Transportation System Plan Update

Appendixes

February 2013

CH2M HILL • DKS
Angelo Planning Group • JLA Public Involvement

Revised Tualatin Transportation System Plan Update
Volume II: Appendixes

Prepared for

City of Tualatin

February 2013

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Contents

Appendixes

Appendix C
Future Transportation Conditions

This Appendix describes the future (2035) traffic conditions in the City of Tualatin and identifies areas where improvements will be necessary to serve expected future growth. This report details the forecasting process, including key assumptions about anticipated roadway improvements and development of land use. The information used to analyze the future traffic operations was provided by the City of Tualatin, Washington and Clackamas Counties, the Oregon Department of Transportation (ODOT), Metro, and the consultant team.

The information in this Appendix served to inform the discussion of the future state of the transportation system in Tualatin. This information was used to help inform the project ideas and alternatives developed into Tualatin's Transportation System Plan (TSP) to address motor vehicle deficiencies.

Travel Demand and Land Use

Land use is a key factor in the functionality of the transportation system. The amount of land that is developed, the type of land uses, and how the land uses are mixed together have a direct relationship to demands placed on the transportation system. Understanding the amount of land to be developed, and the type of land use is critical to understanding future operations and how improvements may best serve those land uses.

Traffic volume forecasts identified in this analysis are based on regional travel demand forecasting models coordinated with Metro and Washington County. Travel demand models translate assumed land uses into person trips, select travel modes and assign motor vehicles to the roadway network. The resulting traffic volume projections form the basis for identifying potential roadway deficiencies, and for evaluating alternative circulation improvements.

Projected Land Use Growth

Projected land uses were developed for the study area and reflect Tualatin's Comprehensive Plan and Metro's land use assumptions for the year 2035.[1] For transportation modeling purposes, Tualatin and the surrounding areas were divided into transportation analysis zones (TAZs). These TAZs represent the sources of vehicle trips being generated from land uses within the study area. For the Tualatin TSP, land use data sets were developed for 2010 (existing base travel forecast for the region) and 2035 future conditions. The land use summary for all TAZs in the Tualatin TSP study area is identified in Table 1.

TABLE 1
Study Area Land Use Totals

Land Use	2010	2035	Percent Growth
Households	10,340	11,270	9%
Employment	23,620	31,040	31%

Source: Metro/Consultant Team

Travel Demand Model Process

The objective of the transportation planning process is to provide the information necessary to make decisions on where and when improvements should be made to the transportation system to meet future travel demand. A determination of future traffic system needs in Tualatin requires the ability to accurately forecast travel demand resulting from estimates of future population and employment for the City.

Future travel demand forecasting can be divided into several distinct but integrated components that represent the logical sequence of travel behavior. These components and their general order in the traffic forecasting process are as follows:

- **Trip Generation** – This stage of the modeling process converts the land use into total person trips.

[1] Metro works cooperatively with local agencies to determine local existing and future land uses that incorporates existing land uses and reflects input from local agencies. These land uses are then regionally adopted and updated when new travel demand models are developed in the future.

- **Trip Distribution** – This step determines the locations that these trips would go to and come from within the region.
- **Mode Choice** – Once the total person trips are generated, this step in the modeling process determines which mode of travel (i.e. motor vehicle, bicycle, pedestrian, transit, carpool, etc.) that each trip will make.
- **Traffic Assignment** – The final step in the modeling process assigns the trips by mode to specific routes in the transportation network that match the trip distribution locations.

Trip Generation

The trip generation process translates land use quantities (number of dwelling units, retail employees, service employees and other employees) into vehicle trip ends (number of vehicles entering or leaving a TAZ). The Metro model trip generation process is elaborate, entailing detailed trip characteristics for various types of housing, retail, service, and other employment, and special activities. The model process is tailored to variations in travel characteristics and activities in the region, and is based on survey data from around the region.

Trip Distribution

This step estimates how many trips travel from one area in the model to any other area. Distribution is based on the number of trip ends generated in each TAZ zone pair, and on factors that relate the likelihood of travel between any two TAZs to the travel time between the zones.

In projecting long-range future traffic volumes, it is important to consider potential changes in regional travel patterns. Although the locations and amount of traffic generation in Tualatin are essentially a function of future land use in the city, the distribution of trips is influenced by expected congestion on roadways and regional growth. The model and trip distribution can also be used to help define the number of internal, external and through trips for the City of Tualatin. These types of trips are as follows:

- **Internal trips** are trips that start and end within the city limits of Tualatin;
- **External trips** are trips that either start in Tualatin and end outside the city, or start outside the city and end within the city; and
- **Through trips** are trips that pass through Tualatin and have neither an origin nor a destination in Tualatin.

Table 2 quantifies the internal, external, and through trips for all roadways within the City of Tualatin, as estimated for 2010 and 2035. The much larger number of external than internal trips reflects the majority of people who either live outside of Tualatin and work in the city, or people who live in Tualatin but work outside of the city. The significant number of through trips through the city indicates that the City of Tualatin acts as a conduit for people who both live and work outside the city limits. However, most trips occurring in the city either originate in or are destined to Tualatin.

TABLE 2
PM Peak Period Motor Vehicle Trip Activity

Trip Type	2010	2035	2010 Share	2035 Share
Internal (within Tualatin)	4,970	5,020	12%	9%
External (from/to Tualatin)	25,440	31,630	61%	56%
Through* (via Tualatin)	11,080	19,570	27%	35%

*Excludes through trips on I-5 and 99W

Source: DKS Associates

When comparing the trip types for the model year 2035 versus 2010, through trips make up the largest increase in trips and have a higher percentage share of overall trips in Tualatin. As can be seen in Table 2, the overall share of trips for both internal and external trips for the City of Tualatin appear to be in decline over the planning horizon year, but that is only due to the fact that through trips are growing at a much higher rate which reduces the overall share for those types of trips.

Mode Choice

This step in the modeling process determines how many trips will be made by various modes (single-occupant vehicle, transit, carpool, pedestrian, bicycle, etc.). The travel model provides estimates of the various modes of travel that can be generally assessed at the transportation analysis zone level. Base year mode splits are derived from travel surveys and incorporated into the base model. Adjustments to mode split may be made for future scenarios, depending on any expected changes in transit or carpool use. These considerations are built into the forecasts used for 2035. Figure 1 illustrates the 2010 Metro model daily mode share for Tualatin. While the total number of trips increases in 2035, the share by mode type is relatively unchanged. Mode share changes reflect a small shift (approximately 0.3 percent of trips) away from driving, primarily toward transit.

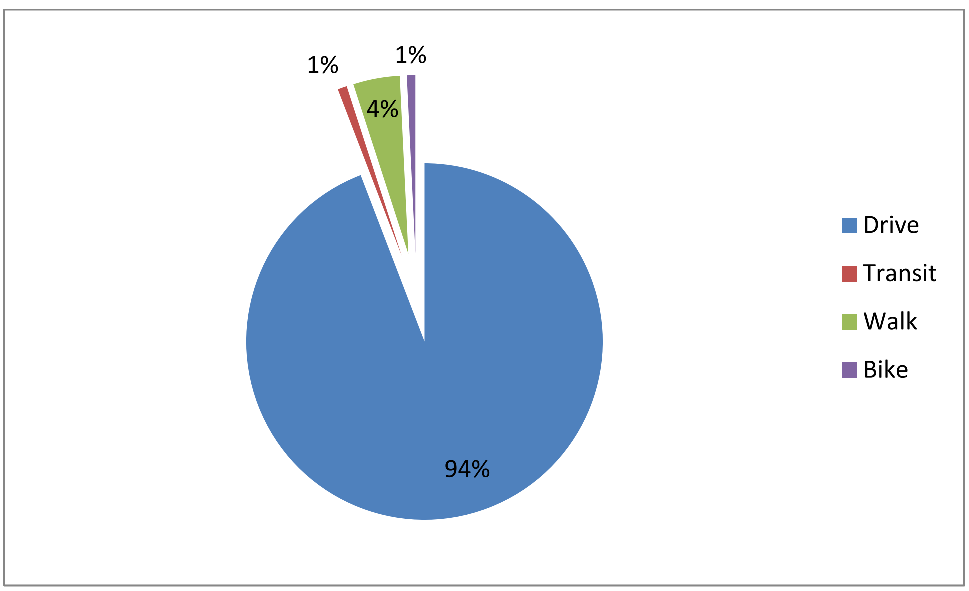


Figure 1: 2010 Metro Model Mode Share

Traffic Assignment

In this process, trips from one zone to another are assigned to specific travel routes in the network, and resulting trip volumes are accumulated on links of the network until all trips are assigned. Network travel times are updated to reflect the congestion effects of the traffic assigned through an equilibrium process. Congested travel times are estimated using what are called "volume-delay functions". There are different forms of volume/delay functions, all of which attempt to simulate the impact of congestion on travel times (greater delay) as traffic volume increases. The volume-delay functions take into account the specific characteristics of each roadway link, such as capacity, speed and facility type. This allows the model to reflect conditions somewhat similar to driver behavior.

The travel demand models represent PM peak period traffic flows for every major roadway segment within Tualatin and most minor arterials and collector streets. Some local streets were included in the model, but most neighborhood streets are represented by TAZ connectors in the model process.

Model Application to Tualatin

The modeling process for the Tualatin TSP update is based upon the 2010 and 2035 travel demand models developed by Metro for the PM peak period. The Metro model is built from travel survey data and is calibrated to traffic volume counts at specific locations on key arterials. Metro uses VISUM, a computer based transportation modeling program, to process the large amounts of data related to land use and person trips for all modes of travel for the Portland Metropolitan area.

From the regional model, Metro developed a subarea model representing the west side of the region, roughly split at the Willamette River. This model is used as a basis for creating the Washington County model, which includes refinements to include more locally significant details than the regional model typically requires. For the Tualatin TSP, additional refinements were made to the Washington County model roadway network, in consultation with Washington County staff. Base 2010 model traffic volumes were compared against actual traffic volumes at TSP study intersections and other key locations. For consistency, all local refinements are carried forward to future (2035) models.

Intersection turn movements were extracted from the model at study area intersections for both the base year 2010 and forecast year 2035 model scenarios. A "post processing" technique is utilized to refine model travel forecasts to the turn movement volume forecasts utilized for 2035 intersection analysis. Post processing is a methodology that uses existing 2011 count data, base year model data and future year model data to help determine future volumes. The methodology adds the increment of growth, the calculated difference in volumes between the future and base year models, to the existing count data. This methodology minimizes the effects of any model error by adding the increment of growth projected based on changes in land use to the base year counts.

Assumed Future Roadway Projects

The future 2035 roadway system includes projects that are considered reasonably likely to be funded and constructed by 2035. This roadway network is considered to represent the future 'no-build' scenario. The future 2035 roadway system in the Metro model consists of the 2035 Metro Regional Transportation Plan (RTP) financially constrained project list. The Washington County model includes a refined set of future roadway projects with additional modifications made for the Tualatin TSP. The locally-significant roadway projects assumed for the Tualatin TSP future 'no-build' scenario are:

- **Tualatin-Sherwood Road**- Widen to 5 Lanes (OR 99W to Teton Avenue)
- **124th Avenue Extension** (Tualatin-Sherwood Road to Tonquin Road)
- **Tonquin Road** - Widen to 3 lanes (Oregon Street to Grahams Ferry Road)
- **Myslony Street** - Widen to 3 lanes and extend (from 124th Avenue to 112th Avenue)
- **Durham Road** - Widen to 5 Lanes (OR 99W to Boones Ferry Road)
- **Herman Road** - Reconstruct (Cipole Road to 124th Avenue)
- **Herman Road** - Widen to 5 Lanes (108th Avenue to Teton Avenue)
- **Herman Road** - Widen to 3 Lanes (Teton Avenue to Tualatin Road)
- **I-5 Auxiliary Lanes** constructed between Elligsen and I-205 Interchange
- **Sagert Street/Martinazzi Avenue Intersection** - New Traffic Signal and grade improvements
- **Avery Street/105th Avenue Intersection** - New Traffic Signal, curve improvements
- **Cipole Street/Herman Road** - New Traffic Signal

Future Intersection Traffic Operations

Future intersection traffic operations are evaluated using 2035 turn movement volume forecasts developed with the methodology identified in previous sections. Since the forecasts are based on a growth increment added to the base year volumes, the future forecasts reflect the identified design hour (30th highest hour) traffic volumes. Table 3 identifies pm LOS and V/C for each study intersection under existing and future conditions. The applicable jurisdictional standard for minimum performance is identified as well.

TABLE 3
PM Peak Hour Intersection Traffic Operations

Intersection	Jurisdiction	Minimum Standard	2011 LOS	2011 V/C	2035 LOS	2035 V/C
Signalized						
SW 124th Ave & Hwy 99W	ODOT	0.99	C	0.69	D	0.99
SW 124th Ave & SW Tualatin Rd	Tualatin	D	B	0.66	C	0.91
SW 124th Ave & SW Herman Rd	Tualatin	D	C	0.53	C	0.83
SW 124th Ave & SW Tualatin-Sherwood Rd	Wash. Co.	0.99	C	0.90	C	0.92
SW Avery St & SW Tualatin-Sherwood Rd	Wash. Co.	0.99	B	0.71	D	0.92
SW Teton Ave & SW Tualatin-Sherwood Rd	Wash. Co.	0.99	D	0.79	E	**1.03**
SW 90th Ave & SW Tualatin-Sherwood Rd	Wash. Co.	0.99	C	0.60	C	0.78
SW Boones Ferry Rd & SW Tualatin-Sherwood Rd	Wash. Co.	0.99	D	0.93	F	**1.30**
SW Martinazzi Ave & SW Tualatin-Sherwood Rd	Wash. Co.	0.99	D	0.94	E	**1.05**
I-5 SB Ramps & SW Nyberg Rd	ODOT	0.99	D	0.79	D	0.90

TABLE 3
PM Peak Hour Intersection Traffic Operations

Intersection	Jurisdiction	Minimum Standard	2011 LOS	2011 V/C	2035 LOS	2035 V/C
I-5 NB Ramps & SW Nyberg Rd	ODOT	0.99	B	0.68	C	0.84
SW 65th Ave & SW Borland Rd	Wash. Co.	0.99	D	0.93	F	**1.47**
SW Teton Ave & SW Herman Rd	Tualatin	D	C	0.65	B	0.66
SW Tualatin Rd & SW Herman Rd	Tualatin	D	B	0.59	B	0.78
SW 90th Ave & SW Tualatin Rd	Tualatin	D	B	0.75	C	0.92
SW Tualatin Rd & SW Boones Ferry Rd	Wash. Co	0.99	B	0.62	C	0.86
SW Martinazzi Ave & SW Boones Ferry Rd	Wash. Co	0.99	D	0.89	F	**1.26**
SW Boones Ferry Rd & SW Lower Boones Ferry Rd	ODOT	0.99	C	0.76	E	**1.11**
SW 72nd Ave & Lower Boones Ferry Rd & Bridgeport Rd	Wash. Co	0.99	C	0.66	D	0.88
I-5 SB Ramps & SW Lower Boones Ferry Rd	ODOT	0.99	C	0.75	D	0.97
I-5 NB Ramps & SW Lower Boones Ferry Rd	ODOT	0.99	B	0.74	D	0.98
SW Boones Ferry Rd & SW Avery St	Wash. Co.	0.99	C	0.87	F	**1.15**
SW Boones Ferry Rd & SW Sagert St	Wash. Co.	0.99	C	0.75	E	**1.11**
SW Boones Ferry Rd & SW Ibach St	Wash. Co.	0.99	B	0.70	D	0.98
SW 105th Ave & SW Avery St[2]	Tualatin	E	C	0.28	C	0.95
SW Martinazzi Ave & SW Sagert St[3]	Tualatin	E	**F**	0.95	D	0.91
All-way Stop-control						
SW Martinazzi Ave & SW Avery St*	Tualatin	E	B	0.55	D	0.83
SW Teton Ave & SW Avery St*	Tualatin	E	C	0.40	**F**	0.76
SW 65th Ave & SW Sagert St*[4]	Wash. Co.	0.99	F	0.98	F	**1.72**
*Minor Street Stop-control**						
SW Teton Ave & SW Tualatin Rd	Tualatin	E	**F**	0.98	**F**	1.44

SOURCE: Consultant Team

*LOS and V/C reported for highest delay movement.

BOLD and highlighted dark grey text indicates meet minimum performance standard is not met

2 Existing Conditions operations evaluated with minor street stop control.

3 Existing Conditions operations evaluated with minor street stop control. HCM Methodology does not account for a three-lane approach for an all way stop (as exists for the southbound approach.) To estimate LOS and V/C for the intersection the three lanes (one dedicated to each movement) are combined into two: through-right and through-left lanes. Because of this approximation, actual performance may be slightly better than reported above.

4 HCM Methodology does not account for a three-lane approach for an all way stop (as exists for the southbound approach.) To estimate LOS and V/C for the intersection the dedicated southbound left turn lane and through lane are combined, due to the relatively small volume on the left turn movement. Because of this approximation, actual performance may be slightly better than reported above.





City of Tualatin

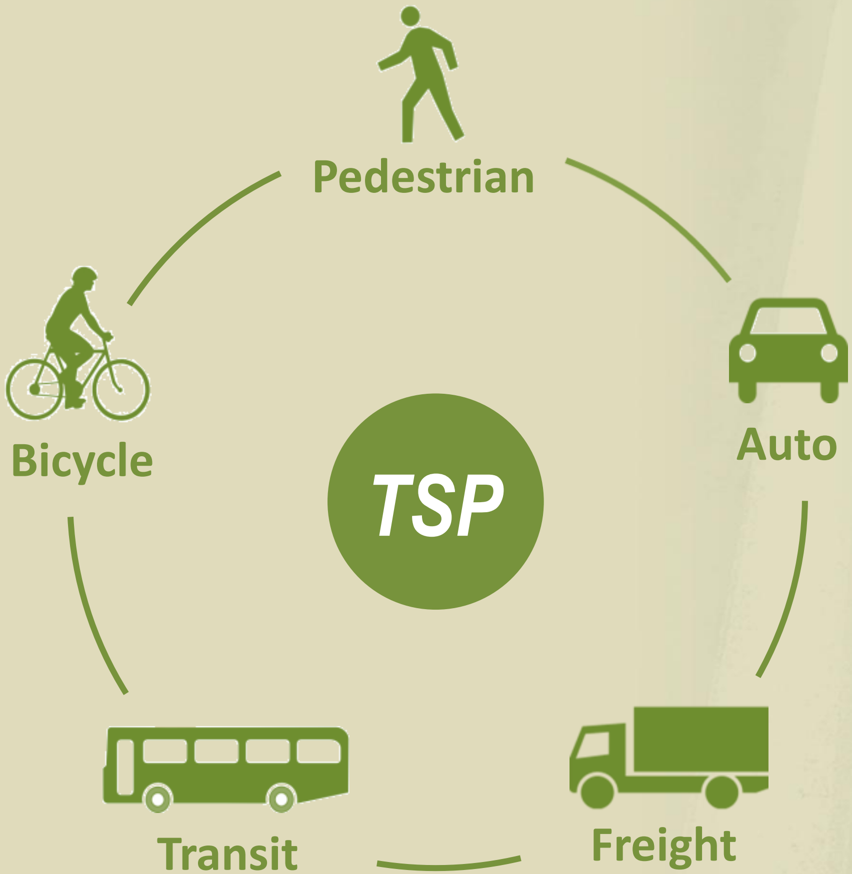
Virtual Tour of Future Conditions

Presentation to
Tualatin Transportation Task Force
February 2, 2012

What is Future Conditions?

- Assessment of conditions by mode in 2035
- Identifies future needs, opportunities, and constraints for all modes of travel
- Incorporates future planned land uses and expected projects/improvements
- Balances community needs with infrastructure needs
- Helps prioritize identified improvements

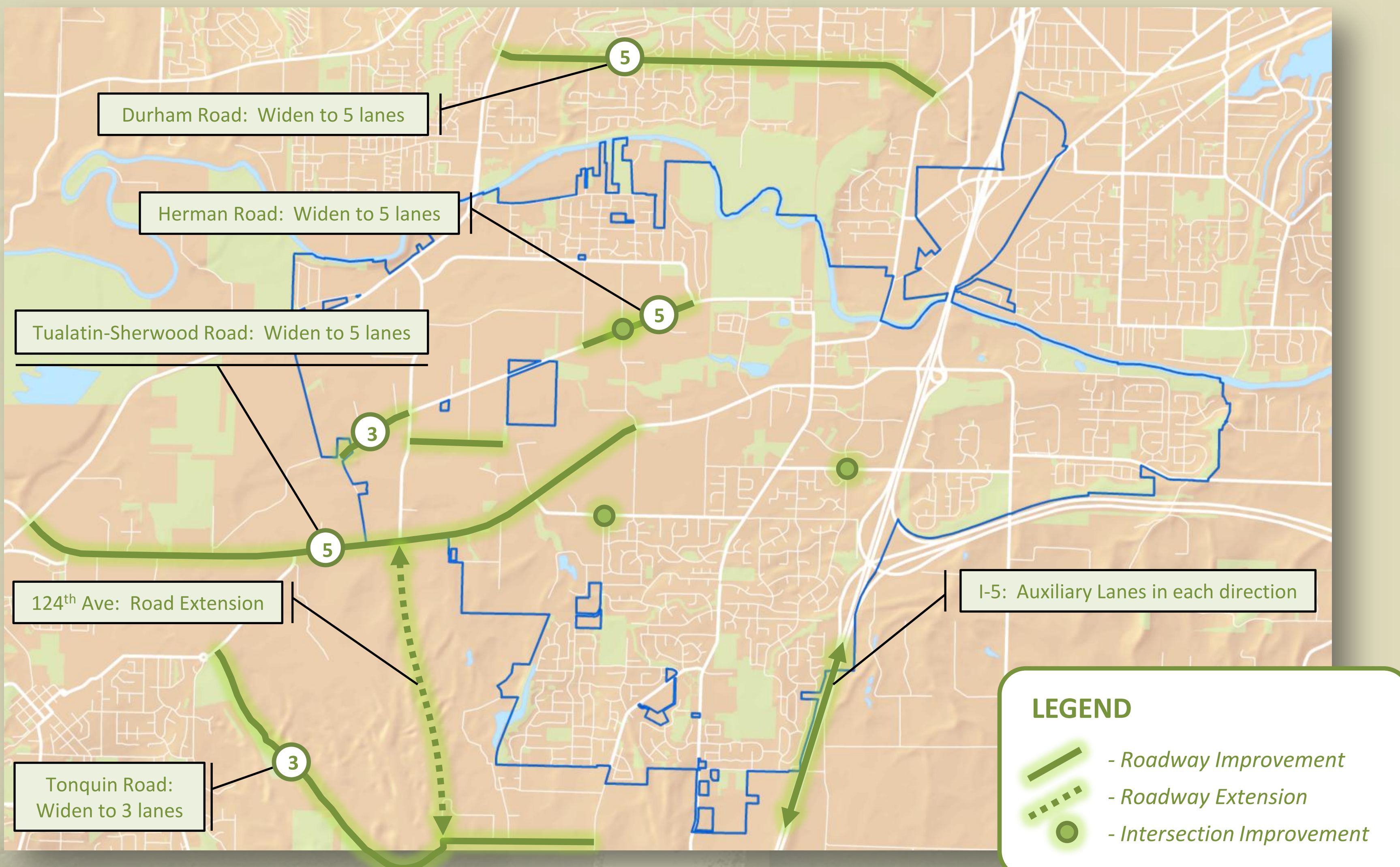
Major Elements of Future Conditions



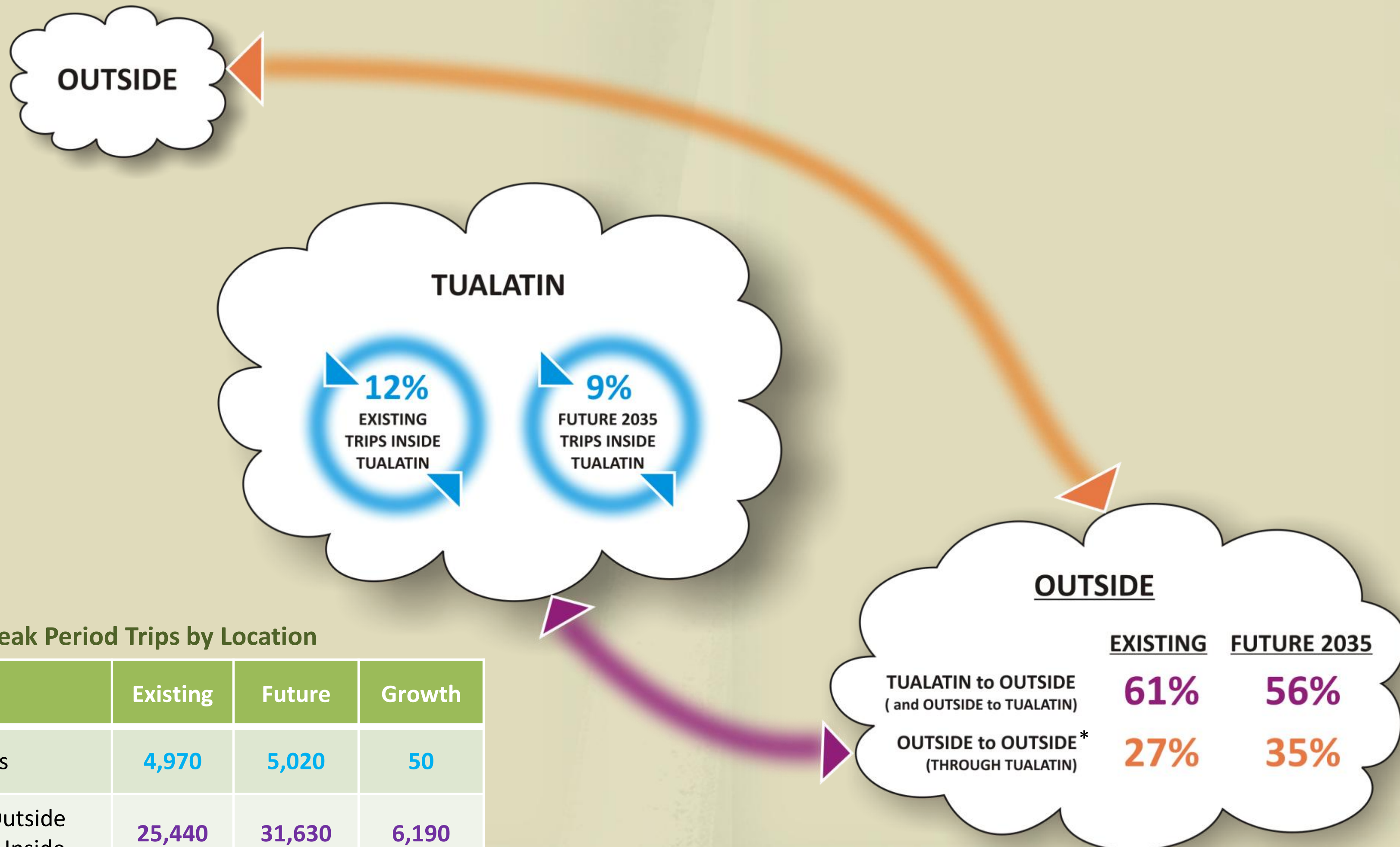
- Mode Choice
- Land Use
- Future improvements
- Future forecasting
- Community values and inputs
- Prioritization

Land Use Overview

Assumed Future 2035 Roadway Projects



PM Peak Period Motor Vehicle Trip Activity

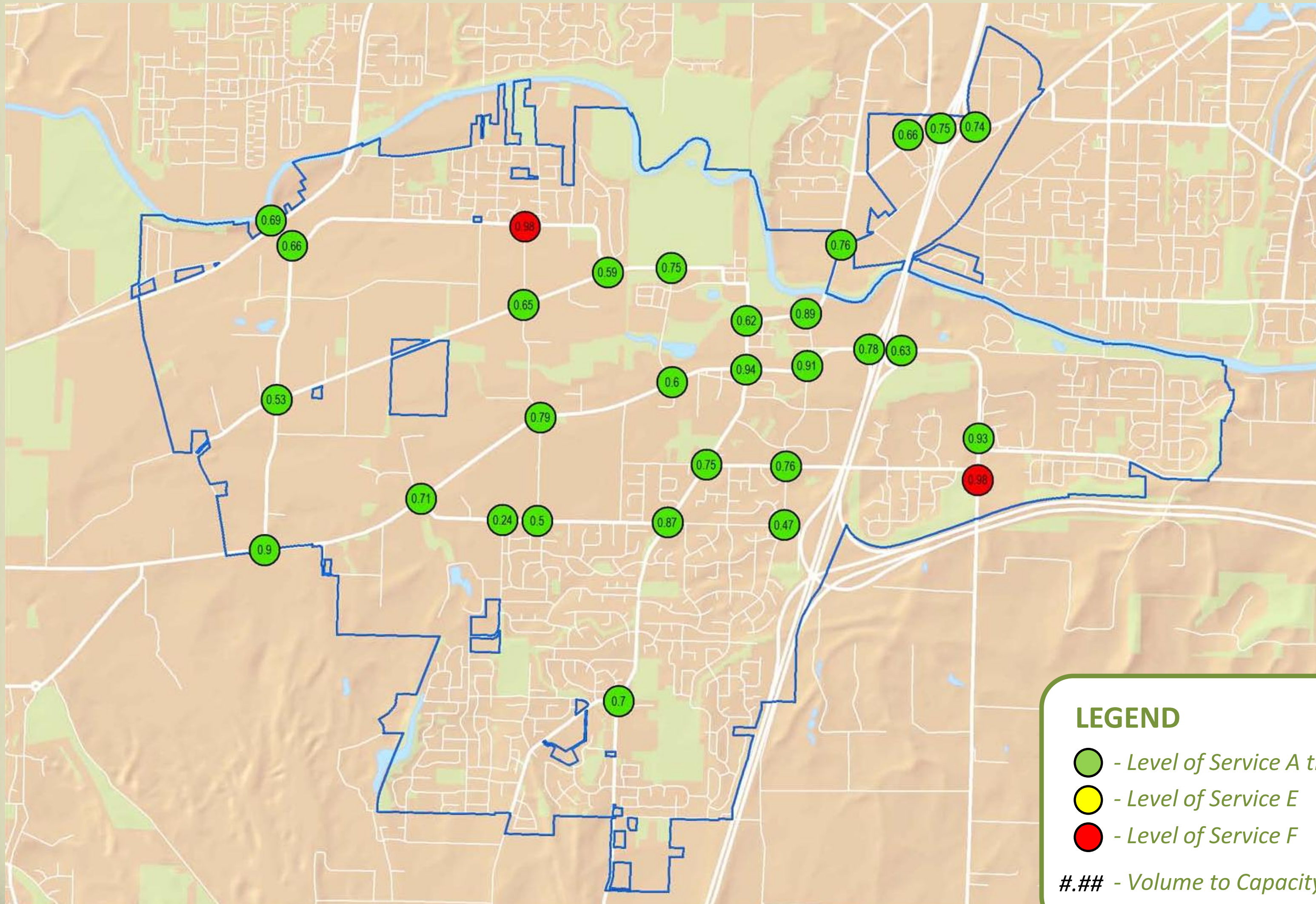


Total PM Peak Period Trips by Location

	Existing	Future	Growth
Inside Trips	4,970	5,020	50
Inside to Outside Outside to Inside	25,440	31,630	6,190
Outside to Outside	11,080	19,570	8,490

*Excludes through trips on I-5 and 99W

Existing PM Peak Intersection Operations



LEGEND

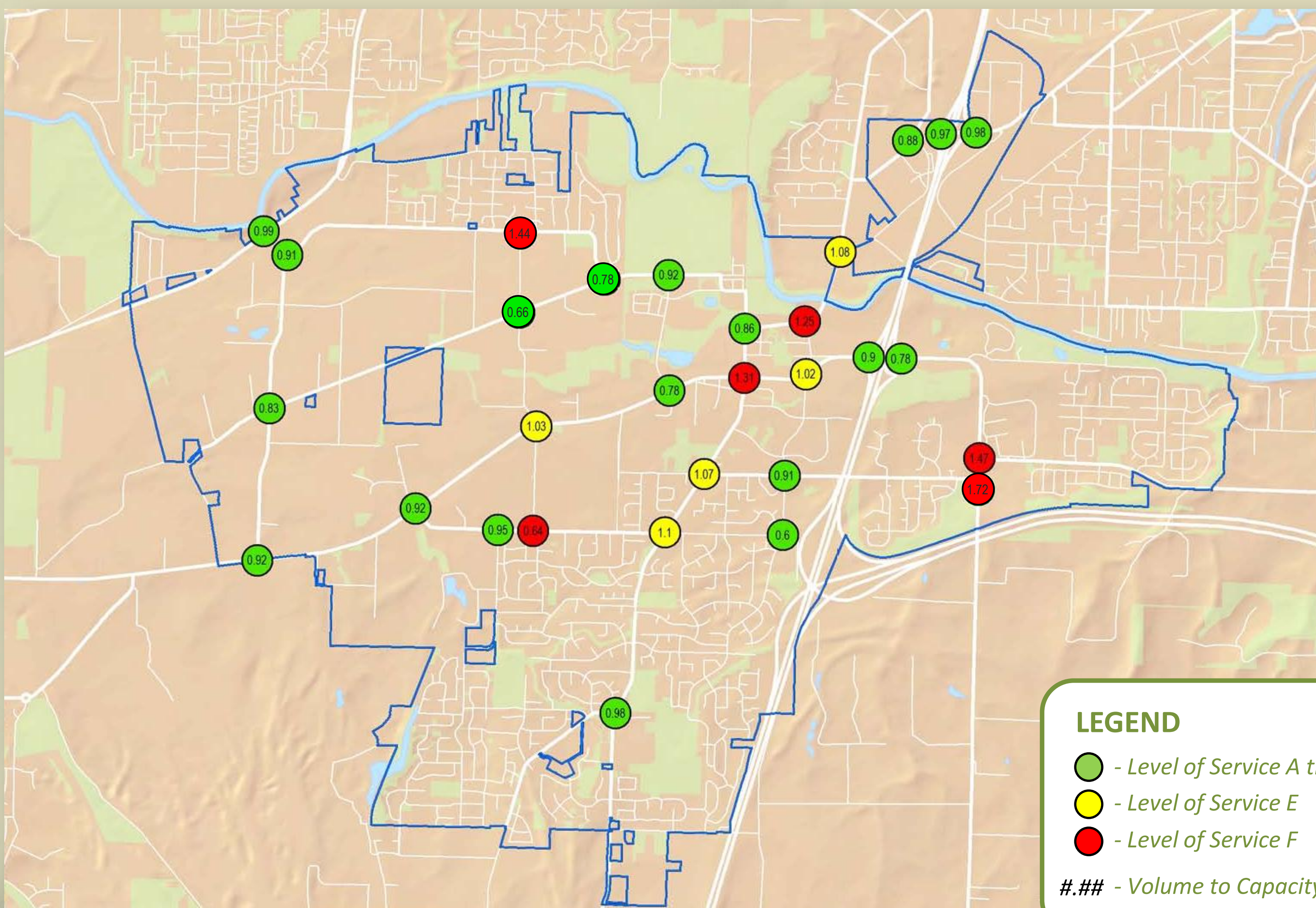
- *Level of Service A through D*

- *Level of Service E*

- *Level of Service F*

#.## *- Volume to Capacity Ratio*

2035 PM Peak Intersection Operations



LEGEND

- Level of Service A through D

- Level of Service E

- Level of Service F

#.## - Volume to Capacity Ratio