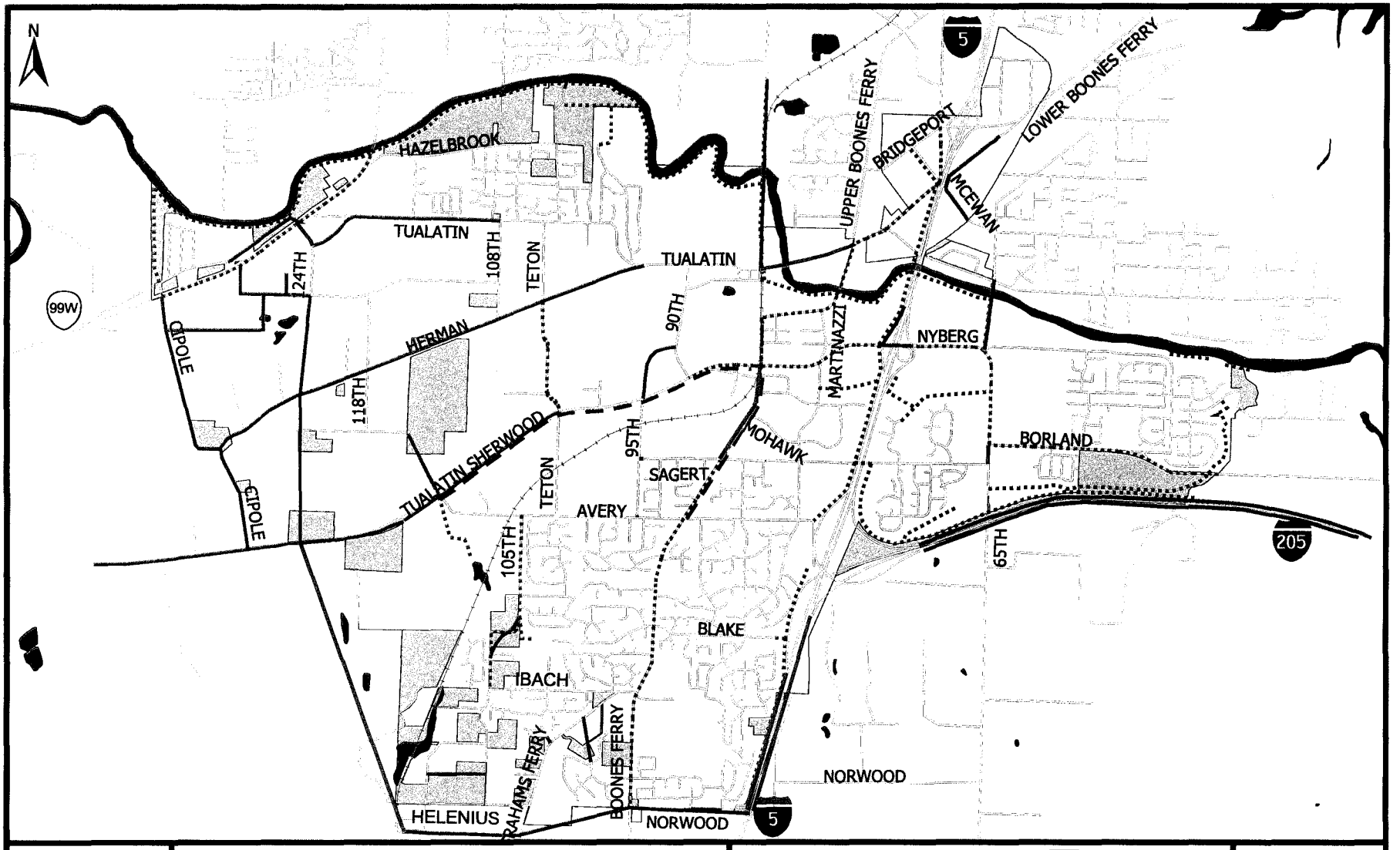


FIGURE 5-9

TUALATIN TRANSPORTATION SYSTEM PLAN
Alternatives Analysis

Alternative 3 Projects

	Alt. 1 and 2 Projects	Alt. 3 Projects
New/Expanded Roadway	~	~
Bike/Ped Improvement	···	
Signal Interconnect	//	
Commuter Rail	~	

Water
City of Tualatin
Tualatin Planning Area

1" = 3,000 feet

SOURCES:
City of Tualatin
KAI Analysis

Lower Boones Ferry Road Extension

Lower Boones Ferry Road would be extended from its present terminus at Boones Ferry Road to Tualatin Road on the west side of the river. This project was identified from the Alternative #2 modeling results.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
●	●	○	○	●	●	●	○	N/A	$14,000,000†

†project team estimate

SW 65th Avenue Extension

SW 65th Avenue would be extended from its present terminus at Nyberg Street to cross the Tualatin River, connecting to Childs Road. This project was identified from the Alternative #2 modeling results.

Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
●	●	○	○	●	●	○	○	N/A	$2,800,000†

†project team estimate

Boones Ferry Road Widening

Boones Ferry Road would be widened to five lanes between Tualatin-Sherwood Road and Sagert Street. This project was identified from the Alternative #2 modeling results.

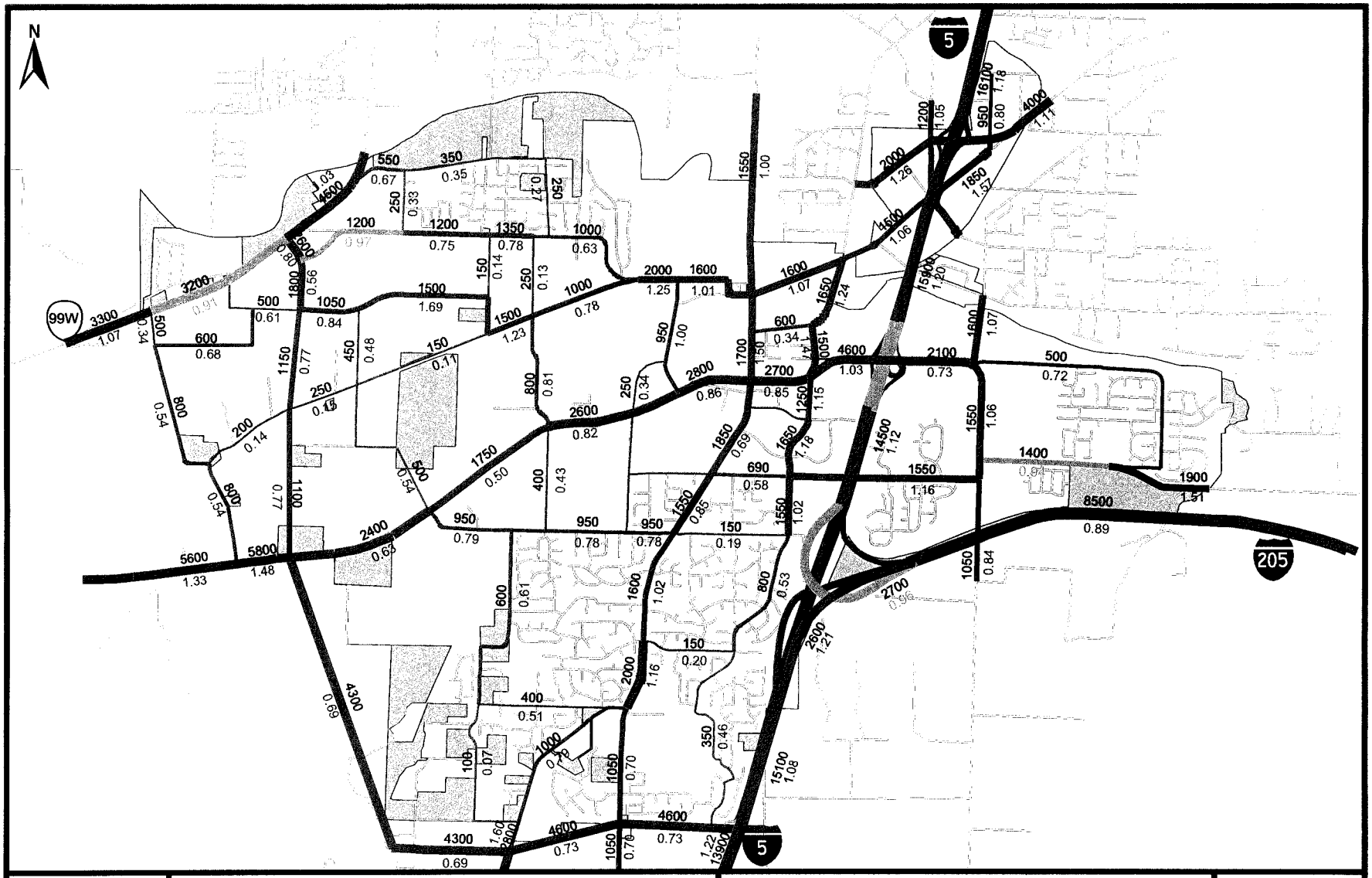
Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
●	●	○	●	●	○	●	○	N/A	$3,000,000†

†project team estimate

5.6.3 Modeling Results

The year 2020 p.m. peak hour traffic demand volumes and demand-to-capacity ratios for Alternative #3 are shown in Figure 5-10. A qualitative description of the modeling results is provided below.

- Cipole Road and SW 124th Avenue were able, for the most part, to accommodate north-south traffic demands between Tualatin-Sherwood Road and Highway 99W. Extending the connector north of Tualatin-Sherwood Road does not appear to be necessary.
- Moving the connector intersection with Tualatin-Sherwood Road to SW 124th Avenue increases the length of Tualatin-Sherwood Road that is congested, as no parallel routes to Tualatin-Sherwood Road are provided west to Sherwood.
- Even with the addition of an auxiliary lane on I-5 between I-205 and the I-5/Highway 99W connector, this segment will still operate over capacity.
- The extension of SW 65th Avenue to the north side of the Tualatin River is projected to operate over capacity, indicating that there is a high travel demand on the east side of I-5 that desires to travel between the Lower Boones Ferry Road corridor and the Nyberg Street corridor. McEwan Road will handle some of this demand, and its operations will worsen as a result.



FIGURE

5-10

TUALATIN TRANSPORTATION SYSTEM PLAN

Alternatives Analysis

Alternative 3 2020 PM Volumes

- The extension of Lower Boones Ferry Road across the Tualatin River to Tualatin Road is projected to operate over capacity. However, demand on the Boones Ferry Road bridge is significantly reduced, although this reduction is not sufficient to restore below-capacity conditions. This connection increases volumes on Tualatin Road and SW 90th Avenue, resulting in over-capacity conditions on those roadways.
- Widening Boones Ferry Road between Tualatin-Sherwood Road and Sagert Street restores this segment of the roadway to below-capacity conditions in theory. However, since the segments to the north and south will remain above capacity, in practice, this extra capacity will either (1) go unused because of the traffic metering effects of upstream intersections, or (2) will be congested, as queues spill back from downstream intersections.
- Portions of Leveton Drive, SW 124th Avenue, Highway 99W, Martinazzi Avenue, and Sagert Street will continue to operate above capacity.

5.7 CONSULTANT RECOMMENDED ALTERNATIVE

5.7.1 Development of the Recommended Alternative

Based on the results of the three alternatives, known funding constraints, TSP goals and objectives, and previous project prioritization work performed by the City, the project team recommended that the capital projects shown in Table 5-3 be incorporated into the draft TSP. This list was reviewed by staff and presented at a public open house; the revised list that resulted became the draft TSP's preferred alternative.

Projects are grouped into short-term (0-5 years), mid-term (6-10 years), and long-term (11-20 years), based on need and the availability of funding. A fourth category lists projects that are likely to be triggered by specific development projects; the need for these projects and the specific timing of when these projects occur will depend on when those developments occur. Projects are listed within each group in descending order of cost, and funding sources are identified.

Although not listed, the recommended alternative includes the transit and TDM projects included in Alternative #3. The transit service improvements assume that the region will work towards implementing the RTP's transit system.

A number of desirable projects, required to fully address identified transportation needs, were not able to be funded. These are listed in Table 5-4. Projects that could be eligible for alternative sources of funding are listed first, in order of priority within each group. Unfunded projects that could be constructed if existing transportation revenues are increased (e.g., as a result of increasing the state gas tax) are listed next, grouped in order of priority. Finally, projects that are included in the current Tualatin Development Code, but that are recommended to be removed from the City's transportation plan, are listed last.

TABLE 5-4
PROJECT TEAM RECOMMENDED ALTERNATIVE

Project Description	Cost	Funding Source(s)
0-5 Years		
Wilsonville-Beaverton Commuter Rail *capital costs to start up service*	$75,000,000	MSTIP, STIP
124th Avenue *new street, Leveton to Myslony, signal at Herman*	$6,500,000	LTIP
Lower Boones Ferry Road *center turn lane, bike lanes, sidewalks, Bridgeport to Boones Ferry*	$5,800,000	MSTIP
Boones Ferry Road *center turn lane, bike lanes, sidewalk, Lower Boones to Tualatin-Sherwood*	$5,313,000	CURP
124th Avenue *new street, Myslony to T-S, signal at T-S*	$4,900,000	LTIP
Nyberg/I-5 interchange (#289) *southbound turn lanes, widen bridge*	$4,000,000	CURP, STIP, SDC
Nyberg Street/65th Avenue/Nyberg Lane *signalize intersection or construct roundabout, sidewalks on Nyberg*	$650,000	SDC
Grahams Ferry Road/Ibach Street *realign, signalize intersection*	$500,000	SDC
Herman Road/Teton Avenue *signalize intersection, railroad interconnect*	$425,000	SDC
Sagert Street/Martinazzi Avenue *signalize intersection*	$425,000	SDC
124th Avenue *additional travel lane at Highway 99W*	$320,000	LTIP
Tualatin-Sherwood Road/Boones Ferry Road *second westbound left-turn lane*	$100,000	SDC
Sagert Street *connect to 95th Place*	$75,000	SDC
95th Place *connect to Avery Street*	$50,000	SDC
Boones Ferry Road *interconnect signals south of Boones Ferry*	$50,000	SDC
Tualatin-Sherwood Road *interconnect signals west of Boones Ferry*	$50,000	SDC
Sagert Street *construct sidewalks and screening on I-5 overpass*	$33,500	SDC
Boones Ferry Road, Martinazzi Avenue *driveway restrictions*	$7,500	SDC

Project Description	Cost	Funding Source(s)
6-10 Years		
Herman Road reconstruct, 108th to 118th	$2,500,000	LTIP
Leveton Drive, 130th Avenue new streets	$2,100,000	LTIP
SW 126th Avenue, Cummins Drive new streets	$1,500,000	LTIP
Herman Road reconstruct, Teton to 108th	$920,000	SDC
Boones Ferry Road complete sidewalks, Tualatin-Sherwood to high school	$500,000	SDC
Sagert Street/65th Avenue turn lane, signalize, interconnect with Borland/65th	$400,000	SDC
SW 125th Place new street	$360,000	LTIP
11-20 Years		
105th Avenue-Blake Street-108th Avenue *realign curves*	$860,000	SDC
Avery Street/Teton Avenue *signalize intersection*	$200,000	SDC
Herman Road *reconstruct, Tualatin to Teton*	$1,700,000	SDC
Tualatin-Sherwood Road *bike lanes, 90th-Nyberg*	$330,000	SDC
Tualatin-Sherwood Road *widen to five lanes, Teton to Highway 99W*	$25,000,000	MSTIP
Hall Boulevard *extend across Tualatin River*	$25,000,000	MSTIP, STIP, CURP?, cities
Development-Related		
East-West Street new street, 108th to 112th Avenues	$1,100,000	Development
Herman Road/108th Avenue signalize, railroad interconnect	$750,000	Development
Herman Road/118th Avenue signalize, railroad interconnect	$750,000	Development
Tualatin Road/108th Avenue signalize	$200,000	Development
Cummins Drive/Cipole Road signalize	$200,000	Development
Durham Quarry Area Refinement Plan *Define road network and interchange improvements needed to accommodate quarry redevelopment*	$50,000	Development
Bridgeport Road widen to City standards, based on Quarry refinement study	TBD	Development

MSTIP: Washington County Major Streets Transportation Improvement Program, STIP: Oregon Statewide Transportation Improvement Program, CURP: Central Urban Renewal Plan, LTIP: Leveton Tax Increment Plan, TGM: Oregon Transportation Growth Management Program, SDC: Systems Development Charge, TBD: to be determined

TABLE 5-5
PROJECTS UNFUNDED OR REQUIRING NEW FUNDING SOURCES

Project Description	Cost*	Comments
Recreation SDC or Bond		
SW 108th Avenue ped/bike bridge	$450,000	connectivity
Tualatin River pathway	$2,500,000	RTP consistency
SW 65th Avenue ped/bike bridge	$450,000	connectivity
Nyberg Creek pathway	$170,000	shown in TDC
Pedestrian trails (6)	$625,000	shown in TDC
Subtotal	**$4,195,000**	
Tax Increment Financing		
Herman/Cipole intersection	$1,800,000	safety, capacity improvement
Myslony extension	$1,880,000	connectivity, shown in TDC
Cipole widening	$6,000,000	carries highest volume of these projects
Herman widening, Cipole-124th	$920,000	low volume
Herman widening, 118th-124th	$1,250,000	low volume
Subtotal	**$11,850,000**	
STIP/Federal Earmark		
I-5/Highway 99W connector	$250,000,000	RTP project, south alignment with one interchange serving industrial area and Sherwood
I-205 widening, I-5 to Stafford	$6,100,000	RTP project, moves congestion off of I-5 and down to Stafford Road interchange
Lower Boones Ferry Road/I-5 interchange (#290)	to be determined based on Quarry Area Refinement Plan	reconstruct with loop ramps, quarry development contribution?
LID		
93rd Street	$150,000	duplicated by Sagert & 95th extensions
Unfunded, Priority		
Boones Ferry Road/Blake Street *turn lanes, signalize*	$1,200,000	ped crossing safety, would likely meet MUTCD warrants following signalization
Teton Avenue *bike lanes, Herman to T-S*	$750,000	RTP project, complete link into industrial area
McEwan Road *reconstruct, LBF to city limits*	$1,800,000	high traffic volume, mostly serves non-Tualatin traffic
Avery Street/105th Avenue *signalize*	$150,000	may be needed in long term, particularly if I-5/99W connector not built
Subtotal	**$3,900,000**	
Unfunded, Desirable		
Lower Boones Ferry Road *extend across Tualatin River*	$14,000,000	cost doesn't include right-of-way
Boones Ferry Road *widen, T-S to Sagert*	$3,000,000	only after alternatives to T-S become available; otherwise T-S will meter traffic

Project Description	Cost*	Comments
Nyberg Street *bike lanes, T-S to 65th*	$850,000	
Borland Road *bike lanes*	$1,500,000	segment east of Wilke more important
SW 65th Avenue *extend across Tualatin River*	$2,800,000	better hospital access, mostly serves non-Tualatin traffic
SW 65th Avenue *bike lanes*	$700,000	Nyberg & Wilke provide alternate route
SW 95th Avenue *extend to SW 90th*	$500,000	low volume
Subtotal	**$23,350,000**	
Unfunded, Non-Priority		
Highway 99Wsidewalks	$1,100,000	RTP project, high-speed road, doesn't connect to pedestrian destinations
SW 105th Avenue *sidewalk*	$84,000	Sidewalk already exists on residential side of street
Deleted		
I-5 pathway	$1,400,000	Parallel routes available
I-205 pathway	$875,000	Parallel routes available
Hall Blvd. ped/bike bridge	$1,000,000	Auto bridge with bike/ped facilities preferred

*2001 dollars; costs are not adjusted for inflation

SDC: Systems Development Charge, RTP: Regional Transportation Plan, TDC: Tualatin Development Code, MUTCD: Manual on Uniform Traffic Control Devices, T-S: Tualatin-Sherwood Road, LID: Local Improvement District, STIP: Oregon Statewide Transportation Improvement Program

5.8 EVALUATION OF SUPPLEMENTAL ALTERNATIVE #4

5.8.1 Alternative #4 Description

Alternative #4 implements the following:

- I-5/Highway 99W connector (north alignment) – this project is modeled as four-lane expressway facility with its western end at the future SW 124th Avenue/Tualatin Sherwood Road intersection and its eastern end at I-5 just south of Norwood Road (similar to the alignment presented under the Alternative #3 scenario in the TSP Alternatives Analysis section). Two mid-facility intersections are included at Boones Ferry Road and Grahams Ferry Road.
- An extension of Hall Boulevard over the Tualatin River.
- All other projects listed in the project team recommended alternative.

5.8.2 Alternative #4 Modeling Results

- In general, Alternative #4's results are similar to Alternative #3's. The main differences between the scenarios are a result of Alternative #4 not including a Lower Boones Ferry Road extension across the Tualatin River to Tualatin Road.
- Without the Lower Boones Ferry Road extension across the Tualatin River, both Bridgeport Road and the existing portion of Lower Boones Ferry Road will operate at below capacity conditions. (Both of these facilities were projected to operate at above capacity conditions in the Alternative #3 scenario.) Traffic that used the Lower Boones Ferry Road bridge under Alternative #3 appears to use the I-5 corridor under Alternative #4. Consequently, Alternative #4 volumes on Tualatin-Sherwood Road are slightly higher, but not enough to alter the overall operation of the facility.
- With the Lower Boones Ferry Road extension under Alternative #3, Tualatin Road between SW 90th Avenue and SW 124th Avenue experienced significantly higher traffic demand, causing it to operate over capacity. The Alternative #4 results indicate that this section of Tualatin Road will operate below capacity.
- Traffic demands on the I-5/Highway 99W Connector under Alternative #4 do not differ much from Alternative #3. The only real difference is on Grahams Ferry Road, where the traffic demands are reduced slightly due to the connection at Boones Ferry Road. This connection helps to distribute access to and from the I-5/Highway 99W Connector more evenly.

5.9 EVALUATION OF SUPPLEMENTAL ALTERNATIVE #5

5.9.1 Alternative #5 Description

Alternative #5 implements the following:

- I-5/Highway 99W connector (south alignment) – this project was modeled as a four-lane freeway running from I-5 just south of Norwood Road to Highway 99W south of the City of Sherwood (similar to the TSP's Alternative #1B alignment). Two connections are provided along this facility: one at Grahams Ferry Road and the other at a future southern extension of SW 124th Avenue.
- An extension of SW 124th Avenue from Tualatin-Sherwood Road to an interchange with the I-5/Highway 99W connector.
- An extension of Hall Boulevard over the Tualatin River.
- All other remaining projects listed in the project team recommended alternative.

5.9.2 Alternative #5 Modeling Results

- The combination of the I-5/Highway 99W connector (southern alignment) and the SW 124th Avenue extension produces several beneficial shifts in traffic. In particular, Tualatin-Sherwood Road experiences a significant reduction from the volumes forecast for any of the alternatives that used the I-5/Highway 99W connector (northern alignment). Part of this reduction can be attributed to industrial trips which now have an opportunity to bypass Tualatin-Sherwood Road by using SW 124th Avenue and the I-

5/Highway 99W Connector (southern alignment) to get to destinations both east and west of Tualatin.

- Forecast demands on the SW 124th Avenue between Tualatin-Sherwood Road and the I-5/Highway 99W Connector will cause it to operate over capacity. A five-lane roadway, as opposed to the modeled three-lane roadway, would be more appropriate.
- As a result of the I-5/Highway 99W Connector (southern alignment), traffic volumes will increase slightly on I-5 and decrease slightly on Highway 99W. The decrease in volumes on Highway 99W is sufficient to allow this facility to operate below capacity within the City of Tualatin.

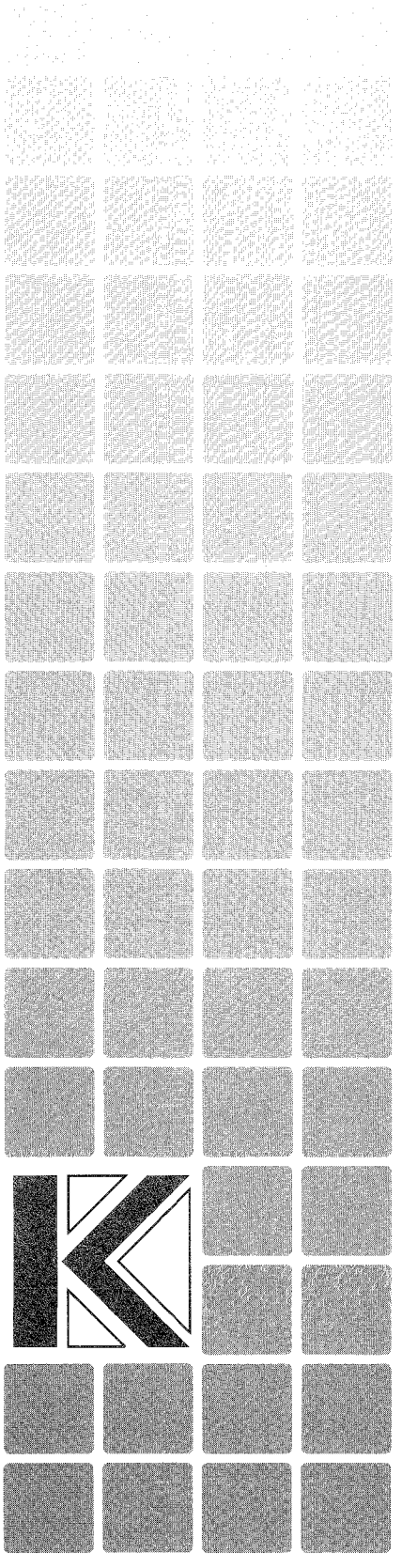
5.10 EVALUATION OF SUPPLEMENTAL ALTERNATIVE #6

5.10.1 Alternative #6 Description

- No I-5/Highway 99W connector.
- An extension of Hall Boulevard over the Tualatin River.
- All other projects listed in the Tualatin TSP preferred alternative.

5.10.2 Alternative #6 Modeling Results

- In general, without the alternative east-west connection provided by an I-5/Highway 99W Connector, traffic demands on Tualatin-Sherwood Road and the other east-west roadways will be similar to those shown for the No-Build scenario.
- Tualatin-Sherwood Road between Martinazzi Avenue and Teton Road is forecast to operate at or over capacity.
- Avery Street between Tualatin-Sherwood Road and SW 105th Avenue is forecast to operate over capacity.
- Boones Ferry Road is forecast to operate near or over capacity south of Teton Avenue.
- Northbound traffic demands on Hall Boulevard increase by about 150 peak hour vehicles; southbound traffic demands are similar to Scenarios #1 and #2.



Section 6

Transportation System Plan

Transportation System Plan

6.1 INTRODUCTION

This section presents the individual elements that comprise the City of Tualatin Transportation System Plan. The TSP addresses those components necessary for the development of the future transportation network including:

- Street Plan
- Local Street Plan
- Pedestrian System Plan
- Bicycle System Plan
- Transit Plan
- Air/Water/Pipeline System Plan
- Access Management Plan
- Implementation Plan

The transportation components presented in this section were developed to address the requirements of Oregon's Transportation Planning Rule (TPR) and Metro's Regional Transportation Plan (RTP). These recommendations have been developed in accordance with the findings presented in the existing and future forecast conditions analysis, the alternative analysis, and the interest of the citizens, business owners, and governmental agencies within the City of Tualatin, as expressed by TAC, TPAC, City staff, and citizen input provided during project meetings.

6.2 TRANSPORTATION GOALS AND OBJECTIVES

Established at the outset of the TSP planning process, the transportation goals and objectives provide guidance and direction for the development of the City of Tualatin's transportation system over the next twenty years. A total of eleven goals have been developed in the categories of mobility, livability, coordination, public transportation, pedestrian and bicycle facilities, accessibility, environment, system preservation, capacity, transportation funding, and safety. Under each of these goals are a set of objectives that help define how each specific goal will be accomplished.

Goal 1: Mobility

Provide a transportation system that serves the travel needs of Tualatin residents, businesses, and visitors.

Objectives

1. Provide an interconnected system of streets, pedestrian and bicycle facilities, and other forms of transportation which will link the community; minimize travel distances and vehicle-miles traveled; and safely, efficiently, and economically move motor vehicles, pedestrians, bicyclists, transit, trucks, and trains to and through the area when it is fully urbanized.
2. Act within the police power of the City as the City Road Authority and in conjunction with the State and Washington and Clackamas County road authorities to protect the safety of the general public by regulating the flow, access and movement of traffic within the City.
3. Encourage and support programs that help the City meet Metro's 2040 mode share targets, including, but not limited to, ridesharing and flexible work hours.

4. Discourage residential development patterns, such as single-entrance subdivisions and gated communities, which reduce connectivity and mobility options for all members of the community.

Goal 2: Livability

Provide a transportation system that balances user needs with the community's desire to remain a pleasant, economically vital city.

Objectives

1. Provide a transportation system that is adequate to handle the truck, transit, and automobile traffic in such a way to encourage industrial development, the preservation of existing residential neighborhoods, the minimization of industrial traffic and congestion in the Town Center area, and the successful implementation of the City's economic development goals.
2. Minimize the adverse social, economic and environmental impacts created by the transportation system, including balancing the need for street connectivity with the need to minimize neighborhood cut-through traffic.
3. Work with surrounding local governments, Washington and Clackamas Counties, Metro, Oregon Department of Transportation, and Tri-Met to develop alternate transportation facilities that will allow development without major disruption of existing neighborhoods or downtown.
4. Incorporate a landscape element into the development plans of arterials, collectors and local streets.
5. Preserve and protect Tualatin's historic sites, where practicable, when developing new transportation facilities.
6. Ensure safe and efficient access to the Tualatin Town Center.

Goal 3: Coordination

Maintain a transportation system plan that is consistent with the goals and objectives of the community, the region, and the state.

Objectives

1. Provide a City transportation system that is consistent with other elements and objectives of the Tualatin Community Plan.
2. Coordinate planning of the City transportation system with the Regional Transportation Plan prepared by the Metro, working toward a plan that is consistent with the RTP.
3. Work with Metro, ODOT, Tri-Met, Washington County, Clackamas County, and other surrounding organizations/jurisdictions to resolve regional and statewide transportation issues that impact Tualatin, including developing one or more arterial routes connecting I-5 and Highway 99W south of Highway 217, ensuring adequate capacity on the freeway system, and improving access to and the capacity of I-5 interchanges between Highway 217 and the North Wilsonville Interchange.

Goal 4: Public Transportation

Improve public transportation service both within Tualatin and to the surrounding area, to reduce reliance on the private automobile.

Objectives

1. Support and assist whenever practicable, the development of the metropolitan public transportation system through cooperation with the Tri-County Metropolitan Transportation District (Tri-Met).
2. Working through Tri-Met, develop transit systems and stations, park and ride systems, and related facilities in convenient and appropriate locations that adequately and efficiently serve the residential and employment populations.
3. Work to create or improve local transit service within Tualatin either through Tri-Met or other local agencies; quick, direct transit service to adjacent communities; and high capacity intercity transit service, where appropriate.

Goal 5: Pedestrian and Bicycle Facilities

Provide for an interconnected system of pedestrian and bicycle facilities throughout Tualatin to serve short-distance and recreational trips.

Objectives

1. Provide sidewalks on both sides of all fully developed streets within the City, except where it would be unsafe to do so.
2. Develop safe and convenient pedestrian and bicycle systems that link all land uses, provide connections to transit facilities, and provide access to publicly-owned land intended for general public use.
3. Maintain and update official map showing existing and future street rights-of-way with bicycle lanes and bikeways.
4. Develop a continuous multi-use pathway along the Tualatin River, and provide opportunities for pedestrian and bicycle movement across the river.
5. Adopt development standards that support pedestrian and bicycle access to commercial, industrial, and institutional development. These include, but are not limited to direct pathway connections, bicycle racks and lockers, and shower facilities.

Goal 6: Accessibility

Provide a transportation system that serves the needs of all members of the community.

Objectives

1. Provide for the transportation disadvantaged by complying with state and federal regulations concerning this matter and cooperating with local, county and regional agencies providing transportation services for the disadvantaged.
2. Upgrade existing transportation facilities and work with public transportation providers to ensure services that improve access for all users.

Goal 7: Environment

Provide a transportation system that protects the environment of the community and region.

Objectives

1. Provide a transportation system which encourages energy conservation, in terms of efficiency of the road network and in the standards developed for street improvements.
2. Cooperate with the Department of Environmental Quality, Unified Sewage Agency, and Metro to meet applicable air and water quality and traffic noise standards.
3. Encourage use of the existing transportation facilities by increasing use of alternative modes of transportation and encourage development that decreases reliance on the automobile.
4. Balance transportation improvements with the need to protect natural resources.

Goal 8: System Preservation

Ensure that development does not preclude the construction of identified future transportation improvements, and ensure that development mitigates the transportation impacts it generates.

Objectives

1. Preserve adequate right-of-way for a new freeway interchange on Interstate 5 between Interstate 205 and north Wilsonville for an expressway connection between this interchange and Highway 99W.
2. Preserve adequate right-of-way for an arterial street connecting Tualatin-Sherwood Road and Highway 99W in the western portion of the industrial area at the general 124th Avenue alignment.
3. Require developers to aid in the development of the transportation system by dedicating or reserving needed rights-of-way, and by constructing half or full street improvements needed to serve new development.
4. Require developers to mitigate the impacts of development on the transportation system by constructing off-street pedestrian, bicycle and transit facilities.
5. Establish local street plans for contiguous vacant and redevelopable areas of five acres or more planned or zoned for development that identify local street access points to the collector and arterial street system, and local street connections to adjacent development.

Goal 9: Capacity

Provide a transportation system that has sufficient capacity to serve user needs.

Objectives

1. Establish an arterial street system which will attract and effectively accommodate all "through" trips to relieve residential collectors and local streets from heavy and hazardous traffic burdens.
2. Locate proposed rail spur lines to minimize conflicts with adjoining land uses and streets.

3. Minimize new railroad grade crossings to reduce time losses due to traffic delays and accidents, and to produce increased efficiency of railroad operation and increased public convenience.
4. Maintain and update the City's access management standards in the Tualatin Development Code Chapter 75 to preserve the safe and efficient operation of the City's roadways, consistent with their functional classification.

Goal 10: Transportation Funding

Provide reasonable and effective funding mechanisms for citywide transportation improvements identified in the transportation system plan.

Objectives

1. Develop a Capital Improvements Program and funding mechanisms for all transportation facilities that complies with the requirements of Statewide Planning Goal 12, Transportation, and the Transportation Planning Rule, including making provisions for alternative modes of transportation that will reduce reliance on the automobile, and reduce air pollution and traffic congestion.

Goal 11: Safety

Provide a transportation system that maintains adequate levels of safety for all users.

Objectives

1. Undertake, as needed, special traffic studies in problem areas, especially around schools, to determine appropriate traffic controls to effectively and safely manage automobile and pedestrian traffic.
2. Work to improve the safety of rail, bicycle, and pedestrian routes and crossings.

6.3 STREET SYSTEM PLAN

The Tualatin street plan reflects the anticipated operational and circulation needs through the year 2020 and provides guidance on how to best facilitate that travel over the next 20 years. The plan was completed in two steps. First, the current functional classification system was reviewed and, where appropriate, recommendations were made for changing classifications and design standards associated with each facility type. Based on this initial step, roadway cross-sections and design standards were developed for the future modernization of existing roadways, and the future construction of new roadways. Second, the key issue of roadway connectivity was addressed, to provide for adequate circulation for both auto and other modes.

6.3.1 Tualatin Functional Classification Plan

The purpose of classifying roadways is to create a mechanism through which a balanced transportation system can be developed that facilitates mobility for all modes of transportation. A roadway's functional classification determines its intended purpose, the amount and character of traffic it is expected to carry, the degree to which non-auto travel is emphasized, and the roadway's design standards. It is imperative that a roadway's classification consider the adjacent land uses and

the transportation modes that should be accommodated. The public right-of-way must also provide sufficient space for utilities to serve adjacent land uses.

The functional classification system for the City of Tualatin establishes fourteen functional categories to address the City's needs for mobility and accessibility. These categories include: freeways, expressways, major arterials, minor arterials, major collectors, minor collectors, residential collectors, local commercial industrial streets, and local streets. Table 6-1 provides a detailed description of each category.

Figure 6-1 presents the functional classifications for all existing and future roadways within the Tualatin planning area. The alignment for future streets should be considered conceptual: the end points of the streets are fixed, but the alignments between intersections may vary depending on design requirements at the time the street is constructed. Table 6-2 presents a summary of the streets assigned to each functional classification (except local).

6.3.2 Street Design Standards

Street design standards are based on the functional and operational characteristics of streets such as travel volume, capacity, operating speed, and safety. They are necessary to ensure that the system of streets, as it develops, will be capable of safely and efficiently serving the traveling public while also accommodating the orderly development of adjacent lands.

The proposed street design standards are shown in Figures 6-2A through 6-2G. The typical roadway cross sections comprise the following elements: right-of-way, number of travel lanes, bicycle and pedestrian facilities, and other amenities such as landscape strips. These figures are intended for planning purposes for new road construction, as well as for those locations where it is physically and economically feasible to improve existing streets. Table 6-3 presents the standards in tabular form. As more than one standard may exist for a given functional class, Figure 6-1 indicates the standard assigned to each roadway segment.

Where a variable sidewalk width is shown for a particular facility, the greater width is used for sidewalks within the pedestrian district shown on the Tualatin Pedestrian Plan (Figure 6-5), and for sidewalks along streets with potential transit service shown on the Tualatin Transit Plan (Figure 6-7). The greater width may also be appropriate for sidewalks adjacent to significant pedestrian generators such as schools.

TABLE 6-1
TUALATIN FUNCTIONAL CLASSIFICATION DESCRIPTIONS

Functional Classification	Description
Freeway	Primary function is to carry high levels of regional vehicular traffic and public transit at high speeds; full access control with access limited to interchanges and street crossings with grade separations; widely spaced access points; serves motorized vehicle traffic only; contains a median.
Expressway - (F)	Primary function is to carry high levels of regional vehicular traffic and public transit at high speeds, but to a lesser extent than freeways; provides a limited number of grade-separated interchanges (preferred) and at-grade intersections; high access control; serves motorized vehicle traffic only; contains a median.
Major Arterial - (Ei) - (Eb&t)	Primary function is to serve both local and through traffic as it enters and leaves the urban area; connects the minor arterial and collector street system to freeways and expressways; provides access to other cities and communities; serves major traffic movements; access control through medians and/or channelization; restricted on-street parking; sidewalks and bicycle facilities required; may allow a right-turn pocket if warranted; will be used by public transit.
Minor Arterial - (Db&t) - (Db&t – Downtown)	Primary function is to serve local and through traffic between neighborhoods and to community and regional facilities; distributes traffic from major arterials to collectors and local streets, higher degree of access than major arterials; trip lengths, traffic volumes, and speeds are lower than on major arterials; sidewalks and bicycle lanes required; likely to be used by public transit.
Major Collector - (Cb&t)	Primary function is to serve local traffic between neighborhoods and community facilities, principal carrier between arterials and local streets; provides some degree of access to adjacent properties, while maintaining circulation and mobility for all users; carries lower traffic volumes at slower speeds than arterials; typically has two to three lanes; may contain some on-street parking; pedestrian and bicycle facilities are required; may be used by public transit.
Minor Collector - (Cb&p) - (Cs&2p) - (Cs&p) - (Cb)	Primary function is to connect neighborhoods with major collector streets to facilitate movement of local traffic; has slower speeds to ensure community livability and safety for pedestrians and bicyclists; on-street parking is prevalent; pedestrian and bicycle facilities are required; bicycle facilities may be exclusive or shared roadways depending on traffic volumes, speeds, and extent of bicycle travel; may be used by public transit.
Residential Collector - (Cr)	Provides primary routes into residential neighborhoods; carries higher volumes than local streets, but is not intended to serve through traffic; provides direct access to adjacent land uses; characterized by moderate roadway distances and slow speeds, serves passenger cars, public transit, pedestrians, and bicyclists, but not truck traffic; pedestrian facilities are required.
Local Commercial Industrial - (B-CI)	Primary function is to provide direct truck, public transit, and vehicular access to commercial and industrial land uses; characterized by short to moderate roadway distances and slow speeds; offers a high level of accessibility; pedestrian facilities are required.
Local Street - (B-D) - (B)	Primary function is to provide direct access to adjacent land uses; characterized by short roadway distances, slow speeds, and low volumes; offers a high level of accessibility; serves passenger cars, pedestrians, and bicycles, but not trucks; may be used by public transit, pedestrian facilities are required.

Note: (Xx&xx): Street design standard – See Figures 6-2A through 6-2G

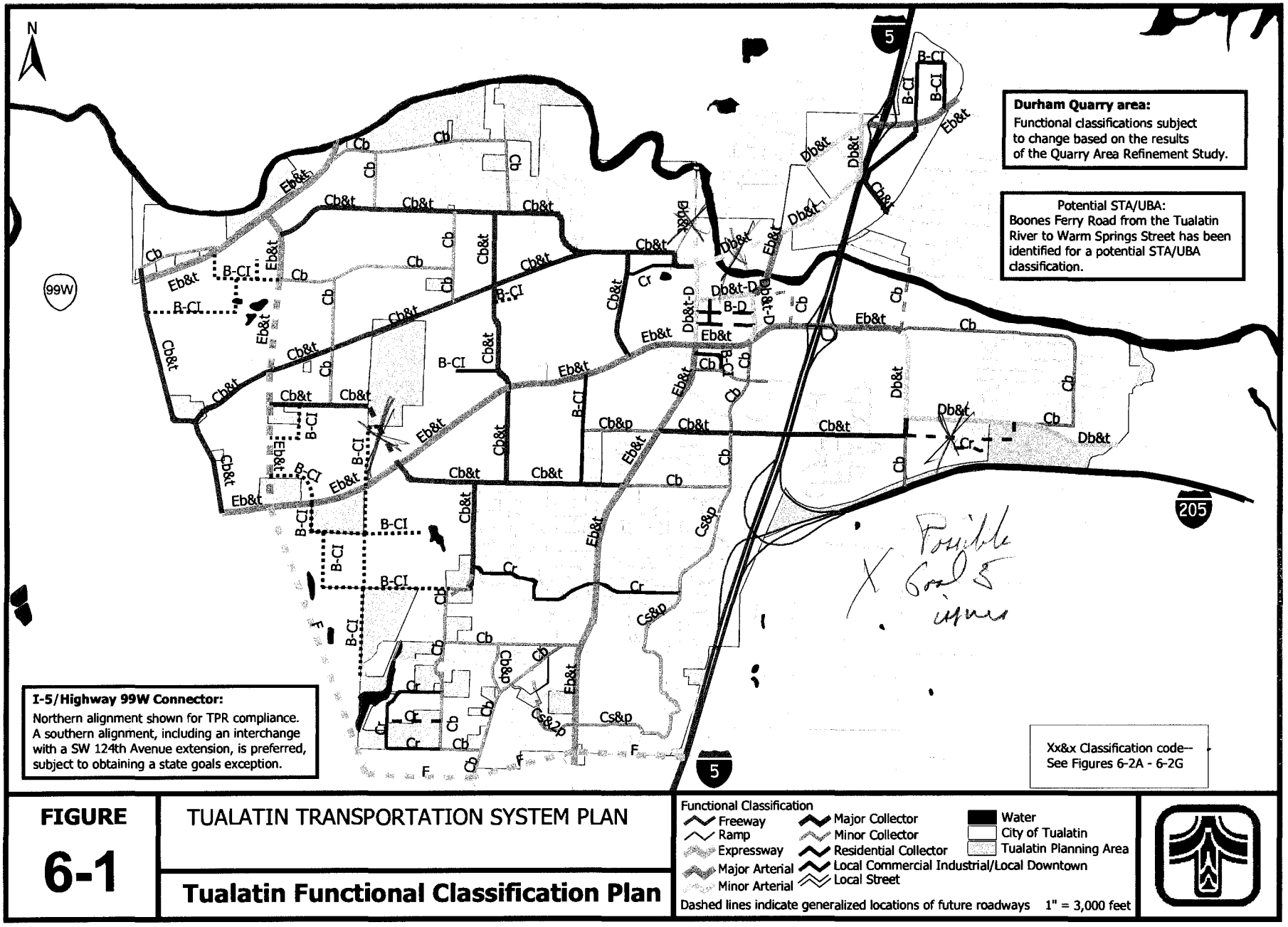


FIGURE 6-1

TUALATIN TRANSPORTATION SYSTEM PLAN

Tualatin Functional Classification Plan

TABLE 6-2
STREET FUNCTIONAL CLASSIFICATION SUMMARY

Freeways	Expressway (F)
I-5 – *north city limits to south city limits* I-205 – *from I-5 to east city limits*	I-5/Highway 99W connector
Major Arterials (Ei) - applies to the following intersections	
Lower Boones Ferry Road/SW 65th Avenue/McEwan Road Lower Boones Ferry Road/Bridgeport Road Tualatin-Sherwood Road/Martinazzi Avenue/Nyberg Street	Highway 99W/SW 124th Avenue Highway 99W/Cipole Road
Major Arterials (Eb&t)	
Highway 99W – *north city limits to south city limits* Tualatin-Sherwood Road – *west city limits to Nyberg Street* Nyberg Street – *Tualatin-Sherwood Road to SW 65th Avenue* SW 124th Avenue – *Highway 99W to Leveton Drive*	SW 124th Avenue – *Leveton Drive to T-S Road* Boones Ferry Road – *T-S Road to south city limits* Boones Ferry Road - *Martinazzi Avenue to Lower Boones Ferry Rd.* Lower Boones Ferry Road – *Bridgeport Road to east city limits*
Minor Arterials (Db&t, Db&t – Downtown)	
Boones Ferry Road – *Tualatin-Sherwood Road to Martinazzi Avenue* Martinazzi Avenue – *Tualatin-Sherwood Road to Boones Ferry Road* SW 65th Avenue – *Nyberg Street to Borland Road* Tualatin Road – *Boones Ferry Road to Hall Boulevard extension* Lower Boones Ferry Road – *Boones Ferry Road to Bridgeport Road*	Bridgeport Road – *west city limits to Lower Boones Ferry Road* Hall Boulevard – *Tualatin Road to north city limits* Borland Road – *SW 65th Avenue to east city limits* SW 72nd Avenue – *Bridgeport Road to north city limits*
Major Collectors (Cb&t)	
Tualatin Road – *SW 124th Avenue to Hall Boulevard extension* Cipole Road – *Pacific Drive to Tualatin-Sherwood Road* Herman Road – *Cipole Road to Tualatin Road* Teton Road – *Tualatin Road to Avery Street* Myslony Street – *SW 124th Avenue to SW 112th Avenue* SW 112th Avenue – *Myslony Street to Tualatin-Sherwood Road*	SW 90th Avenue – *Tualatin Road to Tualatin-Sherwood Road* McEwan Road – *East city limits to Lower Boones Ferry Road* Avery Street – *Tualatin-Sherwood Road to Boones Ferry Road* SW 105th Avenue – *Tualatin-Sherwood Road to Blake Street curves* Sagert Street – *Boones Ferry Road to SW 65th Avenue* SW 65th Avenue – *Borland Road to Sagert Street*
Minor Collectors (Cb&p, Cs&2p, Cs&p, Cb)	
Leveton Drive – *SW 124th Avenue to SW 108th Avenue* SW 108th Avenue – *Tualatin Road to Herman Road* SW 118th Avenue – *Leveton Drive to Myslony Street* Hazelbrook Road – *Highway 99W to Jurgens Avenue* SW 115th Avenue – *Hazelbrook Road to Tualatin Road* Jurgens Avenue – *Hazelbrook Road to Tualatin Road* SW 108th Avenue – *Blake Street curves to Helenius Road* Ibach Street – *SW 108th Avenue to Boones Ferry Road* Grahams Ferry Road – *Ibach Street to south city limits* Pacific Drive – *Cipole Road to Highway 99W* Helenius Road – *SW 108th Avenue to Grahams Ferry Road* SW 103rd Avenue – *Ibach Street to Grahams Ferry Road*	Iowa Drive – *Grahams Ferry Road to Stono Drive* Martinazzi Avenue – *Maricopa Drive to Tualatin-Sherwood Road* Avery Street – *Boones Ferry Road to Martinazzi Avenue* Warm Springs Street – *Boones Ferry Road to Martinazzi Avenue* SW 65th Avenue – *Sagert Street to south city limits* Nyberg Lane – *SW 65th Avenue to SW 50th Avenue* SW 50th Avenue – *Nyberg Lane to Wilke Road* Wilke Road – *Borland Road to SW 50th Avenue* Sagert Street – *Boones Ferry Road to SW 95th Avenue* Stono Drive – *Iowa Drive to Vermillion Drive* Vermillion Drive – *Stono Drive to Maricopa Drive* Maricopa Drive – *Vermillion Drive to Martinazzi Avenue*

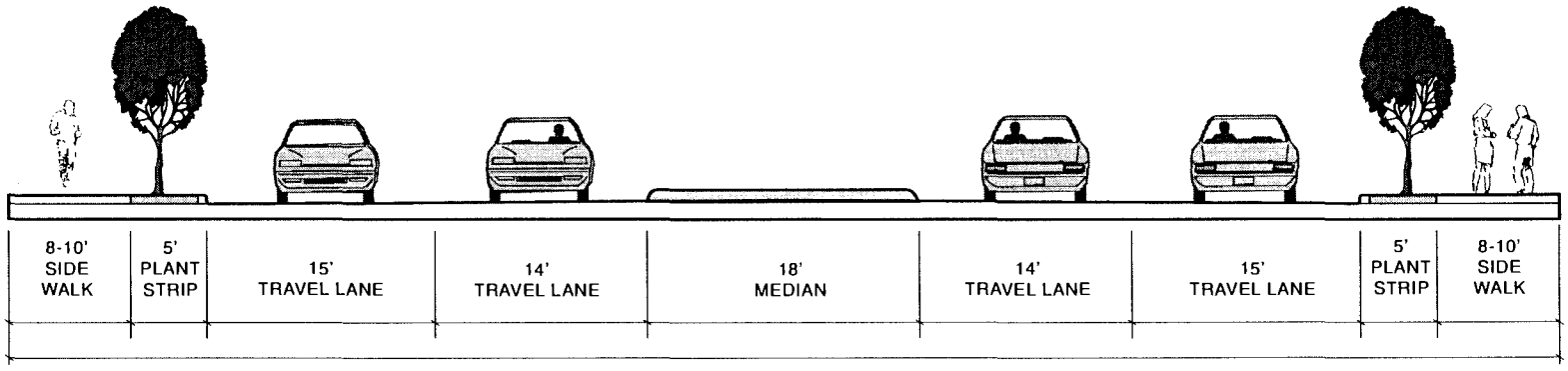
TABLE 6-2 (Cont'd.)
STREET SYSTEM PLAN SUMMARY

Residential Collector (Cr)	
Blake Street – *Martinazzi Avenue to Boones Ferry Road*	Sagert Street – *east of SW 65th Avenue*
Marilyn Road – *SW 112th Avenue to SW 108th Avenue*	Sweek Drive – *Tualatin Road to SW 90th Avenue*
unnamed east/west roadway – *SW 108th Avenue to SW 112th Avenue*	Helenius Road – *SW 108th Avenue to SW 112th Avenue*
Alsea Drive – *SW 99th Avenue to Boones Ferry Road*	Paulina Drive – *SW 105th Avenue to Coquille Drive (west)*
SW 99th Avenue – *Paulina Drive to Alsea Drive*	Paulina Drive – *Coquille Drive (east) to SW 99th Avenue*
SW 112th Avenue – *Marilyn Road to Helenius Road*	Coquille Drive – *Paulina Drive (west) to Paulina Drive (east)*
Local Commercial Industrial (B-CI)	
SW 95th Avenue – *Tualatin-Sherwood Road to Avery Street*	Manhasset Drive – *west of Teton Avenue*
Tonka Road – *Boones Ferry Road to Warm Springs Street*	unnamed roadway – *SW 124th Avenue to Myslony Street (could potentially become a private roadway)*
SW 65th Avenue – *Lower Boones Ferry Road to Rosewood Street*	unnamed roadway – *SW 124th Avenue to Tualatin-Sherwood Road (could potentially become a private roadway)*
Rosewood Street – *SW 65th Avenue to SW 63rd Avenue*	Avery Street extension – *Myslony Street to Tualatin-Sherwood Rd*
SW 63rd Avenue – *Rosewood Street to Lower Boones Ferry Road*	SW 120th Avenue – *south of Tualatin-Sherwood Road to Blake Street ext.*
Leveton Drive – *SW 124th Avenue to SW 130th Avenue*	SW 115th Avenue – *Tualatin-Sherwood Road to McCamant Road*
SW 130th Avenue – *Leveton Drive to Highway 99W*	Blake Street – *west of SW 105th Avenue to SW 120th Avenue extension*
SW 125th Place – *north of Leveton Drive*	unnamed east/west roadway – *east of SW 120th Avenue past SW 115th Ave*
SW 128th Avenue – *Leveton Drive to Cummins Street*	
Cummins Street – *SW 128th Avenue to Cipole Road*	
Spokane Court – *east of Teton Avenue*	
Local Street Downtown (B-D)	
Seneca Street – *west of Martinazzi Avenue*	
Seneca Street – *east of Boones Ferry Road*	
Nyberg Street – *west of Martinazzi Avenue*	
Nyberg Street – *east of Boones Ferry Road*	
SW 84th Avenue – *Boones Ferry Road to Nyberg Street*	

TABLE 6-3
FUNCTIONAL CLASSIFICATION DESIGN STANDARDS SUMMARY

Classification	Right-of-way (ft)*	Median Type	Travel Lanes	Bike Lanes?	Side-walks?	On-Street Parking?	Plant Strip?	Could Include a Bus Pullout?**
Expressway (F)	102 - 106	Median	4	No	Yes	No	Yes	Yes
Major Arterial (Ei)	110 - 114	CTL or Median	4 +right-turn lane	Yes	Yes	No	Yes	Yes
Major Arterial (Eb&t)	98 - 102	CTL or Median	4	Yes	Yes	No	Yes	Yes
Minor Arterial (Db&t)	78 - 82	CTL or Median	2	Yes	Yes	No	Yes	Yes
Minor Arterial (Db&t - Downtown)	72	CTL or Median	2	Yes	Yes	No	No, 6'x6' tree well	Yes
Major Collector (Cb&t)	72 - 76	CTL	2	Yes	Yes	No	Yes	Yes
Minor Collector (Cb&p)	68 - 72	No median	2	Usually	Yes	Yes, one side	Yes	Yes
Minor Collector (Cs&2p)	68 - 72	No median	2	No	Yes	Yes, both sides	Yes	Yes
Minor Collector (Cs&p)	60 - 64	No median	2	No	Yes	Yes, one side	Yes	Yes
Minor Collector (Cb)	62 - 66	No median	2	Yes, one side	Yes	Yes, one side	Yes	Yes
Residential Collector (Cr)	60	No median	2	No	Yes	Yes, both sides	Yes	Yes
Local Commercial Industrial (B-CI)	60	CTL	2	No	Yes	No	Yes	Yes
Local Street (Downtown) (B-D)	60	No median	2	No	Yes	Yes, both sides	No, 4'x4' tree well	Yes
Local Street (B)	50	No median	2	No	Yes	No	Yes	Yes
Local Street (B - Skinny Option)	46	No median	2	No	Yes	No	Yes	Yes

* Additional right-of-way may be required due to topographical constraints or to accommodate additional left- or right-turn lanes at intersections.
** Depending on approval from Tri-Met. Tri-Met currently discourages the use of pullouts.
CTL = center turn lane, Xx&x = street design standard—see Figures 6-2A through 6-2G



EXPRESSWAY (F)

NOTE: TYPICAL RIGHTS-OF WAY AND ULTIMATE CROSS-SECTIONS SHOWN. ADDITIONAL WIDTH MAY BE NEEDED DUE TO TOPOGRAPHICAL CONSTRAINTS OR ADDITIONAL TURN LANES AT INTERSECTIONS. THE PLANTING STRIP DIMENSION INCLUDES A 6' CURB AND GUTTER. INTERIM REDUCED SECTIONS MAY BE CONSTRUCTED WHEN APPROVED BY THE CITY ENGINEER.

RECOMMENDED EXPRESSWAY STREET DESIGN STANDARDS

TRANSPORTATION SYSTEM PLAN
CITY OF TUALATIN, OREGON
JUNE 2001

FIGURE *6-2A*

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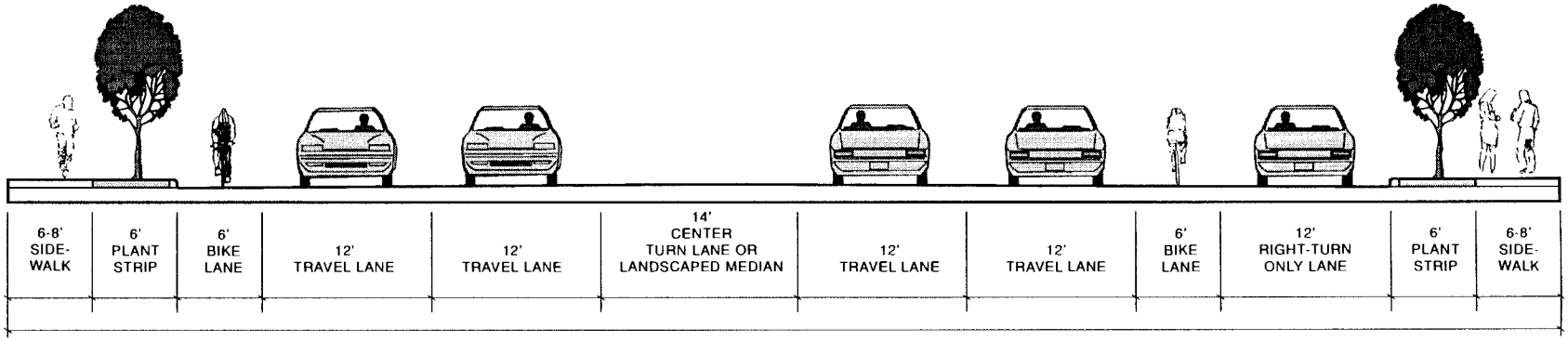
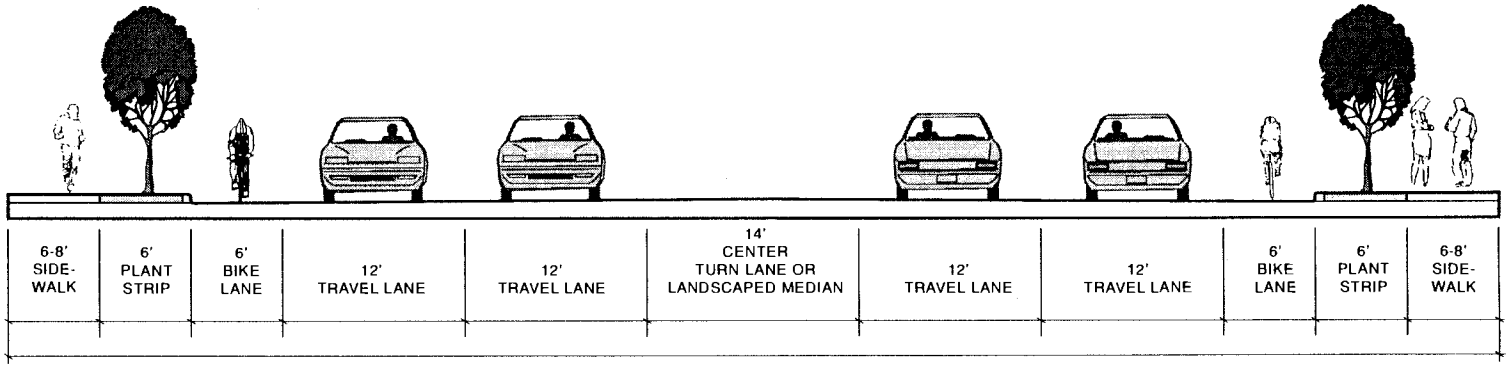


MAJOR ARTERIAL (Ei)



MAJOR ARTERIAL (Eb&t)

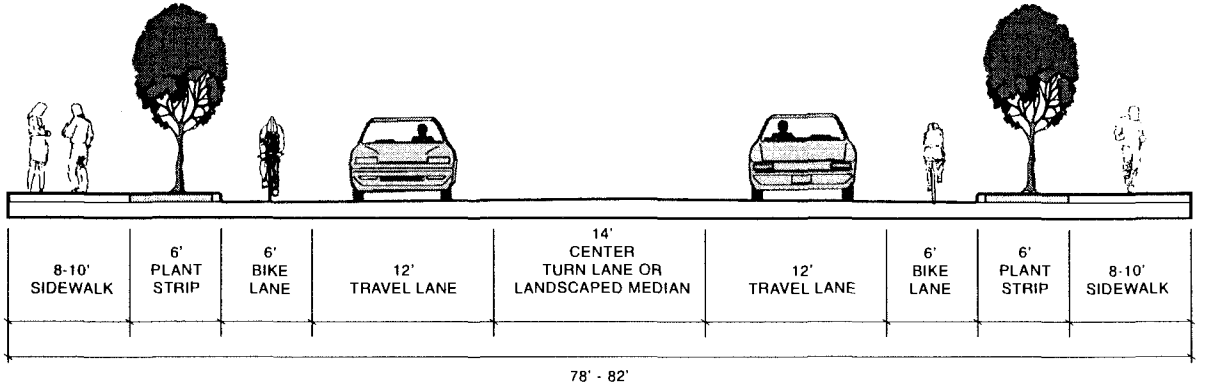
NOTE: TYPICAL RIGHTS-OF WAY AND ULTIMATE CROSS-SECTIONS SHOWN. ADDITIONAL WIDTH MAY BE NEEDED DUE TO TOPOGRAPHICAL CONSTRAINTS OR ADDITIONAL TURN LANES AT INTERSECTIONS. THE PLANTING STRIP DIMENSION INCLUDES A 6' CURB AND GUTTER. INTERIM REDUCED SECTIONS MAY BE CONSTRUCTED WHEN APPROVED BY THE CITY ENGINEER.

RECOMMENDED ARTERIAL STREET DESIGN STANDARDS (1)

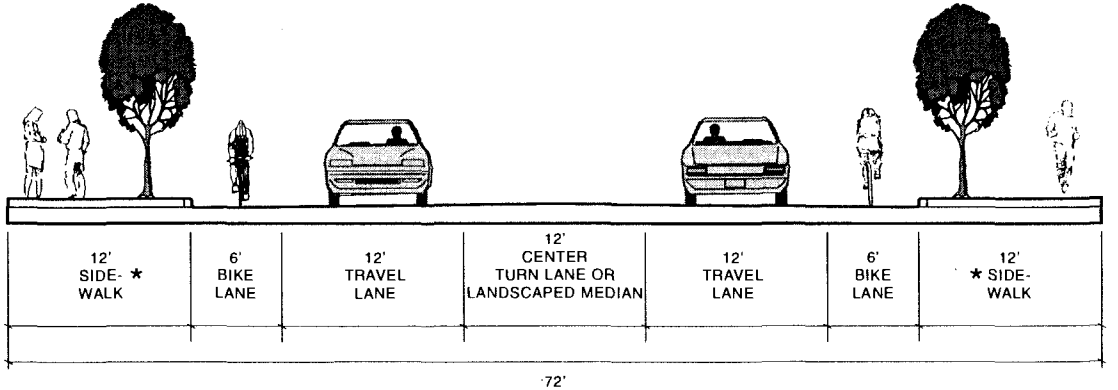
TRANSPORTATION SYSTEM PLAN
CITY OF TUALATIN, OREGON
JUNE 2001

FIGURE 6-2B

4157\DWGS\T812.CDR



MINOR ARTERIAL (Db&t)



MINOR ARTERIAL (Db&t - DOWNTOWN)

★ 12' SIDEWALK INCLUDES A 6'X6' TREE WELL

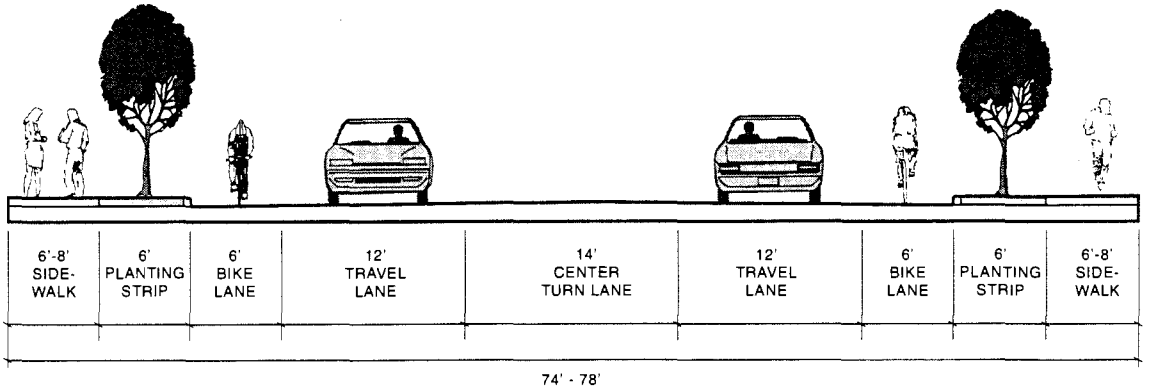
NOTE: TYPICAL RIGHTS-OF WAY AND ULTIMATE CROSS-SECTIONS SHOWN. ADDITIONAL WIDTH MAY BE NEEDED DUE TO TOPOGRAPHICAL CONSTRAINTS OR ADDITIONAL TURN LANES AT INTERSECTIONS. THE PLANTING STRIP DIMENSION INCLUDES A 6' CURB AND GUTTER. INTERIM REDUCED SECTIONS MAY BE CONSTRUCTED WHEN APPROVED BY THE CITY ENGINEER.

RECOMMENDED ARTERIAL STREET DESIGN STANDARDS (2)

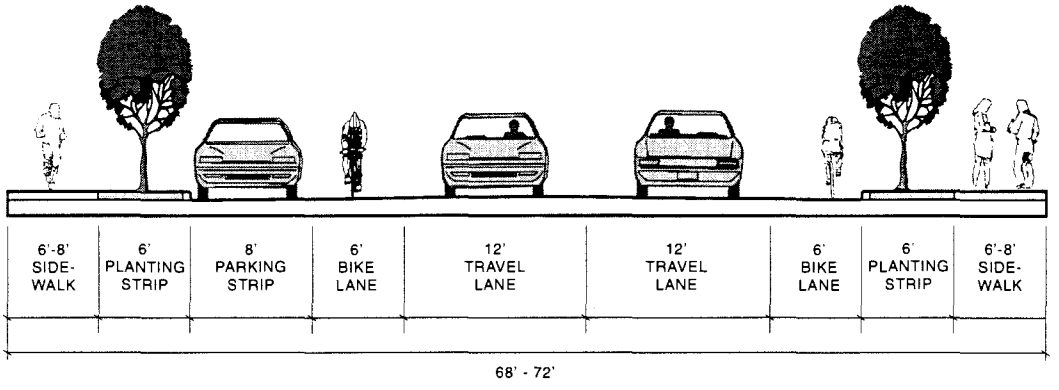
TRANSPORTATION SYSTEM PLAN
CITY OF TUALATIN, OREGON
JUNE 2001

FIGURE 6-2C

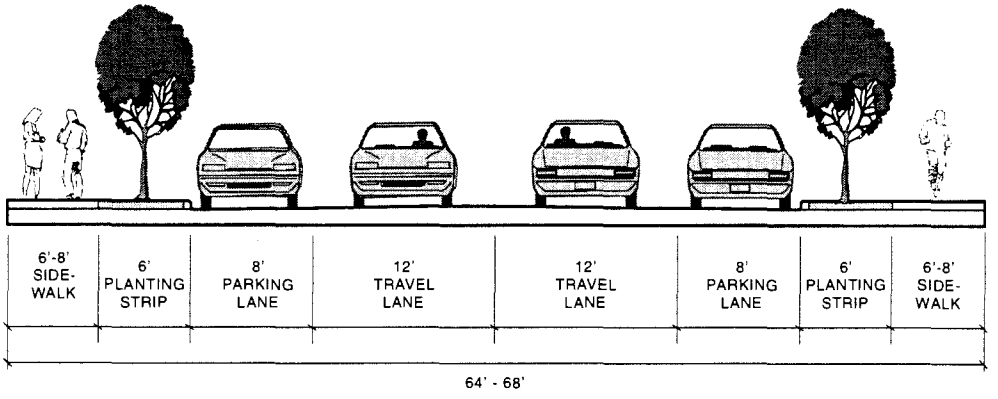
4157\DWGS\T812.CDR



MAJOR COLLECTOR (Cb&t)



MINOR COLLECTOR (Cb&p)



MINOR COLLECTOR (Cs&2p)

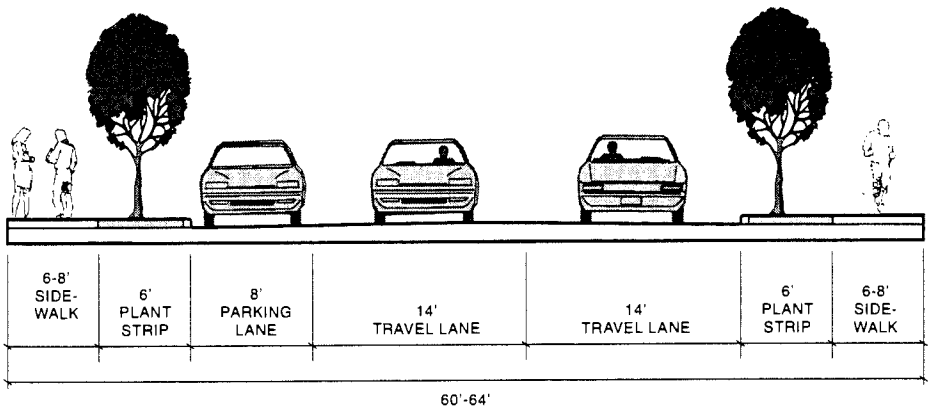
NOTE: TYPICAL RIGHTS-OF WAY AND ULTIMATE CROSS-SECTIONS SHOWN. ADDITIONAL WIDTH MAY BE NEEDED DUE TO TOPOGRAPHICAL CONSTRAINTS OR ADDITIONAL TURN LANES AT INTERSECTIONS. THE PLANTING STRIP DIMENSION INCLUDES A 6' CURB AND GUTTER. INTERIM REDUCED SECTIONS MAY BE CONSTRUCTED WHEN APPROVED BY THE CITY ENGINEER.

RECOMMENDED COLLECTOR STREET DESIGN STANDARDS (1)

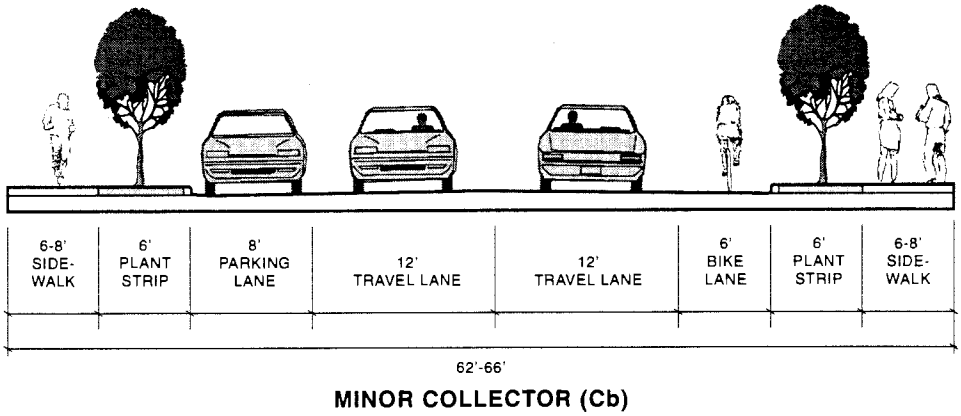
TRANSPORTATION SYSTEM PLAN
CITY OF TUALATIN, OREGON
JUNE 2001

FIGURE 6-2D

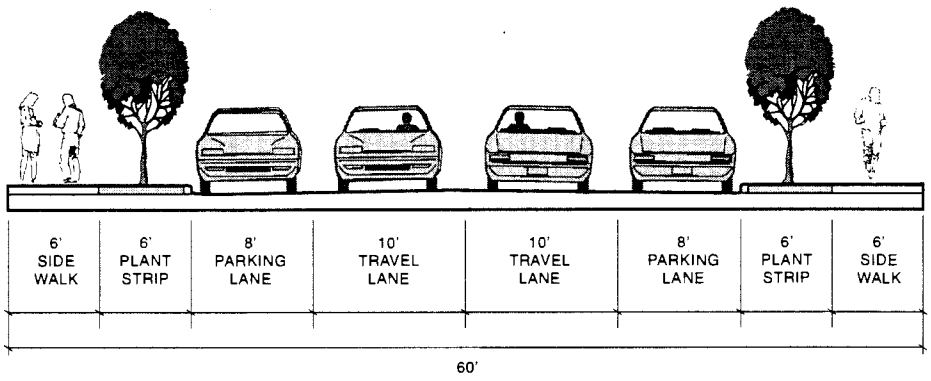
4157\DWGS\T811.CDR



MINOR COLLECTOR (Cs&p)



MINOR COLLECTOR (Cb)



RESIDENTIAL COLLECTOR (Cr)

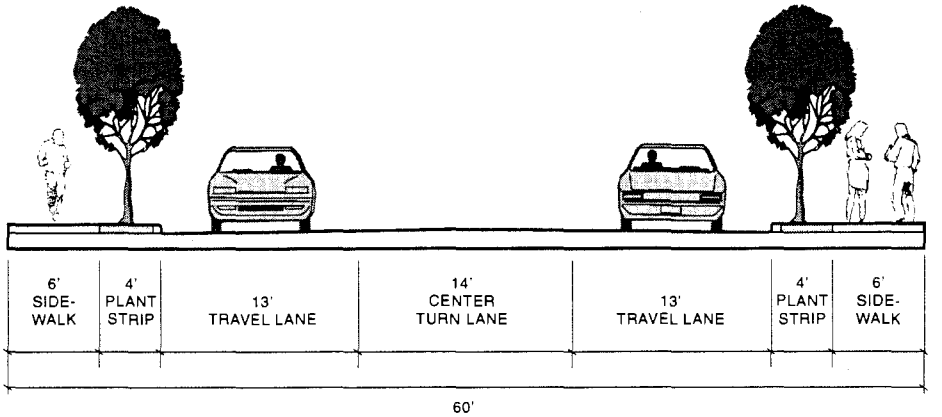
NOTE: TYPICAL RIGHTS-OF WAY AND ULTIMATE CROSS-SECTIONS SHOWN. ADDITIONAL WIDTH MAY BE NEEDED DUE TO TOPOGRAPHICAL CONSTRAINTS OR ADDITIONAL TURN LANES AT INTERSECTIONS. THE PLANTING STRIP DIMENSION INCLUDES A 6' CURB AND GUTTER. INTERIM REDUCED SECTIONS MAY BE CONSTRUCTED WHEN APPROVED BY THE CITY ENGINEER.

RECOMMENDED COLLECTOR STREET DESIGN STANDARDS (2)

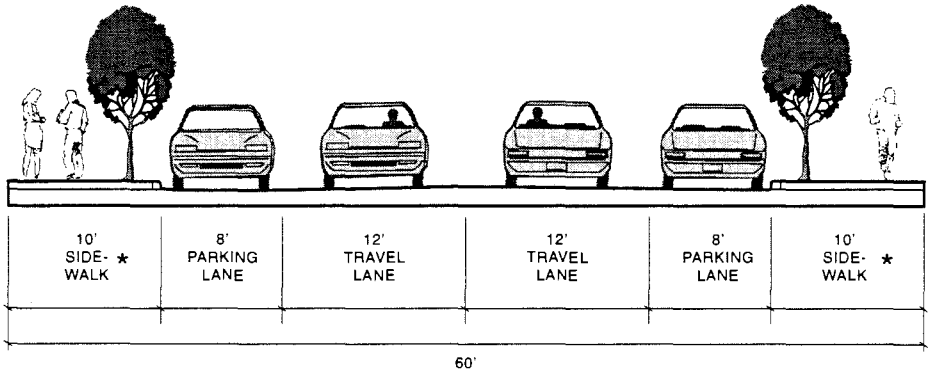
TRANSPORTATION SYSTEM PLAN
CITY OF TUALATIN, OREGON
JUNE 2001

FIGURE 6-2E

4157\DWGS\T811.CDR



LOCAL COMMERCIAL INDUSTRIAL (B-CI)



LOCAL STREET (DOWNTOWN) (B-D)

★ 10' SIDEWALK INCLUDES A 4'X4' TREE WELL

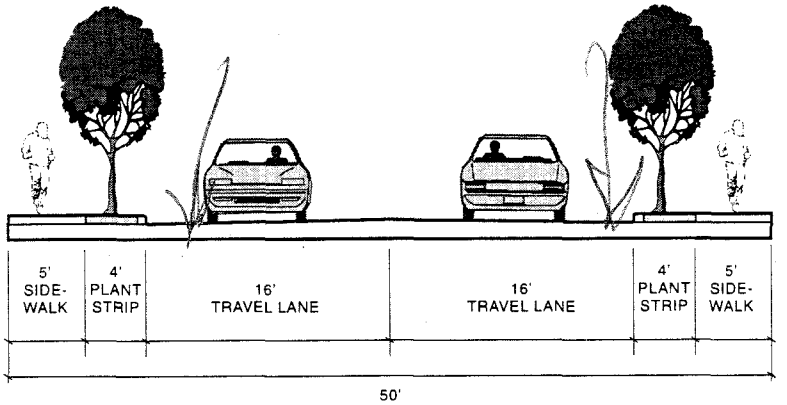
NOTE: TYPICAL RIGHTS-OF WAY AND ULTIMATE CROSS-SECTIONS SHOWN. ADDITIONAL WIDTH MAY BE NEEDED DUE TO TOPOGRAPHICAL CONSTRAINTS OR ADDITIONAL TURN LANES AT INTERSECTIONS. THE PLANTING STRIP DIMENSION INCLUDES A 6' CURB AND GUTTER. INTERIM REDUCED SECTIONS MAY BE CONSTRUCTED WHEN APPROVED BY THE CITY ENGINEER.

RECOMMENDED LOCAL STREET DESIGN STANDARDS (1)

TRANSPORTATION SYSTEM PLAN
CITY OF TUALATIN, OREGON
JUNE 2001

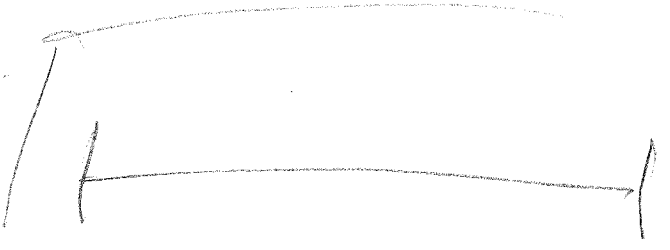
FIGURE 6-2F

4157\DWGS\T811.CDR



LOCAL STREET (B) *

* THE CITY OF TUALATIN MAY CONSIDER AS LOW AS 28-FOOT CURB-TO-CURB PAVEMENT WIDTHS AND AS LOW AS 46-FOOT RIGHTS-OF-WAY WHEN NEEDED TO ADDRESS TOPOGRAPHIC OR OTHER CONSTRAINTS



NOTE: TYPICAL RIGHTS-OF WAY AND ULTIMATE CROSS-SECTIONS SHOWN. ADDITIONAL WIDTH MAY BE NEEDED DUE TO TOPOGRAPHICAL CONSTRAINTS OR ADDITIONAL TURN LANES AT INTERSECTIONS. THE PLANTING STRIP DIMENSION INCLUDES A 6' CURB AND GUTTER. INTERIM REDUCED SECTIONS MAY BE CONSTRUCTED WHEN APPROVED BY THE CITY ENGINEER.

RECOMMENDED LOCAL STREET DESIGN STANDARDS (2)

TRANSPORTATION SYSTEM PLAN
CITY OF TUALATIN, OREGON
JUNE 2001

FIGURE 6-2G

4157\DWGS\T811.CDR

RTP Consistency

The RTP's Regional Street Design System describes typical features of its street design designations. For comparison purposes, Metro's Regional Street Design System map has been recreated in Figure 6-3. The Tualatin TSP's street design standards for roadways shown on the RTP Regional Street Design System map are generally in conformance with the RTP's concepts, particularly in the areas of pedestrian and bicycle lanes, landscape strips, and medians or center turn lanes. The following streets are consistent with the RTP concepts, but do not have a "usual" cross-section:

- Lower Boones Ferry Road and Bridgeport Road — Both of these roads are classified as an Urban Road by the RTP, which includes four travel lanes and a median or center turn lane. Tualatin's Minor Arterial classification calls for two travel lanes and a median or center turn lane, which is not precluded by the RTP concept. One of these roads will likely need a five-lane cross-section; because of unknowns with the Durham Quarry redevelopment and the need for further coordination with Durham, Tigard, and Washington County, a final decision on these roads' classification and cross-section is postponed to the Quarry Area Refinement Plan called for in this TSP.
- Boones Ferry Road (Martinazzi Avenue to Tualatin-Sherwood Road) — Metro's classification is a Regional Boulevard, which includes four travel lanes and a median, center turn lane, or pedestrian refuge. Because of right-of-way and environmental constraints in this section, including railroad tracks, Hedges Creek, a historic building, and other existing buildings, Boones Ferry Road will not be able to be expanded to more than two travel lanes and a median or center turn lane. The RTP concept does not preclude this cross-section.
- Tualatin Road — The entire length of Tualatin Road is classified as an Urban Road by the RTP, which includes four travel lanes and a median or center turn lane. Tualatin's Minor Arterial classification calls for two travel lanes and a mdian or center turn lane, which is not precluded by the RTP concept. The section west of Herman Road is not forecast to have travel demands that would require a five-lane section. The section between Herman Road and a future Hall Boulevard extension is constrained by railroad tracks and a golf course and cannot be widened to a five-lane section.
- Borland Road and the section of SW 65th Avenue between Nyberg Street and Borland Road are classified as a Community Street by the RTP, which calls for four travel lanes and a median or center turn lane, or three lanes with on-street parking when volumes are low enough. Tualatin's Minor Arterial classification calls for two travel lanes and a median or center turn lane, with no on-street parking. These streets should remain at three lanes until: (1) I-205 is widened to six lanes, and (2) former Urban Reserve Area (URA) 34 is brought into the Urban Growth Boundary, at which time the streets should be redesignated as Major Arterials. If these streets are widened before I-205, the TSP's traffic forecasts show that they will attract regional traffic from the freeway, causing operational problems on the City's street system. Locally generated traffic that would require a five-lane section will not occur until the development of former URA 34 occurs. On-street parking is incompatible with the current and future function of these streets; a "regional street" designation would be more appropriate. Neither the "community street" nor the "regional street" designations preclude a three-lane cross-section.

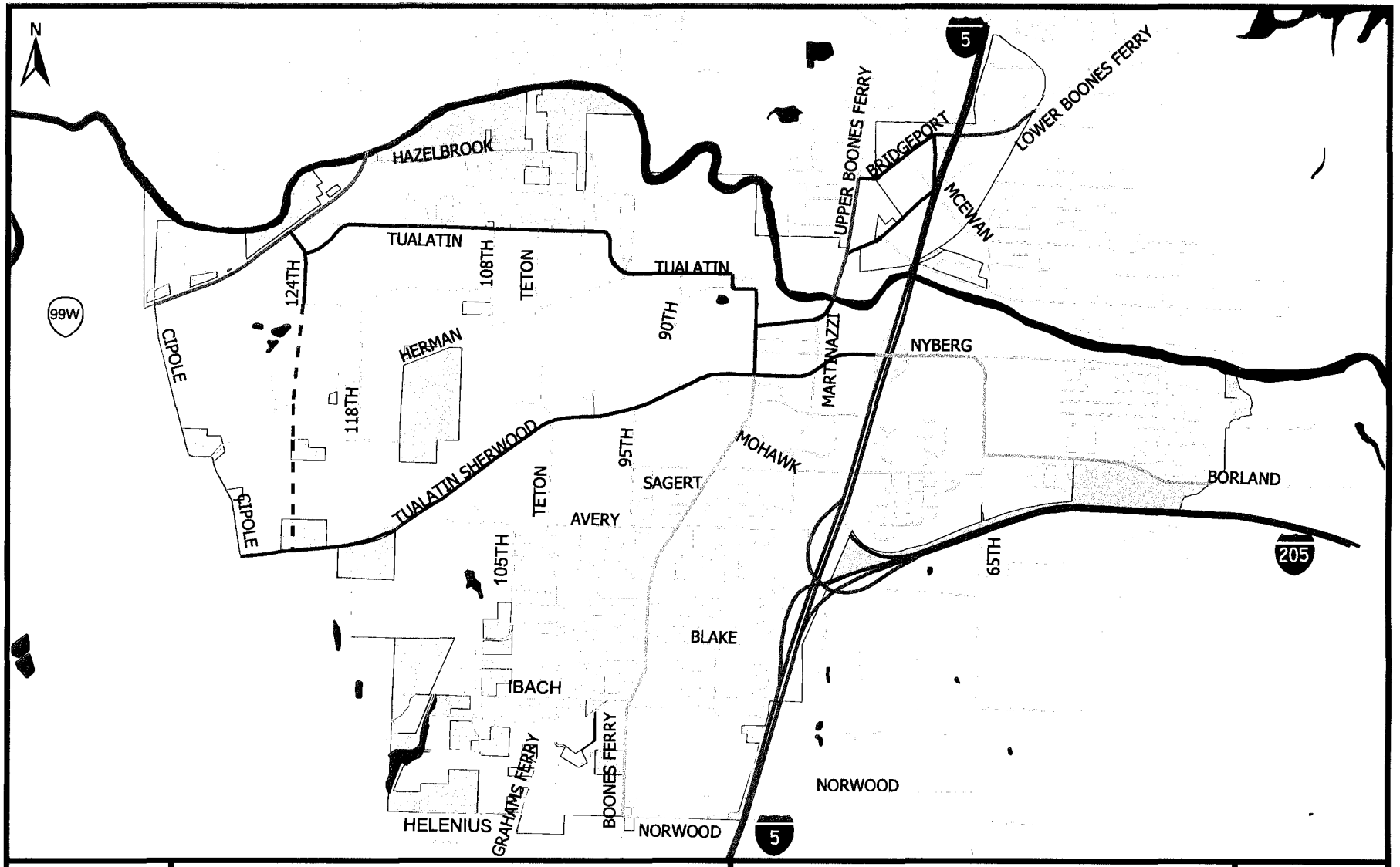


FIGURE 6-3

TUALATIN TRANSPORTATION SYSTEM PLAN

Metro Regional Street Design System

Street Design Designations
- Freeway
- Regional Boulevard
- Regional Street
- Community Street
- Urban Road

Dashed lines indicate generalized locations of future roadways

Water
City of Tualatin
Tualatin Planning Area

1" = 3,000 feet

I-5/Highway 99W Connector

The need for a limited-access connector connecting I-5 to Highway 99W has been identified for many years, and is shown as a priority project in the RTP. The current federal transportation funding program (TEA-21) has earmarked money for environmental reporting for this project. In addition, the Oregon Legislature has identified this connector as one of three corridors outside the Portland UGB that can be developed as a toll facility with ODOT participation (ORS 383.007).

Nevertheless, because the project would lie partly, if not entirely, outside urban growth boundaries, a state goals exception is required, pursuant to the state's Transportation Planning Rule (OAR 660-012-0070). At the time this TSP was prepared, Metro and the Oregon Department of Land Conservation and Development (DLCD) were working towards, but had not yet agreed upon, RTP amendment language that would fulfill the goals exception requirements, which would allow DLCD to grant the exception and acknowledge the section of the RTP addressing the I-5/Highway 99W Connector.

The modeling conducted for this TSP analyzed both the northern and southern alignments for the connector, with several variations of expressway and freeway alignments. ("Northern" and "Southern" refer to where the connector joins Highway 99W in relation to the City of Sherwood.) The TSP makes the following findings with regard to the alignment alternatives.

Northern Alignment

- The northern alignment, in conjunction with widening Tualatin-Sherwood Road to five lanes from Teton Avenue to Highway 99W, results in under-capacity operations on Tualatin-Sherwood Road west of the Tualatin Town Center, and a 40% reduction in traffic demands on Highway 99W through Tualatin, although Highway 99W will still remain congested entering the City from both Tigard and Sherwood.
- Tualatin-Sherwood Road remains congested west of the point where the connector joins it. As a result, congestion would likely spill back onto both facilities during the p.m. peak hour, partly negating the effects of both the Tualatin-Sherwood Road widening and the connector project. Analyzing the connector's alignment through Sherwood was beyond the scope of this TSP, but it appears that the connector would need to be a parallel facility to Tualatin-Sherwood Road all the way to Highway 99W, and that congestion issues on Highway 99W through Sherwood south of the junction of the connector would still need to be resolved.
- The Tualatin Community Plan currently shows the connector running parallel to, and west of Cipole Road. The modeling found that the connector segment between Tualatin-Sherwood Road and Highway 99W, under this alignment, would be little-used.
- More than half of the northern connector's traffic volume consists of traffic coming from Wilsonville or points south via Grahams Ferry or Boones Ferry Roads, which is destined for Tualatin's industrial area, or points further west in Washington County.
- A direct connection to SW 124th Avenue, rather than an extension of SW 124th Avenue to meet the connector farther west, provides the most efficient utilization of the capacities of the connector, SW 124th Avenue, and Cipole Road. However, it also lengthens the portion of Tualatin-Sherwood Road that experiences traffic demands exceeding its capacity.

Southern Alignment

- The southern alignment, which was modeled as a freeway with a single intermediate interchange serving Sherwood's Old Town, consistent with Metro's RTP Priority Model, carries 35-40% less traffic in general than the northern alignment. The majority of the traffic using the connector consists of longer-distance traffic between the Portland area and points southwest of Sherwood along Highways 99W and Highway 18.
- Traffic volumes on Highway 99W through Tualatin are almost half of the no-build volumes, but the section crossing the Tualatin River will still experience traffic demands exceeding its capacity. Traffic demands on Tualatin-Sherwood Road are generally higher, and traffic operations generally worse, under a southern alignment, compared to a northern alignment, assuming widening of Tualatin-Sherwood Road to five lanes between Teton Avenue and Highway 99W.
- The southern alignment does not serve north-south traffic from Wilsonville to and through western Tualatin. As a result, Boones Ferry Road experiences significantly higher traffic volumes than under the northern alignment, and the Ibach Street-SW 108th Avenue-Blake Street-SW 105th Avenue-Avery Street corridor becomes congested with through traffic cutting through residential areas in southwest Tualatin.

Expressway vs. Freeway

The I-5/Highway 99W connector was modeled as both an expressway (with a number of at-grade, signalized intersections) and as a freeway (with a limited number of grade-separated interchanges). The modeling showed that if the connector were to be built as an expressway, the locations of the intersections would have to be carefully considered. For example, providing intersections at Martinazzi Avenue and Boones Ferry Road, as called for in the Tualatin Community Plan, generated significant traffic volumes on both facilities, as motorists used those streets as an alternative to I-5. In addition, ODOT access management policies for expressways restrict the intersection spacing allowed. An expressway would also result in slower overall travel speeds, due to the delays produced by signalized intersections.

On the other hand, the modeling also showed that some Tualatin access is required for a freeway alignment, to avoid undesired neighborhood cut-through impacts resulting from traffic traveling to and from Wilsonville. An interchange at Grahams Ferry Road would serve traffic bound for northern Wilsonville and the prison vicinity, as well as provide freeway access to southern Tualatin without requiring travel through the Tualatin Town Center, but would be located sufficiently far enough west to avoid impacts to Boones Ferry Road. An interchange at a southern extension of SW 124th Avenue is required to provide access to Tualatin's western industrial area, and serve the Wilsonville traffic; auxiliary lanes would probably be needed on the connector between Grahams Ferry and SW 124th Avenue because of this travel demand. An additional goals exception would be required for the SW 124th Avenue extension. Finally, an interchange serving Sherwood's Old Town would be required.

It is recognized that ODOT has expressed a desire to have the I-5/Highway 99W connector serve as a regional route, with a minimum (zero or one) of intermediate interchanges. However, the modeling shows that the demand for this facility would be far less than its capacity (demand-to-capacity ratio of 35%), and that significant north-south regional traffic would be routed through the residential areas of southern Tualatin. In order to avoid generating this cut-through traffic, new

roadway facilities would be needed connecting Day Road, Morgan Road, Tonquin Road, and SW 124th Avenue, all of which would require state land use goals exceptions.

Neighborhood Concerns

Public opinion expressed at the TSP open houses, particularly from residents of southern Tualatin, was uniform that the I-5/Highway 99W should run as far south of the existing neighborhoods as possible (even as far as the North Wilsonville interchange), and in particular, should not run along the existing Norwood Road and Helenius Road alignments, which would place the I-5/Highway 99W connector immediately adjacent to existing houses.

In contrast, the modeling showed that the more indirect the route from I-5 to the western industrial area via the connector, the lower the usage, and the greater the traffic that remained on Tualatin-Sherwood Road. This would call for keeping the connector as close as possible to the south edge of Tualatin to maximize the connector's transportation benefits. Consequently, some trade-offs will be required to preserve neighborhood livability, while maximizing the benefit of the public's investment in a connector.

Recommendations

A final decision on the construction and alignment of the I-5/Highway 99W Connector will occur at a regional level. Because a goals exception has not yet been granted for this facility, in order to comply with the state's Transportation Planning Rule, the Tualatin Functional Classification Plan map (Figure 6-1) shows an alignment connecting within the Urban Growth Boundary and an approximate alignment running along the edge of the UGB. However, this is not the City's preferred alignment.

The TSP's recommendations for the I-5/Highway 99W Connector, subject to change based on further analysis resulting from the environmental reporting process for the connector, are as follows:

- A four-lane freeway or toll road facility, departing I-5 south of, but close to Norwood Road, connecting to Highway 99W south of Sherwood. Auxiliary lanes or braided ramps may be required along I-5 between the connector and I-205 interchanges.
- The connector alignment should not incorporate existing sections of Norwood Road or Helenius Road, nor should it run adjacent to existing urban residential development within Tualatin. Freeway noise impacts upon Tualatin's residential neighborhoods should be mitigated.
- Interchanges serving Grahams Ferry Road, a southern extension of SW 124th Avenue, and Sherwood's Old Town. Auxiliary lanes may be required between Grahams Ferry Road and SW 124th Avenue. The Grahams Ferry Road and SW 124th Avenue interchanges will serve north-south traffic to and from Wilsonville that would otherwise create regional traffic impacts through the residential areas of southern Tualatin. The SW 124th Avenue interchange will also serve traffic to and from Tualatin's western industrial area that would otherwise use Tualatin-Sherwood Road. The Sherwood interchange will serve Sherwood traffic that would otherwise use Tualatin-Sherwood Road.
- The southern alignment is preferred to a northern alignment, subject to the provision of the interchanges described above, as it removes regional traffic between the Portland

metropolitan area and Yamhill County, Polk County, and the Oregon Coast that would otherwise use Tualatin-Sherwood Road. Even with future widening, Tualatin-Sherwood Road will not be able to accommodate both local traffic needs and regional through traffic.

6.3.3 Access Management

Managing access to the City's road system is necessary to preserve the capacity of the City's arterial street system, by minimizing the number of points where traffic flow may be disrupted by traffic entering and exiting the roadway, and to enhance safety along all City roadways by minimizing the number of potential conflict points. The City of Tualatin has developed specific descriptions of where access will occur on the City's arterial street system, which can be found in Chapter 75 of the Tualatin Development Code.

Where a facility is maintained by Washington County, Clackamas County, and/or ODOT, or is within the influence area of an interchange, as defined by ODOT, the City should coordinate with the appropriate agencies about whether or how access will be provided.

6.3.4 Urban Business Area and Special Transportation Area

The 1999 Oregon Highway Plan allows cities and ODOT to jointly designate certain areas as Special Transportation Areas (STAs), Urban Business Areas (UBAs), or Commercial Centers, subject to meeting certain requirements, including identification in the TSP. Designation as one of these areas allows ODOT's access spacing standards to be relaxed. (Outside Metro's jurisdiction, the traffic operations standards are also relaxed.)

STA designations are applicable for compact areas on a state highway in which growth management considerations outweigh the need to limit access. Inclusion in an STA allows for development to occur with access less than the standard spacing. STA designations do not apply to whole cities or strip development areas along individual highway corridors.

The only facility within Tualatin that is eligible for one of these designation is Boones Ferry Road (the Beaverton-Tualatin Highway), from the Tualatin River to Warm Springs Street. Either an STA or an UBA designation could apply. However, the City has already developed access spacing standards for this roadway that would not change as a result of this designation. Also, ODOT's operating standards for this roadway are already at the minimum allowed (v/c of 1.10 or less), because the roadway is within a Town Center. Consequently, neither designation appears to provide a benefit at this time.

6.3.5 Traffic Operations Standards

Metro has adopted lowered traffic operations standards in the RTP, in recognition that insufficient funding is available to improve all of the region's roadways to provide desirable peak hour levels of service. Metro uses a two-hour standard, allowing higher levels of congestion during the peak hour in key areas such as the Tualatin Town Center, as long as better operations can be achieved during the hour-hour periods on either side of the peak hour. The Metro peak hour standard for the Tualatin Town Center is a peak hour volume-to-capacity (v/c) ratio of 1.10 or less, with a v/c ratio of 1.00 allowed during the second hour. Appendix G describes current standards in more detail.

The RTP identifies the Tualatin Town Center area as an "area of special concern", as key roadways within the Town Center area will not meet even Metro's lowered operations standards in the long term. The RTP calls for the TSP to develop a traffic management plan addressing the ability of local streets in the area to absorb some of the traffic demand, and to establish specific plans and benchmarks for facilities determined to exceed the LOS policy. Because the RTP was adopted after the TSP project was scoped and funded, this plan was not developed through the TSP and will need to be developed separately at a later date. The TSP's implementation plan calls for a Transportation Growth Management Program project to address this need. The City's long-term LOS standards for the Town Center area will be determined through this project.

The City of Tualatin has decided to maintain its current practice of using LOS "D" as its minimum standard for signalized intersections and LOS "E" as its minimum standard for unsignalized intersections, as defined by the most recent edition of the Highway Capacity Manual, for areas outside the Tualatin Town Center. The intent of the higher standard is to maintain reasonable operations for all transportation modes operating on public roadways, and to allow development to continue to pay its share of traffic impacts. A volume-to-capacity ratio greater than 1.00 should also be considered to be below the minimum standard, regardless of level of service. Where a facility is maintained by Washington County, Clackamas County, or ODOT, the more restrictive of the City's or the other agency's standards should apply.

The projects included in the TSP's Implementation Plan (Section 6.14) collectively achieve this LOS standard. However, the financially constrained plan does not achieve the standard.

6.4 LOCAL STREETS PLAN

6.4.1 Street Connectivity

The RTP calls for cities to identify all contiguous areas of vacant and re-developable parcels of five or more acres planned or zoned for residential or mixed-use development and to prepare a conceptual new streets plan map. Figure 6-4 presents the City of Tualatin's Local Streets Plan. The intent of this map is to identify the locations of future street connections and desired connections within future development that promote a connected street system. The endpoints of the connections should be considered fixed, unless the City Engineer determines that an alternate connection point is preferable due to safety, operations, improved connectivity concerns, or environmental impacts. The routes connecting endpoints may vary, as long as a reasonably direct route between the two points is provided.

The City adopts the RTP's street connectivity requirements for future residential and mixed-use development (RTP section 6.4.5 (2)), which call for:

- full street connections with spacing of no more than 530 feet between connections, except where prevented by barriers;
- bicycle and pedestrian accessway easements where full street connections are not possible, with spacing of no more than 330 feet, except where prevented by barriers;
- limiting the use of cul-de-sac and other closed-end street systems to situations where barriers prevent full street extensions; and including no permanent closed-end street longer than 200 feet or with more than 25 dwelling units.

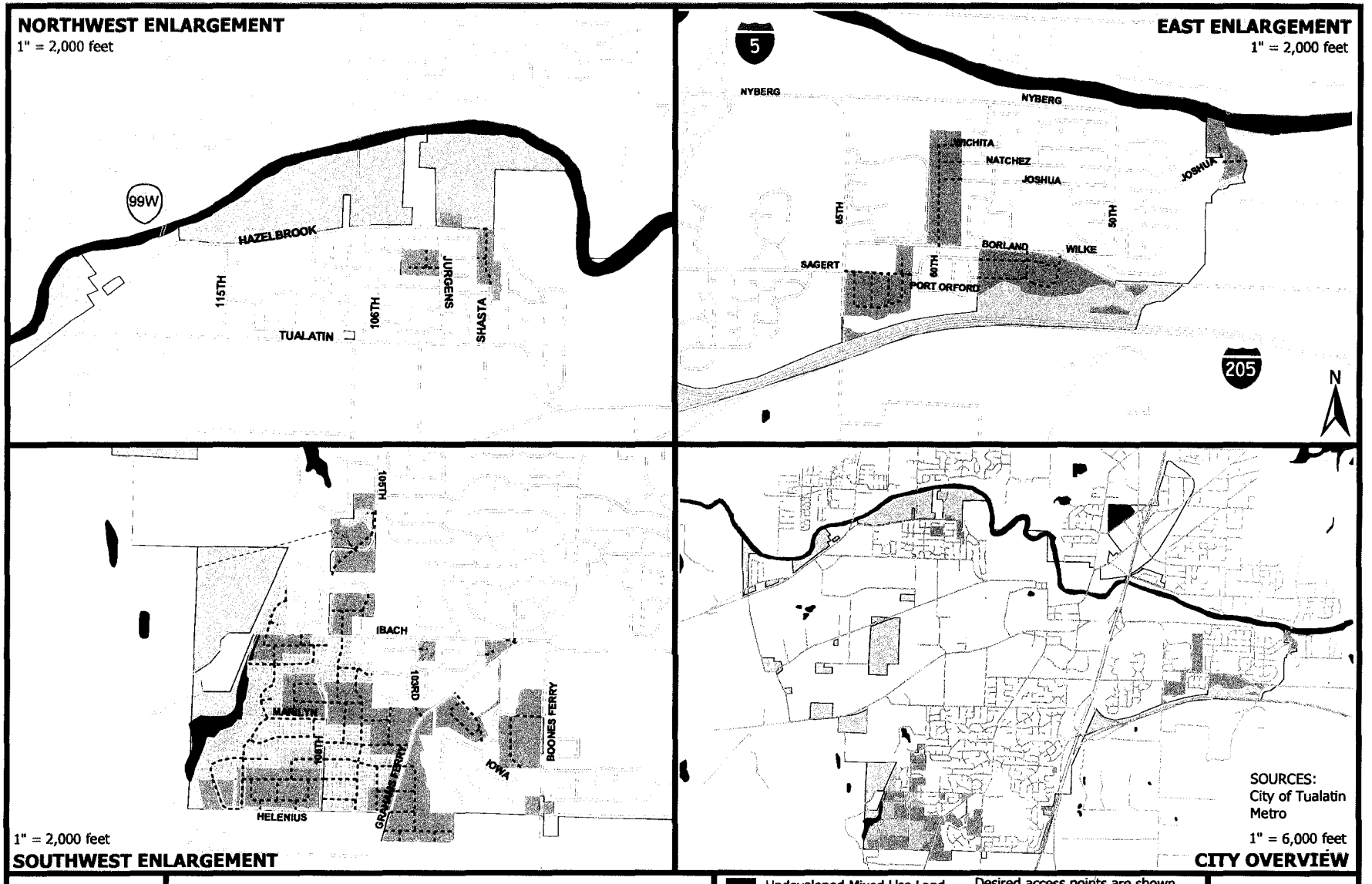


FIGURE 6-4

TUALATIN TRANSPORTATION SYSTEM PLAN

Local Street Plan

- Undeveloped Mixed Use Land
- Platted Residential Land
- Undeveloped Residential Land
- Local Street Connections
- Water
- City of Tualatin
- Tualatin Planning Area

Desired access points are shown. Street alignments between points may change, subject to connectivity and block spacing constraints in the Tualatin Development Code.

Durham Quarry street network to be set by the refinement plan.

6.4.2 Commercial and Industrial Access

The Tualatin Functional Classification Plan map (Figure 6-1) identifies local commercial industrial streets within Tualatin's industrial area. These streets are intended to provide public street access to parcels that have to take access from the City's collector and arterial street system. Additional local commercial industrial streets may need to be developed to serve parcels created through future subdivisions or partitions.

6.5 PEDESTRIAN PLAN

Providing a connected network of pedestrian facilities is important for:

- serving shorter pedestrian trips from neighborhoods to area activity centers, such as schools, churches, and neighborhood commercial uses;
- providing access to public transit;
- meeting residents' recreational needs; and
- providing circulation within the Tualatin Town Center.

The City's street standards call for sidewalks to be provided along all new streets. As development and redevelopment occurs, and as City funding permits, gaps in the existing sidewalk system will be filled. The Tualatin Pedestrian Plan, depicted in Figure 6-5, identifies the sections of the City's arterial and collector system where gaps currently exist.

The need to develop a recreational pathway and trail system carries forward into this TSP. Although transportation funding constraints do not allow the development of this system though TSP projects, the City may wish to consider alternative funding sources, such as parks and recreation bonds or SDCs. Of particular interest are a multi-use path along the south bank of the Tualatin River, and future pedestrian and bicycle bridges across the Tualatin River along the SW 65th and SW 108th Avenue alignments. The future locations of these facilities are shown in Figure 6-5.

The RTP identifies the Tualatin Town Center area as a *Pedestrian District*, as shown on Figure 6-5. These districts are "areas of high, or potentially high, pedestrian activity where the region places priority on creating a walkable environment... These areas will be characterized by buildings oriented to the street and boulevard-type street design features such as wide sidewalks with buffering from adjacent motor vehicle traffic, marked street crossings at all locations with special crossing amenities at some locations, special lighting, benches, bus shelters, awnings, and street trees."

The code language and ordinances that implement this TSP will incorporate these design elements into the applicable development standards. The Tualatin Street Design Standards (see section 6.3.4) provide for wider (8-12 foot sidewalks) along the more important roadways within the Pedestrian District. In addition, the Tualatin Transit Plan calls for incorporating bus shelters and street lighting provisions for development occurring adjacent to existing transit stops. The City's development standards should call for direct pedestrian connections from adjacent sidewalks into developments.

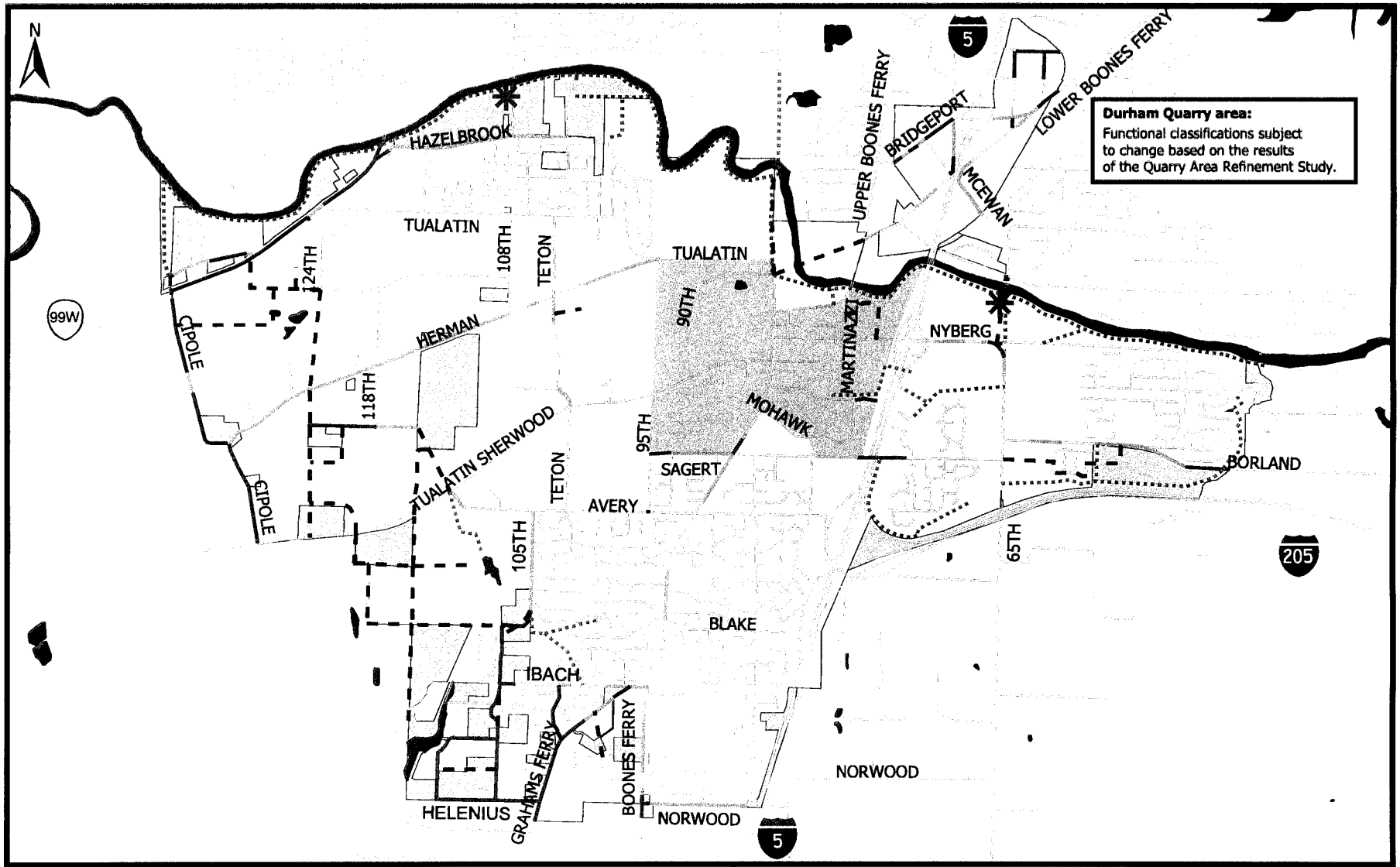


FIGURE 6-5

TUALATIN TRANSPORTATION SYSTEM PLAN

Tualatin Pedestrian Plan

Arterial & collector sidewalk needs
- Both sides
- One side

Future pedestrian facilities
- Future streets
- Multiple-use pathways
- Pedestrian pathways

Future ped/bike bridge

Water
City of Tualatin
Tualatin Planning Area
Pedestrian District

1" = 3,000 feet

As traffic volumes grow, it becomes more difficult for pedestrians to cross streets. Two common means of improving pedestrian crossing safety are constructing pedestrian refuges and curb extensions. Pedestrian refuges, such as those recently installed on Tualatin Road, are provided in the middle of streets, allowing pedestrians to cross one direction of traffic at a time. Curb extensions extend the sidewalk into the parking lane, shortening the crossing distance for pedestrians.

6.6 BICYCLE PLAN

The bicycle plan establishes a network of bicycle lanes and routes that connect the City's bicycle trip generators to provide a safe, interconnected bicycle system. Bicycle lanes are designated on arterial and collector street segments with anticipated future volumes of over 3,000 daily vehicles. Bicycle routes, where bicyclists share a lane with other vehicles, are designated on other lower-volume collector streets, and certain local streets that provide connectivity within neighborhoods or to future multi-use recreation paths.

Figure 6-6 shows the City's bicycle plan. As portions of the City's streets are widened, either through adjacent development or a public works projects, bicycle lanes will be provided where indicated on the plan.

6.7 TRANSIT PLAN

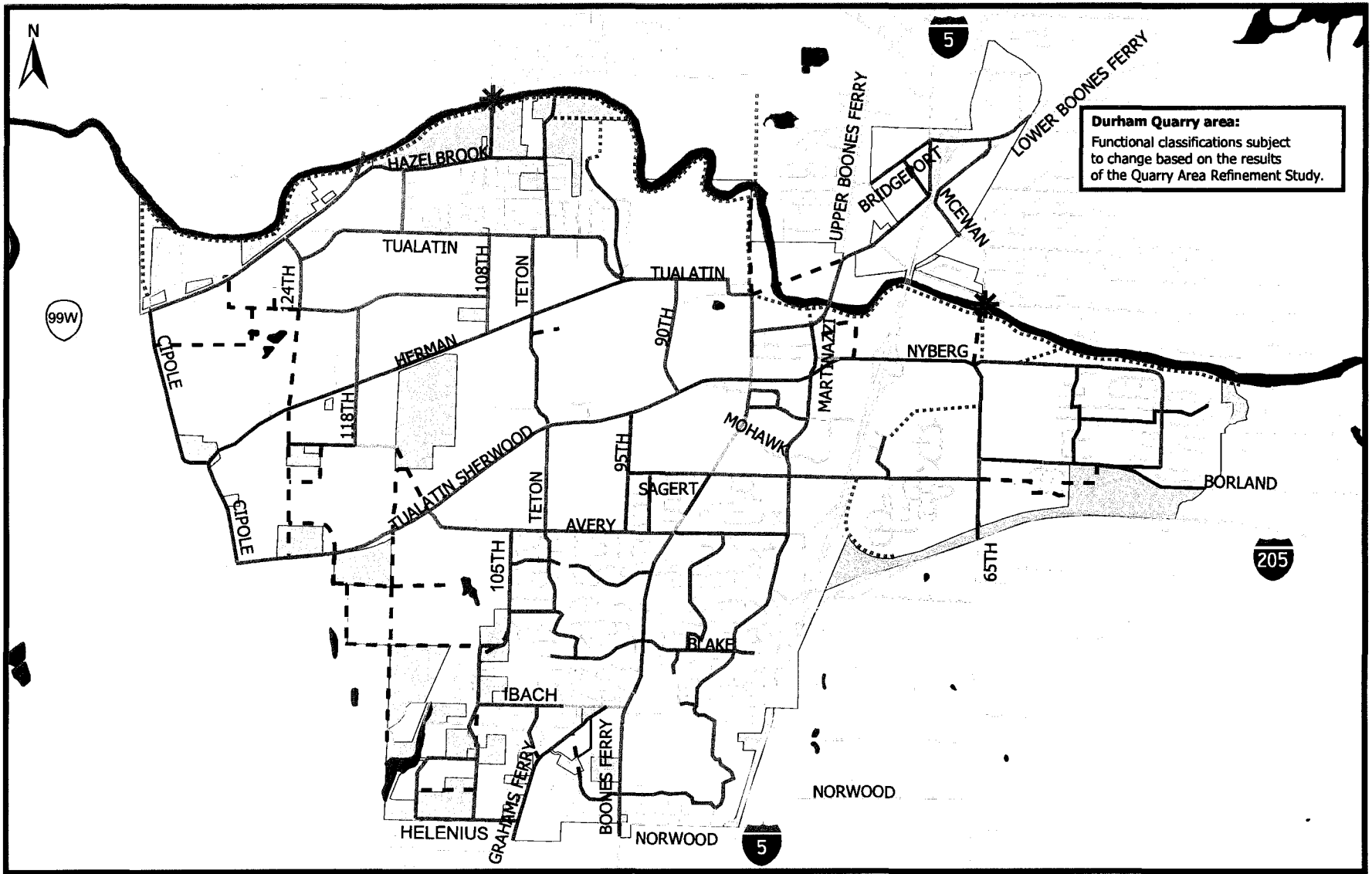
Although the City of Tualatin does not provide public transportation services, it can provide policies and facilities that support the provision and usage of transit service. This section outlines the steps Tualatin plans to take to support increased transit usage, as part of its efforts to work towards Metro's 2040 mode split targets. It must be recognized that in order for these targets to be met, the region must provide greater support for increased local transit service than provided for in the financially constrained RTP.

6.7.1 Transit Streets

Figure 6-7 depicts the streets that are designated as transit streets: streets that are expected to have fixed-route transit service operating along them at some point prior to 2020. Transit streets generally provide a wider-than-normal sidewalk width, as shown in Tualatin's recommended Street Design Standards (see Section 6.3.4). The City should provide notice to Tri-Met of development applications adjacent to existing Tri-Met stops or at intersections located along future transit streets. The City's development standards may allow the conditioning of the following transit-related improvements of such developments, upon request by Tri-Met:

- a paved landing pad, conforming to current Americans with Disabilities Act (ADA) standards;
- a bus shelter or bench, at inbound bus stops; and/or
- an easement for either of these, where transit service does not currently exist.

The City should work with Portland General Electric and with Tri-Met to provide street lighting at stops where adequate lighting does not currently exist.



FIGURE

6-6

TUALATIN TRANSPORTATION SYSTEM PLAN

Tualatin Bicycle Plan

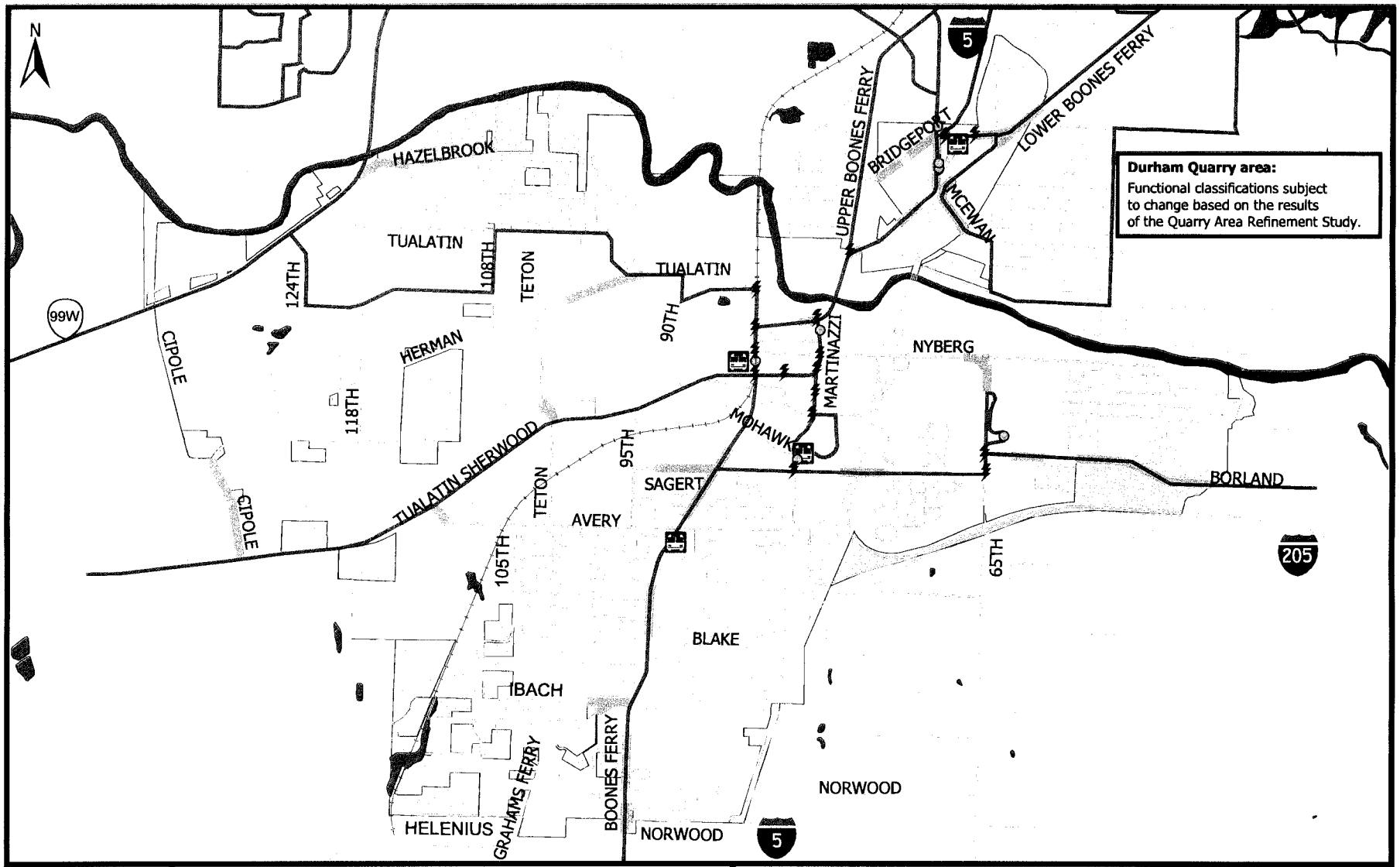


FIGURE 6-7

TUALATIN TRANSPORTATION SYSTEM PLAN

Tualatin Transit Plan

- Transit streets
- Sidewalk needs for transit
- Commuter rail
- Major transit stops
- Transit signal priority candidate
- Park & Ride
- Water
- City of Tualatin
- Tualatin Planning Area

1" = 3,000 feet

The transit streets shown in Figure 6-7 are based on the transit streets identified in the RTP, the results of Tri-Met's Transit Choices for Livability project, and public feedback from the open house. Desired bus service by the year 2020 includes:

- Increased service on Routes 12 and 96 to accommodate increased ridership as Tualatin's population grows, and to maintain headways as congestion increases within the region.
- New local service along Tualatin Road and Leveton Drive, serving the residential areas in northwest Tualatin, and the northern portion of the industrial area. Service should be provided at 30-minute headways, and more frequently during shift change times at major employers within the industrial area.
- New local service on Tualatin-Sherwood Road, at 30-minute headways, serving intercity trips and the southern portion of the industrial area.
- Rapid bus service between Oregon City, Tigard, and Washington Square. Although the RTP shows this service remaining on I-205 and I-5 to the Lower Boones Ferry Road interchange, consideration should be given to serving the hospital and downtown Tualatin, particularly after Hall Boulevard is extended across the Tualatin River.

The City of Tualatin should work with Tri-Met to develop these new services, as demand warrants and funding permits. The Tualatin Transportation Management Association (TMA) is also a potential operator of all-day fixed-route service within the industrial area; however, this service is contingent on obtaining an ongoing source of operations funding, as well as maintaining the TMA's current funding that supports its other activities. The TMA has applied for a grant to cover start-up costs associated with this service. The City should support the TMA's efforts to expand its transit-related services.

6.7.2 Commuter Rail

A commuter rail line between Wilsonville and downtown Beaverton, with stops in downtown Tualatin, downtown Tigard and near Washington Square, is currently being planned. The alignment through Tualatin is shown in Figure 6-7. The location of the downtown Tualatin station is currently planned for the west side of Boones Ferry Road, north of Tualatin-Sherwood Road. A small (100-150 vehicle) park-and-ride lot is planned to serve the station. The City's programmed improvements on Boones Ferry Road will improve pedestrian and sidewalk facilities in the station vicinity.

Design elements associated with the commuter rail line that should be considered as planning moves forward include:

- Providing transit feeder service to serve the new station. No Tri-Met lines currently pass by the station. Two significant constraints exist: (1) the historic building on the southeast corner of the Tualatin Road/Boones Ferry Road intersection, which prevents curb radius widening that would permit regular Tri-Met buses to turn the corner, and (2) a shortage of right-of-way along Boones Ferry Road that would provide room for buses to layover at the station out of the flow of traffic.
- Timing the departure of trains to coincide with the north-south green phase on Boones Ferry Road at Tualatin-Sherwood Road, in order to minimize traffic operations problems at the most important intersection in Tualatin.

- How transfers might be accommodated in the future between this line and a future line using the east-west tracks through Tualatin.

6.7.3 Major Transit Stops

The state's Transportation Planning Rule requires jurisdictions to identify major transit stops. As implemented in the RTP, major transit stops "are intended to provide a high degree of transit passenger and access. Major transit stops are located at stops on light rail, commuter rail, rapid bus, frequent bus or streetcar lines in the central city, regional and town centers, main streets, and corridors. Major transit stops may also be located where bus lines intersect or serve intermodal facilities, major hospitals, colleges, and universities. Major transit stops shall provide schedule information, lighting, benches, shelters, and trash cans. Other features may include real-time information, special lighting or shelter design, public art, and bicycle parking."

Figure 6-7 identifies the major transit stops within Tualatin, which consist of:

- Tualatin Park-and-Ride (north and south lots);
- Tualatin City Center and Library;
- Mohawk Park-and-Ride;
- Meridian Park Hospital; and
- the future Tualatin commuter rail station.

6.7.4 Park-and-Ride Lots

Three park-and-ride lots currently exist within Tualatin, with one new lot planned for the future at the commuter rail station. The two lots listed below are of particular interest.

Tualatin Park-and-Ride

The Tualatin Park-and-Ride, located in the southwest quadrant of the I-5/Lower Boones Ferry Road interchange, currently operates over capacity, with approximately 50-55 vehicles parked on the shoulders of nearby roadways. It is also divided into two sections, separated by Lower Boones Ferry Road, which creates potential vehicle-pedestrian conflicts. As the Durham Quarry, and possibly the surrounding area, redevelops, consideration should be given to reconfiguring the park-and-ride, so the entire lot is contiguous.

City of Tualatin staff believe that a substantial number of the users of the Tualatin park-and-ride lot are carpool commuters to Salem. While this use of the lot is positive from the perspective of the overall transportation system, this practice does add traffic through an already congested interchange area, and takes away parking that could be used by potential Tri-Met customers. The City of Tualatin, City of Wilsonville, Tri-Met, SMART (Wilsonville's transit provider), ODOT, and Metro should work together to explore the possibility of providing a park-and-pool lot in the vicinity of the North Wilsonville interchange. Such a lot would be more convenient to commuters arriving from I-205, would have as good—if not better—freeway access, and would not conflict

with Tri-Met passengers who want to use the Tualatin lot. Enough land use activity already exists in the North Wilsonville interchange vicinity that lot security should not be a greater issue than usual.

Tri-Met and ODOT should also explore amending ODOT's current administrative rules (OAR 734-051-0080(4)(a)) which prohibit all access to freeway ramps. Allowing Tri-Met and SMART buses that use I-5 to enter and exit the freeway via an access between the southbound on-ramp and the park-and-ride lot would significantly speed bus operations, particularly after road realignments are completed in the area. Transit (as well as general vehicle) access to park-and-ride lots from freeway ramps is an accepted practice in other states, including Washington and California.

Mohawk Park-and-Ride

This park-and-ride is currently only about 50% utilized, due in part to its more remote location. Rerouting transit lines from this stop to serve the Tualatin commuter rail station could allow this lot to serve a feeder function, if demand exceeds capacity at the station park-and-ride and shared parking agreements cannot be executed with the adjacent shopping center. Pedestrian access issues between apartments on the west side of Martinazzi Avenue and the bus stops serving the lot are being addressed by a funded City project to, in part, provide a median refuge for pedestrians crossing Martinazzi Avenue.

6.7.5 Transit Signal Priority

The City of Portland and Tri-Met are currently working on a program, termed "Streamlining", to improve transit service times on key routes. An important aspect of this program is giving buses that are behind schedule the ability to get priority at transit signals, either by extending a green phase to allow a bus to clear a signal, or by returning to green earlier than usual to shorten the delay to a bus. The system works with Tri-Met's Bus Dispatch System equipment that is already installed on its buses. A Global Positioning System (GPS) unit on the bus tracks the bus' location, and an on-board computer compares the bus' location to where it should be on its schedule and, if the bus is behind schedule, activates an optical emitter attached to the bus (similar to those used by emergency vehicles) to request priority.

The City of Tualatin can support this program by including the necessary software and equipment in the traffic signal controller cabinet to respond a bus priority request. The cost of this equipment is relatively low in comparison to the traffic signal itself, and can result in transit service becoming more attractive to passengers as a result of decreased travel times and less variability in arrival times. Figure 6-7 indicates current and future traffic signal locations where implementing transit signal priority would be appropriate, based on bus frequency and patronage.

6.7.6 Tualatin Transportation Management Association

In addition to provide its current peak-hour shuttle service to and within the industrial area, the Tualatin TMA helps reduce single-occupant vehicle trips within Tualatin through its carpool and vanpool ride-matching services, transportation fairs for local employers, and by serving as an outlet for Tri-Met's PASSport program, which provides annual transit passes to member business employees at substantial discounts. The TMA also coordinates the Job Access program for Tualatin, which provides transportation to lower-income workers who must travel to and from work during hours when regular transit service is not offered. As mentioned above, the TMA is currently seeking

grant funding to start up all-day fixed-route bus service for Tualatin's industrial area. The City of Tualatin should continue to support the TMA's efforts in these areas.

6.7.7 Intercity Service

No intercity passenger service is available from Tualatin. The nearest intercity bus and rail terminals are located in downtown Portland.

6.7.8 Special Needs Transportation

Passengers who are unable to use the regular Tri-Met service due to a mental or physical disability are served by Tri-Met's door-to-door LIFT program. Clackamas County provides the Transportation Reaching People (TRP) Program, which provides volunteer drivers for eligible passengers.

No deficiencies have been identified with the provision of special needs services.

6.7.9 Transportation Demand Management

Transportation Demand Management (TDM) programs seeks to improve the efficiency of the transportation system by shifting single-occupant vehicle trips to other modes, or away from times of peak traffic volumes. When implemented by a number of employers, TDM measures may avoid the need for some roadway capacity improvement projects, or at least defer the need farther into the future. The Tualatin TMA currently provides support to Tualatin employers wishing to participate. However, the modeling work used to develop this TSP assumes greater levels of TDM measures than currently exist. Examples of these measures include:

- Providing reserved spaces near building entrances for carpools.
- Subsidizing the cost of transit passes and tickets.
- Allowing employees to work at home one day a week.
- Scheduling shift changes to occur outside of peak travel periods.
- Guaranteed-ride-home programs that provide emergency cab rides home, to a child's school or day care, etc., to employees that carpool or use public transit.
- Providing services on site, such as day care or a cafeteria, that reduce the need for a car to make other trips.

6.7.10 Non-SOV Modal Targets

The City should adopt Metro's 2040 non-single occupant vehicle (SOV) goals presented in the RTP. These targets apply to trips to and within each 2040 Metro Design Type. The targets reflect conditions appropriate for the year 2040 and are needed to comply with Oregon TPR objectives to reduce reliance on single-occupancy vehicles.

- Tualatin Town Center: 45-55%
- Other areas: 40-45%

Specific steps that the City has taken in this TSP to work towards these targets include:

- Adopting a pedestrian plan that:
  - includes sidewalks and landscape strips on all future streets
  - designates the Tualatin Town Center as a pedestrian district, with wider sidewalks and provision for pedestrian amenities
  - includes the pedestrian mode as a component of many capital projects listed in the TSP's financially constrained project list
- Adopting a bicycle plan that:
  - designates a system of bicycle lanes and routes throughout the City
- Adopting a transit plan that:
  - designates future transit streets, which provide for wider sidewalks and the provision of transit amenities
  - supports a future commuter rail station in the Town Center area
  - supports the Tualatin TMA's efforts to reduce single-occupant commute trips by Tualatin employees
- Continuing previous pedestrian, bicycle, and transit-supportive provisions in the Tualatin Development Code that have been developed to comply with the TPR.
- Complying with TPR requirements for parking maximums.

The City cautions that achieving these goals will require a commitment by its regional partners to fund transit service at higher levels than provided for in the RTP's financially constrained plan.

6.8 PIPELINE AND TRANSMISSION PLAN

The transmission of power, natural gas, and water are all services of importance to businesses, industry, and residents of Tualatin.

6.8.1 Power Transmission

The Bonneville Power Administration (BPA) anticipates that will be adequate distribution capacity provided and anticipates no need to construct any substations or power lines within the City of Tualatin. Portland General Electric (PGE) anticipates a new substation being constructed to serve the industrial area of Tualatin to handle the increase in jobs for that area. Associated with this new substation will be transmission lines connecting into the transmission lines north of downtown Tualatin.

6.8.2 Pipeline Transmission

Natural Gas

Natural gas is transmitted to Tualatin from high-pressure lines via smaller mains. There are no natural gas supply restrictions in Tualatin as the compressibility of natural gas results in highly variable pipeline capacities. Tualatin residents who live on a street where a natural gas distribution

line already exists, can easily be connected to that distribution line. As a result, there are no infrastructure capacity constraints with the existing or future natural gas pipeline system.

Water

The water usage within the City is expected to grow, but the current water supply system provides adequate supply to meet current demand. Existing pipeline facilities should be maintained and enhanced as needed by the City.

6.9 RAIL PLAN

The Portland & Western Railroad (PNWR) operates two lines in Tualatin, a north-south line and an east-west line. The north-south line is currently undergoing planning for a commuter rail line that will coexist with current freight operations. The east-west line is also considered a candidate for future commuter services from McMinnville, Newberg, and Sherwood to Portland's Union Station via Milwaukie, and for commuter services from Salem, via a new connection between the two lines, although no planning is currently occurring for commuter rail use of the east-west line. Both lines currently meet State of Oregon goals for train speeds and activity.

A number of private grade crossings currently exist in Tualatin, particularly along the east-west line. As the lots served by these crossings redevelop over time, consideration should be given to eliminating the private grade crossings over time as alternative access becomes available, thus allowing safer and potentially higher-speed operations over the rail lines.

Two grade crossings are currently only controlled by crossbucks: the SW 118th Avenue and SW 124th Avenue crossings immediately south of Herman Road. The SW 124th Avenue crossing will be gated, and the adjacent intersection signalized, in conjunction with the City's SW 124th Avenue extension project. The SW 118th Avenue crossing will be gated and signalized as part of the Leveton Tax Increment Financing District. In addition, a traffic signal with railroad interconnect is part of the TSP's 0-5 year improvement program.

6.10 AVIATION PLAN

The air passenger and freight transportation needs of the City of Tualatin are primarily serviced by a system of two airports owned and operated by the Port of Portland (Portland International Airport and Hillsboro Airport) and one owned and operated by ODOT (Aurora Airport). These airports are designed to meet the needs of commercial aviation and personal and business aircraft for passengers and freight movement. The city of Tualatin should continue to support the continued use and expansion of the regional air transportation facilities.

6.11 MARINE PLAN

No economically navigable waterways are located within the City of Tualatin. The closest marine facilities are located in Portland along the Willamette and Columbia Rivers.

6.12 FREIGHT PLAN

Delays to freight movement caused by traffic congestion are a major concern to the business community, because of the added shipping costs and uncertainty in the arrival times of goods that truck delays generate. The Tualatin TSP addresses improving freight movement to and through the City in the following ways:

- a project to widen Tualatin-Sherwood Road to five lanes west of Teton Avenue;
- support for an I-5/Highway 99W Connector, which will facilitate high-speed through truck movements around Tualatin, while freeing up capacity for truck movements in and out of Tualatin's industrial area;
- projects to modernize Herman Road, which is a major access route into the industrial area;
- projects to complete SW 124th Avenue to Tualatin-Sherwood Road, opening a new access route into the industrial area; and
- planning an expanded network of local commercial/industrial streets to improve truck circulation and access within the industrial area.

Figure 6-8 shows the City's designated truck routes.

6.13 PARKING PLAN

The City of Tualatin previously updated its parking standards to implement the requirements of the Transportation Planning Rule (OAR 660-012-045(5)(c)). See Chapter 73.320 to 73.390 of the Tualatin Development Code.

6.14 IMPLEMENTATION PLAN

6.14.1 TSP Implementation Steps

This chapter has outlined specific transportation system improvement policies and recommendations that are required to address the City of Tualatin's long-term transportation needs and to comply with applicable state and regional plans, laws, and rules. This section lists the specific projects that form the TSP's financially constrained capital project plan, and also lists un-funded projects that are required to fully address all of the transportation needs identified through the TSP planning process. New sources of funding, and/or increasing the revenue available from existing funding sources, will be required to meet all of the City's transportation needs.

This TSP will be implemented in two ways. First, the policies set forth in this document will be developed into code language that will be adopted into Tualatin's Community Development Code, and the TSP itself will be adopted as the transportation element of the City's comprehensive plan. Second, the projects contained in the TSP's list will be used to guide the City's annual capital improvement planning efforts.

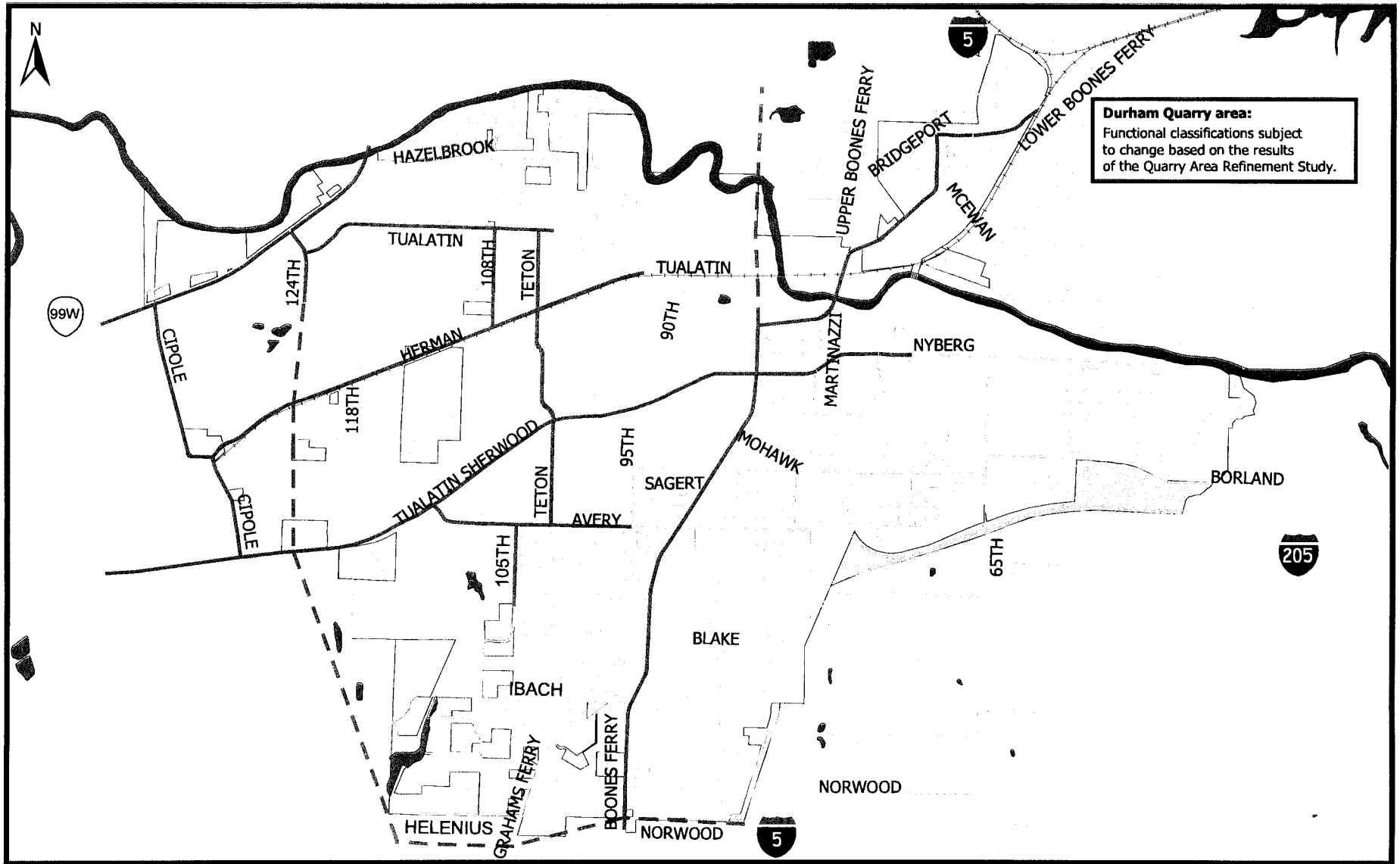


FIGURE 6-8

TUALATIN TRANSPORTATION SYSTEM PLAN

Tualatin Truck Routes

Truck Route
Future Truck Routes
Railroad Facilities

Water
City of Tualatin
Tualatin Planning Area

1" = 3,000 feet

The sequencing plan presented in the TSP is not detailed to the point of a schedule identifying specific years when infrastructure should be constructed, but rather ranks projects to be developed within near-term (0-5 years) and longer-term (6-10 and 11-20 years) horizon periods and by dollar value. In this manner, the implementation of identified system improvements has been staged to spread investment in the City's transportation infrastructure over the 20-year life of the plan. The City will need to periodically update its TSP, and will review the need and timing for longer-term improvements at those times. Prioritizing specific near-term projects will occur annually when the City updates its capital improvement plan for the following year. Future road improvements or related transportation projects listed or not listed in this chapter are not required to be reviewed and approved through a land use process.

The construction of roads, water, sewer, and electrical facilities in conjunction with local development activity should be coordinated if the City of Tualatin is to develop in an orderly and efficient way. Consequently, the plans proposed in the TSP should be considered in light of developing infrastructure sequencing plans, and may need to be modified accordingly.

6.14.2 Financially Constrained Capital Project Summary

The projects listed in Table 6-4 reflect the trade-offs made by the City between addressing transportation needs identified through the TSP process and the financial constraints faced by the City. These projects do not address all of the City's needs, but represent the most important projects that the City can reasonably expect to fund over the next 20 years, under the assumption of no new transportation revenue during that time.

The table is organized into four groups: short-term (0-5 years), mid-term (6-10 years), and long-term (11-20 years) projects, with an additional group of projects that will likely be funded when development occurs that triggers the need for that project. Each project is listed with a location, a short project description, the transportation modes served by the project, the project purpose, the project's estimated cost, and the anticipated funding source. Cost estimates reflect 2001 dollars, are unadjusted for inflation, and generally were developed by the RTP or City staff through prior transportation planning efforts.

Figure 6-9 illustrates the project locations. Each project is described briefly afterwards.

TABLE 6-4
TRANSPORTATION IMPROVEMENT PROGRAM SUMMARY

Figure 6-7 id #	Project Description	Modes Served	Purpose	Cost*	Funding Source(s)
		0-5 Years			
1	Wilsonville-Beaverton Commuter Rail *capital costs to start up service*	transit	mode choice, connectivity	$75,000,000	MSTIP, STIP
2	124th Avenue *new street, Leveton to Myslony, signal at Herman*	auto, ped, bike, rail	connectivity, safety	$6,500,000	LTIP
3	Lower Boones Ferry Road *center turn lane, bike lanes, sidewalks, Bridgeport to Boones Ferry*	auto, ped, bike, transit	safety, connectivity, capacity	$5,800,000	MSTIP
4	Boones Ferry Road *center turn lane, bike lanes, sidewalk, Lower Boones to Tualatin-Sherwood*	auto, ped, bike, transit	safety, connectivity, capacity	$7,000,000	CURP
5	Nyberg/I-5 interchange (#289) *southbound turn lanes, widen bridge*	auto, ped, bike	capacity	$4,000,000	CURP, STIP, SDC
6	Martinazzi Avenue *new southbound lane, Warrn Springs to Sagert*	auto, ped, transit	capacity, safety	$300,000	SDC
7	Grahams Ferry Road/Ibach Street *realign, signalize intersection*	auto, ped, bike	safety, capacity	$700,000	SDC
8	Herman Road/Teton Avenue *signalize intersection, railroad interconnect*	auto, ped, bike, rail	capacity, safety	$425,000	SDC
9	Sagert Street/Martinazzi Avenue *signalize intersection*	auto, ped, transit	capacity	$600,000	SDC
10	124th Avenue *additional travel lane at Highway 99W*	auto, transit	capacity	$270,000	LTIP
11	Tualatin-Sherwood Road/Boones Ferry Road *second westbound left-turn lane*	auto, transit	capacity	$700,000	SDC
12	Boones Ferry Road *interconnect signals south of Boones Ferry*	auto, transit	progress through traffic	$50,000	SDC (needs to be added)
13	Tualatin-Sherwood Road *interconnect signals west of Boones Ferry*	auto, transit	progress through traffic	$50,000	SDC (needs to be added)
14	Sagert Street *construct sidewalks on I-5 overpass*	ped	Pedestrian safety, connectivity	$13,500	SDC (needs to be added)

Figure 6-7 id #	Project Description	Modes Served	Purpose	Cost*	Funding Source(s)
15	Boones Ferry Road, Martinazzi Avenue *driveway restrictions*	auto, transit	safety, capacity	$7,500	SDC
16	Tualatin Town Center Refinement Plan to address RTP Area of Special Concern	Auto, transit, ped, bike	planning	$20,000	City
17	Durham Quarry Area Refinement Plan *Define road network and interchange improvements needed to accommodate quarry redevelopment*	auto, ped, bike, transit	refine TSP to address specific Quarry Area design and policy needs	$50,000	Development
25	Sagert Street *connect to 95th Place*	auto, ped, bike	connectivity	$75,000	SDC
26	95th Place *connect to Avery Street*	auto, ped, bike	connectivity	$50,000	SDC
30	Nyberg Street/65th Avenue/Nyberg Lane *signalize intersection or construct roundabout, sidewalks on Nyberg*	auto, ped, bike	capacity, safety	$650,000	SDC
31(a)	Boones Ferry Road *complete sidewalks, T-S Road to Avery Street*	ped	safety, connectivity	$250,000	SDC (needs to be added)
	6-10 Years				
18	124th Avenue *new street, Myslony to T-S Road, signal at T-S Road*	auto, ped, bike	connectivity	$5,150,000	LTIP
19	Herman Road *reconstruct, 108th to 118th*	auto, ped, bike, freight movement	modernization	$2,720,290	LTIP
36	Herman Road/108th Avenue *signalize, railroad interconnect*	auto, ped, bike, rail	capacity, safety	$200,000	LTIP
37	Herman Road/118th Avenue *signalize, railroad interconnect*	auto, ped, bike, rail	capacity, safety	$200,000	LTIP
20	Herman Road *reconstruct, Teton to 108th*	auto, ped, bike, freight movement	modernization	$920,000	SDC
21	Leveton Drive, 130th Avenue *new streets*	auto, ped, bike	connectivity, facilitate development	$1,961,400	LTIP & Development
22	SW 128th Avenue, Cummins Drive *new streets*	auto, ped, bike	connectivity, facilitate development	$3,001,750	LTIP & Development
23	105th Avenue-Blake Street-108th Avenue *realign curves*	auto, ped, bike	safety	$860,000	SDC

Figure 6-7 id #	Project Description	Modes Served	Purpose	Cost*	Funding Source(s)
11-20 Years					
27	Tualatin-Sherwood Road *widen to five lanes, Teton to Highway 99W*	auto, transit	capacity, freight movement	$25,000,000	MSTIP
28	Hall Boulevard *extend across Tualatin River*	auto, ped, bike, transit	connectivity, recreation, capacity	$25,000,000	MSTIP, STIP, CURP?, cities
29	Herman Road *reconstruct, Tualatin to Teton*	auto, ped, bike	modernization	$1,700,000	SDC
31(b)	Boones Ferry Road *complete sidewalks, Avery St to Tualatin High School*	ped	safety, connectivity	$250,000	SDC (needs to be added)
32	Sagert Street/65th Avenue *turn lane, signalize, interconnect with Borland Road/SW 65th Avenue intersection*	auto, ped, transit	capacity	$400,000	SDC
33	Tualatin-Sherwood Road *bike lanes, 90th-Nyberg*	bike	connectivity	$330,000	SDC (needs to be added)
34	Avery Street/Teton Avenue *signalize intersection*	auto, ped, bike	capacity	$200,000	SDC (needs to be added)
41	Loop Road	auto, ped, bike	connectivity	$2,500,000	CURP
Development-Related					
24	SW 125th Place *new street*	auto, ped, bike	connectivity, facilitate development	$360,000	Development
35	East-West Street in southwest residential Tualatin *new street, 108th to 112th Avenues*	auto, ped, bike	connectivity, facilitate development	$1,100,000	Development
38	Tualatin Road/108th Avenue *signalize*	auto, ped, bike, transit	capacity, safety	$200,000	Development
39	Cummins Drive/Cipole Road *signalize*	auto, ped, bike	capacity	$200,000	Development
40	Bridgeport Road *widen, based on findings from Quarry refinement study*	auto, ped, bike	capacity, connectivity, safety	TBD	Development

*2001 dollars; costs are not adjusted for inflation
MSTIP: Washington County Major Streets Transportation Improvement Program, STIP: Oregon Statewide Transportation Improvement Program, CURP: Central Urban Renewal Plan, LTIP: Leveton Tax Increment Plan, TGM: Oregon Transportation Growth Management Program, SDC: Systems Development Charge, TBD: to be determined.
The projects listed in each time period are for planning purposes only and may change by City Council direction to address development, funding opportunities, or community need.

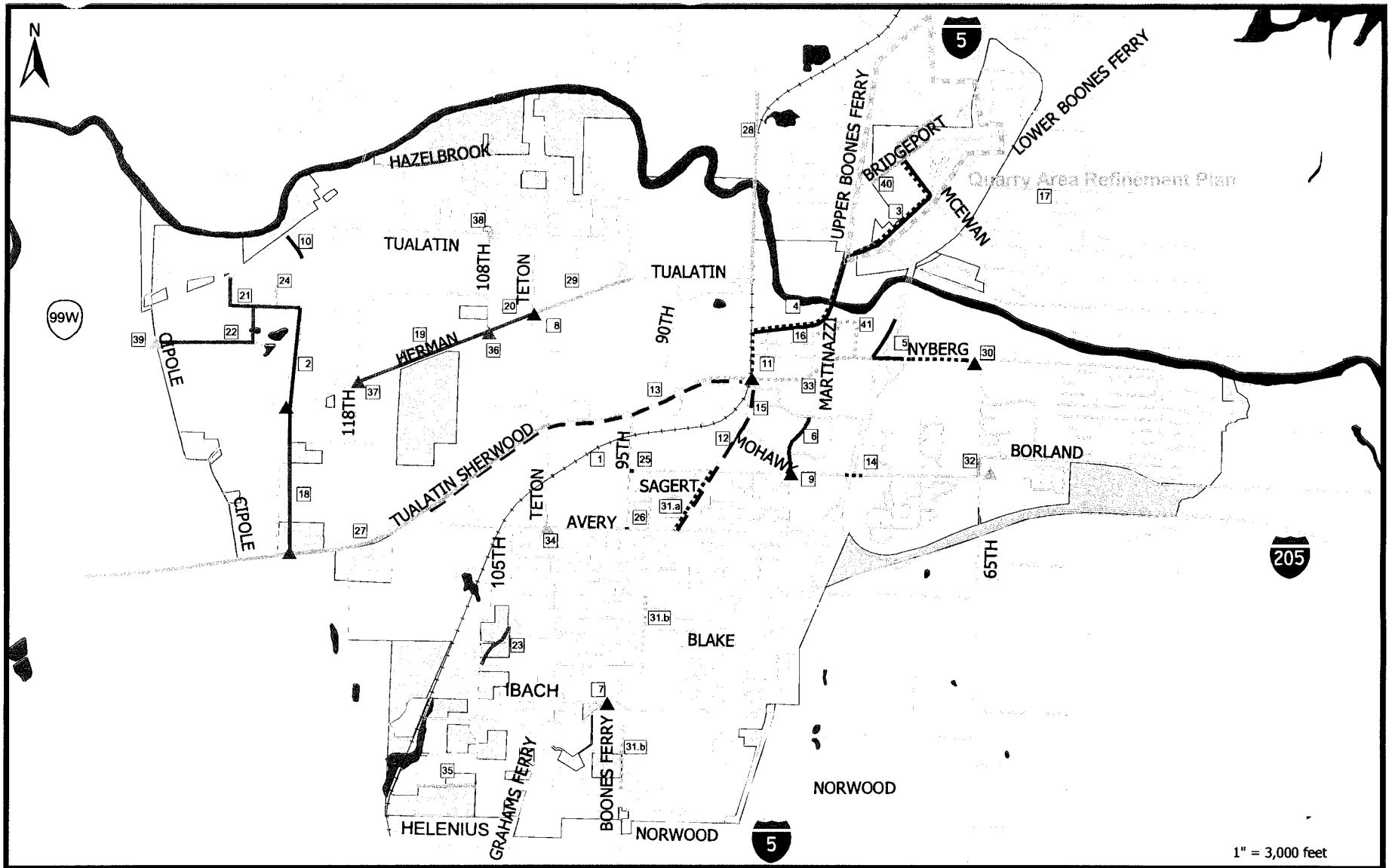


FIGURE 6-9

TUALATIN TRANSPORTATION SYSTEM PLAN

Financially Constrained TSP Projects

Recommended Projects	0-5 years	6-10 years	11-20 years	Development Related
New/Expanded Roadway	~	~	~	~
Bike/Ped Improvement	···	···	···	···
Signal Interconnect	//			
Commuter Rail	~			
Intersection Improvement	▲	▲	▲	▲

[#] Project ID # See Table 6-5
Water
City of Tualatin
Tualatin Planning Area

Wilsonville-Beaverton Commuter Rail

Peak hour commuter rail service along the rail line between Wilsonville and Beaverton, connecting to light rail at the Beaverton Transit Center. A station and small (100-150 space) park-and-ride lot should be located in downtown Tualatin west of Boones Ferry Road, near Tualatin-Sherwood Road.

SW 124th Avenue Extension - Northern Segment

To accommodate development in the industrial sector of Tualatin and to de-emphasize Tualatin Road's role in serving trips to and from the industrial area, SW 124th Avenue should be extended as a three-lane roadway from Leveton Drive south to Myslony Street, with right-of-way reserved for five lanes. The project should include bike lanes, sidewalks, and a traffic signal at Herman Road.

Lower Boones Ferry Road Improvements

To improve access to and from adjacent land uses, and to provide better accommodations for bicycle and pedestrian travel, Lower Boones Ferry Road between Bridgeport Road and Upper Boones Ferry Road should be widened from its current two-lane cross-section to provide a center turn lane, bicycle lanes, and sidewalks.

Boones Ferry Road Widening

Boones Ferry Road should be widened to three lanes between Lower Boones Ferry Road and Tualatin-Sherwood Road, including the Tualatin River Bridge. Pedestrian facilities should be completed and bicycle lanes widened or constructed. Turn lanes at the Martinazzi Avenue intersection should be lengthened to provide more storage, and the Tualatin Road signal should be upgraded.

Nyberg/I-5 Interchange (#289) Improvements

As one of only two major access points from I-5 to Tualatin, the Nyberg Road/I-5 interchange is forced to accommodate the majority of traffic traveling in and out of Tualatin. Consequently, the interchange experiences periods of major congestion, both on the I-5 southbound off-ramp and the Nyberg Road approaches. This project increases the interchange's capacity by adding a second left-turn lane to the southbound off-ramp, and widens the overcrossing to accommodate an additional lane in each direction.

Martinazzi Avenue Improvements

To increase the capacity of Martinazzi Avenue, a new southbound lane should be constructed from Warm Springs Street to Sagert Street, and the median at Mohawk Drive should be closed and a pedestrian refuge provided in the median at the existing crosswalk locations.

Grahams Ferry Road/Ibach Street Intersection Improvements

Ibach Street should be realigned to intersect Grahams Ferry Road at a 90-degree angle, and the intersection should be signalized.

Herman Road/Teton Avenue Intersection Signalization

To address capacity and safety issues, the Herman Road/Teton Avenue intersection should be signalized and interconnected with the adjacent railroad grade crossing.

Sagert Street/Martinazzi Avenue Intersection Signalization

To address existing capacity problems, and to facilitate pedestrian movement from residential areas south of Sagert Street to the Mohawk Park-and-Ride, the Sagert Street/Martinazzi Avenue intersection should be signalized.

SW 124th Avenue Widening at Highway 99W

An additional travel lane should be constructed on SW 124th Avenue between Tualatin Road and Highway 99W in order to provide additional capacity.

Tualatin-Sherwood Road/Boones Ferry Road Intersection Improvement

To improve intersection operations, a second westbound left-turn lane should be constructed from Tualatin-Sherwood Road to Boones Ferry Road, and Boones Ferry Road should be widened for a short distance to accommodate the second lane.

Boones Ferry Road Signal Interconnect

The existing interconnected signal system on Boones Ferry Road should be extended from Tualatin-Sherwood Road to Avery Street. This project will help progress the peak direction flow of traffic throughout the day.

Tualatin-Sherwood Road Signal Interconnect

The existing interconnected signal system on Tualatin-Sherwood Road should be extended from Boones Ferry Road to Avery Street. This project will help progress the peak direction flow of traffic throughout the day.

Sagert Street Pedestrian Improvement

To improve pedestrian travel between the east and west sides of I-5, sidewalks should be constructed on the Sagert Street overpass.

Boones Ferry Road, Martinazzi Avenue Access Management

To reduce delay, and improve roadway capacity and safety, driveways along Boones Ferry Road and Martinazzi Avenue previously identified by the City Engineer should be restricted to right-in, right-out movements.

Durham Quarry Refinement Plan

Addresses transportation system needs associated with the redevelopment of the Durham Quarry. The study area should encompass the area bounded by Upper Boones Ferry Road, Lower Boones Ferry Road, and SW 72nd Avenue, as well as the Lower Boones Ferry Road interchange area as far

east as McEwan Road. The study should include finalizing street classifications, identifying required future intersection and interchange improvements, facilitating access and improving the capacity of the Tualatin Park-and-Ride, and providing good pedestrian and bicycle circulation within the area.

SW 124th Avenue Extension - Southern Segment

SW 124th Avenue should be extended south from Myslony Street to Tualatin-Sherwood Road, providing an alternate truck route into the industrial area. Sidewalk, bike lanes, and a traffic signal at Tualatin-Sherwood Road should be included. SW 124th Avenue should be extended as a three-lane roadway with right-of-way reserved for five lanes.

Herman Road Reconstruction – Teton Avenue to SW 118th Avenue

Future development in the industrial sector of Tualatin will require improvements to Herman Road. This two-lane sub-standard roadway should be reconstructed between Teton Avenue and SW 118th Avenue to provide standard-width travel lanes, a center turn lane, bicycle lanes, a landscape strip, and a sidewalk on the side opposite the railroad tracks.

New Streets in the Industrial Sector

To help facilitate additional development in the industrial sector of Tualatin, several new streets should be constructed to the local commercial/industrial standard. These streets include an extension of Leveton Drive west of SW 124th Avenue, and construction of other connecting streets (SW 130th Avenue, SW 128th Avenue, SW 125th Place, and Cummins Drive).

SW 105th Avenue/Blake Street/SW 108th Avenue Improvements

Several sharp curves where SW 105th Avenue transitions into SW 108th Avenue create a potential safety concern, particularly as residential development continues in southwest Tualatin. The roadway should be reconstructed to increase the curve radii and to provide wider travel lanes, sidewalks, and bicycle facilities.

Sagert Street Extension

To promote east-west travel connectivity and improve emergency access, Sagert Street should be extended as its current cross-section west to connect to SW 95th Place.

SW 95th Place Extension

To promote north-south connectivity and improve emergency access, SW 95th Place, which currently ends in a cul-de-sac just north of Avery Street, should be extended as its current cross-section to connect the two streets.

Tualatin-Sherwood Road Widening

To improve capacity along this busy major arterial, Tualatin-Sherwood Road should be widened to five lanes between Teton Avenue and Highway 99W. This project should include bike lanes and sidewalks.

Hall Boulevard Extension

To provide an alternative north-south route across the Tualatin River, to relieve the high traffic demands on Upper Boones Ferry Road, to facilitate future transit service, and to provide pedestrian and bicycle access to Tigard's Cook Park, Hall Boulevard should be extended south from its present terminus north of the Tualatin River to connect to Tualatin Road on the south side of the river. This extension should be constructed as a three-lane cross-section and provide bike lanes and sidewalks.

Herman Road Reconstruction - Teton Avenue to Tualatin Road

Future development in the industrial sector of Tualatin will require improvements to Herman Road. This two-lane sub-standard roadway should be reconstructed between Teton Avenue and Tualatin Road to provide two standard-width travel lanes, a center turn lane, bicycle lanes, a landscape strip, and a sidewalk on the side opposite the railroad tracks.

Nyberg Street/SW 65th Avenue/Nyberg Lane Intersection Improvement

To improve the safety and operations at this existing unsignalized intersection, either a traffic signal or roundabout should be installed. The project should also include completing the sidewalk system along Nyberg Street.

Boones Ferry Road Sidewalk Completion

Several gaps in the sidewalk network exist at key points along Boones Ferry Road, which passes by two schools and also has transit service. To ensure a well-connected sidewalk network, new sidewalks should be constructed to fill in these gaps.

Sagert Street/SW 65th Avenue Intersection Improvement

To improve capacity, the Sagert Street/SW 65th Avenue intersection should be signalized, a new northbound left-turn lane should be constructed on SW 65th Avenue, and the signal should be interconnected with the Borland Road/SW 65th Avenue signal.

Tualatin-Sherwood Road Bike lanes

To complete a system of east-west bike lanes between Sherwood and Tualatin, bike lanes should be constructed along Tualatin-Sherwood Road between SW 90th Avenue and Nyberg Street.

Avery Street/Teton Avenue Intersection Improvement

To improve safety and intersection operations, a traffic signal would be installed at this intersection.

Herman Road/SW 118th Avenue Intersection

To improve safety and intersection operations, a traffic signal would be installed at this intersection.

Development Related Improvement Projects

In addition to the above list of improvement projects, additional transportation improvement projects have been identified that would most likely be constructed as a result of development related projects. These projects include:

- Construct SW 125th Place.
- A new east-west street connecting SW 108th Avenue to SW 112th Avenue. This project provides connectivity within a future residential development.
- Signalizing the Tualatin Road/SW 108th Avenue intersection. The signal would be warranted based on increasing traffic volumes and poor sight distance for northbound traffic.
- Signalizing the Cummins Drive/Cipole Road intersection.
- Based on the results of the Quarry Area Refinement Plan, Bridgeport Road would be widened to the appropriate City standards.

6.14.3 Priority Project Summary

Table 6-5 identifies additional projects required to fully address the City's long-term transportation needs, but for which no current funding sources have been identified. In some cases, *potential* alternative funding sources have been identified. Should future transportation funding increase above the levels assumed in this TSP, this list can be used as a starting point to prioritize additional projects. Some projects on this list may also be appropriate for development-based funding, depending on the relationship of the development's transportation impacts to the project. Figure 6-10 presents the Priority System TSP Projects.

6.14.4 Traffic Signal Plan

Figure 6-11 shows Tualatin's proposed future traffic signals. This list represents those traffic signals that have been identified as part of the Tualatin TSP. Due to the potential for shifting or unanticipated development, other traffic signal locations may be added based on the findings from a detailed traffic operations and safety analysis.

TABLE 6-5
PROJECTS UNFUNDED OR REQUIRING NEW FUNDING SOURCES

Project Description	Modes Served	Purpose	Cost*
Recreation SDC or Bond			
SW 108th Avenue ped/bike bridge	ped, bike	recreation, connectivity	$450,000
Tualatin River pathway	ped, bike	recreation	$2,500,000
SW 65th Avenue ped/bike bridge	ped, bike	recreation, connectivity	$450,000
Nyberg Creek pathway	ped, bike	recreation, connectivity	$170,000
Pedestrian trail system completion (6 projects)	ped	recreation	$625,000
Unfunded Industrial Area Projects			
Herman Road/Cipole Road *realign, signalize intersection, railroad interconnect*	auto, ped, bike	capacity, safety	$1,800,000
Myslony Street *extend to Tualatin-Sherwood Road*	auto, ped, bike	connectivity	$1,880,000
Cipole Road *widen to three lanes, Highway 99W to T-S*	auto, ped, bike, freight movement	capacity, modernization	$6,000,000
Herman Road *reconstruct, Cipole Road to SW 124th Avenue*	auto, ped, bike, freight movement	modernization	$920,000
Herman Road *reconstruct, 118th Avenue to SW 124th Avenue*	auto, ped, bike, freight movement	modernization	$1,250,000
Leveton Road *widen to five lanes, SW 108th and SW 118th*	auto, ped, bike, freight movement	capacity	$1,000,000
SW 108th Avenue *widen to five lanes, Leveton to Herman*	auto, ped, bike, freight movement	capacity	$500,000
Herman Road *widen to five lanes, SW 108th and Teton*	auto, ped, bike, freight movement	capacity	$900,000
STIP/Federal Earmark			
I-5/Highway 99W Connector	auto, freight movement	capacity, reduce auto & truck delays	$250,000,000
I-205 *widen to six lanes, I-5 to Stafford Road*	auto, freight movement	capacity, safety	$6,100,000

Project Description	Modes Served	Purpose	Cost*
Lower Boones Ferry Road interchange (#290) *reconstruct with loop ramps*	auto, transit	capacity	TBD
LID			
SW 93rd Street *complete to City standards*	auto, ped, bike	modernization	$150,000
Unfunded, Other Priority Projects			
Boones Ferry Road/Blake Street *construct turn lanes, signalize*	auto, ped, bike	safety, capacity	$1,200,000
Teton Avenue *bike lanes, Herman Road to T-S*	Bike	connectivity, safety	$750,000
McEwan Road *widen to three lanes, Lower Boones Ferry to city limits*	auto, ped, bike	capacity, modernization	$2,300,000
Avery Street/SW 105th Avenue *signalize*	auto	capacity	$150,000
Unfunded, Other Desirable Projects			
Lower Boones Ferry Road *extend across Tualatin River*	auto, ped, bike	capacity, connectivity	$14,000,000 + right-of-way
Boones Ferry Road *widen to five lanes, T-S to Sagert*	auto, ped, bike, transit	capacity	$3,000,000
Nyberg Street *bike lanes, T-S to SW 65th Avenue*	bike	connectivity	$850,000
Borland Road *bike lanes*	bike	connectivity	$1,500,000
SW 65th Avenue *extend across Tualatin River*	auto, ped, bike	capacity, connectivity	$10,000,000
SW 65th Avenue *bike lanes, Nyberg to Borland*	bike	connectivity	$700,000
SW 95th Avenue *extend to SW 90th Avenue*	auto, ped, bike	connectivity	$500,000
Highway 99W *sidewalks, north city limits to south city limits*	ped	connectivity	$1,100,000
SW 105th Avenue *sidewalks, west side*	ped	connectivity	$84,000

Project Description	Modes Served	Purpose	Cost*
Tualatin Road/Teton Avenue *signalize*	auto	capacity	$150,000
Leveton Drive/SW 108th Avenue *signalize*	auto	capacity	$150,000
Borland Road/Wilke Road *signalize*	auto	capacity	$150,000
Grahams Ferry Road/Helenius Road *signalize*	auto	capacity	$150,000
Avery Street/Teton Avenue *signalize*	auto	capacity	$150,000
Highway 99W/SW 130th Avenue *signalize*	auto	capacity	$150,000
Central design district pedestrian street enhancements	pedestrian	safety	$2,600,000
Highway 99W *widen to six lanes, Cipole Road to the Tualatin River*	auto	capacity	$4,000,000
Tualatin Road *widen to five lanes, Herman to Boones Ferry*	auto	capacity	$2,500,000
Boones Ferry Road *widen to five lanes, Avery to Ibach*	auto	capacity	$2,600,000
SW 65th Avenue *widen to five lanes, Sagert to Nyberg*	auto	capacity	$2,300,000
Borland Road *widen to five lanes east of Wilke*	auto	capacity	$1,300,000
Nyberg Road *widen to seven lanes, Martinazzi to I-5*	auto	capacity	$700,000
Sagert Street *widen to five lanes, Martinazzi to SW 65th*	auto	capacity	$2,300,000 + bridge widening
SW 90th Avenue *widen to five lanes, Tualatin to Tualatin-Sherwood*	auto	capacity	$1,200,000

*2001 dollars; costs are not adjusted for inflation

MSTIP: Washington County Major Streets Transportation Improvement Program, STIP: Oregon Statewide Transportation Improvement Program, CURP: Central Urban Renewal Plan, LTIP: Leveton Tax Increment Plan, TGM: Oregon Transportation Growth Management Program, SDC: Systems Development Charge, TBD: to be determined

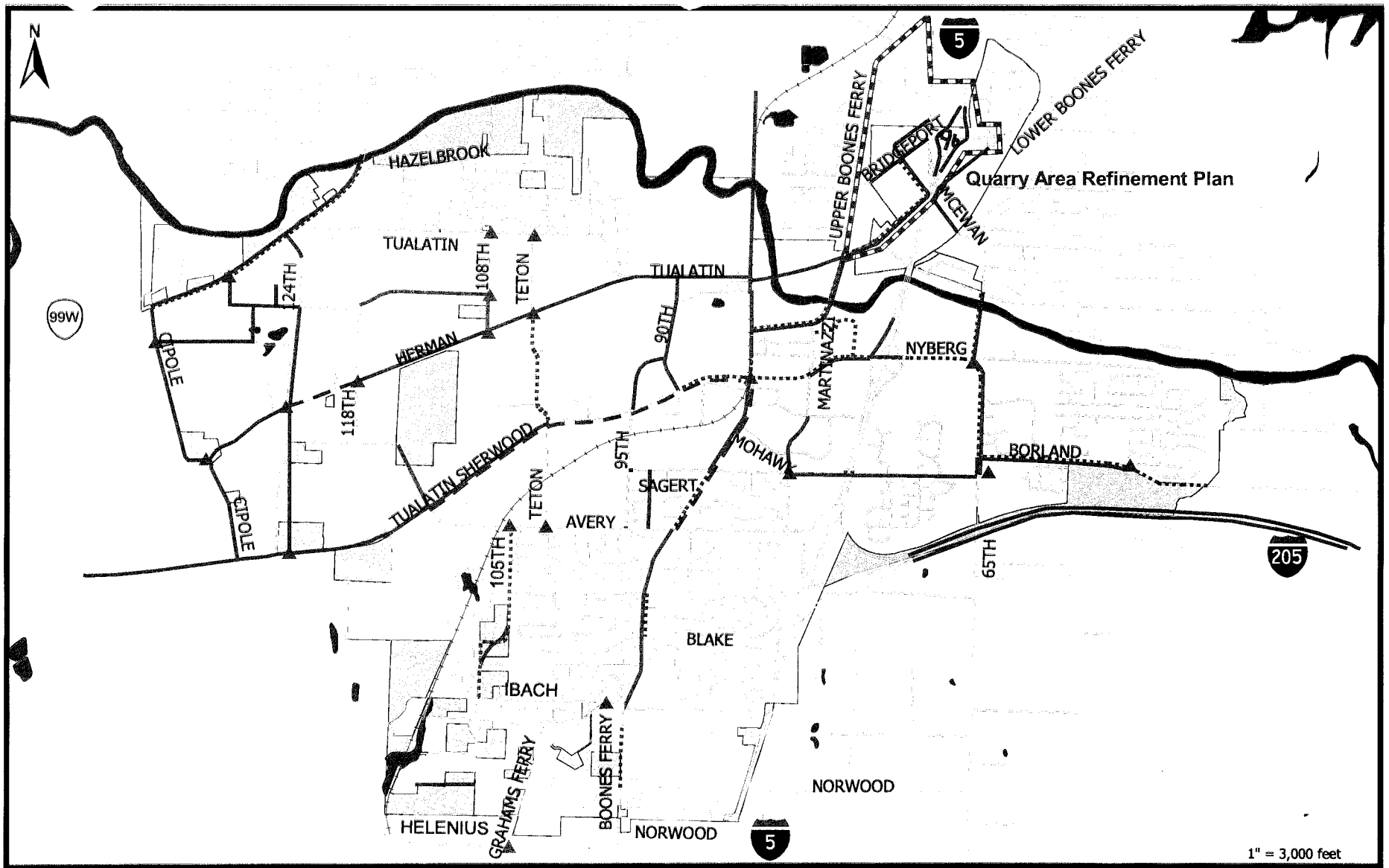


FIGURE 6-10

TUALATIN TRANSPORTATION SYSTEM PLAN

Priority TSP Projects

New/Expanded Roadway
Bike/Ped Improvement
Signal Interconnect
Commuter Rail
Intersection Improvement

Water
City of Tualatin
Tualatin Planning Area

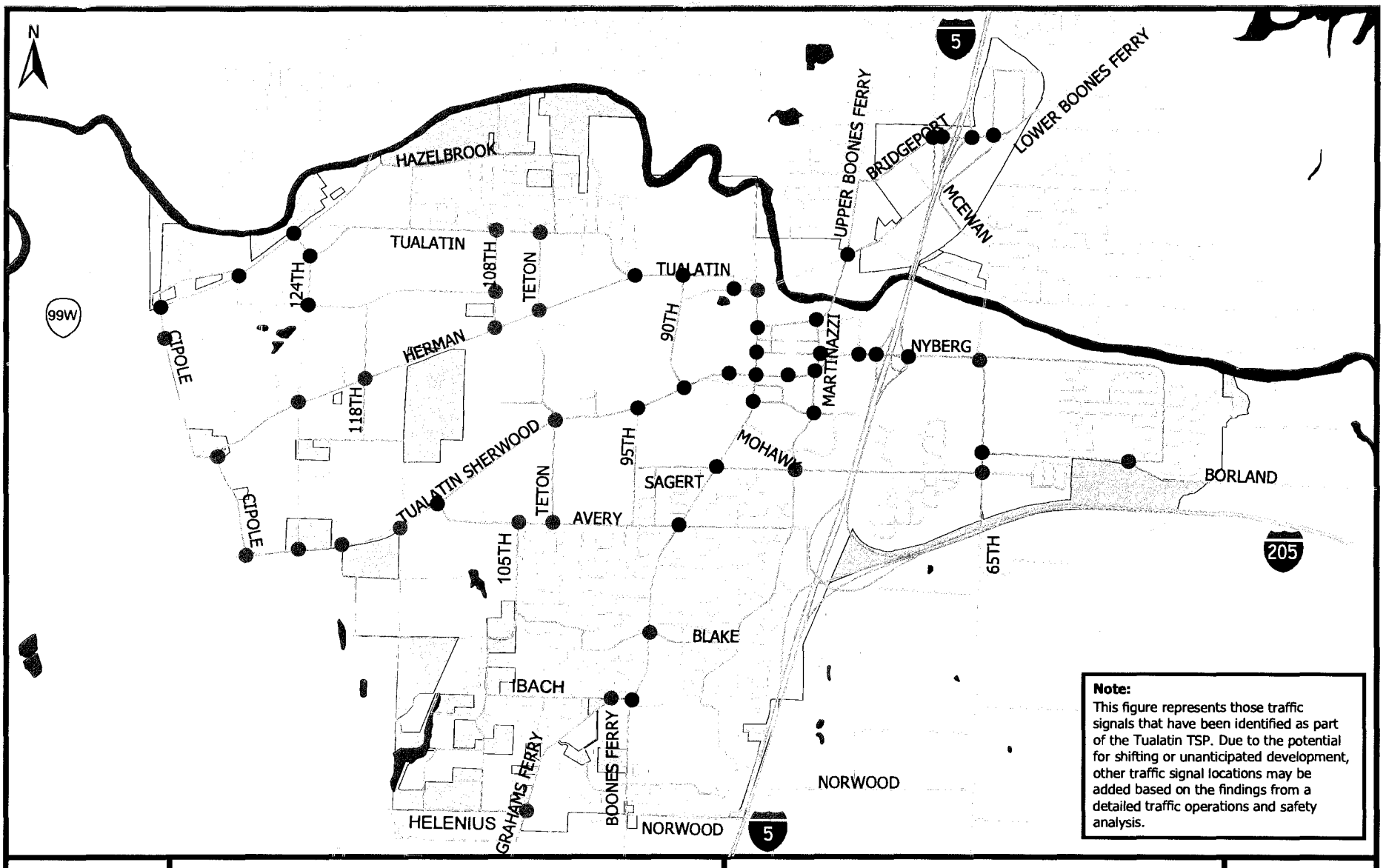


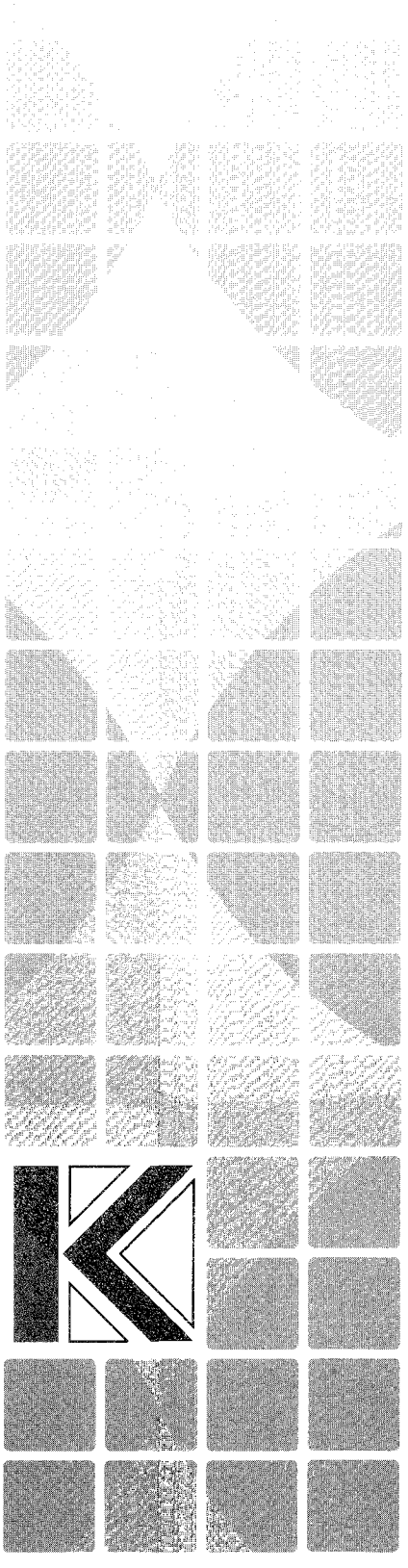
FIGURE 6-11

TUALATIN TRANSPORTATION SYSTEM PLAN

Traffic Signal Plan

- Existing Traffic Signal
- Proposed Traffic Signal
- Future Roadway Network
- Water
- City of Tualatin
- Tualatin Planning Area

1" = 3,000 feet



Section 7

Transportation Funding Plan

Transportation Funding Plan

7.1 INTRODUCTION

The Transportation Planning Rule (OAR 660-12-040) requires that the Tualatin Transportation System Plan (TSP) include a transportation financing program. These programs are to include:

- a list of planned transportation facilities and major improvements;
- a general estimate of the timing for planned transportation facilities and major improvements;
- determination of rough cost estimates for the transportation facilities and major investments identified in the TSP (intended to provide an estimate for the fiscal requirements to support the land uses in the acknowledged comprehensive plan and allow jurisdictions to assess the adequacy of existing and possible alternative funding mechanisms; and
- a discussion of existing and potential financing sources to fund the development of each transportation facility and major improvement (which can be described in terms of guidelines or local policies).

The timing and financing provisions in the transportation financing program are not considered a land use decision as defined by the TPR and ORS 197.712(2)(e) and, therefore, cannot be the basis of appeal under State law. In addition, the transportation financing program is intended to implement the comprehensive plan policies, which provide for phasing of major improvements to encourage infill and redevelopment of urban lands, prior to facilities that would cause premature development of urbanizable areas or conversion of rural lands to urban uses.

The Transportation Funding Plan of this report presents the funding analysis performed for this TSP that was used to develop the "budget" for the financially constrained capital project list presented in Section 6. This analysis provides an overview of transportation funding in the State of Oregon and current and historical funding levels for transportation in the City of Tualatin.

7.2 TRANSPORTATION FUNDING HISTORY

The following is a brief summary of revenues and expenditures for the City of Tualatin for transportation facilities, based on the fiscal year 1999-2000, and for other jurisdictions during the recent period from 1993 through 1999.

7.2.1 City of Tualatin

The City's Street Fund typically receives annually $2.0-2.2 million in revenue dedicated to the City's transportation facilities. The majority of this revenue is used for operations and maintenance, with only traffic impact fee revenue dedicated to capital projects (new construction). Table 7-1 shows the various sources of revenue that make up the annual Street Fund budget.

TABLE 7-1
SOURCES OF STREET FUND - FISCAL YEARS 1999-2005

Source	1999-2000	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005
Beginning Fund Balance	$2,660,160	$1,121,720	$120,160	$189,460	$113,570	$114,820
State Gas Tax	$950,000	$906,310	$898,970	$899,470	$921,970	$944,990
Washington County Gas Tax	$100,000	$75,000	$75,000	$75,000	$75,000	$75,000
Road Utility Fees	$570,000	$584,250	$598,860	$613,830	$629,170	$644,900
Traffic Impact Fees	$577,680	$276,610	$283,520	$290,610	$297,880	$305,320
Transfer from State Revenue Share	$0	$270,570	$72,140	$0	$0	$0
Miscellaneous & Interest	$60,050	$83,300	$62,680	$70,320	$49,370	$73,460
Miscellaneous	$3,700,000*	$4,345,000*	$1,220,000*	$115,000	$85,000	$70,000
Total	**$8,617,890**	**$7,662,760**	**$3,331,330**	**$2,253,690**	**$2,171,960**	**$2,228,490**

*Transfer of Washington County MSTIP funds for Tualatin Road construction

As shown in Table 7-1, the main transportation funding sources come from the City's share of State and Washington County gas taxes, "road utility fees" paid by city residents and businesses for road maintenance in proportion to their property's trip generation (included as part of sewer and water bills), and traffic impact fees paid by new development. Combined, these sources contribute approximately $2 million per year to the street fund. Additional income, varying significantly from year to year, comes from State revenue sharing, interest earned, and other miscellaneous sources such as project funding transferred from the County to the City. An average of approximately $720,000 in surplus historically has been rolled over to the following year as a reserve fund.

Historically, Tualatin has had enough revenue to complete maintenance and preservation projects throughout the city street network. However, as the TSP process has shown to date, future growth will require the need for a number of significant roadway and intersection capital improvement projects throughout the city. City revenue available for these projects is projected to average $350,000 per year, representing approximately 15% of the City's total transportation budget. As many future project needs will occur on County and State facilities, as a result of growth in regional traffic, subsequent sections of this memorandum look at these agencies' recent funding history.

The City of Tualatin has a five-year Capital Improvement Plan covering both road operating costs (e.g., pavement maintenance), and capital improvements (e.g., new signals). The former is funded by state and county gas taxes and road utility fees; the latter is funded by System Development Charges and transfers from the road operating fund. Capital projects programmed through the 2004-05 fiscal year consist of the following:

2000-01

- Grahams Ferry Road/Ibach Street signal ($500,000)
- Tualatin Road (Washington County MSTIP 3 funds managed by the City)
- Driveway turn restrictions on Boones Ferry Road and Martinazzi Avenue ($7,500)
- Matching funds for ODOT I-5/Nyberg Street interchange construction ($80,000)
- Widen Martinazzi Avenue from Warm Springs Street to Sagert Street, Phase 1 ($300,000)
- Tualatin-Sherwood Road/Boones Ferry Road, second westbound left-turn lane ($100,000)

2001-02

- Nyberg Street/Nyberg Lane/SW 65th Avenue signal ($500,000)

2002-03

- Widen Martinazzi Avenue from Warm Springs Street to Sagert Street, Phase 2 ($425,000)

2003-04

- Avery Street/Teton Avenue signal ($425,000)

2004-05

- Herman Road/Teton Avenue signal ($425,000)

The Leveton Tax Increment District will fund three projects in the 2001-06 timeframe, as listed below:

2001-2002

- Construct SW 124th Avenue between Leveton and Myslony ($5,500,000)

2003-2004

- Construct additional travel lane on SW 124th Avenue at Highway 99W ($320,000)

2005-2006

- Construct SW 124th Avenue between Myslony and Tualatin-Sherwood ($4,400,000)

Other roadway projects west of SW 124th Avenue are expected to be funded through the Leveton Tax Increment District in the 2006-10 timeframe.

The Central Urban Renewal District will fund roadway widening and pedestrian and bicycle facilities on Boones Ferry Road between Lower Boones Ferry Road and Tualatin-Sherwood Road during the 2001-06 timeframe, at a cost of $5,380,000. The district may also contribute to I-5 Nyberg interchange improvements.

7.2.2 Washington County

Washington County's Major Streets Transportation Improvement Plan (MSTIP) funds major capital projects within the County. The program is currently in its third round, with projects funded through the 2006-07 fiscal year. The program was originally a serial property tax levy, requiring voter approval for each round of projects. However, as a result of Measure 50, which was passed by Oregon voters in 1998, it is now part of the County's permanent tax rate. Historically, MSTIP projects have been on County facilities, (including a MSTIP 1 project to improve Tualatin-Sherwood Road), but the next round of projects may include state highway and transit projects, as discussed below.

The MSTIP 3 program includes two projects in Tualatin:

- Lower Boones Ferry Road, between Bridgeport Road and Boones Ferry Road. This project, scheduled for 2005, will provide a three-lane cross-section throughout this section of road, sidewalks, bicycle lanes, street lighting, and intersection improvements. The estimated project cost is $5.8 million.
- Tualatin Road, between SW 115th Avenue and Boones Ferry Road, was reconstructed in 2000, including center turn lanes, sidewalks, bicycle lanes, street lighting, and some intersection improvements. The estimated project cost was $8 million.

The County is currently considering extending the MSTIP program through the 2010-11 fiscal year. One of the projects proposed to be included is $32 million towards a Wilsonville-Beaverton commuter rail line, with the remaining $50 million coming from state and federal sources. In order to meet a 2002 construction schedule, the County would bond the commuter rail funding, to be paid back from property tax revenue in the 2006-11 timeframe. No other MSTIP projects have been identified for Tualatin through 2011. Through the completion of MSTIP 3 in 2006, Washington County will have spent approximately $20 million on projects located within Tualatin, an average of $1 million per year.

7.2.3 Clackamas County

Clackamas County's Capital Improvement Plan consists of a five-year transportation funding program, and a twenty-year long-range plan. No improvements are identified to County roads within Tualatin under either plan. However, the Planned Bikeway Network section of the Plan does include a proposed bikeway along Borland Road and SW 65th Avenue in Tualatin.

East of Tualatin, the Borland Road/Stafford Road intersection (Wankers Corner) is identified for signalization and left-turn lanes in the five-year future. However, only $500,000 in County System Development Charge funds are committed to the project, leaving an estimated $1,000,000 budget shortfall. In the twenty-year future, Stafford Road is identified to be reconstructed and widened between I-205 and Rosemont Road, at an estimated cost of nearly $5 million.

7.2.4 State of Oregon

State funding for transportation is generally divided into two categories, road-related funding and transit funding. Road-related funding includes investments in pedestrian and bicycle facilities, because these facilities are frequently included as a design element of the typical roadway cross-section that is being maintained, reconstructed, or built. Transit funding is specifically separated

because state gas tax revenues may not be expended on transit facilities or services. The following sections provide summaries of past and future state funding sources available to Tualatin and other jurisdictions.

Road-Related Funding

Past Funding Sources

The most significant portion of Oregon's highway user taxes and fees come from federal fuel and vehicle taxes, state taxes, and general motor vehicle fees. These categories account for 32 percent, 34 percent, and 25 percent, respectively, of all highway user taxes and fees collected in the State. Through the fiscal year 1998, the matching ratio in Oregon for Interstate Funds was: Federal 92.22 percent and State 7.78 percent.

During the 1980s, Oregon's transportation budget was bolstered by a series of two-cent annual gas tax increases. At the same time, the Federal Government was increasing investment in highways and public transportation. The situation is different today. The last three Oregon Legislatures have failed to increase the gas tax and federal budget cuts are reducing transportation funding available to Oregon. The State Highway Fund is further losing buying power because the gas tax is not indexed to inflation, and increased fuel efficiency of vehicles reduces overall consumption. Nevertheless, fuel taxes are still the largest single source of highway revenues at approximately $390 million annually. Weight-mile taxes levied on trucks are the second largest source of revenue to the Highway Fund, at approximately $215 million annually.

Oregon Highway Trust Fund revenues are distributed among state (60.05 percent), county (24.38 percent) and city (15.57 percent) governments to fund their priority road needs. Under the 1999-2001 Department of Transportation budget adopted by the state legislature, a total of $2.38 billion revenue dollars was identified. Of the total available revenue, approximately $327 million dollars was allocated to counties and $195 million to cities.

Oregon law allows local governments to levy local fuel taxes for street related improvements, in order to supplement the state funding. Multnomah and Washington Counties, and some small cities (Tillamook, The Dalles, Woodburn) have used this authorization. Several attempts have been made by other jurisdictions, but have not been supported by the local electorate. As few local governments have implemented this option, non-user road revenues tend to be relied upon to supplement the funds received from state and federal user revenues. Other local funding sources have included property tax levies, local improvement district assessments, bonds, traffic impact fees, road user taxes, general fund transfers, receipts from other local governments, and other miscellaneous sources.

Oregon's current fee for cars and other light vehicles weighing 8,000 pounds or less is $30 biennially. Oregon law permits local governments (counties) and government entities to impose local option vehicle registration fees. To date, no county has implemented this tax.

Cities in Oregon have relied more on transfers from their general funds to support roadway improvements, than have counties. However, Ballot Measure 5, approved by the voters in 1990, reduced the range of funding and financing options available to both cities and counties. Measure 5 limited the property tax rate for purposes other than for payment of certain general obligation indebtedness to $15 per $1,000 of assessed value. The measure further divided the $15 per $1,000

property tax authority into two components: $5 per $1,000 dedicated to the public schools; the remaining $10 dedicated to other local government units, including cities, counties, special service districts, and other non-school entities. The tax rate limitation for cities and counties went into effect in July 1991. The school portion of the measure was phased in over a five-year period beginning in July 1991.

In 1996, voters again approved a property tax limitation measure, Ballot Measure 47, which further impacted the ability of cities and counties to pay for needed infrastructure through historic or traditional means. Subsequently, Ballot Measure 50 was approved by Oregon voters in May of 1997 and, through implementing legislation, became law in July 1997. Ballot Measure 50 repealed Measure 47 and made efficiency changes to Measure 5. Measure 50 limits taxes on each property by rolling back the 1997-1998 assessed value of each property to 90 percent of its 1995-1996 value. Measure 50 also limits future growth on taxable value to three percent per year, with exceptions for new construction, remodeling, subdivisions, and rezoning. Permanent tax rates for Oregon's local taxing districts are also established in Measure 50 that replace the former tax base amounts of the district. Measure 50 allows voters to approve new short-term levies outside the permanent rate limit if approved by a double majority.

At the same time that increased growth and increased transportation demands are occurring, cities and counties have lost another traditional source of revenue for infrastructure construction and modernization, namely timber harvest receipts. Under a 1993 negotiated mitigation plan, federal forest receipts to support county roads are decreasing 3 percent per year. In 1996, counties received 74 percent of their 1986-90 average receipts, and by 2003 they will receive 55 percent of the late 1980s average receipts.

Given this funding environment, current funding levels and sources are not adequate to meet the transportation needs of the state, counties, or cities, for the next 20 years. In response to this gap between needs and funding, Governor Kitzhaber organized the Oregon Transportation Initiative to look at statewide transportation needs and to develop a program to address how these needs will be met. Through a public process led by business and civic leaders across the State, findings and recommendations on the state of transportation needs and methods to address those needs was submitted to the Governor in July 1996.

One result of these recommendations was the appointment of a committee to develop a legislative proposal to the 1997 Legislature regarding transportation funding. Part of that proposal included a process for identifying a "base" transportation system, with priority given to maintenance, preservation, and operation of a system of transportation facilities and services that ensures every Oregonian a basic level of mobility within and between communities. Other components included provisions for realizing efficiencies resulting from better intergovernmental cooperation (shared resources and equipment, better communication on project needs and definition), and elimination of legislative barriers to more efficient and cost-effective methods of providing transportation services. The State Legislature was unable to reach consensus on the means of collecting and distributing the funds, and the package failed.

The 1999 Legislature reviewed a proposal for a 4-cent gas tax increase that included a $10/year vehicle registration fee increase. This passed the Legislature; however, it was still forwarded as a ballot measure on the May 2000 ballot and failed with the voters.

Future Funding Sources

A part of future transportation funding will include identifying relationships and responsibilities relative to the delivery of projects and services. In Oregon, the primary state role has been to construct and maintain the state highway system and to assist local government with funding other modes. The State also has a role in intercity passenger services and airports. Historically, this role has been minor, but could grow significantly, if serious efforts were put into intercity transportation improvements. Local governments provide local transit and airport support, in addition to providing maintenance, preservation, and construction for local roads, streets, and bridges. The Federal Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) began moving decision-making for federal programs to states and this program and other state policies incorporated in the Oregon Transportation Plan (OTP) encourage reassessment of responsibilities and obligations for funding. The Transportation Equity Act for the 21st Century (TEA-21), passed in 1998, has continued the efforts first initiated by ISTEA.

These changing relationships have resulted in two significant issues for State and local governments. First, there is no clear definition of State responsibility. At one time, the State operated on an informal consensus that it should provide one-half the match on federally funded, local, and other projects that served statewide needs. No similar consensus seems to exist today. The State's responsibility for transit, airports, and other local transportation infrastructure and services is not clear. The question of regional equity is raised in considering high-cost project needs, such as the Bend Parkway or the Portland-area light rail program. Regional equity will probably require consideration of all modes together, because different regions may have different modal needs and financial arrangements.

Given this dynamic transportation funding environment, it is clear that local governments need to reassess traditional methods of funding projects and look creatively at ways to meet public expectations of high quality transportation services.

State Transit Funding

Transit service in Oregon has evolved from private development and reliance on user fees for operating revenue, to public ownership with public subsidy for operations. No clear philosophy of the State role in providing transit services is evident. The State has used general funds, lottery funds, cigarette tax revenue, and other funds at various times to support transit service. These efforts have largely been targeted towards supplying half the required match to federal capital improvement grants. To date, the State has provided no operating funds for transit, other than for the elderly and disabled program. The State role has been one of granting authority to local governments to raise locally generated operating revenue.

While the state's role in transit funding is limited, the ODOT Public Transit Section does administer three public transit funding sources passed through from the federal government. These include Non-Urbanized Area Formula Program (Section 5311, formerly Section 18), the Special Transportation Fund (STF), and the Elderly and Persons with Disabilities Program (Section 5310, formerly Section 16(b)(2)).

The Small and Rural Transit Assistance Program is a federally funded initiative that provides capital to operate and acquire vehicles for public transportation systems in cities with populations of less than 50,000 and in rural areas. The Special Transportation Fund is intended to fund transportation for elderly and disabled citizens and is also funded through the State cigarette tax.

Funding for the purchase of vehicles and equipment for special transportation providers (i.e., serving the elderly and disabled) is provided through the Elderly and Persons with Disabilities Program.

7.2.5 Transit Districts

The formation, governance, and financing authority of transit districts is addressed in Chapter 267 of the Oregon Revised Statutes. The Tri-County Metropolitan Transportation District of Oregon (Tri-Met) was organized under the provisions of ORS 267 to provide mass transit services to Multnomah, Washington, and Clackamas Counties. The formation of the District became effective October 14, 1969 with the assumption of the operation of a privately owned bus system. Since the formation of Tri-Met, three areas have withdrawn from the District to form their own transit districts: Wilsonville, in 1989; South Clackamas County (Molalla), in 1989; and Sandy, in 2000.

Under the provisions of ORS 267.250(1), Tualatin is not eligible to withdraw from the Tri-Met District because it does not meet the definition of an "affected area"—an area at least one square mile in size, containing at least 200 residents, and outside a city of greater than 10,000. For the year 2001, a law passed by the 1999 Oregon Legislature provides an opportunity for most cities between 10,000 and 15,000 population to withdraw from a transit district; however, Tualatin would not qualify under this law. ORS 267.253(2) states that a petition for withdraw may be filed only during the time period January 1-August 31, 2001 and every fifth calendar year thereafter.

Tri-Met's revenue, along with the revenue of other Oregon transit districts, comes primarily from a payroll tax assessed on employers located within the district. Under Oregon law, the maximum initial tax rate is set at 0.6% of each dollar of payroll, but can be increased to compensate for the loss of revenue when areas withdraw from the district. Tri-Met's current tax rate is 0.6195%, reflecting the withdrawal of the areas listed above.

Sources of Tri-Met revenue for the fiscal year ending June 30, 2000, not including federal capital grants for light rail construction, consisted of:

- Payroll tax (62%)
- Passenger fares (18%)
- Federal operating grants (9%)
- Interest income (5%)
- Lease revenue (2%)
- Other income (4%)

Tri-Met's payroll tax rate cannot be increased further, although revenue will continue to increase if the Portland area's job growth continues. In recent years, Tri-Met has increased fares by five cents every two years to fund service increases (e.g., Westside light rail and bus operations) and to keep pace with inflation. Other revenue sources are not likely to increase in the foreseeable future. As a result, Tri-Met estimates that it will be able to increase service hours by approximately 1.5% per year into the future. Because increased traffic congestion is increasing bus travel times on routes by up to one minute per trip each year, much of this service increase is used up by the extra service required to maintain existing headways with longer travel times. Much of the remaining revenue is

used for service increases to accommodate increased passenger volumes on popular routes. No new routes are anticipated in Tualatin for the foreseeable future.

7.3 ESTIMATE OF CAPITAL PROJECT REVENUE THROUGH 2020

The TSP assumes that no new revenue sources will be developed, and that existing sources will continue at current levels, with adjustments for inflation. Table 7-2 estimates the amount of revenue for capital projects within the Tualatin Planning Area that will be available from various sources.

TABLE 7-2
CAPITAL PROJECT FUNDING ESTIMATES, 2001-2020

Source	2001-2005	2006-2010	2011-2020
Tualatin Road Operating Fund	see list in Section 4.3.1	$0	$0
Tualatin Road/SDC Fund		$350,000/year	$350,000/year
Central Tualatin Urban Renewal District	Boones Ferry widening (Lower Boones to T-S)		$0
Leveton Tax Increment District	124th Ave., Leveton to T-S 124th Ave., at Hwy. 99W	Leveton & 130th Cummins & 128th	$0
Washington County	see list in Section 4.3.2	Commuter rail	$10,000,000*
Clackamas County	$0	$0	$0
State/Federal	I-5/Nyberg interchange I-5/99W Connector design	Commuter rail I-5/99W Connector construction**	$0

*assumes continuation of MSTIP program at past levels; funds for use on regional (primarily County) roadways
**assumes continued designation as a "High Priority" project as part of TEA-21 reauthorization

As shown in Table 7-2, short-term revenue for capital projects (through the year 2005) is already committed to specific projects through various capital improvement programs, although some flexibility often exists to substitute other projects in future program updates. In the longer term, it is assumed that Tualatin Road Operating Fund revenue will be used exclusively for operations and maintenance, and that none of this revenue will be transferred to the SDC fund for capital projects. City SDC revenue is anticipated to average $350,000 per year, although this amount will vary from year to year, depending on the amount of development activity occurring in the City. The City's two urban renewal districts are expected to have completed their projects by 2010. Washington County is assumed to provide an average of $1 million per year to Tualatin projects after the completion of MSTIP 4 in 2011; this revenue would take the form of one or two large projects. Clackamas County transportation planning documents do not identify any transportation projects within Tualatin through 2020; therefore, no Clackamas County revenue is assumed. State funding is prioritized through Metro based on the RTP; Wilsonville-Beaverton commuter rail is the only longer-term regional project identified in the financially constrained RTP within Tualatin. Federal funding may be available towards construction of the I-5/Highway 99W connector, depending on the success of Oregon's Congressional delegation in extending its "High Priority" project designation.

7.4 POTENTIAL TRANSPORTATION FUNDING SOURCES

There are a variety of methods to generate revenue for transportation projects. Appendix "E" (Table E-1) provides a summary of federal, state, and local highway, bridge, sidewalk, and bicycle funding programs that have been used in the past. Although property tax is listed as a possible revenue source, the impacts of Ballot Measures 47 and 50 severely limit the opportunities for this funding source.

Table E-2 in Appendix "E" presents details of the revenue sources for streets, bridges, sidewalk, and bicycle facilities currently used by cities. The information is summarized by type of facility, and indicates the percent of revenue each funding source represents for all cities in Oregon, likely trends for the source, known constitutional or other limitations, and their respective rates.

A similar list of currently used revenue sources for public transportation is provided in Table E-3 in Appendix E.

7.4.1 Funding Program

It is anticipated that the City's transportation needs will exceed anticipated revenue through the year 2020. This section looks at potential means for increasing the amount of revenue available for transportation projects.

State Funding

Within the Portland metropolitan area, state and federal transportation funds are prioritized through Metro for incorporation into ODOT's four-year Statewide Transportation Improvement Program (STIP). Statewide, due to funding limitations, ODOT is currently in a preservation/maintenance funding mode.

The roadway facilities that ODOT operates and maintains in the City of Tualatin include Interstate 5, Interstate 205, and Highway 99W. These facilities are all critical components of the City's transportation system, and all impact the City's local roadway network, especially when in comes to providing connectivity and mobility. Boones Ferry Road is also a state facility, and provides the only other continuous north-south route through Tualatin. Funding for planning and design work for an I-5/Highway 99W Connector is also being administered through the STIP, as this project was designated one of 1,850 "high priority" projects earmarked in the federal TEA-21 transportation package. Although limited, state and federal funds will be the primary sources of funding for improvements to these facilities and their interchanges. The RTP prioritizes these projects; the financially constrained RTP does not identify significant capacity improvements to any of these facilities.

While improvement projects affecting ODOT facilities may be included in the City's TSP, the inclusion of these projects in the TSP does not obligate Metro or ODOT to direct funds to them. However, identifying the projects in the TSP is a necessary first step for obtaining future funding.

A good working relationship with ODOT planning staff, the ODOT Regional Manager, and Metro Regional Planning staff, will be important in ensuring that major roadway improvement projects on state facilities within the City are included in ODOT's State Transportation Improvement Program (STIP) and Metro's Regional Transportation Plan (RTP) as they are updated. The City and Washington and Clackamas Counties should take an active role in jointly representing Tualatin's

transportation priorities to the state and regional agencies during their process of formally incorporating priorities into the STIP and RTP. For its part, the City's TSP will provide Metro and ODOT with a prioritized list of highway-related transportation improvement projects of importance to the City, which should be used as a basis for discussions with those jurisdictions.

Local funding participation in projects on state facilities may enable regional decision makers to accelerate the priority of an improvement identified in the STIP. While not normally a requirement of project funding, local participation does demonstrate a strong commitment to the state and regional agencies, and the local funds may be used to leverage state funds. However, as noted elsewhere, local funding is also constrained.

Local Funding

The City of Tualatin should continue to pursue federal, state, and county transportation funds for improvement projects. Given the high level of annual expenditures needed for the construction of the transportation projects identified, existing sources of transportation revenue are not expected to adequately meet the demand for new construction. To meet the additional funding needs, the City may wish to consider additional revenue-generating options. It should be noted that, even with increased funding, it may prove difficult to fund all projects identified in the TSP within the 20-year planning horizon. Accordingly, the City should periodically review the TSP's identified projects to see if priorities need to be changed.

Transportation System Development Charge (SDC)/Traffic Impact Fee (TIF)

The City of Tualatin participates in Washington County's Traffic Impact Fee program. In 1990, County voters approved a County-wide fee on new development occurring in the County. This fee provides jurisdictions with a source of revenue to address transportation needs caused by the general growth of the area, and not directly attributable to a particular development. Tualatin, along with other cities in the County, has signed an intergovernmental agreement with the County agreeing to abide the provisions of the County's TIF Ordinance (WCC 3.17). The TIF Ordinance ensures that a consistent fee is charged throughout the County; however, it also means that Tualatin is unable to unilaterally raise fees to generate more TIF revenue; any increase in the TIF rate requires action by Washington County (WCC 3.17.140), and would be adopted on a County-wide basis.

A $200 per parking space fee is collected in the Clackamas County portion of the City, under a program that pre-dates the Washington County program. New development potential is much lower in this area (within the existing City limits), than in the Washington County portion. However, if the former Urban Reserve Area 34 east of the City were to be annexed into the City in the future, there could be a significant amount of TIF revenue generated in this area. Clackamas County currently assesses a TIF in the unincorporated portions of the County. However, the County is not obligated to spend the funds in the area where they were collected, even if the area is annexed into an adjacent city upon being developed, unless an intergovernmental agreement is in place. The Washington County rates, based on type of land use, at present are generally $50-75 higher per trip than the Clackamas County rates.

Tualatin should consider adopting the Washington County TIF rates for the Clackamas County portion of the City. The City should also consider pursuing an intergovernmental agreement with Clackamas County that unincorporated areas within the City's planning area would be subject to the

City's TIF—this would become relevant if the urban growth boundary were to expand in the future. TIF funds generated in Clackamas County would require a City fund separate from the Washington County TIF funds, in order to comply with Washington County TIF accounting procedures.

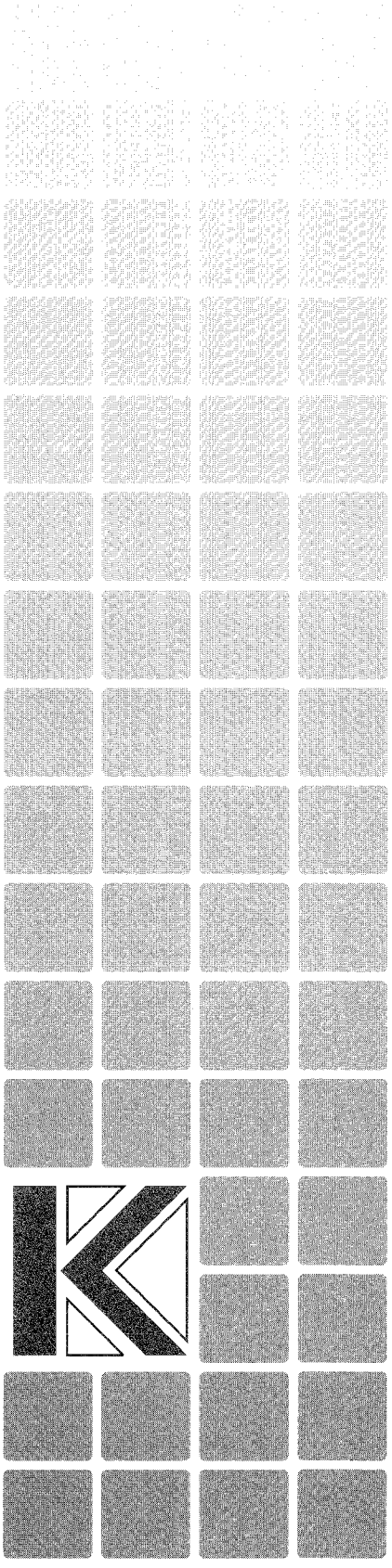
Local Improvement Districts (LID)

Local Improvement Districts have been and are being used in Tualatin to accomplish transportation improvements. Additional districts could be formed to improve currently substandard and unimproved roads. These projects may or may not be fully completed within the 20-year planning horizon.

Additional Considerations

There are important limitations that should be considered with respect to the additional funding options presented in this Section. For example, the dollar amount of SDCs that can be assessed must meet legal requirements for establishing SDCs. Also, the success of any funding plan will be reliant on the approval of the community. Accordingly, the involvement of the citizens and residents of the community in developing and implementing a funding package is essential.

Other funding alternatives available at the local level to supplement existing funds include added street bonding, a local gas tax, and a hotel tax. A combination of these funding sources could be used to generate additional revenue to support the implementation of the 20-year capital improvement needs of the community.



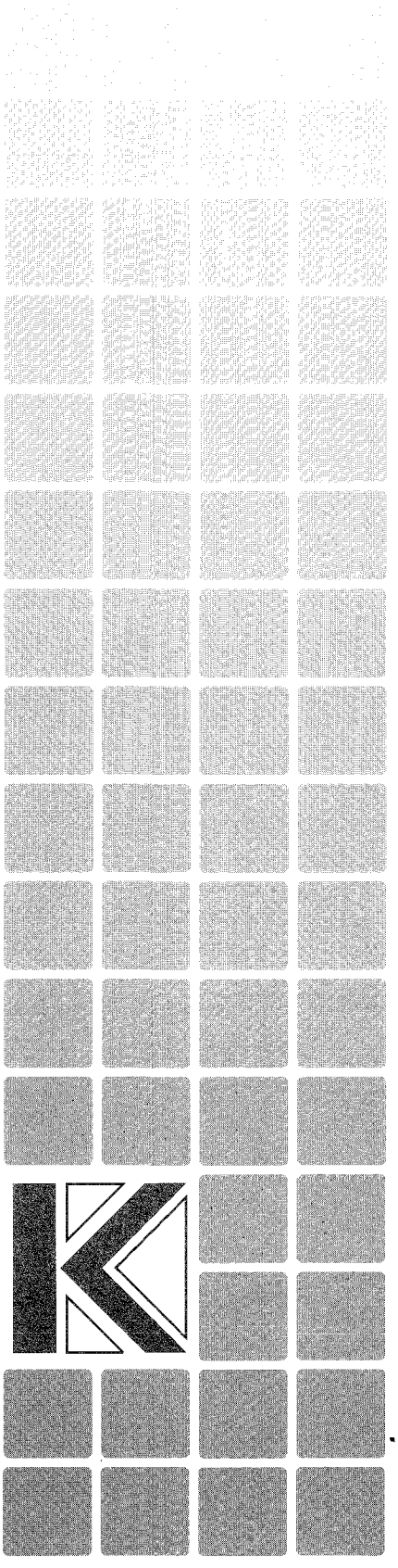
Section 8

Land Use Ordinance Modifications

Land Use Ordinance Modifications

This TSP, as the transportation element of the City's comprehensive plan, presents the City's transportation policy. This policy is implemented through revisions to the Tualatin Development Code, which is the legal document that provides the City's development standards and regulations.

The two Tualatin Development Code chapters which will be most significantly revised as a result of the TSP are Chapters 11 (Transportation), which will be replaced with Section 6 of this TSP, and Chapter 75 (Access Management on Arterial Streets), which will be broadened to include all of the City's transportation-related standards. Many other TDC chapters will have small changes as a result of this work; in particular, the Planning District Standards (Chapters 31-72) have been updated to comply with the Transportation Planning Rule. Final versions of code language will be adopted subsequent to the adoption of this TSP.



Section 9

Transportation Planning Rule and RTP Compliance

Transportation Planning Rule and RTP Compliance

9.1 TPR COMPLIANCE

In April 1991, the Land Conservation and Development Commission (LCDC), with the concurrence of ODOT, adopted the Transportation Planning Rule (TPR), OAR 660 Division 12. Outlined below in Table 9-1 is a list of recommendations (designated by italics) and requirements for a Regional Transportation System Plan for an urban area and how each of those were addressed in the City of Tualatin TSP. The comparison demonstrates that the City of Tualatin TSP is in compliance with the provision of the TPR.

TABLE 9-1
TPR REQUIREMENTS FOR A TRANSPORTATION SYSTEM PLAN

TPR Requirements	Tualatin TSP Compliance
OAR 660-012-0015: Preparation and Coordination of the TSPs	
(3) Preparation, adoption, and amendment of Local TSPs	
(a) Establish a system of transportation facilities and services to meet identified local needs and that are consistent with adopted elements of regional and state TSPs.	**Sections 2 through 5** document Tualatin's existing and future local transportation needs, **Section 6** contains the Tualatin TSP, the section that provides a system of transportation facilities and services to meet these needs. These sections have been prepared in accordance with the Oregon Transportation Planning Rule, the Metro Regional Transportation Plan, and the Oregon Highway Plan.
(b) Coordinate the preparation of the local TSP to assure regional and state transportation needs are met.	All regional and state transportation needs were considered in the development of the Tualatin TSP through the use of technical advisory committees and various coordination meetings with affected agencies.
(4) Cities shall adopt regional and local TSPs as part of their comprehensive plan.	*The City will adopt this TSP as part of its* comprehensive plan.
(5) TSPs preparation shall be coordinated with affected state, federal, and regional agencies; local governments; special districts; and private providers of transportation services.	To ensure that the Tualatin TSP would be consistent with the policies, goals, and needs of affected agencies, a Technical Advisory Committee (TAC) was established at the outset of the planning process. The TAC was made up of representatives from the surrounding cities and counties, plus the Oregon Department of Transportation, Metro, Tri-Met, and Tualatin Valley Fire & Rescue.
OAR 660-012-0020: Elements of Transportation System Plans	
(1) Establish a coordinated network of facilities to serve state, regional, and local transportation needs.	All planned transportation facilities were coordinated with the identified needs of state, regional, and local agencies.
(2) The TSP shall include the following elements:	
(a) Determination of transportation needs per OAR 660-012-0030.	Tualatin's 20-year transportation needs are documented in **Section 4** of this report.
(b) A road plan for a system of arterials and collectors and standards for the layout of local streets and connections.	The Tualatin street plan is documented in **Section 6**, and illustrated in Figures 6-1, 6-2A, 6-2B, 6-2C, 6-2D, 6-2E, 6-2F, 6-2G and Table 6-3.
(c) A public transportation plan.	The Tualatin Transit Plan is documented in **Section 6**

TPR Requirements	Tualatin TSP Compliance
	and illustrated in Figure 6-7
(d) A bicycle and pedestrian plan consistent with ORS 365.514.	The Tualatin Pedestrian Plan is documented in **Section 6** and illustrated in Figure 6-5. The Tualatin Bicycle Plan is documented in **Section 6**, and illustrated in Figure 6-6.
(e) An air, rail, water, and pipeline plan that identifies public use airports, mainline and branchline railroads, port facilities, and major regional pipelines and terminals.	The air, rail, water, and pipeline system plans are documented in **Section 6**.
(g) A parking plan in MPO areas per OAR 660-012-0045 (5)(C)	As discussed in **Section 6** of this plan, Tualatin has already updated its parking standards to comply with the TPR.
(h) Policies and land use regulation for TSP implementation per OAR 660-012-0045.	These will be adopted separately from the TSP.
(3) Each element identified in (2)(b)-(d) shall contain:	
(a) An inventory and assessment of existing and committed facilities and services by function, type, capacity, and condition.	An inventory of Tualatin's existing transportation facilities is documented in **Section 3** of this plan.
(b) A system of planned facilities, services, and major improvements.	A system of planned facilities, services, and major improvements is documented in **Section 6** of this plan.
(c) A description of planned facilities, services, and major improvements including a map showing general location of proposed improvements, minimum and maximum right-or-way widths, and a description of facility or service.	**Section 6** of this plan contains a description of Tualatin's planned facilities, services, and major improvements. A map showing the general location of the proposed improvements is provided for in Figure 6-7. Minimum and maximum right-of-way widths are illustrated in Figures 6-2A through 6-2G and a description of each facility type provided in Table 6-1.
(d) Identification of the provider of each facility or service.	The responsible agency/provider of each facility is documented in **Section 2**, Figure 2-9.
OAR 660-012-0025: Complying with the Goals in TSP Preparation	
(1) Adoption of a TSP shall constitute the land use decision regarding the need for transportation facilities services, and major improvements and their function, mode, and general location.	In process.
(2) Findings of compliance with applicable statewide planning goals and comprehensive plan policies shall be developed in conjunction with adoption of the TSP.	In process.
OAR 660-012-0030: Determination of Transportation Needs	
(1) The TSP shall identify transportation needs including:	
(a) State, regional, and local transportation needs;	The State, regional, and local transportation needs are documented in **Sections 3, 4, and 5** of this plan.
(b) Needs of the transportation disadvantaged;	The needs of the transportation disadvantages are documented in **Sections 3, 4, and 5** of this plan.
(c) Needs for the movement of goods and services.	The needs for the movement of goods and services are documented in **Sections 3, 4, and 5** of this plan.

TPR Requirements	Tualatin TSP Compliance
(3) Within UGBs the determination of transportation needs shall be based upon:	
(a) Population and employment forecasts and distributions consistent with the acknowledged comprehensive plan. Forecasts shall be for 20 years and, if desired, longer periods;	Updated population and employment forecasts were developed by the City of Tualatin, consistent with the comprehensive plan, and were approved by Washington County and Metro. This information is documented and summarized in **Sections 4 and 5** of this plan.
(b) Measures adopted pursuant to OAR 660-012-0045 to encourage reduced reliance on the automobile.	Use of the Metro travel demand model ensures consistency with the regional assumptions for reduced reliance on the automobile in determining future transportation needs.
(4) In MPO areas determination of transportation needs shall be based upon accomplishment of the requirement in OAR 660-012-0035(4) to reduce reliance on the automobile.	Use of the Metro travel demand model ensures consistency with the regional assumptions for reduced reliance on the automobile in determining future transportation needs.
OAR 660-012-0035: Evaluation and Selection of Transportation System Alternatives	
(1) The TSP shall be based upon evaluation of potential impacts of system alternatives that can reasonable be expected to meet the identified needs at reasonable cost. The following shall be evaluated as components of the system alternatives:	
(a) Improvements to existing facilities or services;	Reasonable and cost effective solutions to existing facilities were evaluated before new facilities were considered.
(b) New facilities and services including different modes of travel;	All new facilities were evaluated based on their reasonableness and cost-effectiveness.
(c) Transportation system management measures;	Transportation system management strategies were anticipated in the development of TSP, particularly in Tualatin's industrial sector.
(d) Demand management measures;	Demand management measures were assumed to be in effect with the development of the future travel demand forecasts.
(e) A no-build system alternative required by the national EPA.	**Section 4**, Figures 4-4 and 4-5 document the "no-build" system alternative and its inadequacies to meet the future transportation needs of Tualatin.
(3) The following standards shall be used to evaluate and select alternatives:	
(a) The transportation system shall support urban and rural development by providing types and levels of facilities and services appropriate to serve the land uses identified in the acknowledged comprehensive plan;	The TSP is based on the current, acknowledged comprehensive plan and provides enhancement to the integration of transportation and land use systems.
(b) The transportation system shall be consistent with state and federal standards for the protection of air, land and water quality;	The standards used to evaluate and select transportation alternatives are documented in **Sections 5 and 6** of this plan.
(c) The transportation system plan shall minimize adverse economic, social, environmental, and energy consequences;	The standards used to evaluate and select transportation alternatives are documented in **Sections 5 and 6** of this plan.
(d) The transportation system shall minimize conflicts and facilitate connections between modes of transportation.	The standards used to evaluate and select transportation alternatives are documented in **Sections 5 and 6** of this plan.

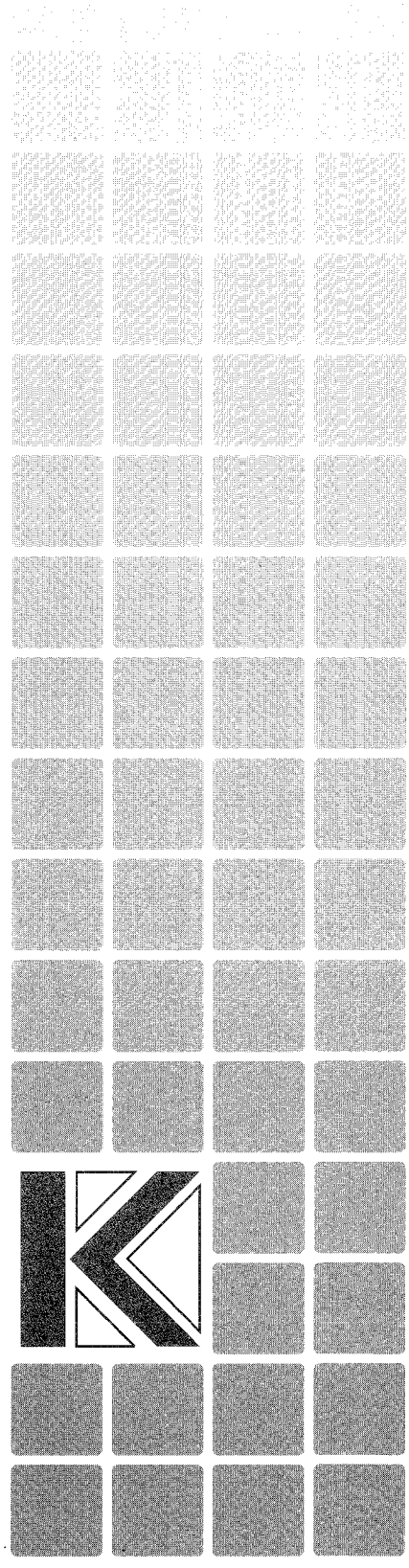
TPR Requirements	Tualatin TSP Compliance
(e) The transportation system plan shall avoid principal reliance of any one mode of transportation and reduce principal reliance on the automobile.	The standards used to evaluate and select transportation alternatives are documented in **Sections 5 and 6** of this plan.
(4) In MPO areas TSPs shall be designed to achieve the objectives listed below for reducing automobile vehicle miles traveled per capita:	
(a) In MPO areas of less than 1 million population, 5% reduction within 20 years of adoption of a plan;	The 20-year travel demand forecast prepared by Metro and used in the development of the Tualatin TSP assumes this objective to be achieved.
(c) Through subsequent planning efforts, an additional 5% reduction within 30 years of adoption of a plan.	The Tualatin TSP adopts Metro's 2040 non-SOV modal targets, which achieve this reduction, and provides means for working towards these targets.
(7) Local TSPs shall include interim benchmarks to assure satisfactory progress towards meeting the requirements of this section at five-year intervals. Local governments shall evaluate progress in meeting interim benchmarks at five year intervals from adoption of the TSP.	The City of Tualatin will continue to coordinate closely with Metro and other regional planning partners to evaluate progress toward established regional benchmarks.
OAR 660-012-0040: Transportation Financing Program	
(1) For areas within an urban growth boundary containing a population greater than 2,500 persons, the TSP shall include a transportation-financing program.	The Tualatin Transportation Funding Plan is documented in **Section 7** of this plan.
(2) A Transportation financing program shall include the items listed in (a) - (d):	
(a) A list of planned transportation facilities and major improvements;	A list pf planned transportation facilities and major improvements is provided in **Section 6**, Table 6-4.
(b) A general estimate of the timing for planned facilities and major improvements;	**Section 6**, Table 6-4 lists the planned transportation facilities and major improvements in the 0-5, 6-10, and 11-20 year time-frames.
(c) A determination of rough cost estimates for the facilities and major improvements identified in the TSP;	**Section 6**, Table 6-4 lists the rough cost estimates for each planned transportation facility and major improvement in the 0-5, 6-10, and 11-20 year time-frames.
(d) Policies to guide selection of transportation facilities and improvement projects for funding in the short-term.	**Section 6** presents the TSP's goals and objectives, which will become the City's transportation policies.
(3) The financing plan shall include a discussion of the facility provider's existing funding mechanisms to fund the development of each facility and major improvement.	Documentation of Oregon's, Washington County's, Clackamas County's, and Tualatin's existing funding mechanisms are provided in **Section 7** of the plan.
(5) The financing program shall provide for phasing of major improvements to encourage infill and redevelopment of urban lands prior to premature development of urbanizing or rural lands.	Investment in transportation improvements has been prioritized to encourage infill and redevelopment of urban lands prior to premature development of urbanizing or rural lands.

9.2 RTP COMPLIANCE

The Metro Council adopted the Regional Transportation Plan on August 10, 2000. The plan was acknowledged by the Oregon Land Conservation and Development Commission (LCDC) on May 4, 2001, except for the sections pertaining to state land uses goals exceptions for the I-5/Highway 99W Connector and the Sunrise Corridor in Clackamas County. Table 9-2 lists the items where the RTP requires consistency (designated by italics) or conformance by local TSPs, and shows how each item was addressed within the Tualatin TSP. The comparison demonstrates that the City of Tualatin TSP complies with the RTP.

TABLE 9-2
RTP COMPLIANCE

RTP Requirements	Tualatin TSP Compliance
Chapter 1	
Policies, objectives, motor vehicle level-of-service measures and modal targets, system maps and functional classifications including the following elements of section 1.3	
-Regional Transportation Policies 1 through 20 and objectives under those policies	The Tualatin TSP was developed in accordance with Policies 1 through 20 in the 2000 RTP.
-All system maps (Figures 1.1 through 1.15, including street design, motor vehicle, public transportation, bicycle, pedestrian, and freight systems)	**Section 6** of the Tualatin TSP satisfies the requirements of Figures 1.1 through 1.15 of the 2000 RTP. See **Section 6.3.4** for a discussion of street standard consistency.
-Motor vehicle performance measures (Table 1.2), or alternative performance measures as provided for in Section 6.4.7(1).	**Section 6.3.7** discusses the motor vehicle performance measures adopted by Tualatin, which require a higher level of service than does the RTP.
-Regional non-SOV modal targets.	**Section 6.7.9** of the Tualatin TSP documents the City's adoption of Metro's 2040 non-single occupant vehicle (SOV) goals.
Chapter 2	
2020 population and employment forecast contained in Section 2.1 and 2.3, or alternative forecast as provided for in Section 6.48 of this chapter, but only for the purpose of TSP development and analysis	Updated population and employment forecasts were developed by the City of Tualatin, consistent with the comprehensive plan, and were approved by Washington County and Metro. This information is documented and summarized in **Sections 4 and 5** of this plan.
Chapter 6	
The following elements of the RTP implementation strategy:	
-Local implementation requirements contained in Section 6.4	This table documents the Tualatin TSP local implementation requirements of the 2000 RTP.
-Project development and refinement planning requirements and guidelines contained in Section 6.7.	**Section 6** documents the Tualatin TSP compliance with the project development and refinement planning requirements of the 2000 RTP.



Appendix A

Description of Transit LOS

Appendix A
Description of Transit Level of Service

Most of the material in this appendix is adapted from the Transit Capacity and Quality of Service Manual, First Edition, *published by the Transportation Research Board.*

Level-of-Service Concept

Level-of-service (LOS) is a concept originally developed to quantify the degree of comfort experienced by motorists while traveling through different elements of a roadway system. Given the widespread acceptance of this system for roadways, a similar concept was developed for transit in the *Transit Capacity and Quality of Service Manual.*

Transit quality of service reflects the overall measured or perceived performance of transit service, from the passenger's point-of-view. Levels-of-service are used to quantify the passenger point-of-view. There are two main aspects to transit quality of service: the availability of transit service, and the comfort and convenience of transit service.

Transit availability assesses an aspect of quality of service that is not considered for highway analysis, for if one has a car available, the road infrastructure exists universally. Transit users, on the other hand, can only travel to the locations that are served by transit, and only at the times that transit service is offered. As a result, if transit service is not available where and when one wants to travel, transit is not a mode choice option for that trip. Availability is measured by three factors: service frequency (how often service is offered), hours of service (how long service is offered), and service coverage (where service is offered).

Assuming that transit service is an option for a particular trip, other factors relating to passenger comfort and convenience are also considered. These include on-vehicle passenger loads, service reliability, and travel time relative to the automobile.

The quality of service framework shown in Table A1 summarizes these factors.

TABLE A-1
TRANSIT QUALITY OF SERVICE FRAMEWORK

	Service & Performance Measures		
Category	**Transit Stop**	**Route Segment**	**System**
Availability	FREQUENCY accessibility passenger loads	HOURS OF SERVICE accessibility	SERVICE COVERAGE % person-minutes served indexes
Quality	PASSENGER LOADS amenities reliability	RELIABILITY travel speed transit/auto travel time	TRANSIT/AUTO TRAVEL TIME travel time safety

Measures of Availability

Service Frequency

For urban scheduled transit service, service frequency LOS is measured by the headway between vehicles going to a particular destination, as given in Table A2.

TABLE A-2
SERVICE FREQUENCY LOS

LOS	Headway (min)	Veh/h	Comments
A	<10	>6	Passengers don't need schedules
B	10-14	5-6	Frequent service, passengers consult schedules
C	15-20	3-4	Maximum desirable time to wait if bus/train missed
D	21-30	2	Service unattractive to choice riders
E	31-60	1	Service available during hour
F	>60	<1	Service unattractive to all riders

At the service frequencies of LOS "A", passengers are assured that a transit vehicle will arrive soon after they arrive at a stop. The delay experienced if one misses a vehicle is low. At LOS "B", service is still relatively frequent, but passengers will consult schedules to minimize their wait time at the transit stop. Service frequencies at LOS "C" still provide a reasonable choice of travel times, but the wait involved if a bus or train is missed becomes long. At LOS "D", service is only available about twice an hour and requires passengers to adjust their routines to fit the transit service provided. The threshold between LOS "E" and "F" is service once an hour; this corresponds to the typical analysis period and to the minimum service frequency applied when determining hours of service LOS. Service at frequencies greater than one hour entails highly creative planning or considerable wasted time on the part of passengers.

Hours of Service

Table A3 provides levels-of-service for the number of hours during the day when service is offered at least once an hour.

TABLE A-3
HOURS OF SERVICE LOS

LOS	Hours per Day	Comments
A	19-24	Night or owl service provided
B	17-18	Late evening service provided
C	14-16	Early evening service provided
D	12-13	Daytime service provided
E	4-11	Peak hour service/limited midday service
F	0-3	Very limited or no service

At LOS "A", service is available for most or all of the day. Workers who do not work traditional 8-5 jobs receive service and all riders are assured that they will not be stranded until the next morning if a late-evening transit vehicle is missed. At LOS "B", service is available late into the evening, which allows a range of trip purposes other than commute trips to be served. Transit runs only into the early evening at LOS "C" levels, but still provides some flexibility in one's choice of time for the return trip home. Service at LOS "D" levels meets the needs of commuters who do not need to stay late, and still provides service during the middle of the day for others. At LOS "E", midday service is limited or non-existent and commuters have a limited choice of travel times. Finally, at LOS "F", transit service is offered only a few hours a day or not at all.

Service Coverage

Service coverage measures how much of the portion of the service area that can support hourly fixed-route transit service is being served. This "transit-supportive area" is defined as those areas with a household density of at least 3 households per gross acre (land area including streets, parks, etc.), or at least 4 jobs per gross acre. Table A4 provides levels-of-service for service coverage.

TABLE A-4
SERVICE COVERAGE LOS

LOS	% Transit-Supportive Area Covered
A	90.0-100.0
B	80.0-89.9
C	70.0-79.9
D	60.0-69.9
E	50.0-59.9
F	<50.0

Comfort and Convenience Measures

Passenger Loads

Passenger loads reflect both passenger comfort (can one find a seat, or if not, how crowded is the vehicle), and transit operator concerns, as a poor LOS may indicate the need to increase service levels or frequency, or—for high-frequency routes—the need to review service reliability to see if vehicle bunching is occurring. A poor passenger load LOS indicates that dwell times at stops will be longer for a given passenger volume at a transit stop and, as a result, travel times and service reliability will be negatively affected. Table A5 presents passenger load LOS values.

TABLE A-5
PASSENGER LOAD LOS

LOS	Bus		Rail		Comments
	ft²/p	*p/seat**	ft²/p	*p/seat**	
A	>12.9	*0.00-0.50*	>19.9	*0.00-0.50*	No passenger need sit next to another
B	8.6-12.9	*0.51-0.75*	14.0-19.9	*0.51-0.75*	Passengers can choose where to sit
C	6.5-8.5	*0.76-1.00*	10.2-13.9	*0.76-1.00*	All passengers can sit
D	5.4-6.4	*1.01-1.25*	5.4-10.1	*1.01-2.00*	Comfortable standee load for design
E	4.3-5.3	*1.26-1.50*	3.2-5.3	*2.01-3.00*	Maximum schedule load
F	<4.3	*>1.50*	<3.2	*>3.00*	Crush loads

*Approximate values for comparison. LOS is based on area per passenger.

At LOS "A" load levels, passengers are able to spread out and can use empty seats to store parcels, bags, etc. rather than carry them on their lap. At LOS "B", some passengers will have to sit next to others, but others will not. All passengers can still sit at LOS "C", although the choice of seats will be very limited. Some passengers will be required to stand at LOS "D" load levels, while at LOS "E", a transit vehicle will be as full as passengers will normally tolerate. LOS "F" represents crush loading levels. A greater range of areas per passenger is provided for rail LOS than for bus LOS, as rail tends to provide fewer seats in favor of more standing room.

Service Reliability

Service reliability looks at how often one will get to one's destination—or make a transfer connection—on time. For high-frequency service, it looks at the tendency of vehicles to bunch together, where several vehicles arrive at once, followed by a long gap in service. Table A6 presents values for reliability LOS.

TABLE A-6
RELIABILITY LOS (ON-TIME PERFORMANCE)

LOS	On-Time Percentage	Comments*
A	97.5-100.0%	1 late transit vehicle per month
B	95.0-97.4%	2 late transit vehicles per month
C	90.0-94.9%	1 late transit vehicle per week
D	85.0-89.9%	
E	80.0-84.9%	1 late transit vehicle per direction per week
F	<80.0%	

Applies to routes with headways greater than 10 minutes.
*user perspective, based on 5 round trips/week of their travel on a particular transit route with no transfers
"On-time"≈ 0-5 minutes late departing published time point (fixed route)
arrival within 10 minutes of scheduled pick-up time (deviated fixed route)
arrival within 20 minutes of scheduled pick-up time (paratransit)

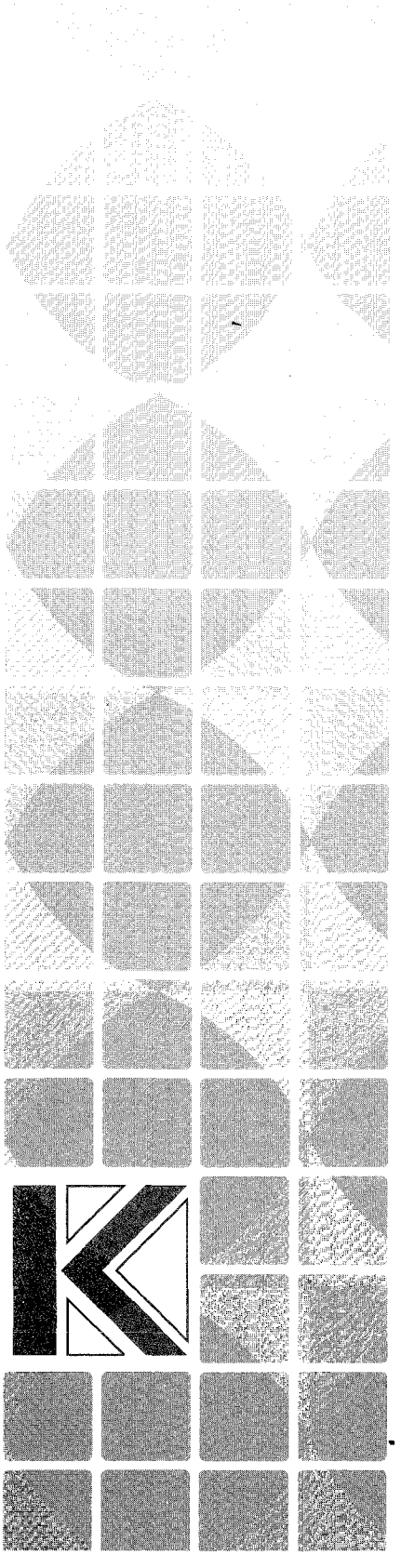
Transit-Auto Travel Time

The final service measures looks at how long trips take by transit, compared to the automobile. This measure reflects the extra travel time associated with indirect routings, poor transfer connections, frequent stops, and traffic signals timed to benefit vehicular traffic, rather than transit vehicles. Table A7 presents values for travel time LOS.

Door-to-door travel by transit is faster than by auto at LOS "A". This level-of-service provides considerable incentive to potential riders to use transit. At LOS "B", the in-vehicle travel times by auto and transit are comparable, but the walk and wait time for transit makes the total trip by transit slightly longer. Riders must spend an extra hour a day using transit at LOS "C" levels and up to 1½ hours at LOS "D". At LOS "E", individual trips take up to an hour longer by transit than by automobile; however, this may be the best possible in small cities where automobile travel times are low. Service at LOS "F" levels involve travel times so long as to be unacceptable to most riders.

TABLE A-7
TRANSIT-AUTO TRAVEL TIME LOS

LOS	Travel Time Difference (min)	Comments
A	≤0	Faster by transit than by automobile
B	1-15	About as fast by transit as by automobile
C	16-30	Tolerable for choice riders
D	31-45	Round-trip at least an hour longer by transit
E	46-60	Tedious for all riders; may be best possible in small cities
F	>60	Unacceptable to most riders



Appendix B

Description of Roadway LOS

Appendix B
Description of Roadway Level of Service

Level-of-Service Concept

Level-of-service (level-of-service) is a concept developed to quantify the degree of comfort (including such elements as travel time, number of stops, total amount of stopped delay, and impediments caused by other vehicles) afforded to drivers as they travel through an intersection or roadway segment. Six grades are used to denote the various level-of-service from A to F.[1]

Signalized Intersections

The six level-of-service grades are described qualitatively for signalized intersections in Table B1. Additionally, Table B2 identifies the relationship between level-of-service and average control delay per vehicle. Control delay is defined to include initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. Using this definition, level-of-service "D" is generally considered to represent the minimum acceptable design standard.

TABLE B-1
LEVEL-OF-SERVICE DEFINITIONS (SIGNALIZED INTERSECTIONS)

Level-of-Service	Average Delay per Vehicle
A	Very low average control delay, less than 10 seconds per vehicle. This occurs when progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.
B	Average control delay is greater than 10 seconds per vehicle and less than or equal to 20 seconds per vehicle. This generally occurs with good progression and/or short cycle lengths. More vehicles stop than for a level-of-service A, causing higher levels of average delay.
C	Average control delay is greater than 20 seconds per vehicle and less than or equal to 35 seconds per vehicle. These higher delays may result from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.
D	Average control delay is greater than 35 seconds per vehicle and less than or equal to 55 seconds per vehicle. The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle length, or high volume/capacity ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.
E	Average control delay is greater than 55 seconds per vehicle and less than or equal to 80 seconds per vehicle. This is usually considered to be the limit of acceptable delay. These high delay values generally (but not always) indicate poor progression, long cycle lengths, and high volume/capacity ratios. Individual cycle failures are frequent occurrences.
F	Average control delay is in excess of 80 seconds per vehicle. This is considered to be unacceptable to most drivers. This condition often occurs with oversaturation. It may also occur at high volume/capacity ratios below 1.0 with many individual cycle failures. Poor progression and long cycle lengths may also contribute to such high delay values.

1 Most of the material in this appendix is adapted from the Transportation Research Board, *Highway Capacity Manual*, Special Report 209 (1997).

TABLE B-2
LEVEL-OF-SERVICE CRITERIA FOR SIGNALIZED INTERSECTIONS

Level-of-Service	Average Control Delay per Vehicle (Seconds)
A	#10.0
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

Unsignalized Intersections

Unsignalized intersections include two-way stop-controlled (TWSC) and all-way stop-controlled (AWSC) intersections. The *1997 Highway Capacity Manual* provides new models for estimating control delay at both TWSC and AWSC intersections. A qualitative description of the various service levels associated with an unsignalized intersection is presented in Table B3. A quantitative definition of level-of-service for unsignalized intersections is presented in Table B4. Using this definition, level-of-service "E" is generally considered to represent the minimum acceptable design standard.

TABLE B-3
LEVEL-OF-SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS

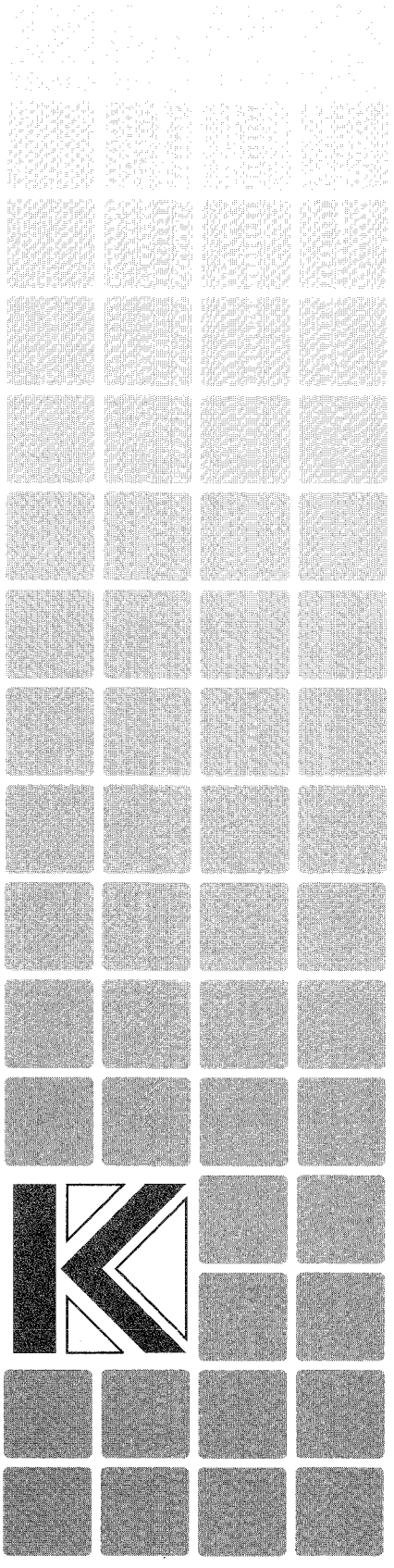
Level-of-Service	Average Delay per Vehicle to Minor Street
A	• Nearly all drivers find freedom of operation. • Very seldom is there more than one vehicle in queue.
B	• Some drivers begin to consider the delay an inconvenience. • Occasionally there is more than one vehicle in queue.
C	• Many times there is more than one vehicle in queue. • Most drivers feel restricted, but not objectionably so.
D	• Often there is more than one vehicle in queue. • Drivers feel quite restricted.
E	• Represents a condition in which the demand is near or equal to the probable maximum number of vehicles that can be accommodated by the movement. • There is almost always more than one vehicle in queue. • Drivers find the delays approaching intolerable levels.
F	• Forced flow. • Represents an intersection failure condition that is caused by geometric and/or operational constraints external to the intersection.

TABLE B-4
LEVEL-OF-SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS

Level-of-Service	Average Control Delay per Vehicle (Seconds)
A	#10
B	>10 and ≤15
C	>15 and ≤25
D	>25 and ≤35
E	>35 and ≤50
F	>50

It should be noted that the level-of-service criteria for unsignalized intersections are somewhat different than the criteria used for signalized intersections. The primary reason for this difference is that drivers expect different levels of performance from different kinds of transportation facilities. The expectation is that a signalized intersection is designed to carry higher traffic volumes than an unsignalized intersection. Additionally, there are a number of driver behavior considerations that combine to make delays at signalized intersections less onerous than at unsignalized intersections. For example, drivers at signalized intersections are able to relax during the red interval, while drivers on the minor street approaches to TWSC intersections must remain attentive to the task of identifying acceptable gaps and vehicle conflicts. Also, there is often much more variability in the amount of delay experienced by individual drivers at unsignalized intersections than signalized intersections. For these reasons, it is considered that the control delay threshold for any given level-of-service is less for an unsignalized intersection than for a signalized intersection. **While overall intersection level-of-service is calculated for AWSC intersections, level-of-service is only calculated for the minor approaches and the major street left turn movements at TWSC intersections.** No delay is assumed to the major street through movements. For TWSC intersections, the overall intersection level-of-service remains undefined: level-of-service is only calculated for each minor street lane.

In the performance evaluation of TWSC intersections, it is important to consider other measures of effectiveness (MOEs) in addition to delay, such as v/c ratios for individual movements, average queue lengths, and 95^{th}-percentile queue lengths. By focusing on a single MOE for the worst movement only, such as delay for the minor-street left turn, users may make inappropriate traffic control decisions. The potential for making such inappropriate decisions is likely to be particularly pronounced when the HCM level-of-service thresholds are adopted as legal standards, as is the case in many public agencies.



Appendix C

Detailed Intersection Operation Results (Existing Conditions)

Appendix C
Detailed Intersection Operations Results (Existing Conditions)

TABLE C-1
EXISTING LEVELS-OF-SERVICE, WEEKDAY P.M. PEAK HOUR (UNSIGNALIZED INTERSECTIONS)

Intersection	Two-Way Stop Controlled				All-Way Stop Controlled		
	Critical Approach	Critical V/C	Movement Delay (sec)	Movement LOS	V/C	Avg. Delay (sec)	LOS
Hazelbrook Rd/115th Ave	NB	0.20	10.6	B			
115th Ave/Tualatin Rd	NB	0.03	10.9	B			
Tualatin Rd/Jurgens Rd	SB	0.12	14.2	B			
Avery St/105th Ave	NBLT	0.16	18.2	C			
108th Ave/Ibach St	WB	0.04	8.8	A			
Grahams Ferry Rd/Ibach St	EB	0.20	11.8	B			
Grahams Ferry Rd/Helenius Rd	EB	0.03	9.2	A			
108th Ave/Marilyn Rd	EB	0.00	8.6	A			
Boones Ferry Rd/Tonka Ave	WBRT	0.11	14.0	B			
Borland Rd/Wilke Rd	SBLT	0.11	24.9	C			
Leveton Dr/124th Ave[1]	--	--	--	--			
65th Ave/Nyberg St	WBLT	0.60	>90	F			
Tualatin Road/Teton Ave	NBLT	0.23	14.7	B			
Herman Road/SW 108th Avenue	SB	0.21	17.8	C			
Leveton Drive/SW 108th Avenue	EB	0.07	9.1	A			
Tualatin Road/SW 108th Avenue	NB	0.28	27.6	D			
65th Ave/Sagert St					1.14	51.0	F
Hazelbrook Rd/Jurgens Rd					0.20	7.9	A
Cipole Rd/Herman Rd					0.58	11.6	B
Teton Ave/Herman Rd					0.83	27.3	D
Avery St/Teton Ave					1.01	50.0	E
Sagert St/Martinazzi Ave					0.95	40.5	E
Avery St/Martinazzi Ave					0.53	11.3	B

v/c = volume-to-capacity ratio, LOS = level-of-service, NB = northbound, SB = southbound, EB = eastbound, WB = westbound, LT = left turn

[1] The Leveton Drive/124th Avenue intersection will be a signalized intersection under future conditions. Construction to extend 124th Avenue to Tualatin Road and to signalize this intersection is underway as part of a City of Tualatin road improvement project.

TABLE C-2
EXISTING LEVELS-OF-SERVICE, WEEKDAY P.M. PEAK HOUR (SIGNALIZED INTERSECTIONS)

Intersection	Signalized Control		
	V/C	Avg. Delay (sec)	LOS
Highway 99W/Cipole Rd	0.77	21.9	C
Tualatin Rd/Herman Rd	0.38	13.7	B
Tualatin-Sherwood Rd/Cipole Rd	0.90	30.9	C
Avery St/Boones Ferry Rd	1.07	66.4	E
Ibach St/Boones Ferry Rd	0.60	14.4	B
Tualatin-Sherwood Rd/90th Ave	0.55	10.9	B
Tualatin Rd/90th Ave	0.60	13.5	B
Upper Boones Ferry Rd/Lower Boones Ferry Rd	0.99	42.7	D
Martinazzi Ave/Boones Ferry Rd	1.00	41.5	D
Boones Ferry Rd/Warm Springs St	0.91	27.1	C
Boones Ferry Rd/Sagert St	0.69	23.9	C
Bridgeport Road/72nd Ave/Lower Boones Ferry	0.81	35.3	D
Borland Ave/65th Ave	0.89	43.5	D
Lower Boones Ferry Road/Interstate 5 NB Ramp	0.99	46.3	D
Lower Boones Ferry Road/Interstate 5 SB Ramp	0.90	32.8	C
Nyberg Street/Interstate 5 NB Ramp	0.66	14.1	B
Nyberg Street/Interstate 5 SB Ramp	1.01	47.9	D
Bridgeport Road/SW 172nd Avenue/Lower Boones Ferry Road	0.81	35.3	D
Boones Ferry Road/Tualatin Road	1.06	69.7	E
Nyberg Street/Martinazzi Avenue	0.67	31.1	C
Tualatin Sherwood Road/Martinazzi Avenue	0.92	41.2	D
Tualatin Sherwood Road/Boones Ferry Road	0.96	45.0	D
Warm Springs Street/Martinazzi Avenue	0.60	27.1	C
Tualatin Sherwood Road/Teton Avenue	0.68	28.7	C
Tualatin Sherwood Road/Avery Street	0.76	18.6	B
Tualatin Road/SW 124th Avenue	0.59	26.3	C
Highway 99W/SW 124th Avenue	0.70	21.0	C
Lower Boones Ferry Road/SW 65th Avenue	1.06	60.6	E

TABLE C-3
1995-1999 INTERSECTION CRASH ANALYSIS

Intersection	# of Crash	Type of Crash					
		Rear End	Angle	Turning	Side-swipe	Fixed Object	Other
Highway 99W/Cipole Road	20	8	5	2	2	1	2
Hazelbrook Road/SW 115th Avenue	0	-	-	-	-	-	-
Hazelbrook Road/Jurgens Road	0	-	-	-	-	-	-
SW 115th Avenue/Tualatin Road	1	0	1	0	0	0	0
Tualatin Road/Jurgens Road	3	1	0	2	0	0	0
Cipole Road/Herman Road	2	0	0	1	0	0	1
Teton Avenue/Herman Road	6	0	4	2	0	0	0
Tualatin/Herman Road/Cheyenne	9	2	1	4	0	0	2
Tualatin Sherwood/Cipole Road	1	0	0	1	0	0	0
Avery Street/SW 105th Avenue	2	0	0	0	0	0	2
Avery Street/Teton Avenue	3	0	0	2	0	0	1
Avery Street/Boones Ferry Road	25	16	2	7	0	0	0
SW 108th Street/Ibach Street	0	-	-	-	-	-	-
Grahams Ferry/Ibach Street	0	-	-	-	-	-	-
Boones Ferry/Ibach Street	10	4	2	3	0	1	0
Grahams Ferry Road/Helenius Road	1	0	0	0	0	1	0
SW 108th/Marilyn	0	-	-	-	-	-	-
Tualatin Sherwood Road/SW 90th Avenue	0	-	-	-	-	-	-
Tualatin Road/SW 90th Avenue	6	3	1	2	0	0	0
Boones Ferry Road/Lower Boones Ferry Road	10	4	1	3	2	0	0
Boones Ferry Road/Martinazzi Avenue	11	8	1	0	0	1	1
Boones Ferry Road/Tonka Avenue	48	0	0	47	0	0	1
Boones Ferry Road/Warm Springs Street	4	0	3	1	0	0	0
Boones Ferry Road/Sagert Street	10	6	2	2	0	0	0
Sagert Street/Martinazzi Avenue	11	2	5	3	0	1	0
Avery Street/Martinazzi Avenue	0	-	-	-	-	-	-
Borland Road/Wilke Road	3	1	0	2	0	0	0
Leveton Drive/SW 124th Avenue	0	-	-	-	-	-	-
SW 65th Avenue/Nyberg Street	1	0	0	1	0	0	0
Tualatin Road/Teton Avenue	4	0	0	3	0	0	1
SW 65th Avenue/Sagert Street	8	4	0	4	0	0	0
SW 65th Avenue/Borland Road	0	-	-	-	-	-	-

Intersection	# of Crash	Type of Crash					
		Rear End	Angle	Turning	Side-swipe	Fixed Object	Other
Lower Boones Ferry Road/Interstate 5 NB Ramp	40	36	1	1	0	0	2
Lower Boones Ferry Road/Interstate 5 SB Ramp	9	0	1	5	1	1	1
Nyberg Street/Interstate 5 NB Ramp	14	0	0	13	1	0	0
Nyberg Street/Interstate 5 SB Ramp	60	29	0	24	2	5	0
Bridgeport Road/SW 72nd Avenue/Lower Boones Ferry Road	15	4	0	10	0	1	0
Boones Ferry Road/Tualatin Road	5	3	0	2	0	0	0
Nyberg Street/Martinazzi Avenue	0	-	-	-	-	-	-
Tualatin Sherwood Road/Martinazzi Avenue	35	16	4	12	1	0	2
Tualatin Sherwood Road/Boones Ferry Road	41	23	3	10	2	2	1
Warm Springs Street/Martinazzi Avenue	11	1	4	5	1	0	0
Tualatin Sherwood Road/Teton Avenue	25	19	1	2	0	0	3
Tualatin Sherwood Road/Avery Street	11	8	0	1	0	0	2
Tualatin Sherwood Road/SW 124th Avenue	No Data	-	-	-	-	-	-
Herman Road/124th Avenue	No Data	-	-	-	-	-	-
Herman Road/SW 108th Avenue	0	-	-	-	-	-	-
Leveton Drive/SW 108th Avenue	1	0	0	0	0	1	0
Tualatin Road/SW 108th Avenue	0	-	-	-	-	-	-
Tualatin Road/SW 124th Avenue	0	-	-	-	-	-	-
Highway 99W/SW 124th Avenue	3	3	0	0	0	0	0
Lower Boones Ferry Road/SW 65th Avenue	4	0	2	2	0	0	0
Norwood Road/Boones Ferry Road	No Data	-	-	-	-	-	-
Tualatin Sherwood Road/Highway 99W	41	29	2	9	1	0	0

TABLE C-4
1995-1999 STUDY INTERSECTION CRASH RATES

Intersection	Number of Crashes	Crashes Per Year	Peak Hour TEV	MEV/Year	Crashes/ MEV	>1Crash/ MEV
Highway 99W/Cipole Road	20	4	2,858	10.43	0.38	No
Hazelbrook Road/SW 115th Avenue	0	0	310	1.13	-	No
Hazelbrook Road/Jurgens Rd	0	0	177	0.65	-	No
SW 115th Avenue/Tualatin Road	1	0.2	290	1.06	0.19	No
Tualatin Road/Jurgens Road	3	0.6	635	2.32	0.26	No
Cipole Road/Herman Road	2	0.4	750	2.74	0.15	No
Teton Avenue/Herman Road	6	1.2	1,155	4.22	0.28	No
Tualatin/Herman Road/Cheyenne	9	1.8	1,400	5.11	0.35	No
Tualatin Sherwood/Cipole Road	1	0.2	2,310	8.43	0.02	No
Avery Street/SW 105th Avenue	2	0.4	825	3.01	0.13	No
Avery Street/Teton Avenue	3	0.6	1,368	4.99	0.12	No
Avery Street/Boones Ferry Road	25	5.0	2,250	8.21	0.61	No
SW 108th Street/Ibach Street	0	0	125	0.46	-	No
Grahams Ferry/Ibach Street	0	0	465	1.70	-	No
Boones Ferry/Ibach Street	10	2	1,490	5.44	0.37	No
Grahams Ferry Road/Helenius Road	1	0.2	236	0.86	0.23	No
SW 108th/Marilyn Road	0	0	34	0.12	-	No
Tualatin Sherwood Road/SW 90th Avenue	0	0	2,316	8.45	-	No
Tualatin Road/SW 90th Avenue	6	1.2	1,400	5.11	0.23	No
Boones Ferry Road/Lower Boones Ferry Road	10	2	2,344	8.56	0.23	No
Boones Ferry Road/Martinazzi Avenue	11	2.2	2,991	10.92	0.20	No
Boones Ferry Road/Tonka Avenue	48	9.6	1,480	5.40	1.78	Yes
Boones Ferry Road/Warm Springs Street	4	0.8	2,040	7.45	0.11	No
Boones Ferry Road/Sagert Street	10	2	1,815	6.62	0.30	No
Sagert Street/Martinazzi Avenue	11	2.2	1,907	6.96	0.32	No
Avery Street/Martinazzi Avenue	0	0	688	2.51	-	No
Borland Road/Wilke Road	3	0.6	1,055	3.85	0.16	No
Leveton Drive/SW 124th Avenue	0	0	705	2.57	-	No
SW 65th Avenue/Nyberg Street	1	0.2	1,980	7.23	0.03	No
Tualatin Road/Teton Avenue	4	0.8	620	2.26	0.35	No

Intersection	Number of Crashes	Crashes Per Year	Peak Hour TEV	MEV/Year	Crashes/ MEV	>1Crash/ MEV
SW 65th Avenue/Sagert Street	8	1.6	1,576	5.75	0.28	No
SW 65th Avenue/Borland Road	0	0	1,859	6.78	-	No
Lower Boones Ferry Road/Interstate 5 NB Ramp	40	8	3,432	12.52	0.64	No
Lower Boones Ferry Road/Interstate 5 SB Ramp	9	1.8	3,896	14.22	0.13	No
Nyberg Street/Interstate 5 NB Ramp	14	2.8	3,750	13.69	0.20	No
Nyberg Street/Interstate 5 SB Ramp	60	12	4,775	17.43	0.69	No
Bridgeport Road/72nd Avenue/Lower Boones Ferry Road	15	3	3,015	11.00	0.27	No
Boones Ferry Road/Tualatin Rd	5	1	1,915	6.99	0.14	No
Nyberg Street/Martinazzi Avenue	0	0	1,777	6.49	-	-
Tualatin Sherwood Road/Martinazzi Avenue	35	7	4,130	15.07	0.46	No
Tualatin Sherwood Road/Boones Ferry Road	41	8.2	3,375	12.32	0.67	No
Warm Springs Street/Martinazzi Avenue	11	2.2	2,050	7.48	0.29	No
Tualatin Sherwood Road/Teton Avenue	25	5	2,465	9.00	0.56	No
Tualatin Sherwood Road/Avery Street	11	2.2	1,941	7.08	0.31	No
Tualatin Sherwood Road/SW 124th Avenue	No Data	-	-	-	-	-
Herman Road/SW 124th Avenue	No Data	-	-	-	-	-
Herman Road/SW 108th Avenue	-	-	624	2.28	-	-
Leveton Drive/SW 108th Avenue	1	0.2	125	0.46	0.44	No
Tualatin Road/SW 108th Avenue	0	-	1,220	4.45	-	-
Highway 99W/SW 124th Avenue	3	0.6	972	3.55	0.17	No
Tualatin Road/SW 124th Avenue	0	-	3,545	12.94	-	-
Lower Boones Ferry Road/SW 65th Avenue	4	0.8	3,890	14.20	0.06	No
Highway 99W/SW Hazelbrook Rd	7	1.4	-	-	-	-
Norwood Road/Boones Ferry Road	No Data	-	-	-	-	-

Appendix D

Detailed Intersection Operation Results (Future Conditions)

Appendix D
Detailed Intersection Operation Results (Future Conditions)

TABLE D-1
YEAR 2020 LEVELS-OF-SERVICE, WEEKDAY P.M. PEAK HOUR (UNSIGNALIZED INTERSECTIONS)

Intersection	Two-Way Stop Controlled				All-Way Stop Controlled		
	Critical Approach	Critical d/c	Movement Delay (sec)	Movement LOS	d/c	Avg. Delay (sec)	LOS
Hazelbrook Rd/115th Ave	NB	0.50	17	C			
115th Ave/Tualatin Rd	NB	0.08	13	B			
Tualatin Rd/Jurgens Rd	SB	0.12	14	B			
Avery St/105th Ave	NB RT	1.02	>55	F			
108th Ave/Ibach St	WB	0.48	26	D			
Grahams Ferry Rd/Ibach St	EB	1.59	>55	F			
Grahams Ferry Rd/Helenius Rd	EB	1.26	>55	F			
108th Ave/Marilyn Rd	EB	0.15	15	B			
Boones Ferry Rd/Tonka Ave	WB	0.12	10	B			
Borland Rd/Wilke Rd	SB LT	0.56	>55	F			
65th Ave/Nyberg St	WB LT	>5	>55	F			
Tualatin Road/Teton Ave	NB LT	1.01	>55	F			
Herman Road/SW 108th Ave	SB	>5	>55	F			
Leveton Drive/SW 108th Ave	EB	3.77	>55	F			
Tualatin Road/SW 108th Ave	NB	1.56	>55	F			
65th Ave/Sagert St					2.25	>55	F
Hazelbrook Rd/Jurgens Rd					0.41	10	A
Cipole Rd/Herman Rd					0.96	38	E
Teton Ave/Herman Rd					3.27	>55	F
Avery St/Teton Ave					1.92	>55	F
Sagert St/Martinazzi Ave					1.96	>55	F
Avery St/Martinazzi Ave					0.89	26	D

d/c = demand-to-capacity ratio, LOS = level-of-service, NB = northbound, SB = southbound, EB = eastbound, WB = westbound, LT = left turn, RT = right turn

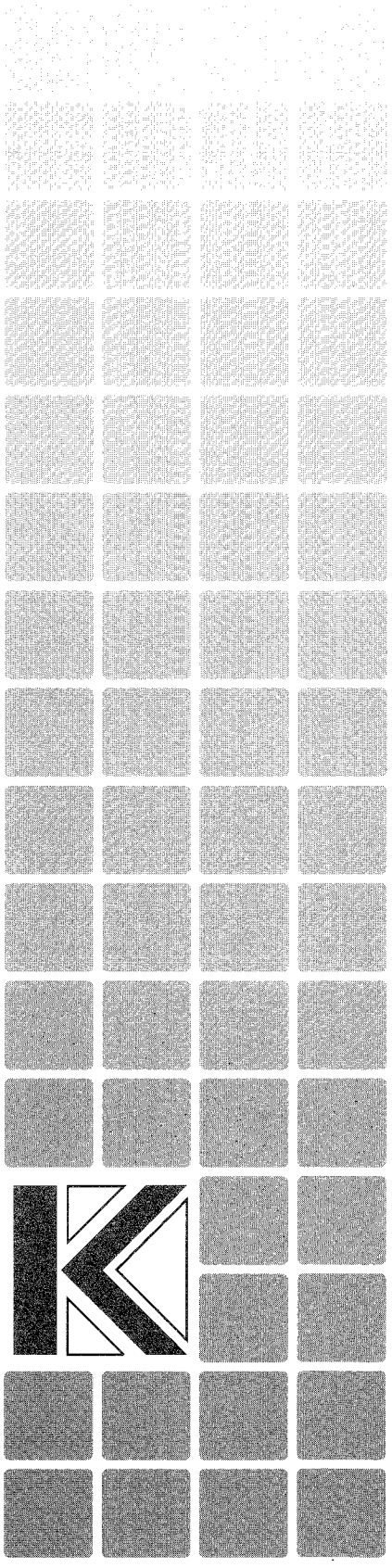
TABLE D-2
YEAR 2020 LEVELS-OF-SERVICE, WEEKDAY P.M. PEAK HOUR (SIGNALIZED INTERSECTIONS)

Intersection	Signalized Control		
	d/c	Avg. Delay (sec)	LOS
Highway 99W/Cipole Rd	1.88	>80	F
Tualatin Rd/Herman Rd	0.78	20	C
Tualatin-Sherwood Rd/Cipole Rd	1.80	>80	F
Avery St/Boones Ferry Rd	1.80	>80	F
Ibach St/Boones Ferry Rd	1.31	>80	F
Tualatin-Sherwood Rd/90th Ave	1.19	>80	F
Tualatin Rd/90th Ave	0.86	12	B
Upper Boones Ferry Rd/Lower Boones Ferry Rd	1.54	>80	F
Martinazzi Ave/Boones Ferry Rd	1.48	>80	F
Boones Ferry Rd/Warm Springs St	1.44	>80	F
Boones Ferry Rd/Sagert St	1.18	>80	F
Bridgeport Road/72nd Ave/Lower Boones Ferry	1.24	>80	F
Borland Ave/65th Ave	1.78	>80	F
Lower Boones Ferry Road/Interstate 5 NB Ramp	1.31	>80	F
Lower Boones Ferry Road/Interstate 5 SB Ramp	1.16	69	E
Nyberg Street/Interstate 5 NB Ramp	0.88	20	C
Nyberg Street/Interstate 5 SB Ramp	1.41	>80	F
Bridgeport Road/SW 72nd Avenue/Lower Boones Ferry Road	0.81	35	D
Boones Ferry Road/Tualatin Road	1.96	>80	F
Nyberg Street/Martinazzi Avenue	1.48	>80	F
Tualatin Sherwood Road/Martinazzi Avenue	1.41	>80	F
Tualatin Sherwood Road/Boones Ferry Road	2.86	>80	F
Warm Springs Street/Martinazzi Avenue	0.69	30	C
Tualatin Sherwood Road/Teton Avenue	1.31	>80	F
Tualatin Sherwood Road/Avery Street	1.25	>80	F
Tualatin Road/SW 124th Avenue	1.06	75	E
Highway 99W/SW 124th Avenue	1.18	78	E
Lower Boones Ferry Road/SW 65th Avenue	1.41	>80	F

d/c = demand-to-capacity ratio, LOS = level-of-service

Appendix E

Summary of Project Alternatives



Appendix E
Summary of Project Alternatives

Roadway Projects

Project Description	Alts.	Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
Nyberg Interchange (#289)SB Ramp, Bridge Widening	1,2,3	○	○	●	○	○	○	●	○	N/A	$4,000,000
Lower Boones Ferry Road Bike/Ped/Signal Improvements	1,2,3	○	○	●	○	●	○	○	●	N/A	$5,800,000
Tualatin-Sherwood Road Widen, 99W to Teton	1,2,3	○	●	●	○	○	○	●	○	N/A	$25,000,000
SW 124th Avenue Construct North Segment	1,2,3	●	●	●	○	●	●	●	○	○	$10,000,000
SW 124th Avenue Construct South Segment	1A, 2	●	●	○	○	●	●	●	○	N/A	$3,500,000
I-5/99W Connector North Alignment, Expressway	1A,2, 3	●	●	●	○	●	●	●	○	N/A	$250,000,000
I-5/99W Connector South Alignment, Freeway	1B	●	●	○	○	○	●	●	○	●	$250,000,000
Myslony Street Extend to T-S/Avery	1,2,3	●	●	●	○	●	●	●	○	N/A	$1,880,000
Sagert Street Extend to 95th	1,2,3	●	●	●	○	●	○	○	○	○	$75,000
Blake Street Realign curves	1,2,3	○	○	●	○	●	●	○	●	N/A	$860,000
SW 103rd Avenue Extend to Grahams Ferry	1,2,3	●	○	●	○	●	○	○	○	N/A	$1,150,000
Iowa Drive Extend to Grahams Ferry	1,2,3	●	○	●	○	●	○	○	○	N/A	$1,100,000
New East-West Street108th to 112th Avenues	1,2,3	●	○	●	○	●	○	○	○	●	$1,100,000
Pacific Drive Realign to 124th, access mgmt.	1,2,3	●	●	●	○	●	○	○	●	N/A	$450,000
Leveton/130th Construct new street	1,2,3	●	○	●	○	●	○	●	○	N/A	$2,100,000

Project Description	Alts.	Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
SW 125th Place Construct new street	1,2,3	○	○	●	○	●	○	●	○	N/A	$360,000
SW 128th Avenue/Cummins Construct new street	1,2,3	●	○	●	○	●	○	●	○	N/A	$1,500,000
Herman Road Center turn lane, 108th-118th	1,2,3	○	○	●	○	●	○	●	●	N/A	$3,750,000
95th Place Connect to Avery	2,3	●	○	○	○	●	○	○	○	N/A	$50,000
95th Place Extension to SW 90th Ave.	2,3	●	○	○	○	●	○	○	○	●	$500,000
Boones Ferry Road Widen, Lower Boones – T.S.	2,3	○	●	○	●	●	○	●	●	●	$5,313,000
Tualatin-Sherwood Road Railroad xing improvement	2,3	○	○	○	○	○	○	●	●	N/A	$500,000
Tualatin-Sherwood Road Signal Interconnect	2,3	○	●	○	○	○	○	●	○	N/A	$50,000
Boones Ferry Road Signal Interconnect	2,3	○	●	○	○	○	○	●	○	N/A	$50,000
Herman Road widening From Cipole – 118th	2,3	○	○	○	○	●	○	●	●	N/A	$2,170,000
Herman Road widening From 108th – Teton	2,3	○	○	○	○	●	○	●	●	N/A	$707,000
Herman Road widening From Teton – Tualatin	2,3	○	○	○	○	●	○	●	●	N/A	$1,700,000
Cipole Road widening From T-S Rd – Highway 99W	2,3	○	○	○	○	●	○	○	●	N/A	$6,000,000
McEwan Road reconstruction Between R.R. & 65th	2,3	○	○	○	○	●	○	●	●	N/A	$1,800,000
93rd Avenue extension From Sagert - Avery	2,3	●	○	○	○	●	○	○	○	N/A	$150,000
I-205 widening From I-5 to Stafford Road	2,3	○	●	●	○	●	○	●	●	○	$6,100,000
Hall Boulevard extension Across Tualatin River	2,3	●	●	●	●	●	●	○	○	●	$25,000,000
Teton realignment To SW 108th Avenue	2	●	●	○	○	●	○	○	●	○	$2,100,000

Project Description	Alts.	Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
I-5/99W Connector North alignment modification	3	●	●	●	○	●	●	●	○	N/A	<$250,000,000
I-5 widening,I-205 to I-5/99W connector	3	○	●	○	○	○	○	●	○	○	$1,900,000
Lower Boones Ferry Road Extension to Tualatin Road	3	●	●	○	○	●	●	●	○	N/A	$14,000,000
SW 65th Avenue extension Across the Tualatin River	3	●	●	○	○	●	●	○	○	N/A	$2,800,000
Boones Ferry Road widening From T-S to Sagert Street	3	●	●	○	●	●	○	●	○	N/A	$3,000,000

Transit Projects

Project Description	Alts.	Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
Wilsonville-Beaverton Commuter Rail	1,2,3	●	○	●	●	○	○	●	○	●	$75,000,000
Northwest Tualatin service	2,3	●	○	●	●	○	○	○	○	N/A	$400,000*
Sherwood service	2,3	●	○	●	●	○	○	○	○	N/A	$300,000*
Oregon City-Tualatin-Tigard	2,3	●	○	●	●	○	○	○	○	N/A	$1,000,000*
Lake Grove/L.O. service	2,3	●	○	●	●	○	○	○	○	N/A	$400,000*

*annual cost

Pedestrian/Bicycle Projects

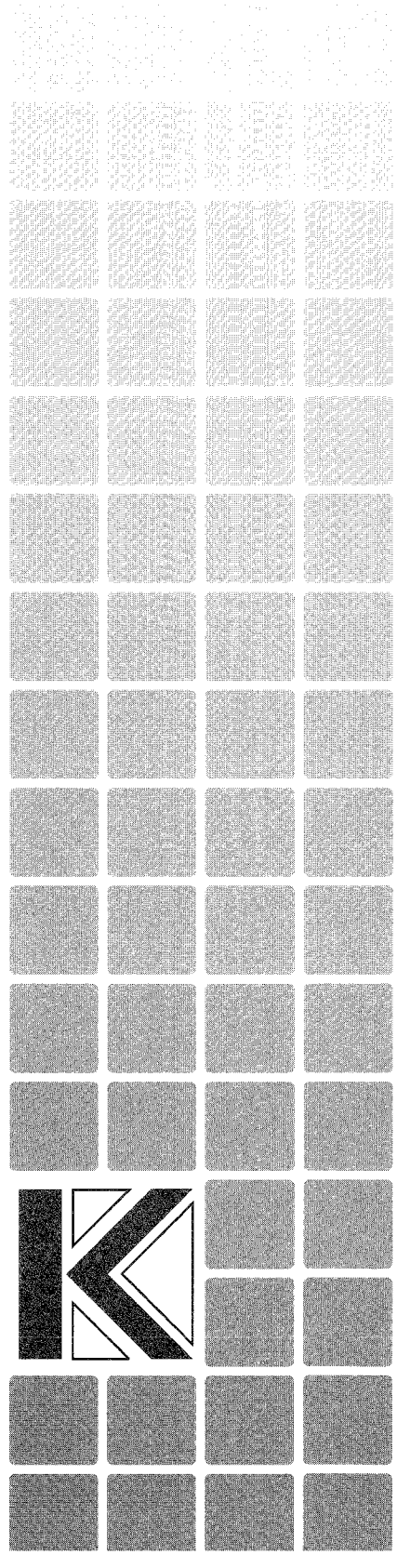
Project Description	Alts.	Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
Boones Ferry sidewalks Tualatin Road-Sagert	1,2,3	●	○	●	●	●	○	○	●	○	$325,000
99W sidewalks NCL-WCL	1,2,3	●	○	●	○	●	○	○	●	N/A	$1,100,000
Hall Boulevard ped/bike bridge	1	●	○	●	○	●	○	○	○	N/A	$1,000,000
SW 108th Avenue ped/bike bridge	1,2,3	●	○	●	○	●	○	○	○	○	$450,000
SW 65th Avenue ped/bike bridge	1,2,3	●	○	●	○	●	○	○	○	○	$450,000
Boones Ferry bike lanes Tualatin Road-SCL	1,2,3	●	○	●	○	●	○	○	●	●	$2,100,000
Nyberg bike lanes Tualatin-Sherwood to 65th	1,2,3	●	○	●	○	●	○	○	●	○	$850,000
65th Avenue bike lanes Nyberg - Borland	1,2,3	●	○	●	○	●	○	○	●	N/A	$700,000
Borland bike lanes65th-ECL	1,2,3	●	○	●	○	●	○	○	●	●	$1,500,000
Teton bike lanes Herman to Tualatin-Sherwood	1,2,3	●	○	●	○	●	○	○	●	●	$750,000
Tualatin-Sherwood bike lanes90th-Nyberg	1,2,3	●	○	●	○	●	○	○	●	○	$330,000
Tualatin River pathway99W-ECL	1,2,3	●	○	●	○	●	○	○	○	○	$1,800,000
Tualatin River pathwayPacific-99W	1,2,3	●	○	●	○	●	○	○	○	○	$700,000
Tualatin River pathway connectors, 3 projects	1,2,3	●	○	●	○	●	○	○	○	○	$250,000
I-5 pathway	1,2,3	●	○	●	○	●	○	○	○	●	$1,400,000
I-205 pathway	1,2,3	●	○	●	○	●	○	○	○	●	$875,000

Project Description	Alts.	Mobility	Livability	Coordination	Transit	Ped/Bike	Environment	Capacity	Safety	Public	Cost
Nyberg Creek pathway72nd-65th	1,2,3	●	○	●	○	●	○	○	○	N/A	$170,000
Pedestrian trails6 projects	1,2,3	○	○	●	○	●	○	○	○	●	$625,000
Sagert Street sidewalks Over I-5	2,3	○	○	○	○	●	○	○	●	N/A	$13,500
105th Avenue sidewalks South of Avery to city limits	2,3	○	○	○	○	●	○	○	●	N/A	$84,000

Comparison of Alternatives

Measure	Existing	No-Build	Alt. 1A	Alt. 1B	Alt. 2	Alt. 3
Lane-miles of congestion: Collectors/Arterials	4.47	28.06	16.63	28.92	13.35	15.69
Lane-miles of congestion: Freeways/Expressways	2.37	27.23	10.84	10.10	5.30	6.33
TLOS Indicator: Population	6.6%	6.3%	7.0%	7.0%	12.5%	12.5%
TLOS Indicator: Jobs	7.2%	5.8%	8.4%	8.4%	15.4%	15.4%
Miles of new ped/bike facilities	N/A	0.28	25.64	25.64	26.50	27.00
Peak hour VMT: Collectors	11,000	19,700	18,500	18,400	14,400	14,800
Total project cost—City facilities	N/A	$0	$32,949,000	$32,949,000	$67,223,500	$65,123,500
Total project cost—Clackamas County facilities	N/A	$0	$1,500,000	$1,500,000	$1,500,000	$1,500,000
Total project cost—Washington County facilities	N/A	$0	$33,300,000	$33,300,000	$39,850,000	$56,650,000
Total project cost—ODOT facilities	N/A	$4,000,000	$260,250,000	$260,250,000	$271,713,000	$276,613,000

Lane-miles of congestion: total length of lanes operating over capacity under the alternative.
TLOS: Florida Transit Level of Service Indicator (percent of time average person has transit available during day throughout Tualatin)—indicates relative levels of transit availability.
Miles of new ped/bike facilities: total length of new bike lanes, sidewalks, and pathways constructed under the alternative, excluding facilities provided with new roadways.
Peak hour vehicle-miles traveled: street link volume multiplied by street link length, summed for all collectors—indicates relative amount of traffic diverting off arterial system.
Project cost: estimated cost of all projects comprising the alternative, unadjusted for inflation.
N/A = not applicable.



Appendix F

Potential Funding Sources

Appendix F
Potential Funding Sources

TABLE F-1
SUMMARY OF ROAD-RELATED TRANSPORTATION FUNDING PROGRAMS

Federal Sources	
Program Name	**Description**
Community Development Block Grants	(CDBG) Community Development Block Grants (CDBG) are administered by the Department of Housing and Urban Development (HUD) and potentially be used for transportation improvements in eligible areas.
State Sources	
Program Name	**Description**
OR Transportation Infrastructure Bank	As a pilot program for the USDOT, the Oregon Transportation Commission has made $10 million available from projects that will not be contracted in FY 1996. The OTIB will make loans for transportation projects and will offer a variety of credit enhancements. Initial loans must be for improvements on federal aid highways, repayments go into an account that will be made available for any mode. Ability to repay will be a key factor in all loans.
Traffic Control Projects	The State maintains a policy of sharing installation, maintenance, and operational costs for traffic signals and luminaire units at intersections between State highway and city streets (or county roads). Intersections involving a State highway and a city street (or county road) which are included on the state-wide priority list are eligible to participate in the cost sharing policy. ODOT establishes a statewide priority list for traffic signal installations on the State Highway System. The priority system is based on warrants outlined in the Manual for Uniform Traffic Control Devices. Local agencies are responsible for coordinating the statewide signal priority list with local road requirements.
Special Public Works Fund (SPWF)	The State of Oregon allocates a portion of revenues from the state lottery for economic development. The Oregon Economic Development Department provides grants and loans through the SPWF program to construct, improve and repair infrastructure to support local economic development and create new jobs. The SPWF provides a maximum grant of $500,000 for projects that will help create a minimum of 50 jobs.
Transportation Access Charges	The most familiar transportation access charge is a bridge or highway toll. These charges are most appropriate for high-speed, limited access corridors; service in high-demand corridors; and bypass facilities to avoid congested areas. Congestion pricing, where drivers are charged electronically for the trips they make based on location and time of day, is the most efficient policy for dealing with urban congestion. It not only generates revenue for maintenance and improvements; but also decreases congestion and the need for capital improvements by increasing the cost of trips during peak periods. The Oregon Revised Statutes allow ODOT to construct toll bridges to connect state highways and improve safety and capacity. The Statues also allow private development of toll bridges. Recent actions by the Oregon legislature provide authority for developing toll roads. State authority for congestion pricing does not exist; new legislation would be required.
Immediate Opportunity Fund (IOF)	Financed at a level of $5 million per year to a maximum of $40 million through FY96. The fund is to support specific economic developments in Oregon through the construction and improvement of roads and is restricted for use in situations that require a quick response and commitment of funds. It is anticipated that the maximum amount available for a single project is $500,000 or 10 percent of the annual program level. This fund may be used only when other sources of financial support are unavailable or insufficient and are not a replacement or substitute for other funding sources.
OR Transportation Infrastructure Bank	As a pilot program for the USDOT, the Oregon Transportation Commission has made $10 million available from projects that will not be contracted in FY 1996. The OTIB will make loans for transportation projects and will offer a variety of credit enhancements. Initial loans must be for improvements on federal aid highways, repayments go into an account that will be made available for any mode. Ability to repay will be a key factor in all loans.
Traffic Control Projects	The State maintains a policy of sharing installation, maintenance, and operational costs for traffic signals and luminaire units at intersections between State highway and city streets

Projects	(or county roads). Intersections involving a State highway and a city street (or county road) which are included on the state-wide priority list are eligible to participate in the cost sharing policy. ODOT establishes a statewide priority list for traffic signal installations on the State Highway System. The priority system is based on warrants outlined in the Manual for Uniform Traffic Control Devices. Local agencies are responsible for coordinating the statewide signal priority list with local road requirements.
Local Sources	
Program Name	**Description**
Street Utility Fee	Most city residents pay water and sewer utility fees. Street user fees apply the same concept to city streets. A fee would be assessed to all businesses and households in the city for use of streets based on the amount of use typically generated by a particular use. For example, a single-family residence might, on average, generate 10 vehicle trips per day compared to 130 trips per 1,000 square feet of floor area for retail uses. Therefore, the retail use would be assessed a higher fee based on higher use. Street services fees differ from water and sewer fees because usage cannot be easily monitored. Street user fees are typically used to pay for maintenance more than for capital projects. Tualatin uses this fee.
Vehicle Registration Fees	Counties can implement a local vehicle registration fee. The fee would operate similar to the state vehicle registration fee. A portion of the County fee would be allocated to the City.
Property Taxes	Local property taxes could be used to fund transportation, although this is limited by Ballot Measure 5 and 47.
Revenue Bonds	Revenue Bonds are bonds whose debt service is financed by user charges, such as service charges, tolls, admissions fees, and rents. If revenues from user charges are not sufficient to meet the debt service payments, the issuer generally is not legally obligated to levy taxes to avoid default, unless they are also based by the full faith and credit of the insuring governmental unit. In that case, they are called indirect general obligation bonds. Revenue bonds could be secured by a local gas tax, street utility fee, or other transportation-related stable revenue stream.
Special Assessments/Local Improvements Districts	Special assessments are charges levied on property owners for neighborhood public facilities and services, with each property assessed a portion of total project cost. They are commonly used for such public works projects as street paving, drainage, parking facilities and sewer lines. The justification for such levies is that many of these public works activities provide services to or directly enhance the value of nearby land, thereby providing direct and/or financial benefit to its owners. Local Improvement Districts (LIDs) are legal entities established by the City to levy special assessments designed to fund improvements that have local benefits. Through a local improvement district (LID), streets or other transportation improvements are constructed and a fee is assessed to adjacent property owners.
Systems Development Charges (Impact Fees)	Systems Development Charges (SDCs) are fees paid by land developers intended to reflect the increased capital costs incurred by a municipality or utility as a result of a development. Development charges are calculated to include the costs of impacts on adjacent areas or services, such as increased school enrollment, parks and recreation use, or traffic congestion. Numerous Oregon cities and counties presently use SDCs to fund transportation capacity improvements. SDCs are authorized and limited by ORS 223.297 - 223.314.
Local Gas Tax	A local gas tax is assessed at the pump and added to existing state and federal taxes. Tillamook, The Dalles and Woodburn are Oregon cities that have a local gas tax. Multnomah and Washington Counties also have gas taxes.
Local Parking Fees	Parking fees are a common means of generating revenue for public parking maintenance and development. Most cities have some public parking and many charge nominal fees for use of public parking. Cities also generate revenues from parking citations. These fees are generally used for parking-related maintenance and improvements.

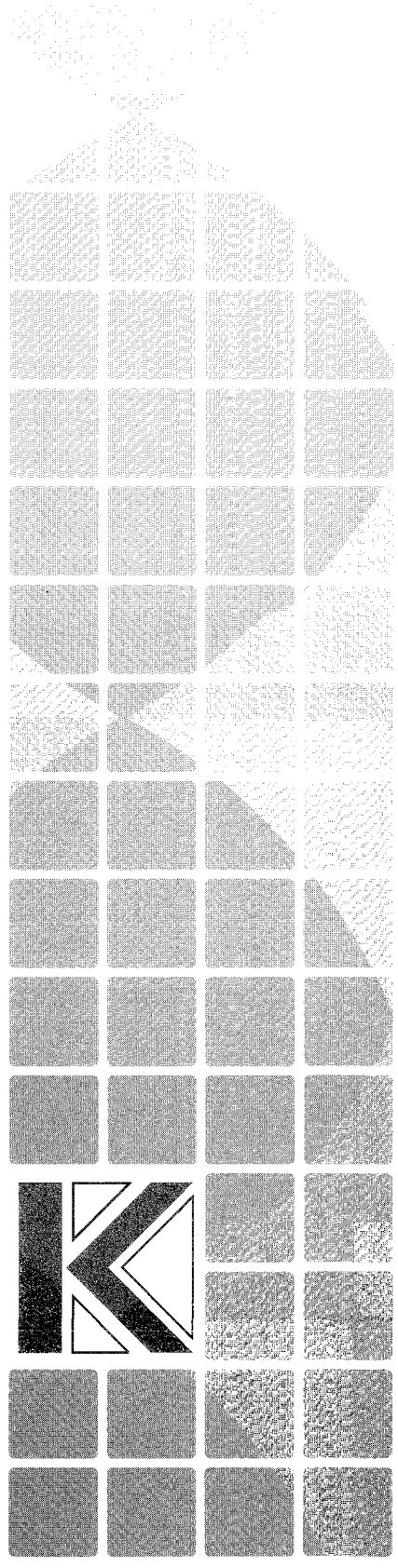
TABLE F-2
CURRENTLY USED REVENUE SOURCES FOR CITIES (MILLIONS OF 1995 DOLLARS)

Facility	Revenue Source	Importance	3-year Trend	Dedication	Rate
Streets/Bridges/Sidewalks/Bike Lanes	Oregon Highway Trust Fund	51% of total road or $89.	Growing about 1.75% per year.	Constitutionally limited to funding activities that benefit autos & trucks.	24¢/gal. for gas; $30/biennium registration fee.
	General Fund Transfers	9% or $15.	Varies but assume growth @ 3%/yr. But not used by all cities.	May be used for any purpose.	Varies widely.
	Special Property Tax Levies	5% or $7.	Increasing, only used by about 18 cities.	May be used for purpose described in election.	Varies widely.
	Improvement District Assessments	7% or $12.5.	Varies but increases when local development increases.	May be used for construction of adjacent streets-sidewalks.	Varies with construction cost & local ordinances.
	Systems Development Charges/Traffic Impact Fees	4% or $7.	Varies but increases when local development increases, only used by about 2 dozen cities.	May be used for construction of new streets.	Varies with construction cost & local ordinances. Rates generally higher in Portland Metro area.
	Utility Franchise Fees	3% or $4.	Grows roughly w/population and inflation.	Is a general revenue used by some cities for streets.	Statutory limit of 5% of utility gross receipts.
	Interest Earnings	4% or $6.	Varies w/current interest rates.	Have same Constitutional limits as Highway Fund.	Used as general street revenue.
	Local Gas Tax	0.44% or $0.7	Unchanged.	Have same Constitutional limits as Highway Fund.	Used by Tillamook, The Dalles, and Woodburn.
	Private Contributions	3% or $4.3	Varies widely.	Usually contributions are related to specific development street impacts.	Negotiated individually.
	Misc. - permit fees, finds, fines, parking, Motel Tax, other	8% or $14.5.	Gradual growth.	General revenues used for streets.	Varies widely by City.
	Federal - FHWA+HUD	3% or $5.6.	Relatively stable	Used mainly for new construction w/some rehab.	Based on federal allocation to Oregon.
	Misc. State Revenues - mainly Lottery funds.	2% or $3.	Varies, no trend.	Used mainly for economic development capital improvements.	Specific grants to individual cities each year.

Off-street Bike Paths	Misc. general funds & ISTEA	??	Varies from year to year.	ISTEA & General Funds used for construction, General Funds used for maintenance & repair.	Varies from year to year.

TABLE F-3
CURRENTLY USED PUBLIC TRANSPORTATION REVENUE SOURCES IN OREGON

Transit Service Type/Function	Funding Sources	Status
Urban Public Transportation (Portland & Eugene) (operating & capital)	1. Local Payroll Tax - operating 2. Federal grants - capital 3. Federal grants - operating 4. Fares & advertising	1. Major Source - $100 million/yr. Growing - Sensitive to Economic Conditions 2. Major source - $10 million/yr - Stable 3. Minor source - $5 million/yr - Declining 4. Minor source - Growing w/ridership
Urban Public Transportation (Salem, Corvallis, Medford, K-Falls)	1. Property tax (typically a tax base or stand-alone levy w/in $10 cap for local gov't services) 2. Federal grants - capital 3. Federal grant - operating 4. Fares & advertising	1. Major Source - Growing Slowly 2. Major Source - $2 million/yr. - Stable 3. Major Source - $2 million/yr. - Declining 4. Minor Source - Growing w/ridership
Small City & Rural (Astoria, Union County, etc.) (operating & capital)	1. Federal grants - capital & operating 2. Local Property Tax (typically w/in city or county operating levy) 3. Fares, donations & advertising	1. Major Source - Declining 2. Major Source - Stable 3. Minor Source - Stable
Mobility for Seniors & People with Disabilities - (operating & capital)	1. Special Transportation Fund (2¢ state cigarette tax) - operating & capital 2. Social Service Agency grants / contracts - operating 3. Local Property Tax (typically w/in city or county operating levy) 4. Federal grants - capital & operating 5. Fares, donations advertising	1. Major Source - $5 million/yr. - Declining 2. Major Source - Declining 3. Minor Source - Stable 4. Major Source - Declining 5. Minor - Stable
Intercity Bus (operating & capital)	1. Major Interstate Routes: Fares 2. Branch & feeder routes: Private capital, Fares	1. Sole Source - Declining 2. Private



Appendix G

Additional Modeling Work

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION PLANNING/TRAFFIC ENGINEERING
610 SW ALDER, SUITE 700 • PORTLAND, OR 97205 • (503) 228-5230 • FAX (503) 273-8169

MEMORANDUM

Date: May 23, 2001 **Project #**: 4445

To: Mike McKillip
City of Tualatin
18880 SW Martinazzi Avenue
Tualatin, OR 97062-0369

From: Paul Ryus & Matt Hughart

Project: Additional Transportation Modeling Analysis for the Tualatin TSP

Subject: Modeling Results

As requested, Kittelson & Associates, Inc. has modeled three new scenarios and compared them with the three alternatives developed for the Tualatin Transportation System Plan (TSP). This memorandum summarizes the results of this work.

New Scenario #1

Scenario #1 includes the following transportation elements:

- I-5/Highway 99W connector (north alignment) – this project is modeled as four-lane expressway facility with its western end at the future SW 124th Avenue/Tualatin Sherwood Road intersection and its eastern end at I-5 just south of Norwood Road (similar to the alignment presented under the Alternative #3 scenario in the TSP Alternatives Analysis section). Two mid-facility intersections are included at Boones Ferry Road and Grahams Ferry Road.
- An extension of Hall Boulevard over the Tualatin River.
- All other projects listed in the Tualatin TSP's preferred alternative.

Modeling Results

Metro's EMME/2 transportation demand model for the Portland region was used to forecast 2020 p.m. peak hour volumes. This model incorporates the regional growth used to develop the Regional Transportation Plan (RTP), and the updated growth forecasts for Tualatin developed by City staff. The assumed transportation network was as described above.

The future traffic volumes that the model forecasted for this scenario were compared to the TSP's no-build alternative, and to Alternative #2 and Alternative #3. The results of this comparison are as follows:

- In general, Scenario #1's results are similar to Alternative #3's. The main differences between the scenarios are a result of Scenario #1 not including a Lower Boones Ferry Road extension across the Tualatin River to Tualatin Road.
- Without the Lower Boones Ferry Road extension across the Tualatin River, both Bridgeport Road and the existing portion of Lower Boones Ferry Road will operate at below capacity conditions. (Both of these facilities were projected to operate at above capacity conditions in the Alternative #3 scenario.) Traffic that used the Lower Boones Ferry Road bridge under Alternative #3 appears to use the I-5 corridor under Scenario #1. Consequently, Scenario #1 volumes on Tualatin-Sherwood Road are slightly higher, but not enough to alter the overall operation of the facility.
- With the Lower Boones Ferry Road extension under Alternative #3, Tualatin Road between SW 90th Avenue and SW 124th Avenue experienced significantly higher traffic demand, causing it to operate over capacity. The Scenario #1 results indicate that this section of Tualatin Road will operate below capacity.
- Traffic demands on the I-5/Highway 99W Connector under Scenario #1 do not differ much from Alternative #3. The only real difference is on Grahams Ferry Road, where the traffic demands are reduced slightly due to the connection at Boones Ferry Road. This connection helps to distribute access to and from the I-5/Highway 99W Connector more evenly.

Hall Boulevard Select Link Analysis

A select link analysis was performed for Hall Boulevard at the future Tualatin River bridge. This analysis determines the origins and destinations of the vehicles using the bridge. Table 1 shows the distribution of northbound and southbound trips.

Table 1
Origins and Destinations of Hall Boulevard Trips: Scenario #1

Location	% of Southbound Trip Destinations	% of Northbound Trip Origins
TRIPS STARTING OR ENDING IN TUALATIN		
Tualatin Town Center	27%	40%
Southeast Tualatin	14%	7%
Sagert Street offices/apts.	9%	7%
Southwest Tualatin	4%	0%
Industrial area	3%	3%
90th Avenue & other Tualatin areas	5%	10%
Total—Tualatin-based trips	**62%**	**67%**
TRIPS PASSING THROUGH TUALATIN		
I-205 east	13%	14%
Boones Fy/Grahams Fy/I-5 south	11%	12%
Borland east	6%	3%
Tualatin-Sherwood west	5%	3%
65th Avenue south	3%	1%
Total—Through trips	**38%**	**33%**

As Table 1 shows, about two-thirds of the traffic using the bridge will have a trip origin or destination inside Tualatin, and many of these trips will start or end near the bridge—either in the Tualatin Town Center, or in the area immediately west, along SW 90th Avenue. The remaining one-third of the trips will be regional trips, mainly oriented towards the south and east.

New Scenario #2

Scenario #2 includes the following transportation elements:

- I-5/Highway 99W connector (south alignment) – this project was modeled as a four-lane freeway running from I-5 just south of Norwood Road to Highway 99W south of the City of Sherwood (similar to the TSP's Alternative #1B alignment). Two connections are provided along this facility: one at Grahams Ferry Road and the other at a future southern extension of SW 124th Avenue.
- An extension of SW 124th Avenue from Tualatin-Sherwood Road to an interchange with the I-5/Highway 99W connector.
- An extension of Hall Boulevard over the Tualatin River.
- All other remaining projects listed in the Tualatin TSP preferred alternative.

Modeling Results

Scenario #2's results are similar to Scenario #1's. Under both scenarios, Hall Boulevard is forecast to have similar traffic volumes, and the bridge provides similar levels of positive impact on Bridgeport Road, Boones Ferry Road, and Lower Boones Ferry Road. The significant differences between the two scenarios are as follows:

- The combination of the I-5/Highway 99W connector (southern alignment) and the SW 124th Avenue extension produces several beneficial shifts in traffic. In particular, Tualatin-Sherwood Road experiences a significant reduction from the volumes forecast for any of the alternatives that used the I-5/Highway 99W connector (northern alignment). Part of this reduction can be attributed to industrial trips which now have an opportunity to bypass Tualatin-Sherwood Road by using SW 124th Avenue and the I-5/Highway 99W Connector (southern alignment) to get to destinations both east and west of Tualatin.
- Forecast demands on the SW 124th Avenue between Tualatin-Sherwood Road and the I-5/Highway 99W Connector will cause it to operate over capacity. A five-lane roadway, as opposed to the modeled three-lane roadway, would be more appropriate.
- As a result of the I-5/Highway 99W Connector (southern alignment), traffic volumes will increase slightly on I-5 and decrease slightly on Highway 99W. The decrease in volumes on Highway 99W is sufficient to allow this facility to operate below capacity within the City of Tualatin.

Hall Boulevard Select Link Analysis

Table 2 shows the results of the select link analysis for Scenario #2. Slightly less than two-thirds of trips using the bridge will have trip origins or destinations inside Tualatin, and more than half of these local trips will start or end near the bridge, either in the Tualatin Town Center or along SW 90th Avenue. Interestingly, very few industrial trips use the bridge, indicating that the combination of the I-5/Highway 99W Connector (south alignment) and the SW 124th Avenue extension are relieving enough traffic from Highway 99W that it becomes an attractive route for trips between the industrial area and points to the north.

Table 2
Origins and Destinations of Hall Boulevard Trips: Scenario #2

Location	% of Southbound Trip Destinations	% of Northbound Trip Origins
TRIPS STARTING OR ENDING IN TUALATIN		
Tualatin Town Center	25%	35%
Southeast Tualatin	14%	7%
Sagert Street offices/apts.	9%	7%
Southwest Tualatin	5%	3%
Industrial area	2%	0%
90th Avenue & other Tualatin areas	7%	11%
Total—Tualatin-based trips	**62%**	**63%**
TRIPS PASSING THROUGH TUALATIN		
I-205 east	12%	14%
Boones Fy/Grahams Fy/I-5 south	13%	16%
Borland east	5%	3%
Tualatin-Sherwood west	4%	2%
65th Avenue south	4%	2%
Total—Through trips	**38%**	**37%**

New Scenario #3

Scenario #3 includes the following transportation elements:

- No I-5/Highway 99W connector.
- An extension of Hall Boulevard over the Tualatin River.
- All other projects listed in the Tualatin TSP preferred alternative.

Modeling Results

The main purpose of Scenario #3 is to examine the impacts of not building an I-5/Highway 99W connector, but keeping the identified transportation improvements in the financially constrained Tualatin TSP preferred alternative. The modeling results of this scenario are summarized below.

- In general, without the alternative east-west connection provided by an I-5/Highway 99W Connector, traffic demands on Tualatin-Sherwood Road and the other east-west roadways will be similar to those shown for the No-Build scenario.
- Tualatin-Sherwood Road between Martinazzi Avenue and Teton Road is forecast to operate at or over capacity.
- Avery Street between Tualatin-Sherwood Road and SW 105th Avenue is forecast to operate over capacity.
- Boones Ferry Road is forecast to operate near or over capacity south of Teton Avenue.
- Northbound traffic demands on Hall Boulevard increase by about 150 peak hour vehicles; southbound traffic demands are similar to Scenarios #1 and #2.

Hall Boulevard Select Link Analysis

Under Scenario #3, more Tualatin-based trips are made over the Hall Boulevard bridge than under the other two scenarios. Traffic congestion in central Tualatin resulting from the lack of an I-5/Highway 99W Connector appears to deter the use of the bridge for trips towards the east. In addition, traffic congestion on Highway 99W shifts traffic headed to Sherwood onto Herman Road and Tualatin-Sherwood Road.

Table 3
Origins and Destinations of Hall Boulevard Trips: Scenario #3

Location	% of Southbound Trip Destinations	% of Northbound Trip Origins
TRIPS STARTING OR ENDING IN TUALATIN		
Tualatin Town Center	30%	41%
Southeast Tualatin	15%	6%
Sagert Street offices/apts.	8%	5%
Southwest Tualatin	5%	2%
Industrial area	3%	2%
90th Avenue & other Tualatin areas	7%	6%
Total—Tualatin-based trips	**68%**	**62%**
TRIPS PASSING THROUGH TUALATIN		
I-205 east	0%	11%
Boones Fy/Grahams Fy/I-5 south	13%	22%
Borland east	4%	2%
Tualatin-Sherwood west	11%	2%
65th Avenue south	4%	1%
Total—Through trips	**32%**	**38%**

The EMME/2 volume plots for each scenario are attached to this memo for your reference. If you have any questions regarding this memo, please call us at (503) 228-5230.

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MEMORANDUM

Date: June 4, 2001 **Project #**: 4445

To: Mike McKillip
City of Tualatin
18880 SW Martinazzi Avenue
Tualatin, OR 97062-0369

From: Paul Ryus & Matt Hughart

Project: Additional Transportation Modeling Analysis (2) for the Tualatin TSP

Subject: Modeling Results

As requested, Kittelson & Associates, Inc. has modeled a fourth scenario and compared it with the alternatives previously prepared for the Tualatin Transportation System Plan (TSP). This memorandum summarizes the results of this work.

Scenario #4

Scenario #4 includes the following transportation elements:

- no Hall Boulevard extension across the Tualatin River;
- no I-5/Highway 99W connector (north or south alignment);
- A two-lane road that follows the general alignment of the I-5/Highway 99W connector (north alignment), but only runs between Boones Ferry Road and Tualatin-Sherwood Road (herein referred to as the Tualatin-Sherwood/Boones Ferry connector); and
- The remaining projects included in Scenario #3 from the May 23 modeling work.

Modeling Results

The main purpose of Scenario #4 is to examine the impacts of the identified transportation improvements in the financially constrained Tualatin TSP preferred alternative without an extension of Hall Boulevard across the Tualatin River or an I-5/Highway 99W connector. The modeling results of this scenario are summarized below.

- Without the alternative east-west connection provided by an I-5/Highway 99W connector, traffic demands on Tualatin-Sherwood Road between SW 124th Avenue and Boones Ferry Road are higher than in the scenarios that include an I-5/Highway 99W connector (see the results from Scenario #3). However, the combination of providing a Tualatin-Sherwood/Boones Ferry connector and not providing a Hall Street bridge reduces traffic demands sufficiently that Tualatin-Sherwood Road between SW 124th Avenue and

Martinazzi Avenue operates below or near capacity. This differs from Scenario #3 where the traffic demands on Tualatin-Sherwood Road between Teton Avenue and Boones Ferry Road are projected to be over capacity.

- Approximately two-thirds of the demand on the Tualatin-Sherwood/Boones Ferry connector travels east from Tualatin-Sherwood Road to Boones Ferry Road and then south along Boones Ferry towards Wilsonville. This is consistent with all other scenarios that involved the north alignment of the I-5/Highway 99W connector showing a high travel demand between Highway 99W and Wilsonville. The connector operates below capacity in the two-lane configuration.
- Boones Ferry Road between Teton Avenue and the new Tualatin-Sherwood/Boones Ferry connector is forecast to operate below capacity. This differs from Scenario #3 where this same stretch of Boones Ferry Road was forecast to operate near or over capacity. The improvement seen under Scenario #4 can be attributed to the combination of providing the Tualatin-Sherwood/Boones Ferry connector (serving as a bypass), and not providing a Hall Street bridge (which was a source of Boones Ferry traffic in Scenario #3) .
- Avery Street between Tualatin-Sherwood Road and SW 105th Avenue is forecast to operate over capacity.
- As seen under Scenario #1, #2, and #3, Highway 99W is projected to operate near or above capacity under Scenario #4. In general, the Scenario #4 volumes are similar to the Scenario #3 volumes.
- With the absence of the Hall Boulevard extension, the overall traffic demand on Upper Boones Ferry Road, Boones Ferry Road north of Tualatin-Sherwood Road, and I-5 increase as these facilities provide the only other alternative routes across the Tualatin River. In Scenario #3, Upper Boones Ferry Road, Boones Ferry Road, and I-5 were forecast to operate above capacity even with the Hall Boulevard extension. This indicates that the demand to cross the Tualatin River is greater than can be accommodated with or without an extension of Hall Boulevard.
- The Scenario #4 modeling results for the remainder of the City are generally similar to the modeling results obtained under Scenario #3.

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION PLANNING/TRAFFIC ENGINEERING
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MEMORANDUM

Tualatin TSP—City Contract
Tualatin Transportation System Plan
Level of Service Standards

Date: June 26, 2001 **Project #:** 4445

To: **Mike McKillip, P.E.**
From: Paul Ryus, P.E.

cc: Jason Tuck, Jim Jacks

Introduction

The Alternative 3 modeling results showed that some roadways within Tualatin would operate over capacity during the p.m. peak hour in the year 2020, even after an extensive set of roadway and transit improvement projects throughout the City. However, within the Tualatin Town Center, some of these over-capacity roadways will meet Metro's level-of-service standards, which allow for one hour of level of service (LOS) "F" conditions (over-capacity), with a half-hour of LOS "E" conditions on either side of the peak. Further, the modeled traffic demands on some over-capacity roadway segments might not materialize in practice, as motorists trying to use those segments would be caught in congestion elsewhere on the roadway system. This memorandum identifies the roadways that are shown in TSP Figure 5-10 as operating over capacity and determines (1) whether they would meet the Metro two-hour standards, and (2) whether their modeled traffic demands are constrained elsewhere.

LOS Standards

The City of Tualatin currently has an informal standard of LOS "D" for signalized intersections and LOS "E" for unsignalized intersections, based on a detailed operations analysis of an intersection. The TSP uses a planning-level analysis that looks at street segments between intersections, rather than at individual intersections. Street segments are categorized as under capacity (corresponding to LOS "D" and v/c ratio $\leq$ 0.90), near capacity (corresponding to LOS "E" and v/c ratio between 0.90 – 0.99), or over capacity (corresponding to "F" and v/c ratio $\geq$1.00). Actual intersection levels of service along streets will depend on relative traffic volumes, the presence of turn lanes, the amount of green time provided to the main street, and other factors not accounted for in the Metro model. However, for planning purposes, it can be assumed that streets shown as under or near capacity could meet the City's standards.

Washington County currently uses a volume-to-capacity ratio of 0.90 as the standard for signalized intersections if peak one-hour volumes are used (as was done in the TSP), or 0.95 if peak 15-minute volumes are used (as is typically done in a site transportation impact analysis). For planning purposes,

Washington County's standard is similar to the City's. Washington County is currently updating its TSP and may change its standard through the TSP process sometime in 2002.

Clackamas County uses a standard of LOS "D" for signalized intersections and LOS "E" for unsignalized intersections, which is the same as the City's standard.

ODOT and Metro now use essentially the same standard, following action by the Oregon Transportation Commission on December 13, 2000 to update the Oregon Highway Plan to bring ODOT's standards in line with Metro's standards within the Metro region. The difference between the two agencies is that Metro presents their standards in terms of levels of service, while ODOT presents their standards in terms of volume-to-capacity ratios. However, the relationships between level of service and volume-to-capacity ratios used by the two agencies are identical.

Metro uses a two-hour standard, allowing higher levels of congestion during the peak hour, if the half-hours on either side of the peak (the "second hour") are less congested. Within Town Center areas, the standard is LOS "F" for the peak hour and LOS "E" for the second hour. Elsewhere within Tualatin, the standard is LOS "E" for both hours. ODOT has established a maximum v/c ratio of 0.95 for Highway 99W from SW 124th Avenue north through Tigard; a maximum v/c ratio of 0.99 applies to the remainder of the highway within Tualatin.

Effects of Adopting Metro's LOS Standard

Because Metro has set a maximum of LOS "E" outside of Town Center areas, only roadways within the Tualatin Town Center area would be affected by the lower standard. Elsewhere, for planning purposes, Metro's standard is similar to the City's when applied to roadway segments. Roadway segments within the Tualatin Town Center that are shown as over capacity in TSP Figure 5-10 are listed below, along with whether they would meet the Metro standard.

Roadway Segment	**Meets Metro standard?**
Tualatin Road, 90th to Boones Ferry	yes
Hall Boulevard extension over river	yes
Lower Boones Ferry extension over river	yes
Boones Ferry, Martinazzi to Lower Boones	no
Boones Ferry, Tualatin to Tualatin-Sherwood	no
Martinazzi, Boones Ferry to Tualatin-Sherwood	no
Nyberg, Martinazzi to I-5	yes
Martinazzi, Tualatin-Sherwood to Sagert	yes
Sagert, Martinazzi to 65th	yes
90th, Tualatin to Tualatin-Sherwood	yes

Capacity Constraints

The Metro model measures demands to use particular roadways. Where demands exceed a roadway's capacity, the actual volumes that would be observed on roadway segments downstream from the congestion point would be lower than those modeled. This is because vehicles would be delayed in congestion at the first over-capacity location, resulting in not all of them being able to reach the downstream segments during the peak hour. This effect is the same as when an accident occurs on a six-lane freeway and blocks a lane of traffic—traffic backs up behind the accident site but flows freely beyond the accident site. Capacity is constrained at the accident location, where only two lanes of freeway capacity are available, but three lanes of traffic (the demand) wish to get past the accident site.

Beyond the accident site, two lanes worth of traffic have full use of three lanes, so the freeway flows smoothly. A congested roadway segment works the same way to meter traffic, except that the congestion occurs every day. Under this principal, the roadway segments listed below that are shown as over capacity in the Metro model are constrained by upstream congestion and would be expected to operate under or near capacity, instead. For example, Highway 99W will not be widened through Tigard, so not all of the modeled volumes will be able to reach Tualatin during the peak hour.

- Highway 99W, north of 124th Avenue
- Lower Boones Ferry, east of McEwan
- 72nd Avenue, north of Lower Boones Ferry
- Boones Ferry, Martinazzi to Lower Boones Ferry
- Boones Ferry, Tualatin to Tualatin-Sherwood
- Martinazzi, Boones Ferry to Sagert
- Nyberg, Martinazzi to I-5 (over capacity on I-5)

Modeling Anomalies

By necessity, the Metro model models only the more important streets (typically collectors and arterials), and traffic from a given area is loaded onto the street network at only one or two points. Where multiple routes exist to distribute traffic from an area onto the street network, the model may overestimate volumes on roadway segments close to the points where an area's traffic is loaded. For example, traffic for the residential areas in southern Tualatin loads to the network at two points: the Martinazzi/Sagert and the Boones Ferry/Blake intersections, causing a sharp jump in volumes on nearby sections of Martinazzi and Boones Ferry. The Boones Ferry volumes are reasonable, given the number of streets that have access (volumes would decline more slowly in reality than shown in the model), but it is unlikely that Martinazzi between Sagert and Avery would have the traffic demands that the model shows.

Remaining Needs

The following roadways would need an additional lane in each direction to meet either the City's one-hour LOS "D"/"E" standard or Metro's two-hour standards in 2020:

- Leveton, 108th to 118th
- 108th, Leveton to Herman
- Herman, 108th to Teton
- Tualatin, Herman to 90th
- Boones Ferry, Avery to Grahams Ferry
- 65th, Sagert to Childs
- Borland, east of Wilke
- McEwan, south of Lower Boones Ferry
- Bridgeport, west of Lower Boones Ferry, OR Lower Boones Ferry, Boones Ferry to McEwan

The following roadways would need an additional lane in each direction under the City's LOS "D"/"E" standard, but not under Metro's two-hour standard:

- Tualatin, 90th to Boones Ferry
- Hall extension over river
- Lower Boones Ferry extension over river
- Nyberg, Martinazzi to I-5
- Sagert, Martinazzi to 65th
- 90th, Tualatin to Tualatin-Sherwood