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# MEMORANDUM

**TO**: Bill Gille, Yamhill County
John Phelan, Yamhill County
Terry Cole, ODOT Region 2

**FROM**: Bob Schulte, PTP
Julie Sosnovske, P.E.

**DATE**: November 30, 2012

**SUBJECT:** **YAMHILL COUNTY TRANSPORTATION SYSTEM PLAN** **P# 11086-04**
Technical Memorandum #3 – Existing Transportation Conditions

This memo documents the analysis of existing transportation conditions for the Yamhill County Transportation System Plan. The findings of the analysis will be used in the development of proposed improvements to address transportation needs within the county.

The objective of the study is the development of a comprehensive transportation plan document that will serve to guide transportation system management and project programming for both state and county facilities over the next 20 to 25 years.

The study area, shown in Figure 1, comprises the rural portion of Yamhill County and does not include incorporated areas or county roads within these areas. Within the study area, agriculture is the predominant land use, with some commercial and residential development. The wine industry is a significant component of the agricultural sector. Over 80 wineries and 200 vineyards represent the largest concentration of wine growers and producers in Oregon.

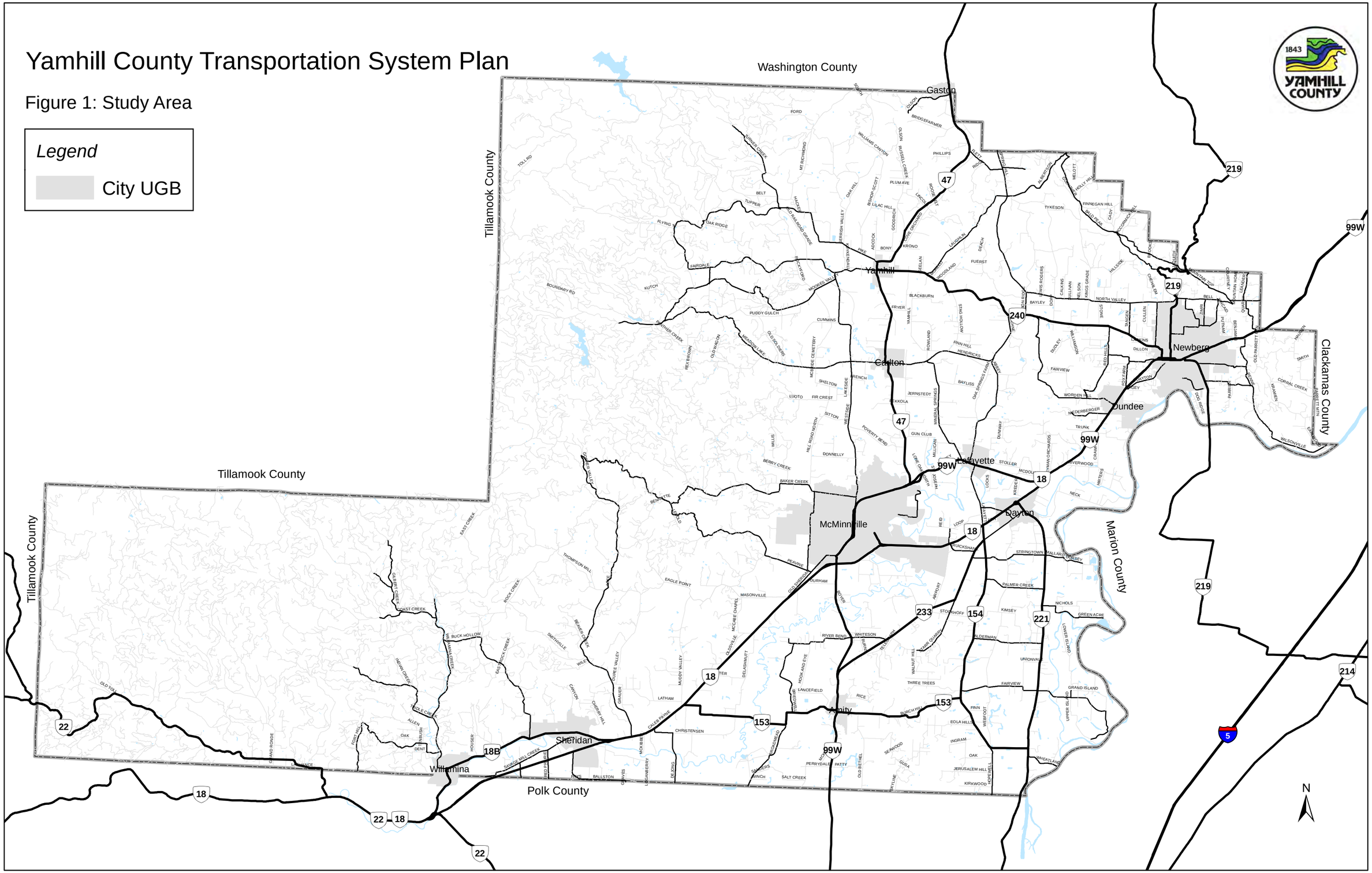
Yamhill County is adjacent to Tillamook, Washington, Clackamas, Marion, and Polk Counties. Thus, there is a significant amount of commute traffic between the incorporated areas of the county, such as Newberg and McMinnville, and the Portland metropolitan and Salem areas. The primary commute routes are OR 99W, OR 47, and OR 221. OR 99W and OR 18 also serve as one of the main routes for recreational travel from the Portland area to the Oregon coast.

# Yamhill County Transportation System Plan

Figure 1: Study Area

*Legend*

City UGB



Two approaches were used in the analysis of existing transportation conditions. With the first approach, transportation data such as traffic volumes and roadway characteristics were collected and analyzed. The results of the analysis were compared to standards, and for locations that did not meet the standards, a need was identified. The second approach was to gather information on existing transportation needs from stakeholders, agency staff, and members of community. This information was obtained through stakeholder interviews, meetings with ODOT and Yamhill County roadway maintenance staff, and input from the county's Road Improvement Advisory Committee (RIAC). The reported needs from these sources were cataloged, and field reconnaissance was conducted at the reported need locations to investigate the nature of the problems.

## ROADWAYS

### FACILITIES

#### Network Overview

The existing study area roadway network comprises roughly 117 miles of state highways and 210 miles of county roadways classified as minor collector or above. There are eleven state highways within the study area. The areas they serve are listed below in Table 1.

**Table 1 – State Highways Within Study Area**

| State Highway | ODOT Highway Number | Primary Areas Served |
|---|---|---|
| OR 18 | 039 | Dayton and McMinnville, with connections to Sheridan, Willamina, and the Oregon Coast |
| OR 18B | 157 | Sheridan, Willamina |
| OR 22 | 032 | Connection between OR 18 and Oregon Coast |
| OR 47 | 029 | Yamhill, Carlton, and McMinnville, with connection to Washington County |
| OR 99W | 091 | Newberg, Dundee, Lafayette, McMinnville, and Amity, with connections to Portland and Polk County |
| OR 153 | 153 | Amity, south Yamhill County |
| OR 154 | 154 | Dayton, south Yamhill County |
| OR 219 | 140 | Newberg, east Yamhill County, with connections to Washington County and Woodburn |
| OR 221 | 150 | Dayton, south Yamhill County, with connection to Salem |

| State Highway | ODOT Highway Number | Primary Areas Served |
|---|---|---|
| OR 233 | 155 | Amity, Dayton |
| OR 240 | 151 | Newberg, Yamhill |

**Functional Classification**

The county's existing functional classification system was reviewed and updated in coordination with Yamhill County staff and the RIAC. The functional classification system describes the hierarchy of roadway types and their relative roles in the system, and provides criteria for classifying specific roadways.

The roadway network performs two essential functions: to facilitate mobility and provide access to property. Higher classified roadways (e.g., freeways and arterials) primarily provide mobility, while lower classified roadways, such as local roads, primarily provide land access. Intermediate classifications (e.g., collectors) serve both mobility and access needs.

The classifications provide guidance for the design standards to be applied when a roadway is improved and, for county roads, prioritization of improvement and maintenance projects. The county's design standards are applied for county roads and ODOT's design standards are applied for state highways.

The updated functional classification system is summarized in Table 2. The classification assigned to each roadway is shown in Figure 2.

**Table 2 – Functional Classification System**

| Classification | Description/Characteristics |
|---|---|
| Principal Arterial | • Carries substantial volume of statewide or interstate travel.<br>• Penetrates urban boundaries or comes within 10 miles of the center of an urban area. |
| Minor Arterial | • Links cities, larger towns, and other major traffic generators, providing interregional and intercounty service.<br>• Serves travel flows of greater length and density than those served by lower classified roads.<br>• Connects state highways. |

| Classification | Description/Characteristics |
|---|---|
| | • Typically carries average daily traffic (ADT) volume of 2,000 or higher. |
| Major Collector | • Provides service to larger towns not served by higher classified roads. Also serves schools, county parks, and important agricultural areas.<br>• Connects these places with nearby larger towns or cities or with arterials.<br>• Serves intracounty travel. |
| Minor Collector | • Collects traffic from local roads.<br>• Provides service to remaining smaller communities.<br>• Serves locally important traffic generators. |
| Resource Road | • Provides a connection between resource areas and the remaining roadway network.<br>• Facilitates movement of goods and services. |
| Local Roads | • Provides access to adjacent land and higher classified roads.<br>• Accommodates travel over shorter distances compared to collectors or arterials. |

As shown in Figure 2, most state highways are classified as principal arterials or major arterials under the county's updated functional classification system. There are a few county roads classified as minor arterials, primarily in the more developed northern portion of the study area (Westside Rd., Abbey Rd./Kuehne Rd., Hendricks Rd., Spring Hill Rd./Flett Rd., Wilsonville Rd., Stringtown Rd., and Hopewell Hwy.). Most of the county roads, however, are classified as collectors, resource, or local roads.

**Physical and Operational Features**

The number of through travel lanes for state highways within the study area is shown in Figure 3. The majority of state highways are two-lane facilities, with additional through lanes at some locations along OR 99W and OR 18. Turning lanes are provided at most major intersections along OR 99W and OR 18, but generally are not provided on other state highways. Existing turn lanes are shown in Figure 4.

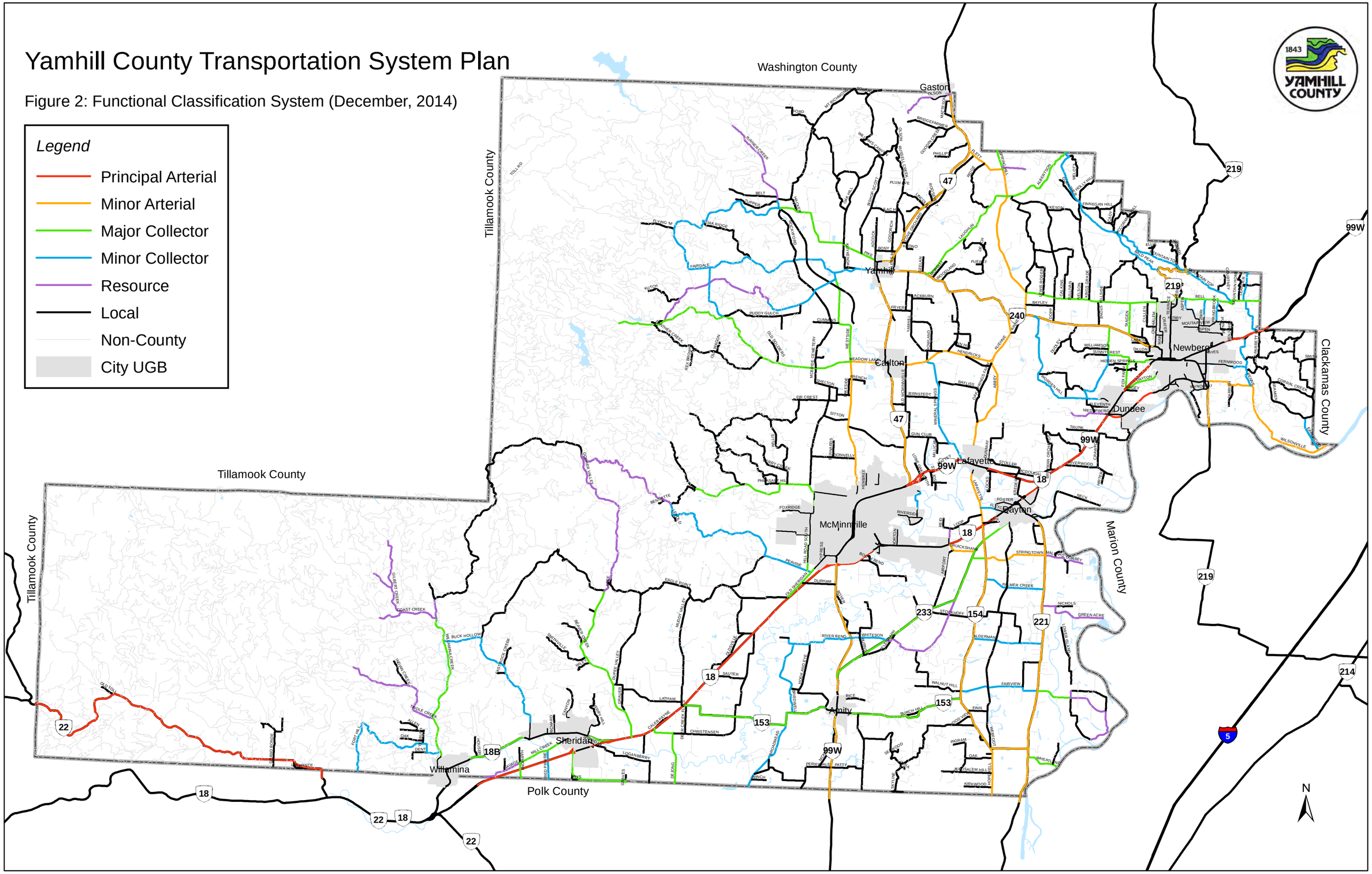
The basic speed rule is in effect for almost all state highways, with isolated slower speed zones in rural developed areas. There are no signalized intersections along state highways outside of the incorporated areas in the county.

# Yamhill County Transportation System Plan

Figure 2: Functional Classification System (December, 2014)

*Legend*

- Principal Arterial
- Minor Arterial
- Major Collector
- Minor Collector
- Resource
- Local
- Non-County
- City UGB

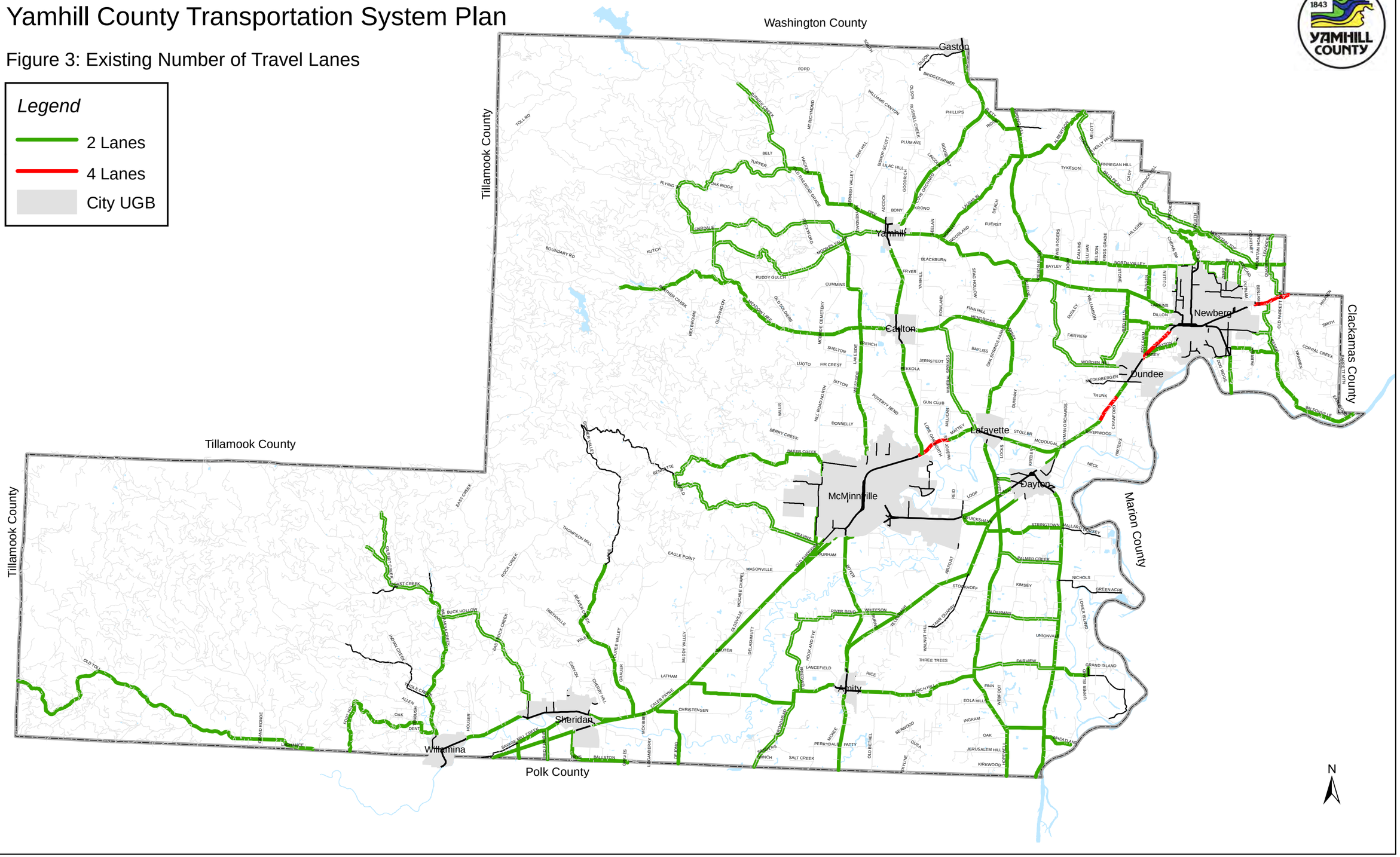


# Yamhill County Transportation System Plan

## Figure 3: Existing Number of Travel Lanes

*Legend*

- 2 Lanes
- 4 Lanes
- City UGB



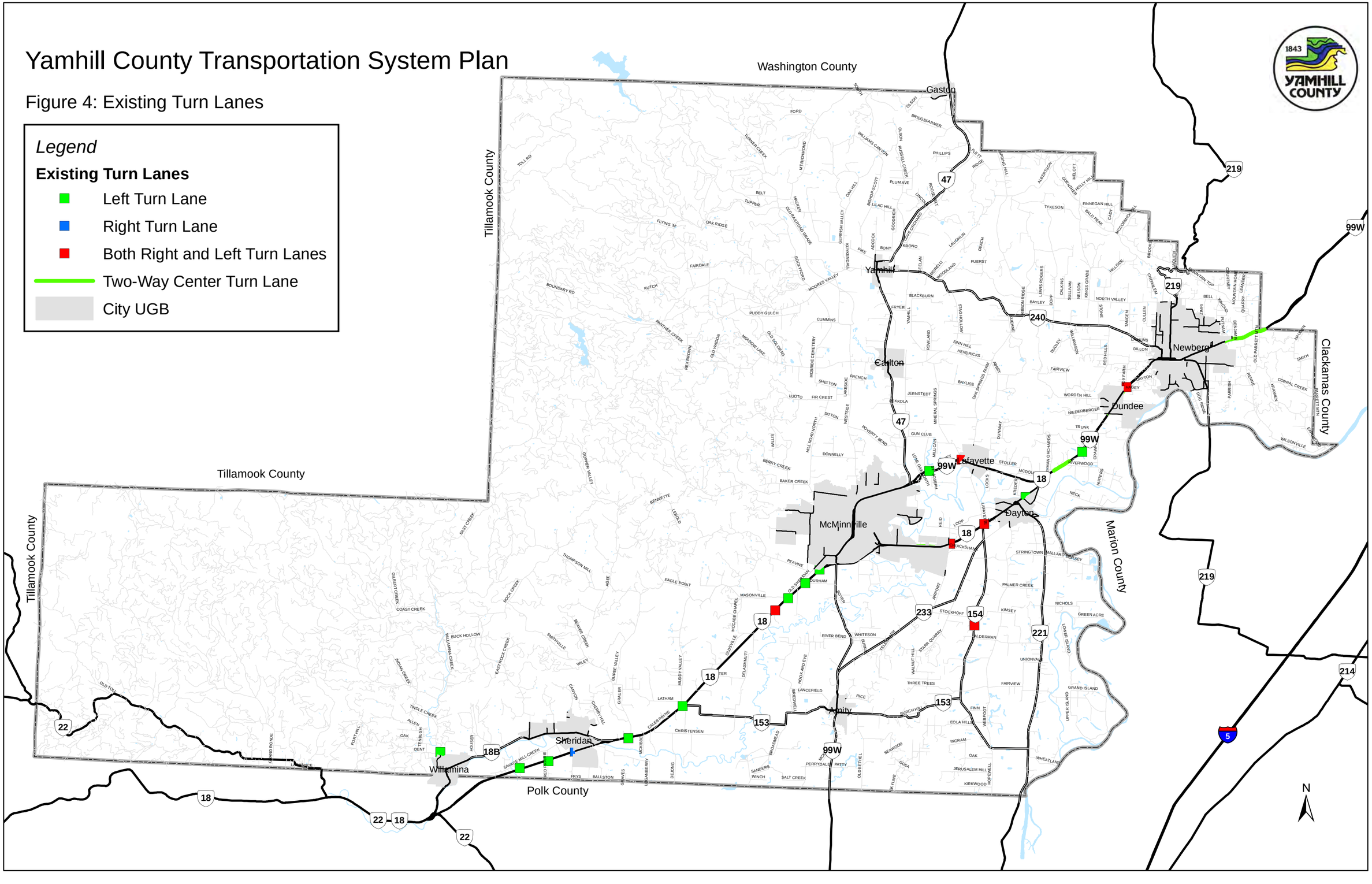
# Yamhill County Transportation System Plan

Figure 4: Existing Turn Lanes

*Legend*

**Existing Turn Lanes**

- Left Turn Lane
- Right Turn Lane
- Both Right and Left Turn Lanes
- Two-Way Center Turn Lane
- City UGB



The county road system is comprised entirely of two-lane road segments with no medians. Most of the county roadways classified as resource road or above are paved; those segments that are gravel are shown in Figure 5. The local roads are mostly gravel. Turn lanes are provided on only a few intersection approaches, as shown in Figure 4. The basic speed rule covers most of the system, with slower speed zones in rural developed areas and for specific segments with geometric deficiencies. Currently within the rural area, there are no signalized county intersections. There is, however, four-way stop control at isolated locations, such as the Westside Rd./Meadow Lake Rd. intersection.

TRAFFIC VOLUMES

Traffic volume data was obtained from several sources, including ODOT, Yamhill County and traffic counts collected specifically for this study.

ODOT data included Automatic Traffic Recorder (ATR) data at three locations in Yamhill County, as well as turning movement counts and vehicle classification counts. In addition, 2009 annual average daily traffic (AADT) volumes were obtained for each link on the state highway system.[1]

County data included hourly volume classification counts collected over roughly the past 10 years as a part of the county's annual traffic counting program.

The counts conducted specifically for this study included 20 P.M. peak hour intersection turning movement counts, five 16-hour vehicle classification turning movement counts, and twelve 24-hour two-way tube counts.

**Daily Volumes**

A summary of the AADTs for state highways throughout the study area is shown in Figure 6. The state highways within the study area carry volumes generally ranging between 3,000 and 15,000 vehicles per day. However, volumes are as low as less than 1,000 vehicles per day on some district-level routes and as high as over 30,000 vehicles per day on OR 99W east of Newberg. The highest-volume routes are OR 99W between the Washington County line and Newberg and OR 18.

[1] ODOTs FACS (Features, Attributes & Conditions Survey) Data To Go, data obtained in February/March 2012.

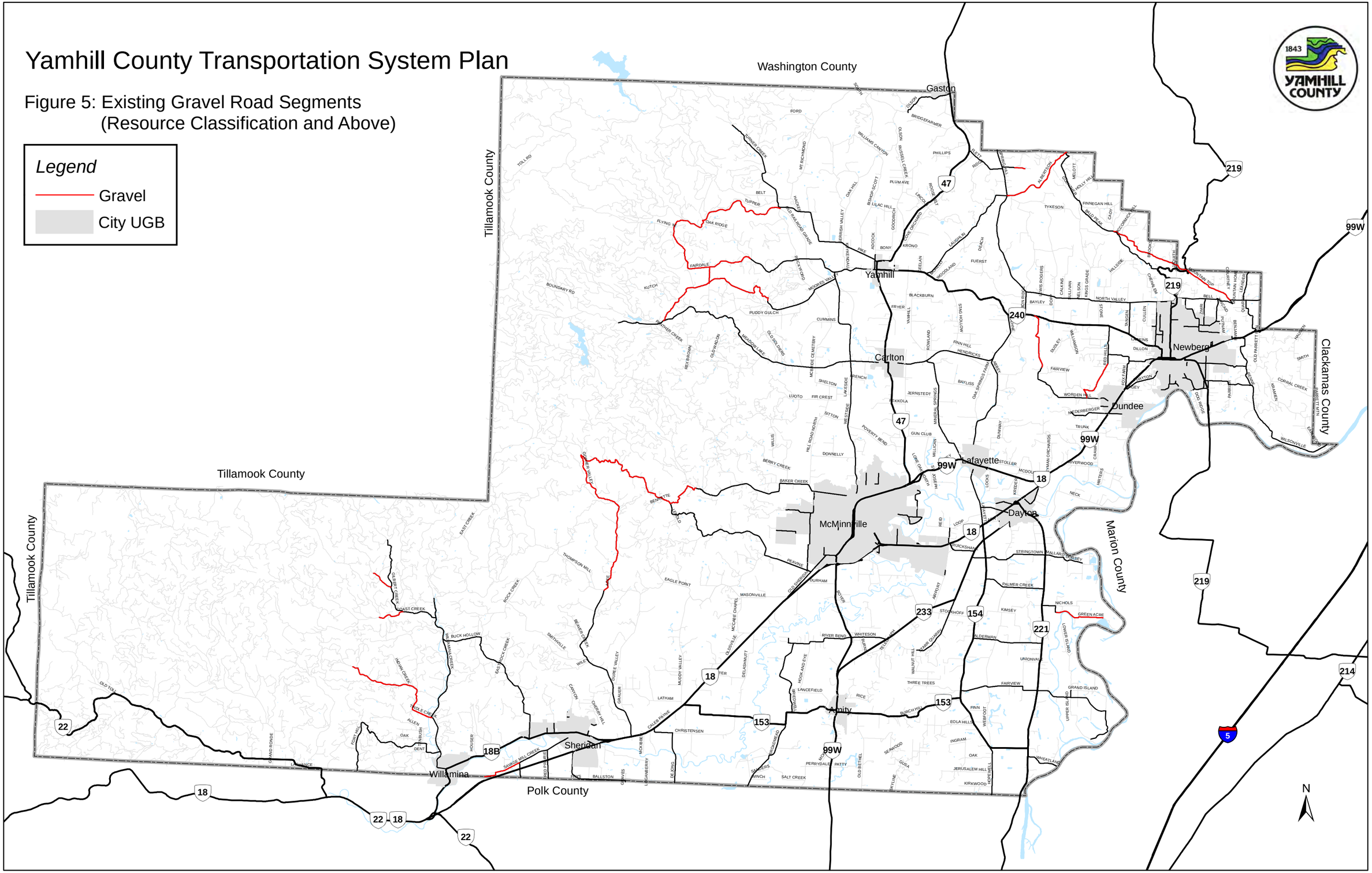
# Yamhill County Transportation System Plan

Figure 5: Existing Gravel Road Segments
(Resource Classification and Above)

*Legend*

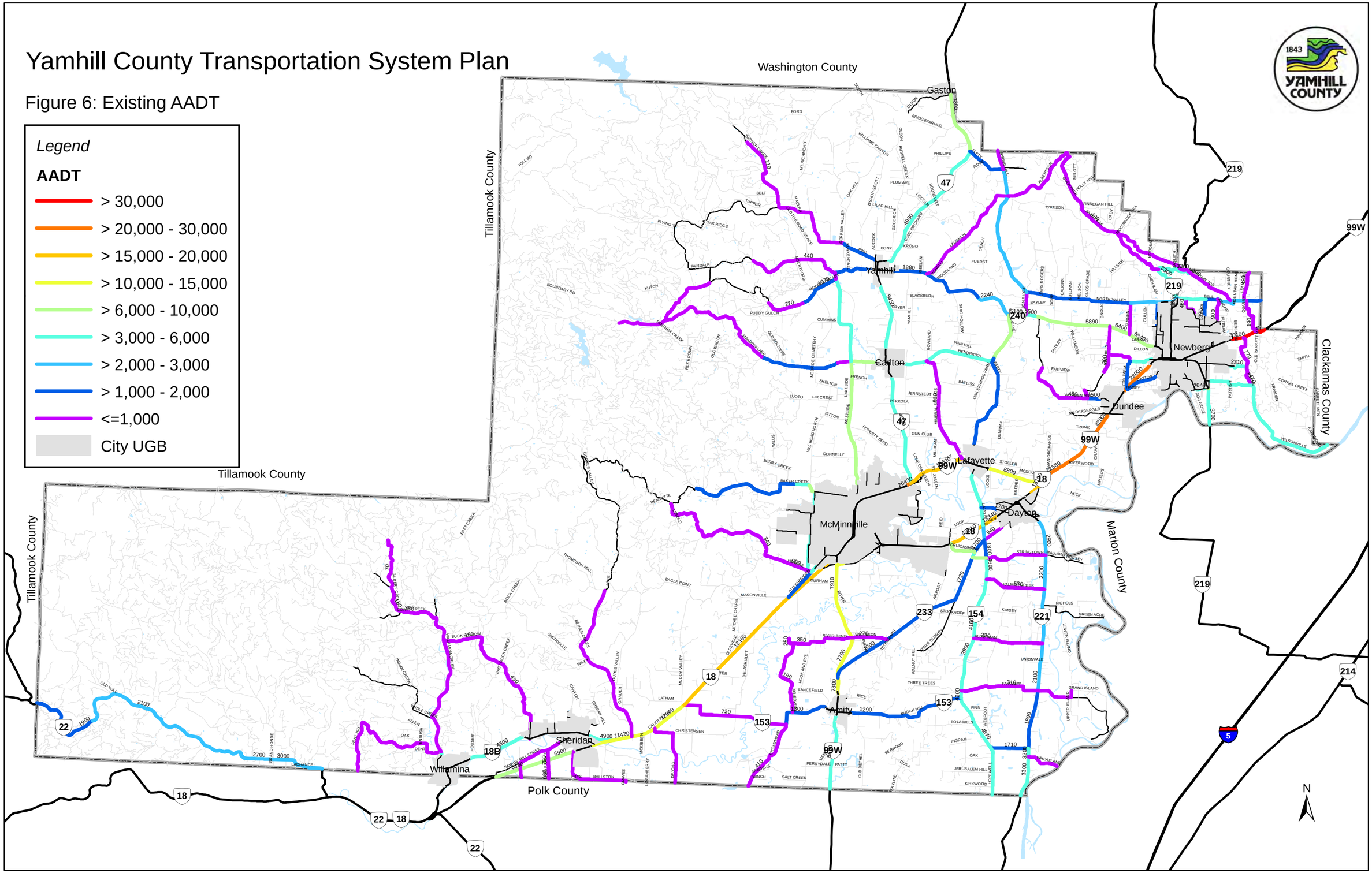
Gravel

City UGB



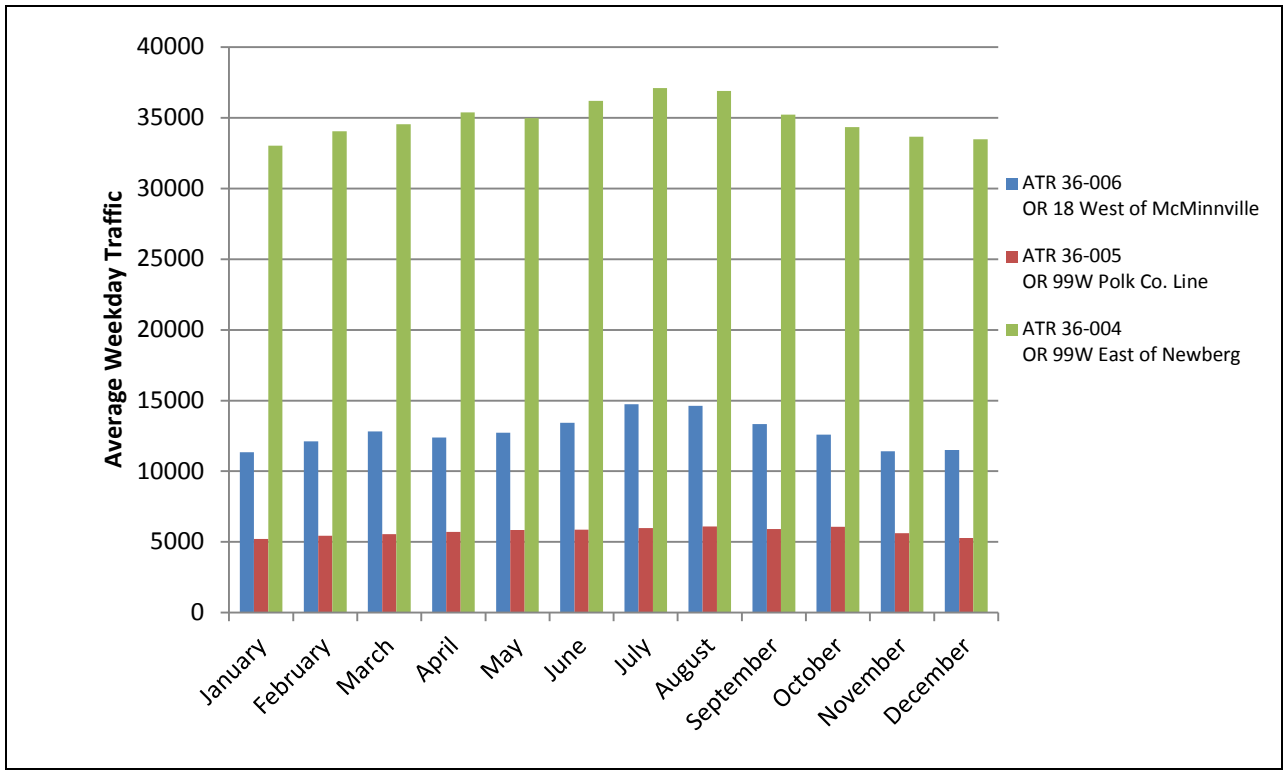
# Yamhill County Transportation System Plan

Figure 6: Existing AADT



A majority of county roadways carry less than 1,500 vehicles per day, with the highest volume about 5,000 vehicles per day. Figure 7 shows monthly volume profiles developed based on data from ODOT's three ATRs in Yamhill County.

**Figure 7 – Monthly Volume Profiles**




These indicate that:

- Along OR 99W near the Polk County line, volumes do not vary significantly over the course of the year.
- There is some seasonal variation in volumes on OR 99W east of Newberg, but this is dampened due to the effect of commuter traffic, which is fairly consistent throughout the year.
- Seasonal variation is the strongest along OR 18 to the west of McMinnville, where recreational travel makes up a larger percentage of the total traffic than at locations further to the east.

**Hourly Volumes**

Hourly volume profiles for a sample of state highways and county roadways are shown in Figure 8. The routes were separated into three groups:

- High - volume/high - peaking routes (state highways used as primary commute routes)
- Medium - volume/medium peaking routes (routes used for both commuting and local traffic)
- Low - volume/low - peaking routes (routes used primarily for local traffic)

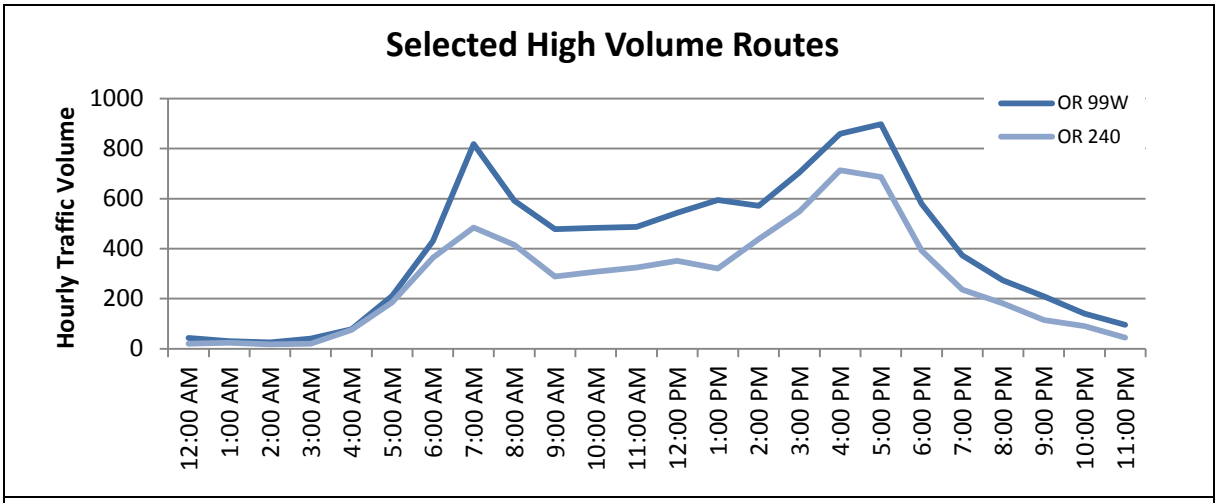
These profiles indicate that traffic volumes typically peak between 6 - 8 A.M. and 3 - 6 P.M., with the peaks more pronounced for the higher volume routes. The morning peaks generally have lower volumes than the afternoon peaks.

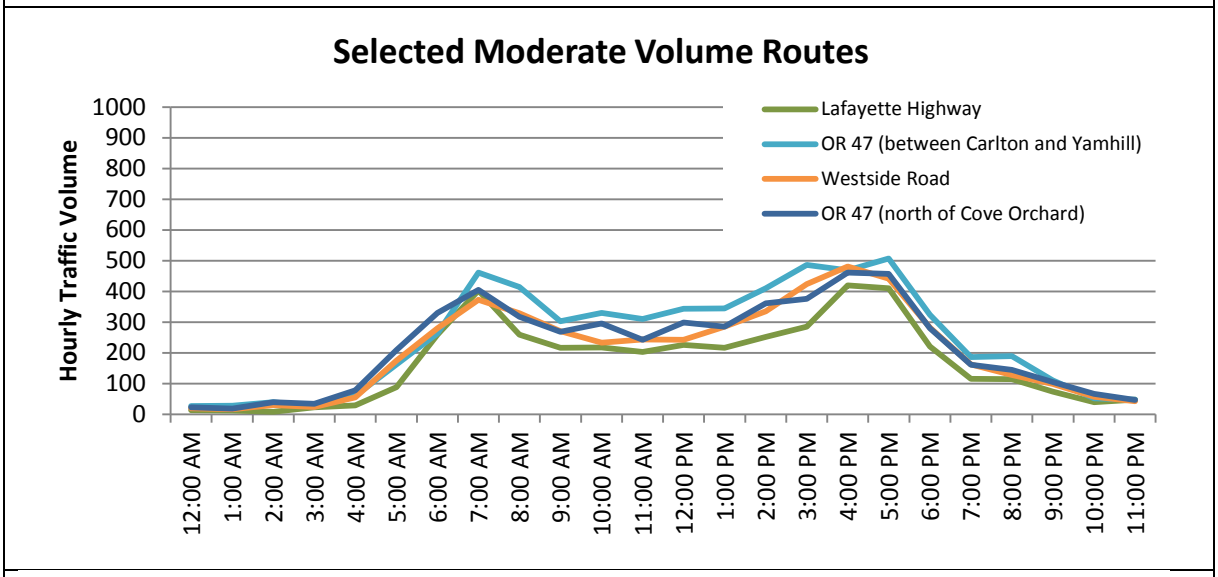
NEEDS

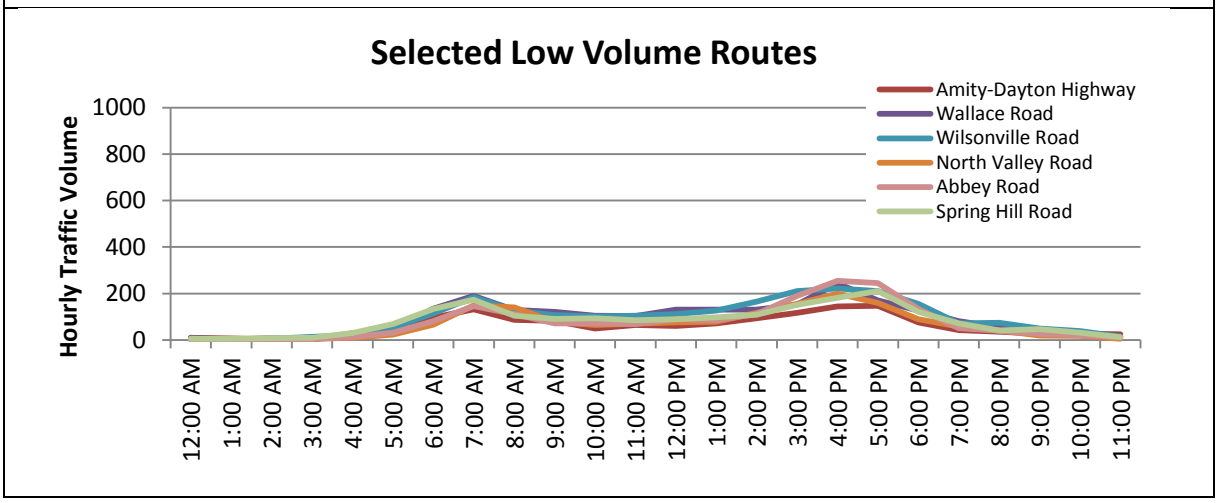
Existing roadway needs within the unincorporated portion of Yamhill County are significantly different than the needs typically found in urban areas. This is due both to the low density of development in rural areas as well the character of the roadway network that has been built to serve this development. Because of the higher development densities in urban areas, the most serious needs are usually related to mobility and traffic operations. Geometric deficiencies are of lower importance because urban streets are built to relatively high design standards. In rural areas, on the other hand, mobility is less frequently an issue and operational problems are primarily related to deficient geometrics or the lack of passing opportunities. Safety and geometric deficiencies are, however, of greater importance than in urban areas. In the unincorporated area of Yamhill County this is not surprising, since many of the roads were never designed, but simply evolved as transportation needs arose.

Existing needs were analyzed in the areas of mobility, traffic operations, safety, geometrics, and access. With the exception of mobility, this was done for roadways with a functional classification of minor collector or higher.

**Figure 8 – Hourly Volume Profiles**



As mentioned previously, two approaches were used in the analysis of existing transportation conditions. With the first approach, transportation system data such as traffic volumes and roadway characteristics were collected and analyzed. The results of the analysis were compared to standards, and for locations that did not meet the standards, a need was identified. The second approach was to gather information on existing transportation needs from stakeholders, county and ODOT road maintenance and traffic engineering staff and the RIAC. The reported needs from these sources were cataloged, and field reconnaissance was conducted at these locations to confirm the need and investigate the nature of the problem.

## Mobility Needs

### Analysis Volumes

Design hour volumes (DHVs) for state highways are shown in Figure 9. These volumes correspond to the 30th highest hour, the time period for which existing conditions on state highways were analyzed. The volumes were developed based on ODOT's reported AADT volumes for state highway segments using the procedures contained in ODOT's Analysis Procedures Manual (APM).[2] $K_{30}$ factors[3] were applied to the AADT volumes to obtain a DHV for each analysis segment.

For county roadways, average weekday peak hour volumes were used for the segment analysis (see Figure 10). The average weekday peak hour was selected rather than the 30th highest hour because for county roadways, there is less difference between peak hour volumes and 30th highest hour volumes compared to state highways, which typically have a stronger seasonal traffic component. These volumes were developed by multiplying the county's most recent daily traffic counts by an average peak hour factor ($K_{Peak\ Hour}$). An overall countywide peak hour time period of 4-5 P.M. was established using bi-directional county traffic counts for a range of roadways and functional classifications. Two $K_{Peak\ Hour}$ factors were developed, one for arterial roadways and the other for collectors, based on the relationship between the peak hour (4-5 P.M.) volumes and daily volumes for a sample of roadways for each functional classification.

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[2] Oregon Department of Transportation, Analysis Procedures Manual, (2011).
[3] $K_{30}$ factors were obtained from ODOT's OTMS Traffic Volume and Vehicle Classification (2010) database.

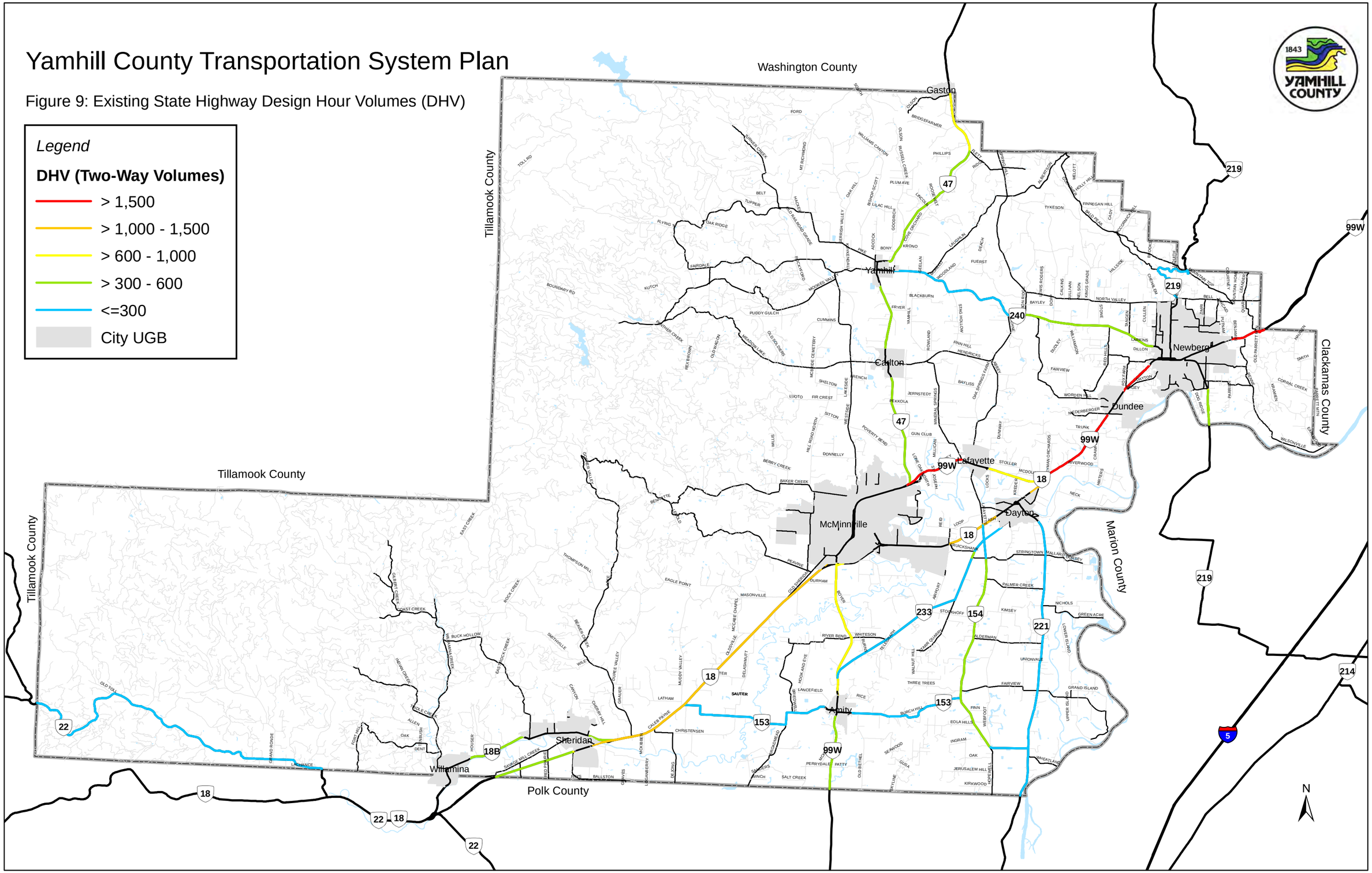
# Yamhill County Transportation System Plan

Figure 9: Existing State Highway Design Hour Volumes (DHV)

*Legend*

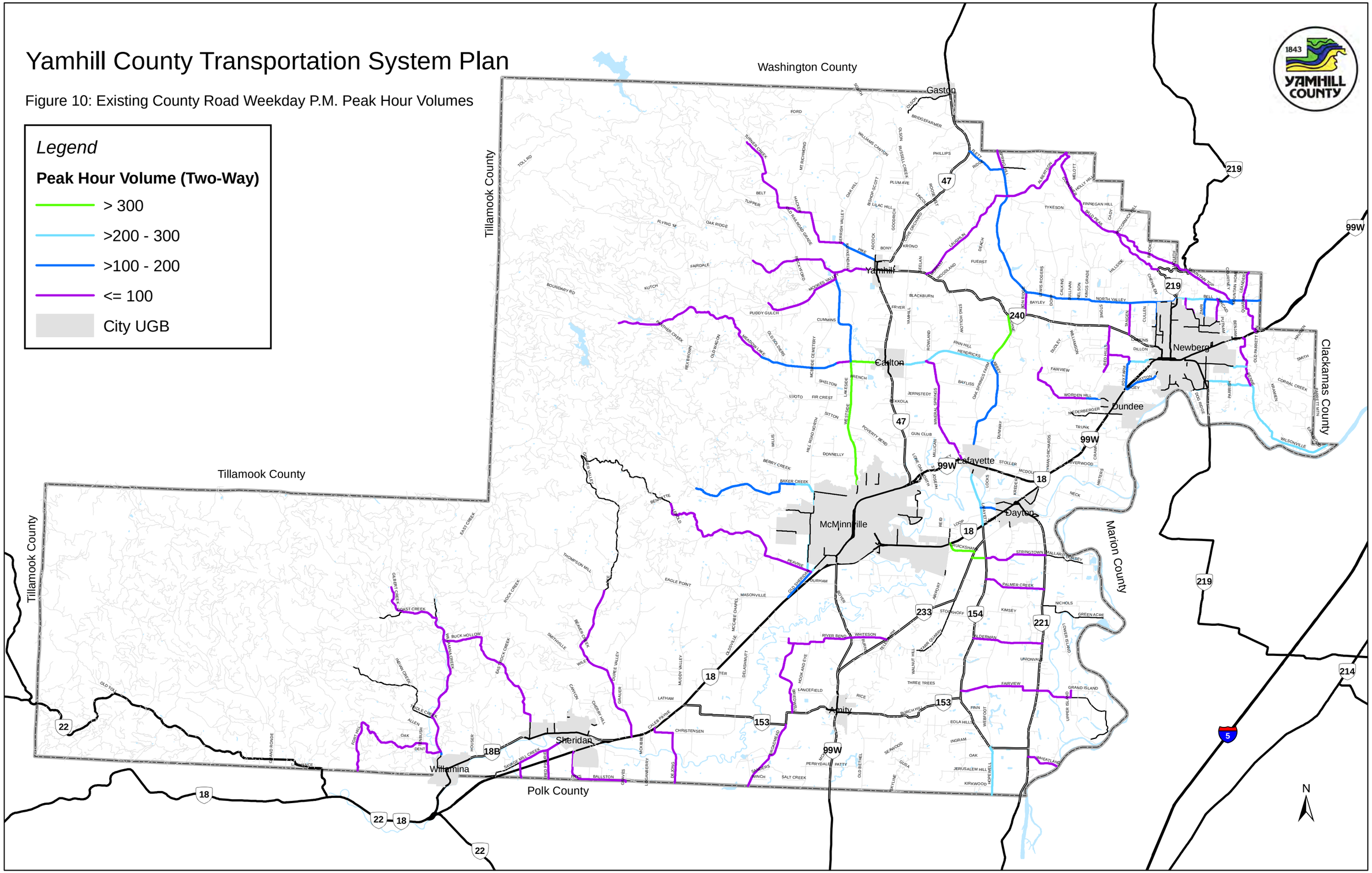
**DHV (Two-Way Volumes)**

- > 1,500
- > 1,000 - 1,500
- > 600 - 1,000
- > 300 - 600
- <=300
- City UGB



# Yamhill County Transportation System Plan

Figure 10: Existing County Road Weekday P.M. Peak Hour Volumes



Intersection turning movement counts were conducted at 25 locations within the study area along both state highways and county roadways. An examination of the count data showed that the system peak for state highway intersections occurs between 4:30 and 5:30 P.M. and the system peak for county intersections occurs between 4:00 and 5:00 P.M. Therefore, the counts for these periods were used in the development of intersection analysis volumes.

Seasonal adjustment factors were applied to all of the state highway intersection counts to reflect the 30th highest hour. The "ATR Trend Summary Method" described in the APM was used to determine the factors. The counts for the county intersections were not seasonally adjusted, but represent an average weekday peak hour condition.

Mobility Standards

Existing mobility needs were identified by comparing volume-to-capacity (v/c) ratio estimates for roadway segments and intersections to the appropriate v/c ratio standards. The applicable standards for state highways are shown in Table 3. The standards reflect the revisions to the Oregon Highway Plan (OHP) Policy 1F[4] that went into effect in January, 2012.

**Table 3 – State Highway Mobility Standards (Volume-to-Capacity Ratio)**

| Area/Highway Category | Segments/Signalized Intersections | Unsignalized Intersections* |
|---|---|---|
| **Outside Urban Growth Boundary/Rural Lands** | | |
| Statewide Expressways (OR 99W, OR 18) | 0.70 | 0.75 |
| Regional<br>(OR 22, OR 47, OR 99W, OR 154) | 0.70 | 0.75 |
| District<br>(OR 18B, OR 153[5], OR 219, OR 221, OR 233, OR 240) | 0.75 | 0.75 |

Source: Table 6 of the OHP Policy 1F Revisions – Adopted by the Oregon Transportation Commission: December 21, 2011.
* For unsignalized intersections, the v/c ratio shown is for the controlled approaches.

For county roadways, a v/c ratio standard of 0.75 was applied for both roadway segments and intersections.[6]

[4] Oregon Department of Transportation, OHP Policy 1F Revisions, (2011).
[5] The portion of OR 153 south of OR 154 is a regional route, for which the associated mobility standards were used.

Segment Mobility

For capacity analysis purposes, roadway segment endpoints for both state highways and county roads were defined by intersections with minor collector roads or higher. A segment capacity analysis was conducted for all state highways and for county roads classified as major collector or higher.[7]

Segment v/c ratio estimates were developed using the DHV estimates for state highways and the average weekday peak hour volume estimates for county roads. The analysis was performed according to the methodologies for two-lane rural highways outlined in the 2000 Highway Capacity Manual (HCM2000)[8] and the APM.

Figure 11 shows the estimated v/c ratios for state highways and county roads within the study area. The existing mobility for state highway segments is summarized in Table 4.

Figure 12 shows the segments not meeting the mobility standards. The only segments with v/c ratios exceeding the standards are along OR 99W between Newberg and Dundee and between Dundee and OR 18. All county roadways currently operate well within the mobility standard.

Intersection Mobility

A list of intersection locations with suspected level of service problems was developed based on discussions with county staff, as well as a review of daily intersection volumes. All intersections of state highways were also included.

Intersection v/c ratio estimates were developed using the HCM2000 methodology for unsignalized intersections. This methodology reports the v/c ratio for the worst movement at an intersection, which is usually the minor road left-turn for two-way stop intersections. This v/c ratio is evaluated against the applicable mobility standard to determine if a mobility need exists. Typically, the v/c ratio for turning traffic on the mainline is low.

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[6] Based on discussions with county staff, it was decided that the state highway mobility standards should be used for county roadways. In this regard, it was assumed that county roadways are most similar to ODOT's district level highways.
[7] The analysis was not performed for roadways below this classification because it was assumed that the low volumes for these roadways would not result in mobility needs.
[8] Transportation Research Board, Highway Capacity Manual, Special Report 209, (2000).

# Yamhill County Transportation System Plan

## Figure 11: Existing V/C Ratios

*Legend*

| Intersections | Segments |
|---|---|
| <= 0.70 | <= 0.70 |
| > 0.70 - 0.80 | > 0.70 - 0.80 |
| > 0.80 - 0.90 | > 0.80-0.90 |
| > 0.90 - 1.0 | > 0.90-1.0 |
| >1.0 | > 1.0 |
| City UGB | |

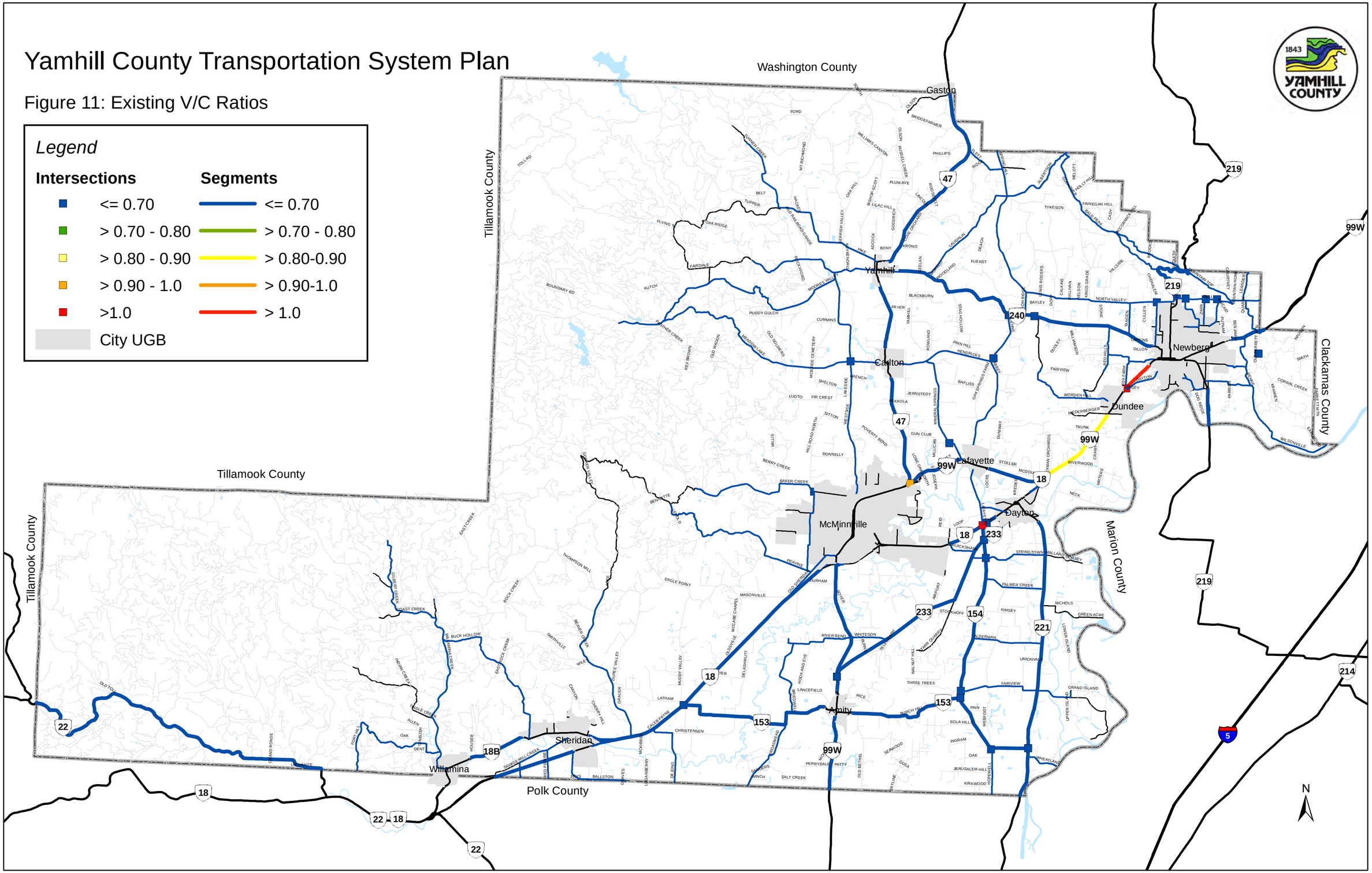


**Table 4 – Existing Mobility Summary - State Highway Segments**

| State Highway | V/C Standard | Total Miles | % Deficient |
|---|---|---|---|
| OR 18 | 0.70 | 16.2 | 0% |
| OR 18B | 0.75 | 3.0 | 0% |
| OR 22 | 0.70 | 12.9 | 0% |
| OR 47 | 0.70 | 14.3 | 0% |
| OR 99W | 0.70 | 17.7 | 27% |
| OR 153 (west of OR 154) | 0.75 | 9.9 | 0% |
| OR 153 (south of OR 154) | 0.70 | 3.4 | 0% |
| OR 154 | 0.70 | 6.3 | 0% |
| OR 219 | 0.75 | 4.5 | 0% |
| OR 221 (north of OR 153) | 0.75 | 8.2 | 0% |
| OR 221 (south of OR 153) | 0.70 | 1.7 | 0% |
| OR 233 | 0.75 | 8.2 | 0% |
| OR 240 | 0.75 | 10.4 | 0% |
| **Total** | | 116.7 | 4% |

The results of the intersection capacity analysis are shown in Table 5 and Figure 11. All of the intersections currently operate within the mobility standards, with the exception of OR 18/Lafayette Hwy., OR 47/OR 99W and OR 99W/Fox Farm Rd. The v/c ratios for the mainline turning movements for these intersections meet their respective mobility standard, however.

Reported Mobility Needs

There were multiple comments from stakeholders, agency staff and the RIAC members about the general need for additional capacity along the OR 99W/OR 18 corridor, the need for alternate routes to OR 99W, and the need for more routes connecting communities (see Figure 13 and Table A-1 in Appendix A). Overall mobility within the county was not a significant concern, however.

# Yamhill County Transportation System Plan

## Figure 12: Existing Mobility Needs

*Legend*

- Intersection mobility need
- Segment mobility need
- City UGB

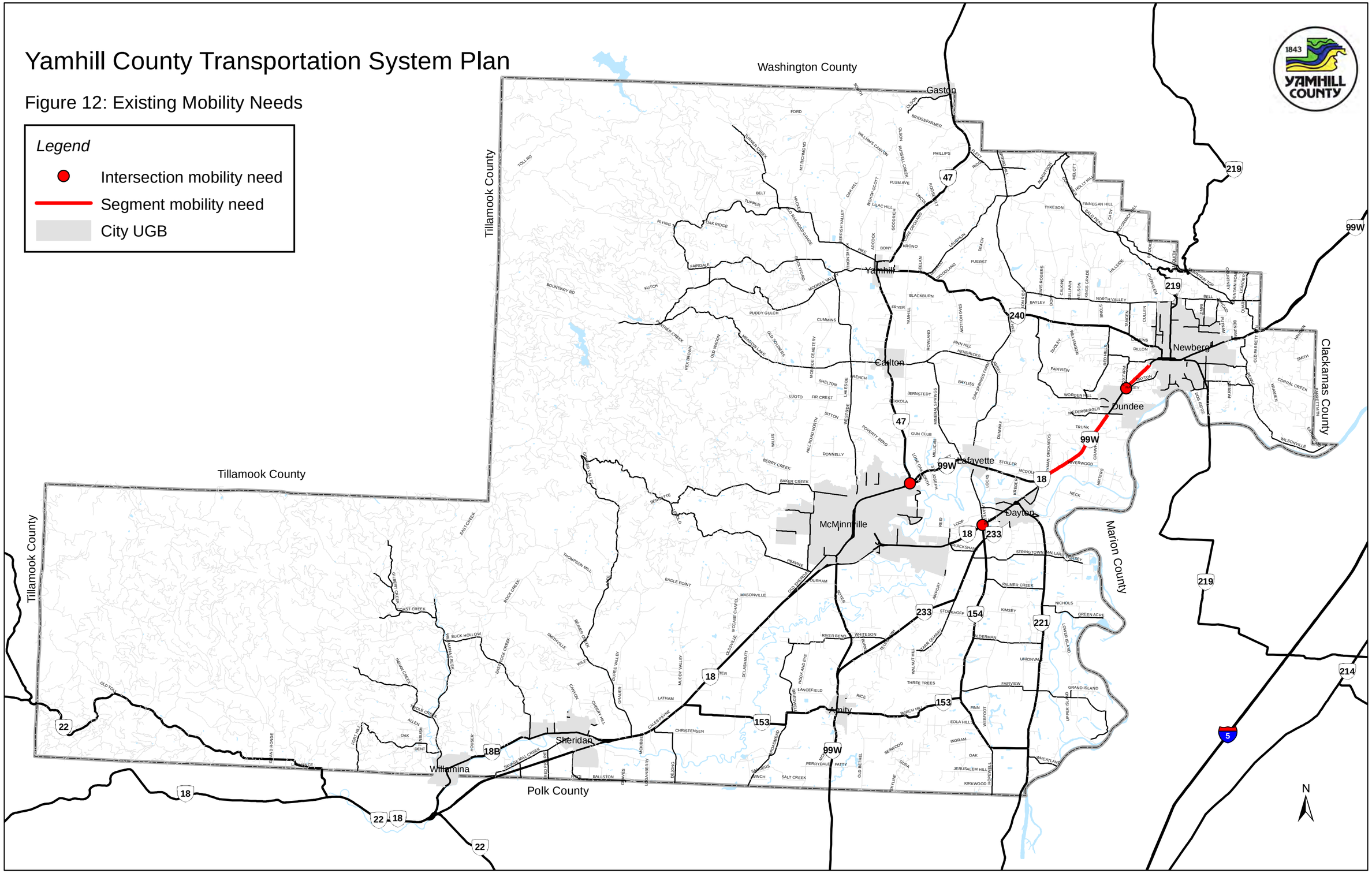


**Table 5 – Existing Mobility Summary - Intersections**

| Intersection | Mobility Standard (Major/Minor V/C Ratio) | V/C Ratio* (Major) | V/C Ratio* (Minor) |
|---|---|---|---|
| NW Hill Rd./SW 2nd St. | 0.75/0.75 | 0.28 | 0.04 |
| NW Hill Rd./NW Baker Creek Rd. | 0.75/0.75 | 0.26 | 0.11 |
| NW Westside Rd./NW Meadow Lake Rd. | 0.75/0.75 | 0.32 | 0.26 |
| NE Abbey Rd./NE Hendricks Rd. | 0.75/0.75 | 0.23 | 0.11 |
| OR 240/NE Kuehne Rd. | 0.75/0.75 | 0.28 | 0.14 |
| OR 219/NE Bell Rd. | 0.75/0.75 | 0.34 | 0.02 |
| N. Aspen Way/NE Bell Rd. | 0.75/0.75 | 0.05 | 0.02 |
| OR 18/OR 99W/McDougall Rd. | 0.70/0.75 | 0.66 | 0.47 |
| OR 18/SE Ash Rd. | 0.70/0.75 | 0.00 | 0.31 |
| OR 18/SE Lafayette Hwy. | 0.70/0.70 | 0.43 | **>1.0** |
| OR 154/OR 233 | 0.70/0.75 | 0.21 | 0.14 |
| OR 154/Stringtown Rd. | 0.70/0.75 | 0.14 | 0.25 |
| OR 153/Hopewell Rd | 0.70/0.75 | 0.00 | 0.23 |
| OR 154/SE Fairview Rd. | 0.70/0.75 | 0.01 | 0.01 |
| OR 240/Worden Hill Rd. | 0.75/0.75 | 0.00 | 0.01 |
| Zimri Rd./Bell Rd. | 0.75/0.75 | 0.05 | 0.08 |
| Springbrook Rd./Bell Rd. | 0.75/0.75 | 0.03 | 0.03 |
| Parrett Mountain Rd./Schaad Rd. | 0.75/0.75 | 0.01 | 0.00 |
| Gun Club Rd./Mineral Springs Rd. | 0.75/0.75 | 0.04 | 0.01 |
| Chehalem Dr./North Valley Rd. | 0.75/0.75 | 0.09 | 0.01 |
| OR 18/OR 153 | 0.70/0.75 | 0.37 | 0.04 |
| OR 99W/OR 233 | 0.70/0.75 | 0.28 | 0.25 |
| OR 47/OR 99W | 0.70/0.70 | 0.33 | **0.94** |
| OR 154/OR 153 | 0.70/0.70 | 0.17 | 0.09 |
| OR 221/OR 153 | 0.75/0.75 | 0.06 | 0.11 |
| OR 99W/Fox Farm Rd. | 0.70/0.75 | 0.68 | **>1.0** |

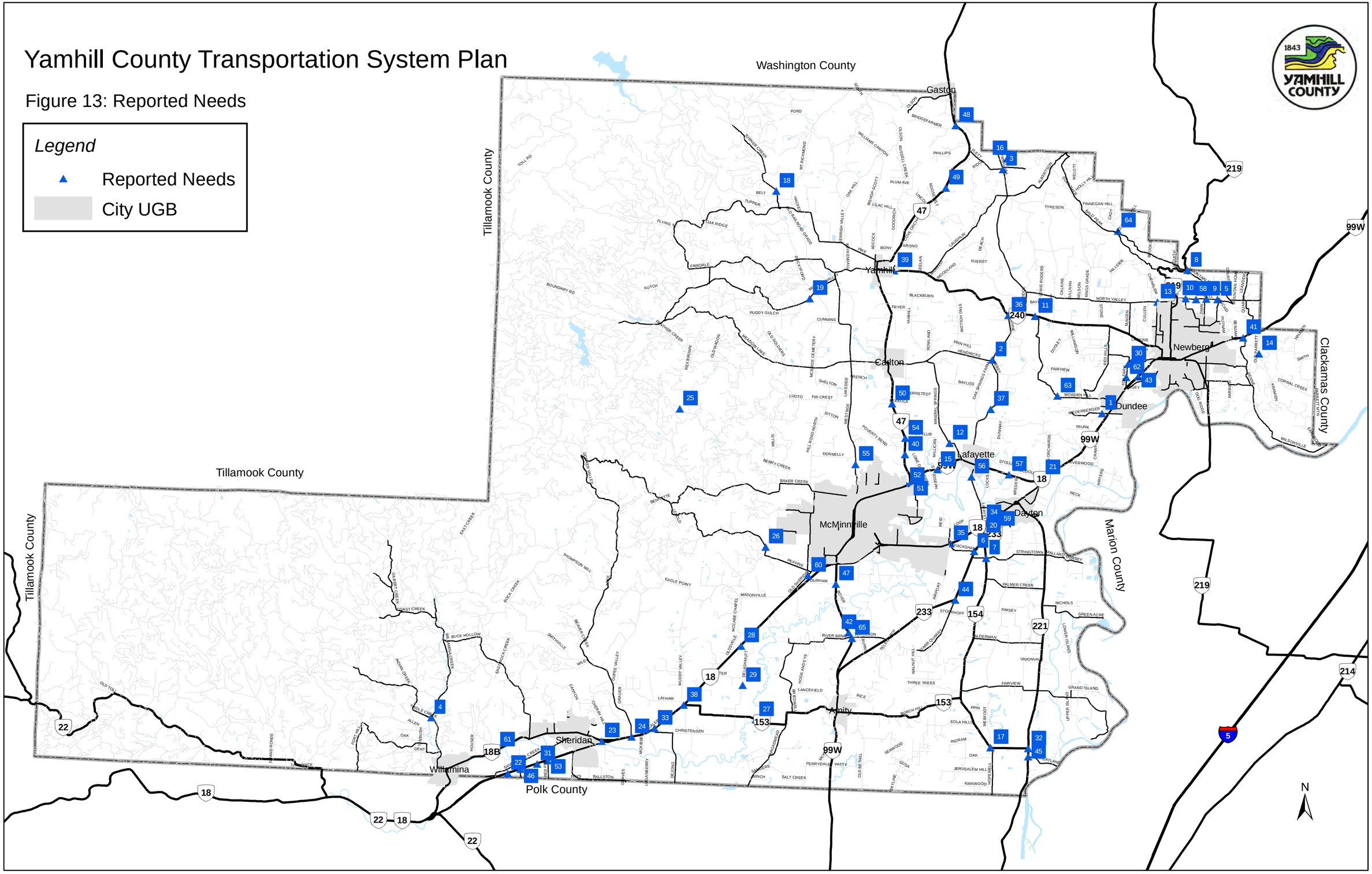
* V/C ratio for worst movement is reported. Bold/shaded cells indicate intersections not meeting mobility standard.

# Yamhill County Transportation System Plan

Figure 13: Reported Needs

*Legend*

- Reported Needs
- City UGB



## Traffic Operations Needs

### Intersections

Traffic operations needs were identified for unsignalized intersections where left-turn or right-turn lanes may be needed. Left-turn lanes reduce the possibility of rear-end collisions and improve traffic flow by preventing left-turning vehicles from blocking the flow of through traffic. Right-turn lanes reduce the delay of through vehicles behind right-turning traffic and ease right-turns for drivers by providing a refuge from the higher-speed through traffic stream.

Turn lane needs were determined using the turn lane criteria contained in the APM.[9] The volume criterion for left-turn lanes is based on the hourly opposing volume per lane and advancing volume per lane, hourly turning volume, and posted speed limit at an intersection. As the opposing plus advancing volume and/or turning volume increases, or as the speed limit increases, the volume threshold at which a turn lane should be considered decreases. The volume criterion for right-turn lanes is based on the hourly approaching volume in the outside lane (through plus right-turn volume), hourly turning volume, and speed limit. As any of these factors increases, the volume threshold for a right-turn lane decreases.

Table 6 shows the intersections where left-turn lane needs were found. The existing left-turn volume is listed along with the threshold for which a left-turn lane would be warranted based on the existing advancing/opposing traffic volumes. Table 7 shows similar data for intersections where right-turn lane needs were found.

Table 8 summarizes intersections where either a left-turn lane or a right-turn lane is warranted based on existing volumes and posted speeds. The results of the analysis are shown in Figure 14. A majority of the turn lane needs are on state highways.

[9] Oregon Department of Transportation, Analysis Procedures Manual, (2011).

**Table 6 – Existing Left-Turn Lane Needs**

| Roadway | Intersection | Direction | Left-Turn Volume | Left-Turn Volume Threshold |
|---|---|---|---|---|
| **State Highways** | | | | |
| OR 240 | Kuehne Rd. | WB | 396 | 12 |
| OR 154 | Stringtown Rd. | NB | 162 | 23 |
| OR 99W | OR 47 | EB | 238 | 10 |
| OR 154 | OR 153 | NB | 32 | 16 |
| OR 221 | OR 153 | NB | 82 | 26 |
| OR 99W | Fox Farm Rd. | NB | 135 | 38 |
| **County Roadways** | | | | |
| Hill Rd. | 2nd St. | SB | 55 | 26 |
| Baker Creek Rd. | Hill Rd. | WB | 151 | 22 |
| Abbey Rd. | Hendricks Rd. | SB | 211 | 18 |

**Table 7 – Existing Right-Turn Lane Needs**

| Roadway | Intersection | Direction | Right-Turn Volume | Right-Turn Volume Threshold |
|---|---|---|---|---|
| **State Highways** | | | | |
| OR 18 | Ash Rd. | EB | 52 | 0 |
| OR 153 | Hopewell Rd. | EB | 162 | 82 |
| OR 99W | OR 47 | WB | 36 | 30 |
| OR 99W | Fox Farm Rd. | SB | 230 | 80 |
| OR 99W | Fox Farm Rd. | EB | 55 | 0 |

**Table 8 – Existing Turn Lane Need Summary**

| Intersection | Northbound | | Southbound | | Eastbound | | Westbound | |
|---|---|---|---|---|---|---|---|---|
| | LT | RT | LT | RT | LT | RT | LT | RT |
| **State Highways** | | | | | | | | |
| OR 240/Kuehne Rd. | | | | | | | √ | |
| OR 18/Ash Rd. | | | | | | √ | | |
| OR 154/Stringtown Rd. | √ | | | | | | | |
| OR 153/Hopewell Rd. | | | | | | √ | | |
| OR 99W/OR 47 | | | | | √ | | | √ |
| OR 154/OR 153 | √ | | | | | | | |
| OR 221/OR 153 | √ | | | | | | | |
| OR 99W/Fox Farm Rd. | √ | | | √ | | √ | | |
| **County Roadways** | | | | | | | | |
| Hendricks Rd./Kuehne Rd. | | | √ | | | | | |
| Hill Rd./2nd St. | | | √ | | | | | |
| Baker Creek Rd./Hill Rd. | | | | | | | √ | |

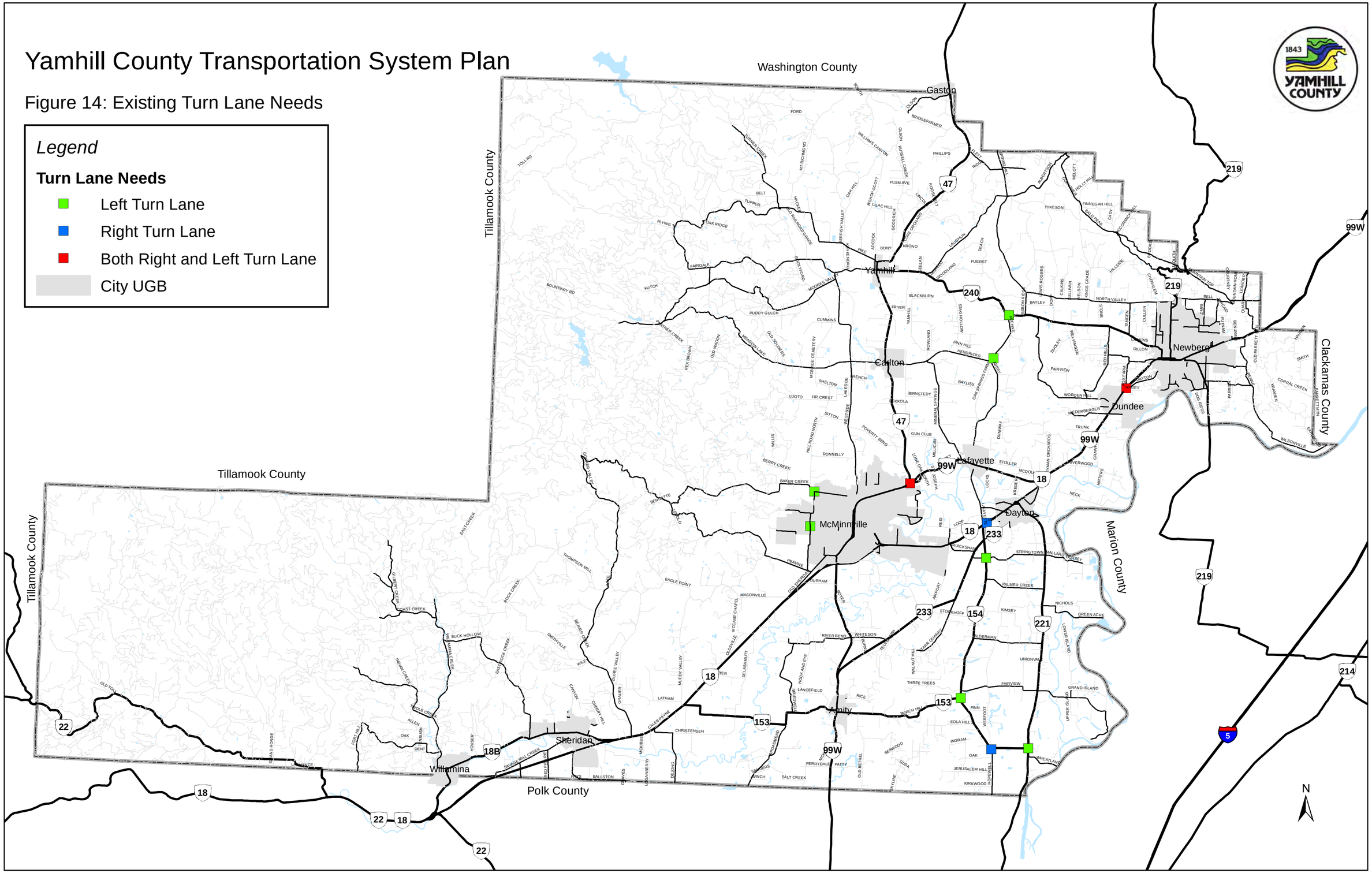
# Yamhill County Transportation System Plan

## Figure 14: Existing Turn Lane Needs

*Legend*

**Turn Lane Needs**

- Left Turn Lane
- Right Turn Lane
- Both Right and Left Turn Lane
- City UGB



Reported Traffic Operations Needs

Numerous traffic operations needs were reported by stakeholders, agency staff, and the RIAC members (see Figure 13 and Table A-1 in Appendix A). Many of the comments were related to problems with turning vehicles and the need for two-way center lanes and turn lanes at intersections, particularly along OR 18. Other specific concerns noted were:

- Difficulty in turning onto and crossing OR 18 from side roads.
- Lack of pull-outs for buses countywide.
- Lack of designated stop areas for buses countywide.
- Lack of alternate routes for OR 99W.
- Driver confusion at the OR 99W/OR 18/McDougall Rd. intersection due to the atypical intersection geometry.
- Need for a traffic signal along OR 18 in the Sheridan/Willamina area.
- Need for a traffic signal in Dundee to facilitate crossing/turning traffic.
- Need for a turn lane at OR 18/Christensen Rd.[10]
- Driver confusion at a number of intersections caused by lane geometry that allows free-flow turning movements (e.g., the north-to-west and east-to-south movements at OR 154/Stringtown Rd.).
- Driver confusion at OR 18/Cruickshank Rd. due to the atypical intersection geometry.
- Difficulty in accessing OR 99W from Old Parrett Mountain Rd., Corral Creek Rd., and Quarry Rd. due to high speeds and high traffic volumes on OR 99W.
- High crossing volumes at OR 18/Harmony Rd.
- Need for a turn lane at OR 47/Goodin Creek Rd.
- Driver confusion at OR 47/OR 99W.
- Difficulty of drivers turning back to see on-coming traffic at several intersections with separated right-turn lanes.

**Safety Needs**

The safety needs analysis included the calculation of crash rates for intersections and road segments along all roads with a functional classification of minor collector or higher. ODOT's Safety Priority Index System (SPIS) locations were also included in the analysis. The crash rates,

[10] A project to add a westbound left-turn lane is underway.

SPIS locations, and input from the RIAC, stakeholders, and county staff were then considered to identify seven locations for further investigation.

Crash Rates

Crash data for the most recent five year period (2006 – 2010) were obtained from ODOT[11] for the calculation of crash rates for county roads and state highways. Roadway segment and intersection crash rates were calculated separately using the same data set. The crash rates are not additive, since the crashes included in the intersection crash rates are also reflected in the segment crash rates. Thus, all of the crashes were included in the segment rates, while only a subset of the crashes were included in the intersection rates.

Segment crash rates were calculated as the number of crashes per million vehicle miles traveled (MVMT), based on the number of crashes and the AADT volume. Statewide average crash rates were used as the standard of comparison for both the county road and state highway segments.[12] The statewide average crash rates for the 2006 to 2010 period were averaged and are shown in Table 9 below.

**Table 9 – Statewide Average Crash Rates - 2006 to 2010**

| Functional Classification | Statewide Average Crash Rate |
|---|---|
| Other Principal Arterials | 0.672 |
| Minor Arterials | 0.960 |
| Rural Major Collectors | 1.166 |
| Rural Minor Collectors | 0.748 |

Figure 15 shows the crash rates for county road and state highway segments as a percentage of the applicable statewide average. The analysis shows that there are multiple county roadway and state highway segments with crash rates of 200% or more of the statewide average for similar facilities.

[11] Oregon Department of Transportation, Crash Data System website, https://keiko36.odot.state.or.us/whalecome5690917adb26326abdb252e22d8/whalecom0/SecureKeiko36PortalHomePage/, accessed April 3, 2012.
[12] Oregon Department of Transportation, 2010 State Highway Crash Rate Tables, (2010).

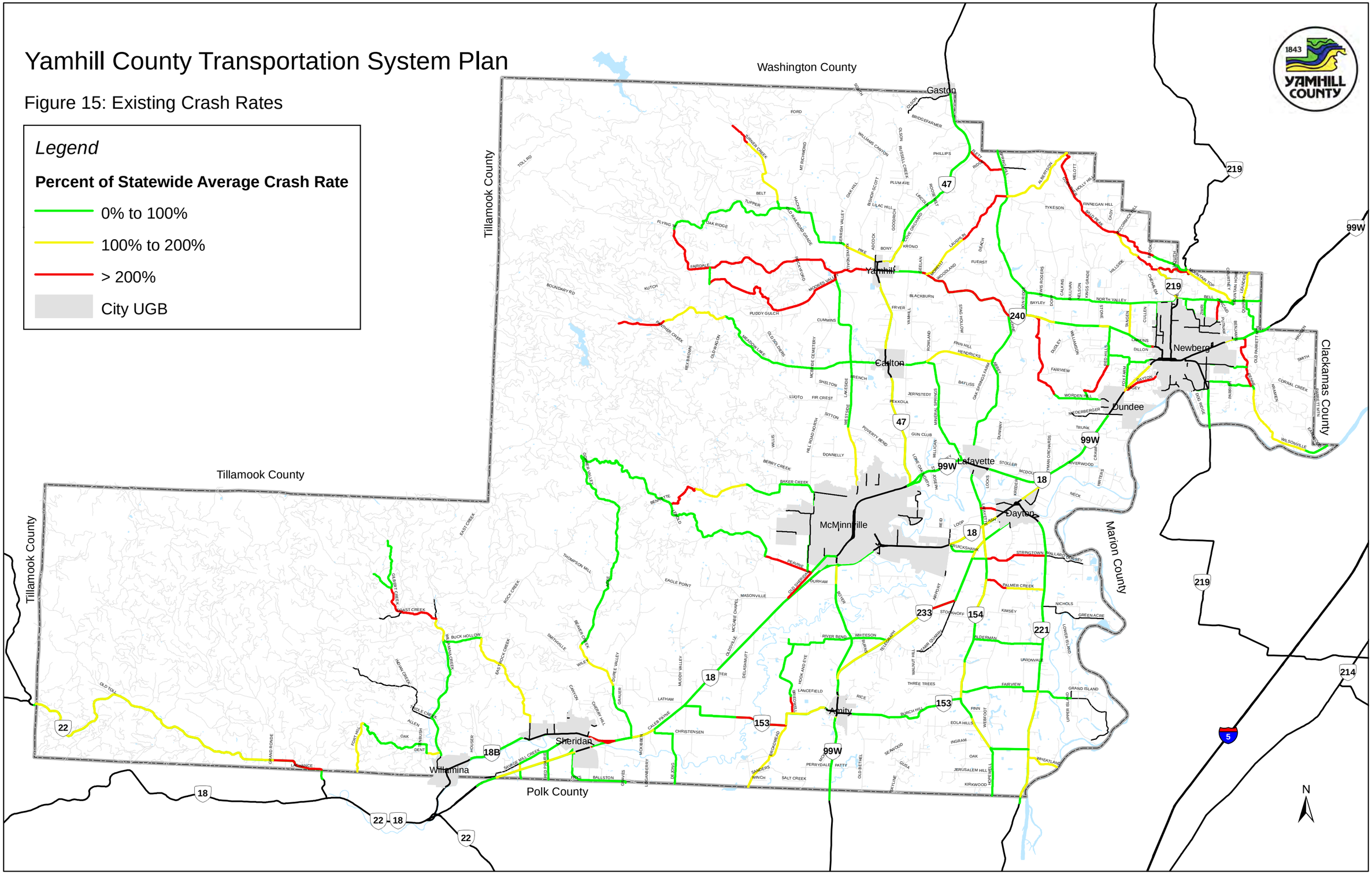
# Yamhill County Transportation System Plan

Figure 15: Existing Crash Rates

*Legend*

**Percent of Statewide Average Crash Rate**

- 0% to 100%
- 100% to 200%
- > 200%
- City UGB



Intersection crash rates were calculated as the number of crashes per million entering vehicles (MEV), based on the number of crashes and the annual average total entering volume. ODOT does not have an intersection crash rate standard. Instead, the APM includes a rule-of-thumb for identifying potential problem locations of greater than 1.0 crashes per MEV.[13] This guideline was applied to the 16 intersections for which crash rates were calculated.[14] Only the intersection of OR 18/Cruickshank Rd., with a crash rate of 1.31 crashes per MEV, exceeded this rate and was flagged for further investigation. Both of the county road intersections included in the analysis had crash rates of less than 1.0 crashes per MEV.

ODOT Safety Priority Index System

ODOT maintains the SPIS for the identification and analysis of locations on the state highway system with potential safety needs. Each year, the system is used to produce a list of sites within each ODOT Region that are ranked within the top 5$^{th}$ or top 10$^{th}$ percentiles of all SPIS locations statewide. The SPIS score is based on three years of crash data and reflects crash frequency, crash rate, and crash severity. A roadway location is defined as a SPIS site if there have been three or more crashes or at least one fatal crash over the three-year period. SPIS sites are defined as 0.10 mile sections on the state highway system.

The SPIS sites within the study area in the top 5$^{th}$ and top 10$^{th}$ percentiles for the 2008-2010 time period are listed in Table 10 and shown in Figure 16.

As would be expected, a majority of the SPIS sites are at intersections. OR 18 and OR 99W have the largest number of sites. There are two areas along these highways with closely-spaced SPIS sites. The first is along OR 99W between the westbound lane drop and the Dundee city limits (Locations 11 and 12) and the second is on OR 18 between Lafayette Hwy. and Ash Rd. (Locations 2 and 3). Three of these SPIS sites are discussed in more detail in the following section.

[13] Oregon Department of Transportation, Analysis Procedures Manual, (2011).
[14] Crash rates were calculated for 16 intersections only because these were the only locations with traffic count data available.

**Table 10 – Top 5th and Top 10th Percentile SPIS Sites - 2008 to 2010**

| Location No. | Highway | Beginning M.P. | Ending M.P. | Location | SPIS Percentile Ranking |
|---|---|---|---|---|---|
| 1 | OR 18 | 31.57 | 31.75 | Red Prairie Rd. | 5 |
| 2 | OR 18 | 49.82 | 50.00 | OR 154/Lafayette Hwy. | 5 |
| 3 | OR 18 | 50.01 | 50.19 | Ash Rd. | 5 |
| 4 | OR 22 | 16.91 | 17.09 | E/O USFS Road | 10 |
| 5 | OR 22 | 21.92 | 22.10 | Grande Ronde Rd. | 10 |
| 6 | OR 221 | 9.17 | 9.29 | OR 153 | 10 |
| 7 | OR 233 | 5.00 | 5.16 | Starr Quarry Rd. | 10 |
| 8 | OR 240 | 2.31 | 2.45 | Woodland Loop | 10 |
| 9 | OR 47 | 42.34 | 42.46 | OR 99W | 5 |
| 10 | OR 99W | 19.91 | 20.09 | Parrett Mtn. Rd. | 10 |
| 11 | OR 99W | 24.91 | 25.09 | WB Lane Drop | 10 |
| 12 | OR 99W | 25.44 | 25.62 | Dundee W.C.L. | 5 |
| 13 | OR 99W | 39.91 | 40.02 | Durham Ln. | 5 |

Safety Investigation

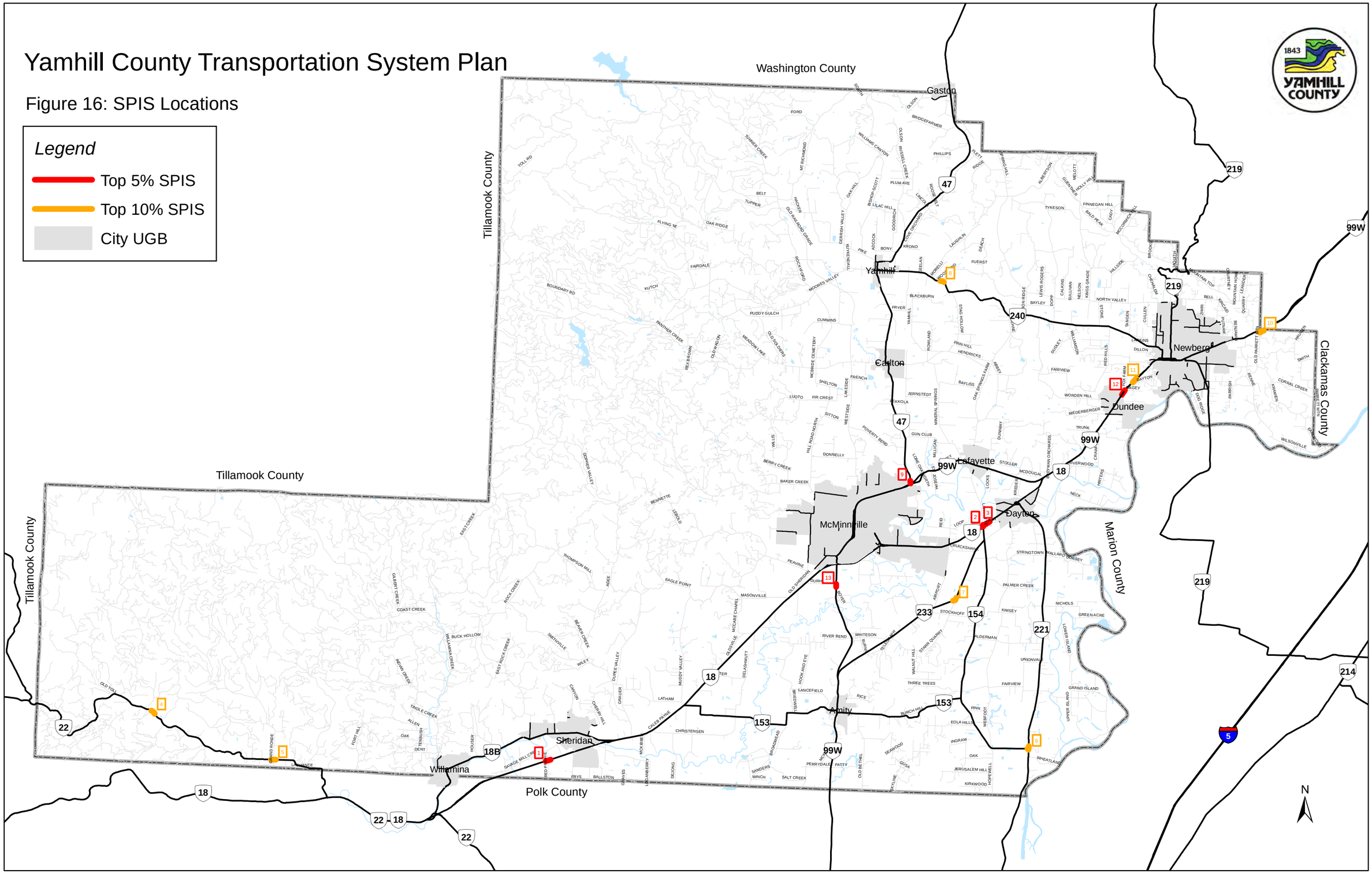
Based on the crash rates, SPIS data, and input received from the stakeholders, RIAC, and county staff, the following seven locations were selected for further investigation:

- Abbey Rd./Hendricks Rd. intersection
- Stringtown Rd. between OR 154 and OR 221
- Worden Hill Rd. from OR 240 to the end of pavement
- OR 99W/OR 18/McDougall Rd. intersection
- OR 18 between OR 154/Lafayette Hwy. and Ash Rd.
- OR 18/SW Red Prairie Rd. intersection
- OR 99W/OR 47 intersection

These locations are shown in Figure 17.

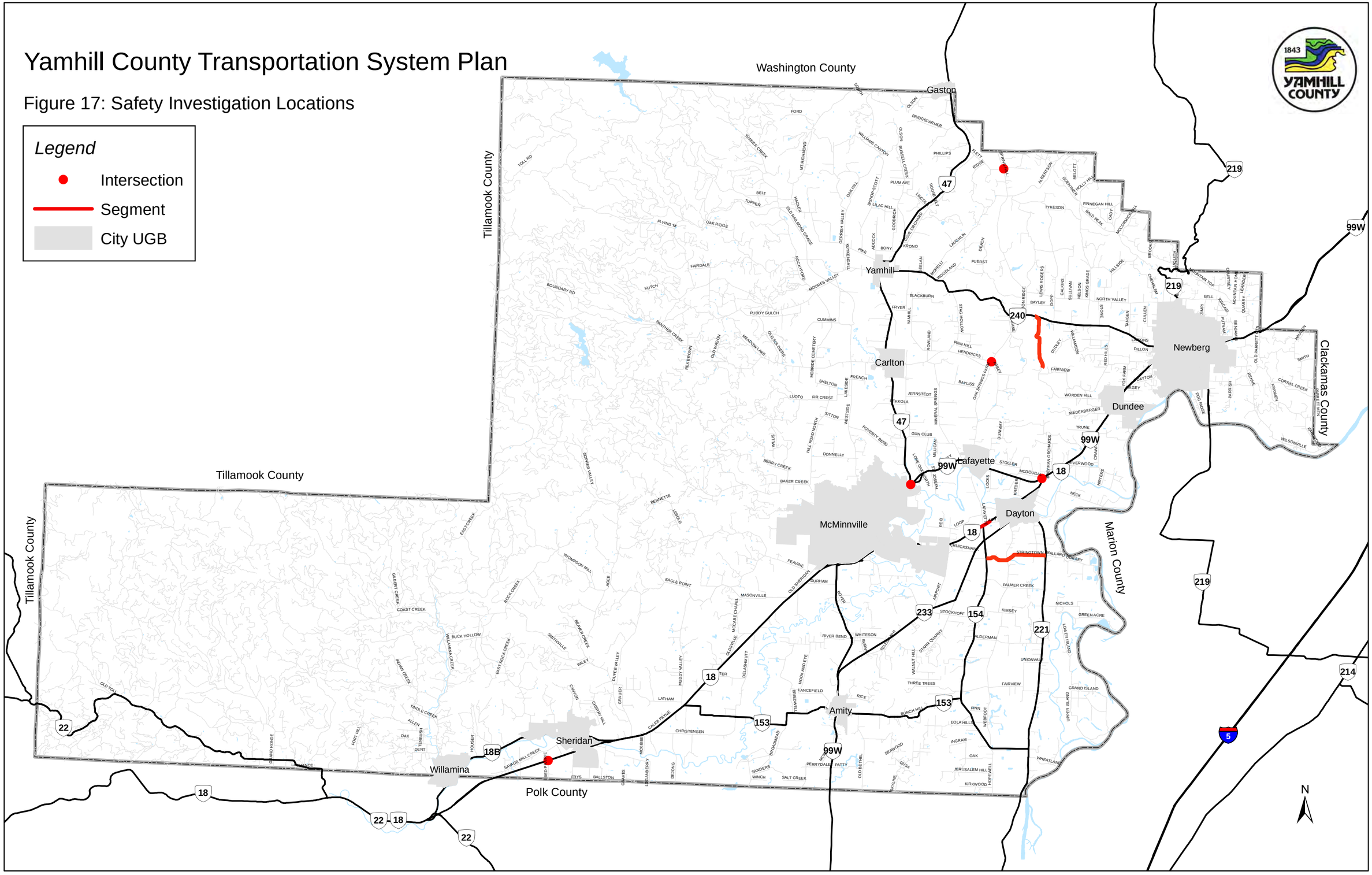
# Yamhill County Transportation System Plan

## Figure 16: SPIS Locations



# Yamhill County Transportation System Plan

## Figure 17: Safety Investigation Locations



*Abbey Rd./Hendricks Rd. Intersection*

The Abbey Rd./Hendricks Rd. intersection was identified by the RIAC, stakeholders, and county road maintenance staff as a safety problem location. A total of five crashes occurred at this intersection between 2006 and 2010, resulting in crash rate of 0.58 crashes per MEV.

One of the crashes involved a through vehicle on eastbound Hendricks Rd. and a vehicle turning left from the Abbey Rd.-to-Hendricks Rd. connector onto westbound Hendricks Rd. The cause of this crash was cited as the failure to yield by the turning vehicle.

Two other crashes were fixed object crashes involving eastbound/northbound vehicles on Hendricks Rd. near the Abbey Rd./Kuehne Rd. intersection. In both cases, the vehicle left the roadway and ended up in the ditch. This location is on a curve following a long straight section to the west along Hendricks Rd. The cause cited for both crashes was excessive speed, which may indicate that the drivers did not adjust their speed for the curve from the straight section. In one of these crashes, foggy weather and an icy road surface may also have been contributing factors.

The remaining crashes were rear-end crashes involving southbound/westbound vehicles on Kuehne Rd. approaching the Hendricks Rd./Abbey Rd./Kuehne Rd. intersection. The crash cause in both cases was “following too close”. In these crashes, the impacted vehicles may have been stopped on southbound Kuehne Rd., waiting for a gap in the eastbound/northbound traffic on Hendricks Rd. to access Abbey Rd.

All of the crashes at this intersection appear to be related to driver error.

*Stringtown Rd. Between OR 154 and OR 221*

Five crashes occurred along this section of Stringtown Rd. over the five-year period. The crash rate of 8.55 crashes per MVMT is nearly 8.5 times the average rate for similar roadways in Oregon. Part of the reason for the higher crash rate is that Stringtown Rd. is a relatively low-volume road, which amplifies the effect of crash frequency on the crash rate. This section was identified by the RIAC, county maintenance staff, and stakeholders as a safety problem location.

A review of the crash history did not indicate a strong pattern of the crashes. One of the crashes was a rear-end collision at the intersection of OR 154/Stringtown Rd., in which the

driver was following too close. The other four crashes were fixed-object collisions. Three of these occurred on curves and the other on a straight section. In one of the crashes, the fixed-object was a piece of equipment on or near the roadway, and another involved a collision with a deer or elk. Excessive speed was cited as a contributing cause in all of the fixed-object crashes.

*Worden Hill Rd. from OR 240 to End of Pavement*

Four crashes were recorded on this section of Worden Hill Rd. between 2006 and 2010. It was identified as a safety problem location by the RIAC and county maintenance staff. The crash rate of 11.94 crashes per MVMT is nearly 11 times the statewide average. The relatively low volume on this road contributes to the high crash rate.

This two-mile section of roadway is gravel. It is characterized by narrow width, horizontal and vertical curves, no shoulders, little or no clear zone, and obstructions such as trees, utility poles, and embankments along the roadside. All of the crashes occurred at locations where there is a combination of horizontal and vertical curves. One of the crashes was a head-on collision, while the others involved vehicles either overturning or leaving the roadway and striking fixed objects. These crash types suggest that the roadway characteristics may limit the driver's ability to anticipate upcoming roadway features and traffic, as well as the likelihood of recovery. The gravel roadway surface does not appear to be a factor, since the surface condition was dry in the all of the crashes.

*OR 99W/OR 18/McDougall Rd. Intersection*

The OR 99W/OR 18/McDougall Rd. intersection was identified by stakeholders and county maintenance staff as a safety problem location. There were seven crashes at this location over the 2006 – 2010 period, resulting in a crash rate of 0.20 crashes per MEV.

Four of the crashes were turning or angle crashes at the intersection. Three of these crashes involved southbound vehicles on McDougall Rd. attempting to cross or turn left onto OR 99W, in which the driver passed the stop sign and flashing beacon or failed to yield. This indicates that the drivers did not properly recognize the upcoming intersection or cross traffic on OR 99W. The fourth crash occurred between an eastbound through vehicle and a westbound vehicle turning left onto OR 18 that failed to yield. The fifth crash at the intersection was a rear-end collision in the westbound left-turn lane that happened during snowy conditions.

The other two crashes occurred just to the east of the intersection. The first crash was a fixed-object crash that appeared to be unrelated to the intersection. The second crash was at the merge point between eastbound OR 99W and the connector from OR 18 in which the vehicle on OR 18 failed to yield.

*OR 18 between OR 154/Lafayette Hwy. and Ash Rd.*

This section of OR 18 is identified as a top 5th percentile SPIS site. Over the 2006 – 2010 period, 30 crashes occurred within this segment. All of these were at or near the OR 18/OR 154/Lafayette Hwy. and OR 18/Ash Rd. intersections.

At the OR 18/OR 154/Lafayette Hwy. intersection, 12 of the 20 crashes were angle crashes involving vehicles on OR 154/Lafayette Hwy. attempting to cross OR 18. In all cases, the cause was failure to yield or passing the stop sign and flashing beacon. One of the crashes resulted in a fatality. Three other crashes were turning crashes in which the driver failed to yield to the cross traffic on OR 18. These crash types indicate that the drivers may have been unaware of the intersection or cross traffic. Another cause could be that the gap in the traffic stream was too small, which may be related to the high traffic volumes and higher speeds along OR 18. The other five crashes were all rear-end crashes involving stopped vehicles on OR 18. The causes of these crashes were either driver inattention or following too closely.

There was a similar pattern of crashes at the OR 18/Ash Rd. intersection, where there was a total of 10 crashes. Six of the crashes were turning or angle crashes in which the drivers failed to yield or passed the stop signs on the Ash Rd. intersection approaches. One of the crashes resulted in a fatality. There were also two rear-end crashes due to inattention/driver error and two fixed object crashes, one caused by tire failure and the other by excessive speed with icy road conditions.

*OR 18/SW Red Prairie Rd. Intersection*

This intersection is listed in the top 5th percentile of ODOT's SPIS sites. All ten of the crashes occurring from 2006 to 2010 were angle crashes between vehicles attempting to cross OR 18 from Red Prairie Rd. and through traffic on OR 18. The primary cause was failure to yield, indicating that the drivers may have tried to use gaps that were too short for the crossing maneuver. In one case, the crash cause was passing the stop sign and flashing beacon on the Red Prairie Rd. intersection approach.

*OR 99W/OR 47 Intersection*

The OR 99W/OR 47 intersection is a top 5th percentile SPIS site, with 29 crashes between 2006 and 2010. Most of the crashes at this location were angle or rear-end collisions. There were 10 angle collisions involving vehicles crossing OR 99W from/to OR 47. In almost all of the crashes, the reported cause was failure to yield. In two cases, the drivers passed the stop signs and flashing beacons on the approaches to the intersection. There was also a large proportion of rear-end crashes (13). Nine of these occurred on southbound Hwy. 47, which approaches OR 99W at an angle. Two others were located on the west connection between the westbound and eastbound roadways of OR 99W. The remaining two rear-end crashes were on the westbound approach of OR 99W to OR 47, which may have involved vehicles slowing to turn onto Hwy. 47.

Four other crashes occurred between vehicles turning onto westbound OR 99W from either southbound Hwy. 47 or the east connection between the westbound and eastbound roadways of OR 99W. The reported cause in two of these crashes was improper overtaking. Passing a stop sign and excessive speed were cited as the causes in the other two crashes.

Two crashes near the intersection appeared to be unrelated to the intersection, one involving a vehicle backing up in the travel lane and the other a fixed-object crash caused by excessive speed.

<u>Reported Safety Needs</u>

The safety needs reported by the stakeholders, agency staff, and RIAC members are shown in Figure 13 and Table A-1 in Appendix A. A number of the locations are also the SPIS sites described above.

Nearly all of the reported problems were related to intersections of state highways and county roads. At several of these intersections, difficulty in accessing the highway because of high volumes and high speeds was cited as a possible cause. This includes the OR 18/OR 154/Lafayette Hwy. intersection, which was the most frequently reported safety need location. At other intersections, driver confusion related to the atypical intersection configuration and the lack of recognition of the approaching intersection were mentioned as possible causes.

Segment safety needs were identified along OR 99W between Newberg and Dundee where the highway narrows from two lanes to one lane in the westbound direction and on the OR 18 South Yamhill River Bridge near McMinnville, which was described as needing replacement.

## Geometric Needs

### Segment Geometrics

Geometric needs related lane width and shoulder width were identified for roadway segments. The lane and shoulder widths for state highway segments were compared to two sets of standards contained in the ODOT Highway Design Manual (HDM).[15] For OR 18 and the portion of OR 99W to the east of OR 18, the 4-R new rural arterial design standards were used in the comparison. For all other state highways, the 3-R rural non-freeway design standards were used. This approach was based on the assumption that the future improvements for most state highways would likely be resurfacing, restoration, or rehabilitation projects for which the 3R standards would apply. The use of the 3-R standards for the identification of needs, however, does not preclude the possibility that the higher 4-R standards may be followed at the time an improvement project is developed. Both sets of standards reflect the design values contained in the current version of the HDM, which are subject to change.

Because the AADT volumes for OR 18 and OR 99W to the east or OR 18 are well over 2,000, the 4R standards indicate that the lane widths should be at least 12 feet and shoulder widths should be at least 8 feet. The 3-R standards vary based on traffic volume, speed, and the percentage of trucks, and are summarized in Table 11 below.

The existing lane and shoulder widths for state highways are shown in Figures 18 and 19. For all state highways, the applicable shoulder width standard is not met along more than 50% of the highway (see Table 12). The highest-volume highways, OR 99W and OR 18, have significantly lower percentages of deficient shoulder widths, however, than the lower-volume highways. Lane width deficiencies are more unevenly distributed, with some highways having no deficient mileage (OR 18, OR 22, OR 47, OR 99W, OR 219, and OR 240), while the other highways have deficient lane widths over more than 50% of their mileage (OR 18B, OR 153, OR 154, OR 221, and OR 233). OR 154 has deficient lane widths over its entire length.

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[15] Oregon Department of Transportation, Highway Design Manual, (2003).

**Table 11 – ODOT 3-R Rural Non-Freeway Design Standards**
**Minimum Lane and Shoulder Widths**

| Design Year Volume (ADT) | Average Running Speed | Less than 10% Trucks | | More than 10% Trucks | |
|---|---|---|---|---|---|
| | | Lane Width | Shoulder Width | Lane Width | Shoulder Width |
| < 750 vehicles | < 50 mph | 9’ | 2’ | 10’ | 2’ |
| | >= 50 mph | 10’ | 2’ | 10’ | 2’ |
| 750 – 2,000 vehicles | < 50 mph | 10’ | 2’ | 11’ | 2’ |
| | >= 50 mph | 11’ | 3’ | 12’ | 3’ |
| 2,001 – 4,000 vehicles | All Speeds | 11’ | 4’ | 12’ | 4’ |
| > 4,000 vehicles | All Speeds | 11’ | 6’ | 12’ | 6’ |

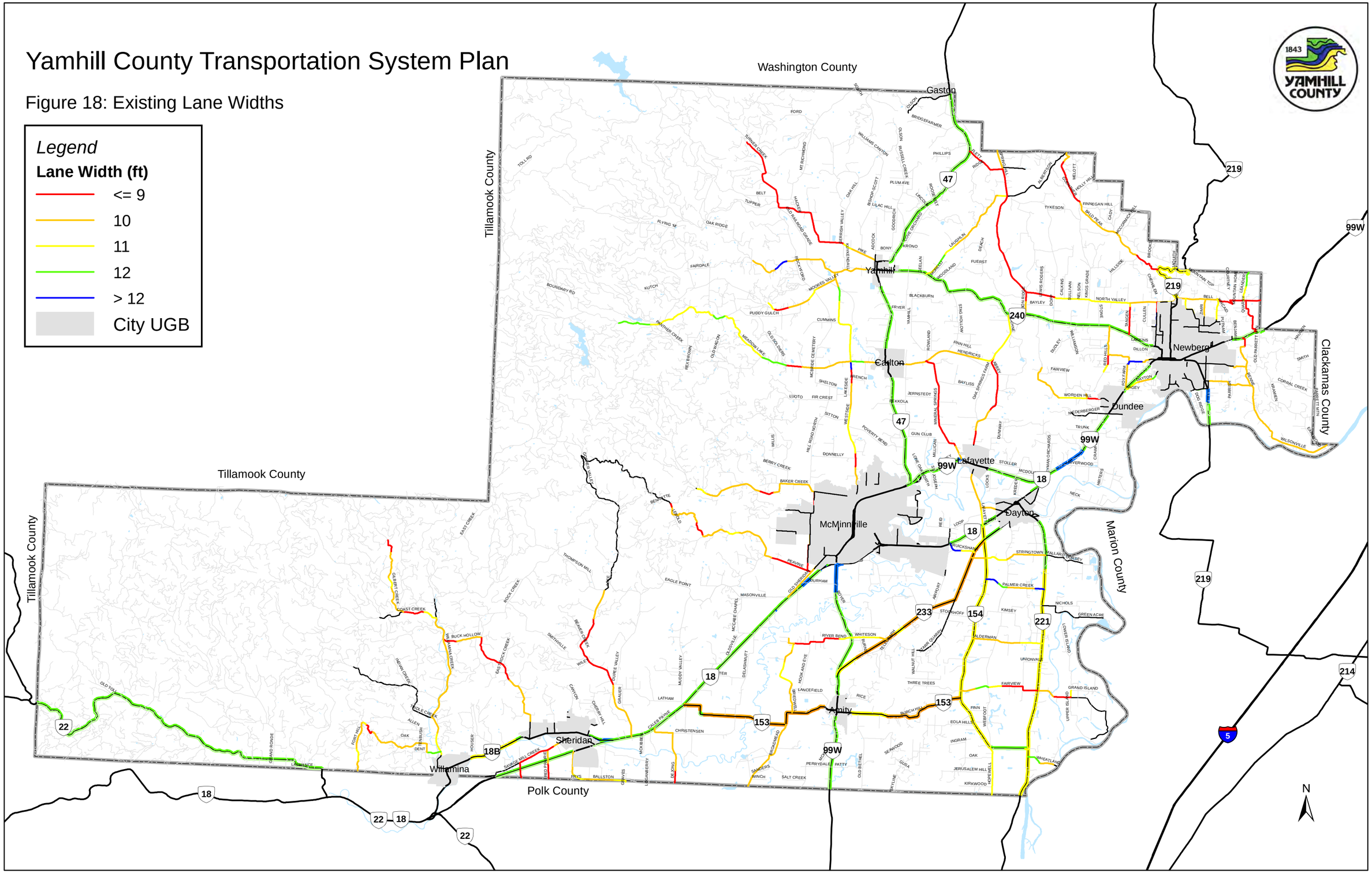
**Table 12 – Existing Lane and Shoulder Width Summary – State Highways**

| State Highway | Total Miles | Shoulder Width Standard | % Deficient | Lane Width Standard | % Deficient |
|---|---|---|---|---|---|
| OR 18 | 16.17 | 8’ | 53% | 12’ | 0% |
| OR 18B | 3.02 | 6’ | 89% | 12’ | 59% |
| OR 22 | 12.88 | 3-4’ | 99% | 12’ | 0% |
| OR 47 | 14.29 | 6’ | 94% | 12’ | 0% |
| OR 99W | 17.70 | 6-8’ | 60% | 11-12’ | 0% |
| OR 153 | 13.34 | 2-6’ | 94% | 10-12’ | 60% |
| OR 154 | 6.26 | 3-6’ | 100% | 12’ | 100% |
| OR 219 | 4.46 | 4-6’ | 78% | 11’ | 0% |
| OR 221 | 9.88 | 3-4’ | 97% | 11-12’ | 83% |
| OR 233 | 8.19 | 2-6’ | 98% | 11-12’ | 90% |
| OR 240 | 10.44 | 2-6’ | 98% | 11-12’ | 0% |

For Yamhill County, updated design standards were developed. Three separate sets of standards were developed, the first for new construction and reconstruction projects, the second for maintenance projects, and the third for private roads for public travel. The maintenance project standards for lane and shoulder widths, summarized in Table 13 below, were used for the assessment of geometric needs for county roads.

# Yamhill County Transportation System Plan

## Figure 18: Existing Lane Widths



# Yamhill County Transportation System Plan

Figure 19: Existing Shoulder Widths

*Legend*

**Shoulder Width (ft)**

- 0-1
- 2
- 3
- 4-5
- >=6
- City UGB

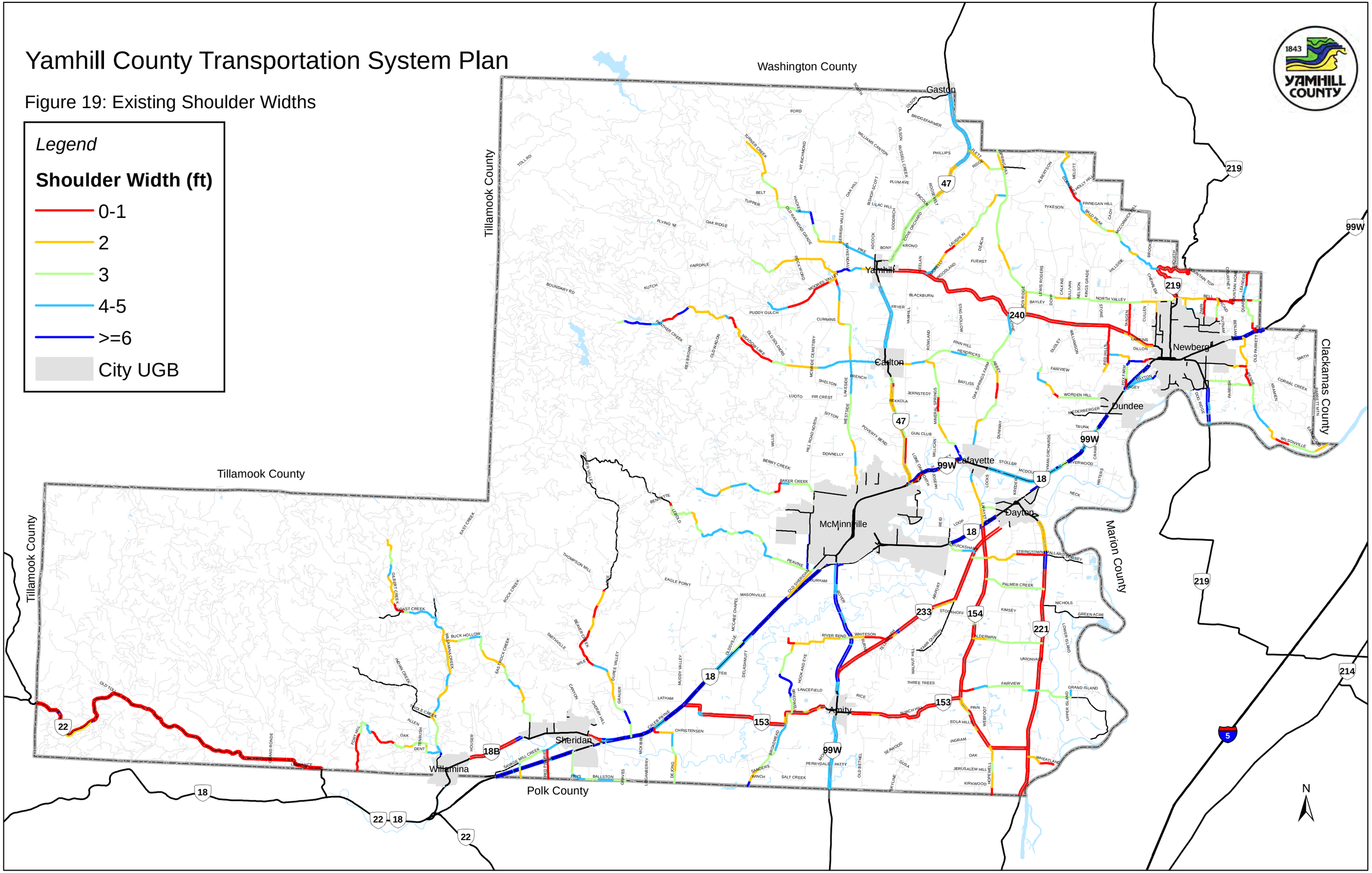


**Table 13 – County Maintenance Project Standards**
**Minimum Lane and Shoulder Widths**

| Measure | Principal Arterials | Minor Arterials | Major Collectors | Minor Collectors | Resource Roads | Local Roads |
|---|---|---|---|---|---|---|
| Lane Width | 12’ | 11’ | 11’ | 11’ | 10’ | 10’ |
| Shoulder Width | 4’ | 3’ | 2’ | 2’ | 2’ | 2’ |

The existing county roadway lane and shoulder widths are shown in Figures 18 and 19. Comparison to the standards indicated that roughly 75% of the paved roadways classified as minor collector or above do not meet the lane width standards and about 21% do not meet the shoulder width standards.

The existing lane width and shoulder width deficiencies for state highways and county roads are shown in Figure 20.

Intersection Geometrics

For intersections, geometric needs were analyzed for the minor road approaches. This was done for intersections where there was a potential problem identified by the stakeholders, county or ODOT staff, and the RIAC, or through field reconnaissance. Approach width, approach grade, intersection angle, and intersection sight distance were investigated and compared to the American Association of State Highway and Transportation Officials (AASHTO) standards.[16]

Intersection approach widths should be a minimum of 20-24 feet, based on the lane width standard of 10-12 feet for state highways and 11 feet for county roadways (minor collector and above). Adequate approach width is needed to provide spacing between vehicles traveling in opposite directions on the approach and to allow larger vehicles to turn onto/off of the roadway without cutting corners. The following intersections did not meet the standards:

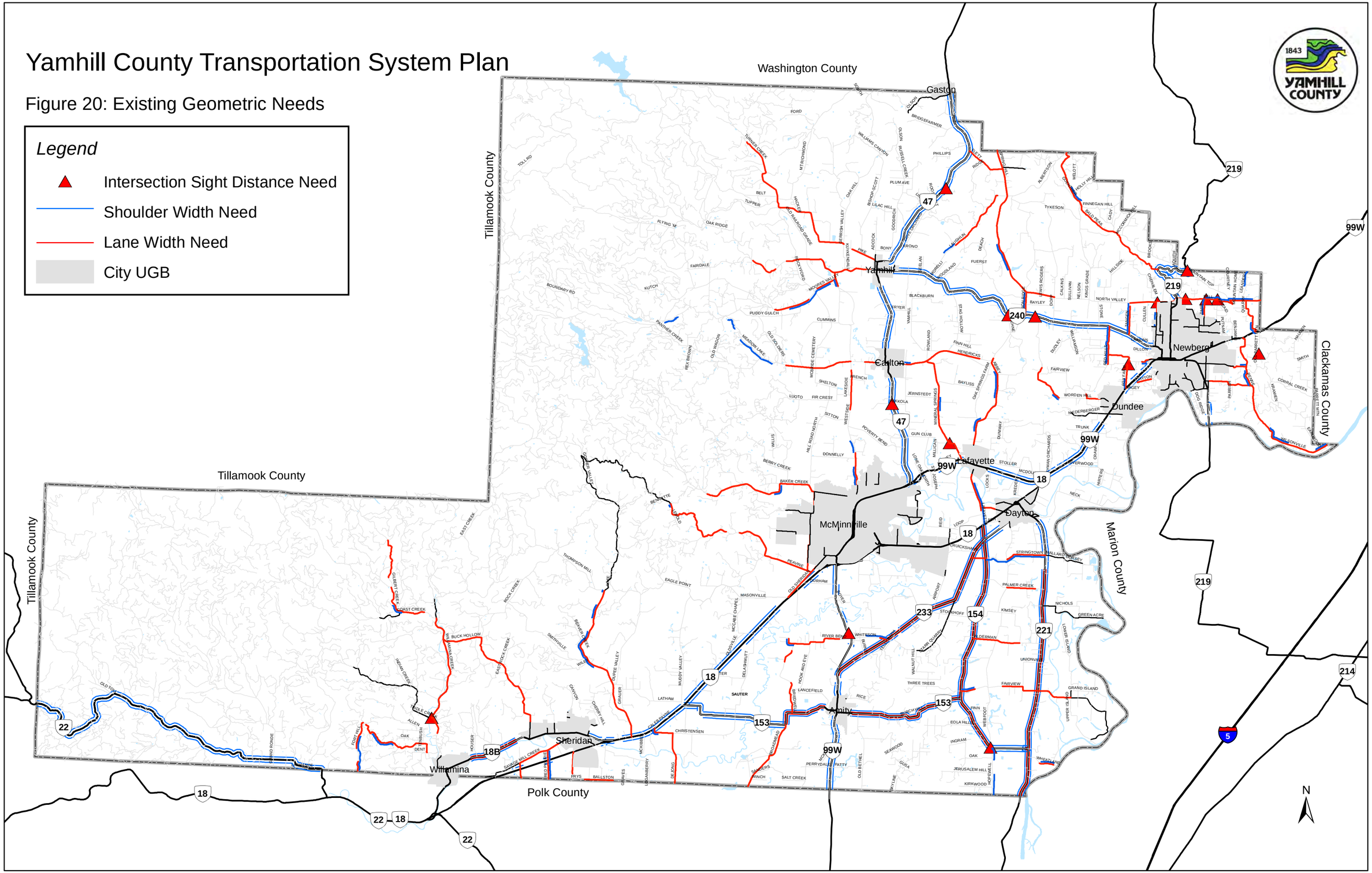
[16] AASHTO, A Policy on the Geometric Design of Highways and Streets, (2004)

# Yamhill County Transportation System Plan

## Figure 20: Existing Geometric Needs

*Legend*

- Intersection Sight Distance Need
- Shoulder Width Need
- Lane Width Need
- City UGB



- Schaad Rd. (20 feet) at Parrett Mountain Rd.
- Worden Hill Rd. (18 feet) at OR 240
- Hidden Springs Rd. (17 feet) at Fox Farm Rd.
- North Trade St. (18 feet) at Cherry Rd.

Approach grades should be three percent or lower for all roadways. If the approach is steeper than this, vehicles may have difficulty stopping (on a negative grade) or accelerating from a stop (on a positive grade). The approach grades at the following intersections failed to meet this standard:

- Aspen Way approaching Bell Rd.
- Zimri Dr. approaching Bell Rd.
- Schaad Rd. approaching Parrett Mountain Rd.
- Worden Hill Rd. approaching OR 240
- Mountain Top Rd. approaching OR 219
- Tindle Creek Rd. approaching Willamina Creek Rd.
- Fox Farm Rd. approaching OR 99W

The intersection angle should be no less than 60 degrees.[17] Sharp intersection angles can result in limited sight distance for stopped vehicles on the approach. Tight turns can also occur if the angle is too severe, requiring larger vehicles to use the opposing travel lane. The following intersections have less than a 60 degree angle:

- OR 154/Stringtown Rd. (connector road)
- OR 219/Mountain Top Rd.
- OR 240/Worden Hill Rd.
- OR 153/OR 221 (connector road)
- Kuehne Rd./Hendricks Rd.
- Willamina Creek Rd./Tindle Creek Rd.
- Mineral Springs Rd./Gun Club Rd.
- Schaad Rd./Parrett Mountain Rd.
- OR 18/OR 153/Muddy Valley Rd.
- OR 99W/Fox Farm Rd.

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[17] AASHTO, A Policy on the Geometric Design of Highways and Streets, (2004)

Adequate intersection sight distance is required for drivers turning from the minor road to clearly see oncoming traffic, turn into the traffic stream, and safely accelerate. The largest sight distance requirements are for drivers turning left from the minor road. Longer sight distances are required for trucks than cars to account for the slower acceleration rate of trucks.

Intersection sight distances were measured and compared with the standards contained in the HDM.[18] The ODOT standards are based on the recommendations contained in the AASHTO Green Book.[19] They vary depending on vehicle speed and the approach grade of the minor road. The intersections not meeting the standards are listed in Table 14 and shown in Figure 20.

**Table 14 – Intersection Sight Distance Deficiencies**

| Roadway | Intersection Approach | Speed Limit (mph) | Intersection Sight Distance | | |
|---|---|---|---|---|---|
| | | | Movement | Standard | Measured Sight Distance |
| Bell Rd. | Springbrook Rd. | 45 | NB LT | 500’ | 150’ |
| | | | NB RT | 430’ | 300’ |
| Bell Rd. | Zimri Rd. | 45 | NB LT | 500’ | 300’ |
| Bell Rd. | Aspen Way | 45 | NB LT | 500’ | 200-225’ |
| Fox Farm Rd. | Hidden Springs Rd. | 55 | EB LT | 610’ | 350’ |
| Mineral Springs Rd. | Gun Club Rd. | 55 | NB LT | 610’ | 390’ |
| | | | EB TH | 610’ | 390’ |
| North Valley Rd. | Chehalem Dr. | 45 | NB LT | 500’ | 325’ |
| | | | SB LT | 500’ | 350’ |
| OR 153 | Hopewell Hwy./ Webfoot Rd. | 55 | SB LT | 610’ | 385’ |
| | | | NB LT | 610’ | 575’ |
| OR 219 | Mountain Top Rd. | 30 | WB LT | 335’ | 325’ |
| OR 240 | Worden Hill Rd. | 55 | NB LT | 610’ | 325’ |
| OR 240 | Kuehne Rd. | 55 | NB RT | 530’ | 240’ |

[18] Oregon Department of Transportation, Highway Design Manual, (2003).
[19] AASHTO, A Policy on the Geometric Design of Highways and Streets, (2004).

| Roadway | Intersection Approach | Speed Limit (mph) | Intersection Sight Distance | | |
|---|---|---|---|---|---|
| | | | Movement | Standard | Measured Sight Distance |
| OR 47 | Cove Orchard Rd. (north) | 55 | WB LT | 610’ | 425’ |
| OR 47 | Pekkola Rd. | 55 | WB LT | 610’ | 275’ |
| OR 99W | Cherry Rd. | 55 | WB LT | 610’ | 200’ |
| Parrett Mountain Rd. | Schaad Rd. | 55 | EB LT | 610’ | 100’ |
| Willamina Creek Rd. | Tindle Creek Rd. | 55 | NB LT | 610’ | 275’ |
| | | | EB RT | 610’ | 275’ |
| OR 99W | Fox Farm Rd. | 35 | SB LT | 390’ | --* |
| | | 35 | SB RT | 335’ | --* |

* To be determined at time of project development.

Reported Geometric Needs

Geometrics was, by a large margin, the most frequently reported type of need. These are shown in Figure 13 and Table A-1 in Appendix A. For intersections, the main problem identified was poor intersection sight distance caused by horizontal or vertical curves and vegetation. Other problems mentioned were skewed intersection alignment and atypical intersection configuration that results in driver confusion.

One of the most frequently mentioned intersections was Hendricks Rd./Abbey Rd./Kuehne Rd., where skewed alignment, driver confusion about the right-of-way, and high-speed turning movements were identified as problems. Another intersection receiving multiple comments was OR 154/Stringtown Rd., where the separated right turn lanes require drivers to turn their heads sharply to see on-coming traffic and cause confusion for drivers who are unfamiliar with the intersection.

Commonly mentioned roadway segment needs were poor horizontal and vertical alignment, such as along Abbey Rd. between Oak Spring Farms Rd. and Millican Creek, and narrow roadways. Two overall needs identified were shoulder widening and roadway widening.

**Access Needs**

Similar to many state highways which, in addition to serving through traffic, provide access to adjacent property, there are areas along OR 47 and OR 240 with high concentrations of access points. The problems associated with high access density are well understood, including reduced capacity, traffic operations and safety conflicts between slower-moving turning vehicles and higher-speed through-traffic, and degradation of the bicycle and pedestrian environment.

In order to better understand access conditions along these corridors, an inventory of existing approaches was conducted, including public streets and private driveways. The data was assembled using ODOT video log and road inventory data.

The OHP establishes access spacing standards to improve safety and mobility by limiting turning conflicts. These standards, which apply to both driveways and public streets, vary depending on highway classification, traffic volume, posted speed, and the character of surrounding land uses.

The existing access spacing for OR 47 and OR 240 was compared to ODOT's spacing standards to identify areas that do not meet the standards.[20] For the analysis, segments were defined by where roadways classified as minor collector or above intersected the highway or where the access spacing standard changed based on roadway classification, volume, and/or speed.

Table 15 presents the results of the evaluation, showing the number of approaches by segment along each side of the highway and comparing the average approach spacing (total number of approaches divided by segment length) to the applicable standard. Directional segments not meeting the spacing standard are indicated in shaded/bold type and are shown in Figure 21.

While this level of analysis does not identify specific properties where the spacing standards are not met, it does reflect the degree to which the overall spacing is consistent with the standards. The rightmost column of the table indicates the maximum number of approaches that would be allowed according to the standards. This number is exceeded by all but a few of the segments.

[20] Standards reflect the approach spacing requirements contained in SB 264 that went into effect on January 1, 2012.

**Table 15 – OR 47 and OR 240 Access Spacing**

| Analysis Segment | From/To | Milepost | No. of Approaches | | Average Approach Spacing | | | No. of Approaches Allowed |
|---|---|---|---|---|---|---|---|---|
| | | | Eastside* | Westside | Std. (ft.) | Eastside | Westside | |
| **OR 47** | | | | | | | | |
| 1 | County Line – Olson Rd. | 25.72 -26.52 | 0 | 1 | 600 | 0 | 4,198 | 6 |
| 2 | Olson Rd. – n/o Country Ln. | 26.52 – 26.67 | 0 | 1 | 750 | 0 | 792 | 1 |
| 3 | N/O Country Ln. – Flett Rd. | 26.67 – 28.78 | 4 | **20** | 990 | 2,693 | **539** | 10 |
| 4 | Flett Rd. – Wapato School Rd. | 28.78 – 30.00 | 2 | **9** | 990 | 3,247 | **722** | 6 |
| 5 | Wapato School Rd. – Graham Ave. | 30.00 – 31.36 | 5 | 11 | 650 | 1,489 | 677 | 11 |
| 6 | Graham Ave – Yamhill City Limit | 31.36 – 33.77 | 12 | **19** | 990 | 1,056 | **667** | 12 |
| 7 | Yamhill City Limit – n/o Yamhill St. (Carlton) | 35.06 – 37.29 | 9 | **26** | 990 | 1,200 | **415** | 10 |
| 8 | N/O Yamhill St. – Carlton City Limit | 37.29 – 37.37 | **3** | 0 | 750 | **378** | N/A | 1 |
| 9 | Carlton City Limit – OR 99W | 38.53 – 42.46 | 31 | 25 | 650 | 669 | 829 | 31 |
| **OR 240** | | | | | | | | |
| 1 | Yamhill City Limit – w/o Yamhill Rd. | 0.57 – 1.01 | **6** | 3 | 360 | **260** | 519 | 4 |
| 2 | W/O Yamhill Rd. – Kuehne Rd. | 1.01 – 5.49 | 24 | 24 | 650 | 1,010 | 1,010 | 37 |
| 3 | Kuehne Rd. – Ribbon Ridge Rd. | 5.49 – 6.09 | 0 | **6** | 700 | N/A | **506** | 4 |
| 4 | Ribbon Ridge Rd. – Worden Hill Rd. | 6.09 – 6.41 | **4** | 2 | 700 | **462** | 924 | 2 |
| 5 | Worden Hill Rd. – Red Hills Rd. | 6.41 – 9.12 | **28** | **29** | 700 | **513** | **495** | 20 |
| 6 | Red Hills Rd. – Tangen Rd. | 9.12 – 9.87 | 5 | **8** | 700 | 739 | **462** | 5 |
| 7 | Tangen Rd. – Old Yamhill Rd. | 9.87 – 10.67 | **5** | **6** | 700 | **618** | **515** | 4 |
| 8 | Old Yamhill Rd. – w/o Chehalem Dr. | 10.67 – 10.85 | **5** | **8** | 500 | **459** | **287** | 4 |
| 9 | W/O Chehalem Dr. – Newberg City Limit | 10.85 – 11.01 | **5** | 2 | 250 | **201** | 502 | 4 |

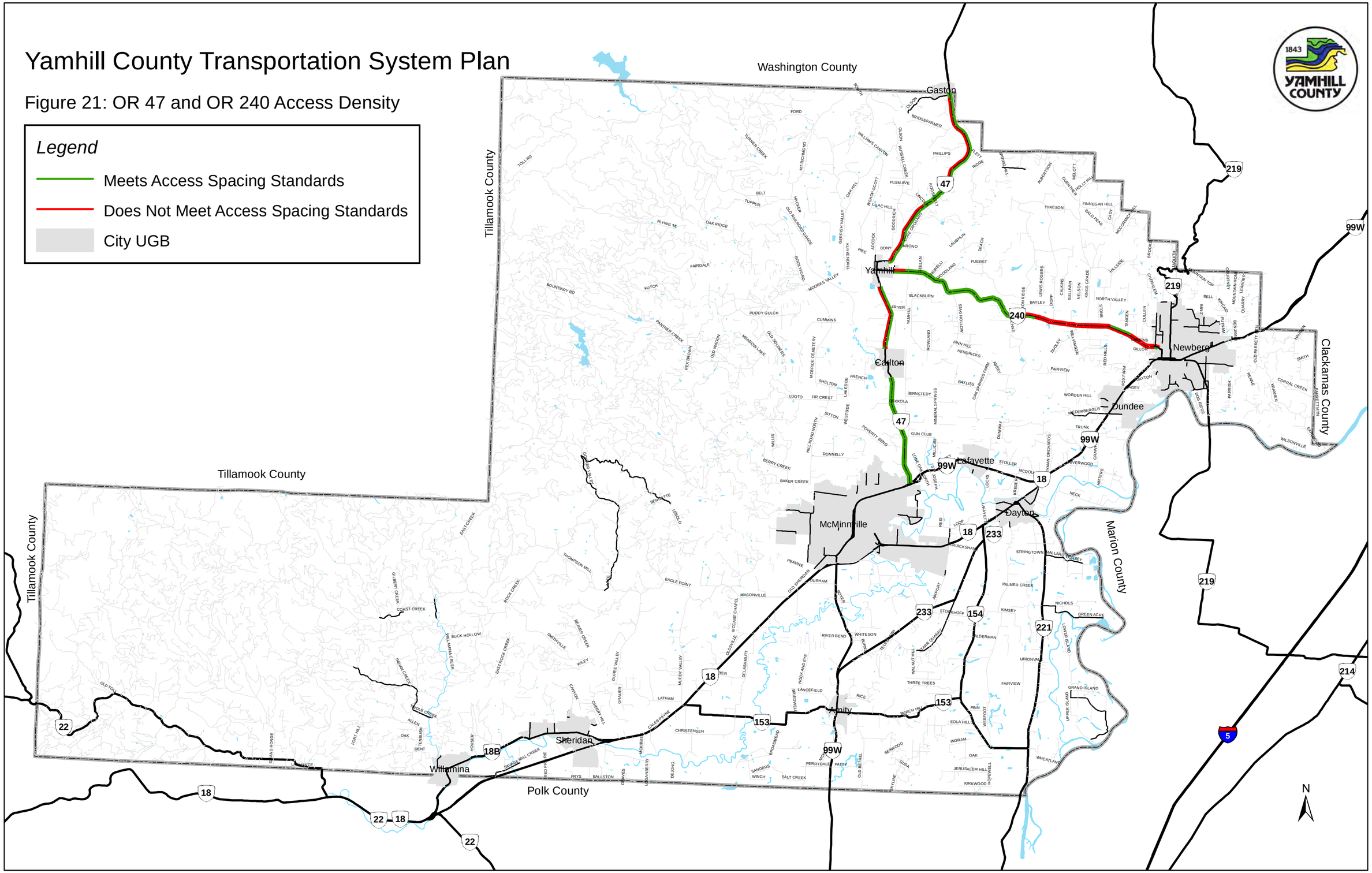
* Bold/shaded cells indicate intersections not meeting access spacing standard.

# Yamhill County Transportation System Plan

Figure 21: OR 47 and OR 240 Access Density

*Legend*

- Meets Access Spacing Standards
- Does Not Meet Access Spacing Standards
- City UGB



## BICYCLE AND PEDESTRIAN

### FACILITIES

Bikeways include shoulder bikeways, shared roadways, bike lanes, and shared-use paths. A shoulder bikeway is a paved shoulder that provides a suitable area for bicycling, reducing conflicts with faster moving motor vehicle traffic.[21] On a shared roadway, bicyclists and motorists share the same travel lanes. There are no standard dimensions for shared roadways. They are common on rural roads and low-volume highways. Shoulder bikeways and shared roadways comprise nearly all of the bicycle facilities within the rural Yamhill County area.

Bike lanes are a portion of the roadway designated for preferential use by bicyclists. They are marked with pavement stencils and an eight-inch wide stripe. Bike lanes are typically provided on busy urban and suburban streets, but may also be provided on rural highways near urban areas, where there is high bicycle use. There are only a few bike lanes in the study area, located on Dayton Ave. outside of Newberg, and on Hill Rd., Old Sheridan Rd., and Baker Creek Rd. near McMinnville. There are no shared-use paths within the rural county area.

Walkways include sidewalks, paths, and shoulders. There are no sidewalks or paths within the study area. Thus, all of the pedestrian facilities consist of shoulders, which may be used to serve pedestrians as well as bicyclists in rural areas.[22]

### BICYCLE AND PEDESTRIAN VOLUMES

Bicycle and pedestrian volumes were collected as a part of the peak period (3-6 P.M.) intersection turning movement counts conducted for the study. These volumes are shown in Table 16.

Bicycle and pedestrian volumes are very low, with the highest volumes occurring near cities (e.g., NW Hill Rd./NW Baker Creek Rd. near McMinnville).

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[21] Oregon Department of Transportation, Bicycle and Pedestrian Design Guide, (2011).
[22] Oregon Department of Transportation, Highway Design Manual, (2003).

**Table 16 – Peak Period Bicycle and Pedestrian Volumes**

| Intersection | Bicycle Volume | Pedestrian Volume |
|---|---|---|
| NW Hill Rd./NW 2nd St. (McMinnville) | 0 | 11 |
| NW Hill Rd./NW Baker Creek Rd. (McMinnville) | 2 | 2 |
| NW Westside Rd./NW Meadow Lake Rd. | 0 | 0 |
| NE Abbey Rd./NE Hendricks Rd. | 0 | 0 |
| OR 240/NE Kuehne Rd. | 0 | 0 |
| OR 219/North Valley Rd. | 3 | 0 |
| N. Aspen Way/NE Bell Rd. | 0 | 0 |
| OR 99W/OR 18/McDougall Rd. | 2 | 0 |
| OR 18/SE Ash Rd. | 0 | 0 |
| OR 18/OR 154/Lafayette Hwy. | 0 | 0 |
| OR 154/OR 233 | 0 | 0 |
| OR 154/SE Stringtown Rd. | 0 | 0 |
| OR 153/Hopewell Rd./SE Webfoot Rd. | 0 | 0 |
| OR 154/SE Walnut Hill Rd./SE Fairview Rd. | 0 | 0 |
| OR 240/Worden Hill Rd. | 0 | 2 |
| NE Zimri Rd./NE Bell Rd. | 0 | 0 |
| NW Springbrook Rd./NE Bell Rd. | 1 | 0 |
| Parrett Mountain Rd./Schaad Rd. | 1 | 2 |
| Mineral Springs Rd./Gun Club Rd. | 1 | 0 |
| Chehalem Dr./North Valley Rd. | 0 | 0 |

NEEDS

The ODOT Bicycle and Pedestrian Guide[23] indicates that shared roadways are suitable for bicycle use on low-volume rural roads and highways. Thus, shared roadways are appropriate for most county roads and some state highways within the study area, with no bicycle needs along these facilities.

On rural roads with high bicycle use or demand, however, the Guide states that roads should include paved shoulders where vehicle speeds and volumes are high. Further, the Guide

[23] Oregon Department of Transportation, Bicycle and Pedestrian Design Guide, (2011).

recommends that the shoulder width standards for rural highways contained in the HDM should be used in determining adequate shoulder widths for bicycle use. Similarly, the county uses their maintenance project shoulder width standards in determining shoulder widths for bicycle use along county roadways.

Based on these guidelines, bicycle needs were identified where there are higher bicycle and vehicle volumes and:

- The shoulder width standard is not met; or
- The shoulder is not paved.

These locations are shown in Figure 22 and include all or portions of:

- OR 47
- OR 99W
- OR 154/Lafayette Hwy.
- Westside Rd.
- Old Sheridan Rd.

The locations with higher bicycle volumes were identified based on information received from the stakeholders and the bicycle counts.

It is unlikely that additional bike lanes are currently needed within the study area. This is because all of the locations with higher bicycle volumes are on high-speed rural roadways, where bike lanes are generally not recommended.[24] The reason for this is that at channelized intersections along these facilities, the speeds are too high to place a through bike lane to the left of right-turning vehicles.

For pedestrians, shoulders are typically the most appropriate type of facility in rural areas, because pedestrian volumes are too low to warrant sidewalks or paths. The ODOT Bicycle and Pedestrian Guide[25] indicates that the shoulder widths recommended in the HDM are generally adequate to accommodate pedestrians. The county considers shoulders meeting their maintenance project shoulder width standards to be adequate for serving pedestrians.

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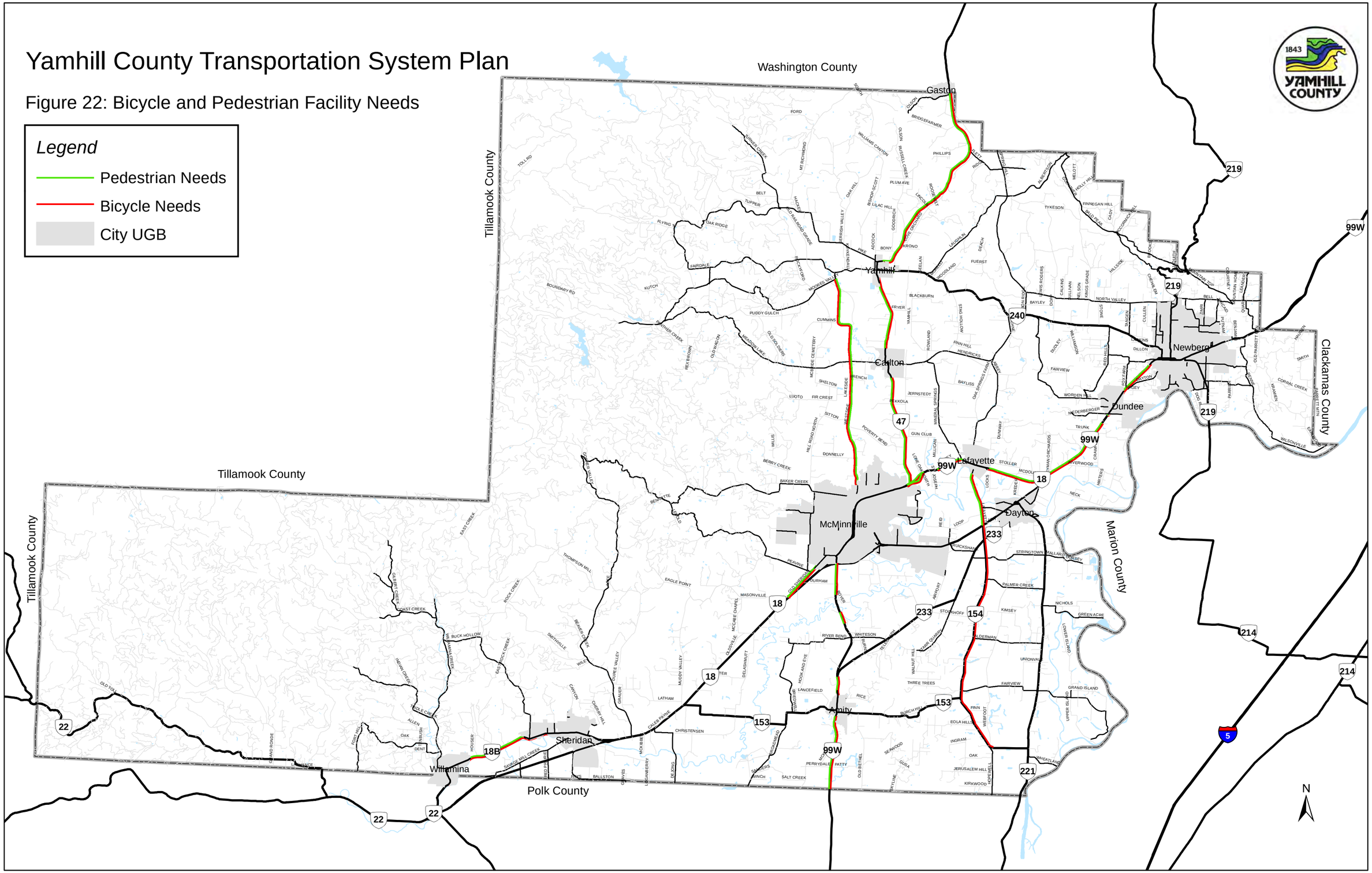
[24] Oregon Department of Transportation, Bicycle and Pedestrian Design Guide, (2011).
[25] Oregon Department of Transportation, Bicycle and Pedestrian Design Guide, (2011).

# Yamhill County Transportation System Plan

## Figure 22: Bicycle and Pedestrian Facility Needs

*Legend*

- Pedestrian Needs
- Bicycle Needs
- City UGB



The roadway segments identified by the stakeholders as having higher pedestrian volumes that do not meet the ODOT and county shoulder width standards are shown in Figure 22. These are largely the same as the locations with bicycle needs, with the exception of OR 18B between Sheridan and Willamina. Here, there are several areas with shoulder widths of only a foot or so.

**Reported Needs**

The roadways with bicycle and pedestrian needs reported by the stakeholders include the locations listed on the previous page, as well as the following:

- OR 233
- North Valley Rd.
- Worden Hill Rd.
- Fox Farm Rd.

These are shown in Figure 13 and Table A-1 in Appendix A. The need to accommodate bicyclists and pedestrians with improved facilities along these roadways was identified by the stakeholders.

## CORRIDOR HEALTH

### CORRIDOR HEALTH CONCEPT

The U.S. Department of Transportation recommends the use of a multiple criteria to analyze needs and prioritize transportation projects and investments in rural areas.[26] Following this guidance, a Corridor Health Tool was applied for all state highways and county roads within the study area with a functional classification of minor collector or higher. The corridor health concept is based on the idea of measuring the "health" of a corridor for several different categories of performance, and then combining the measurements to provide a picture of overall corridor health.

[26] U.S. Department of Transportation, Planning for Transportation in Rural Areas, (2001).

DEVELOPMENT OF FACTORS, WEIGHTS, AND FORMULAS

The Corridor Health Tool comprises a set of factors, weights, and formulas that are used to calculate a composite health score for each corridor segment. The factors correspond to the same areas of need described in the previous sections, i.e., mobility, traffic operations, safety, geometrics, and bicycle and pedestrian facilities.

A set of weights was developed for the factors, with the sum of the weights equal to 100. Formulas were also developed to calculate scores for each of the factors. The formulas were set up to produce scores ranging from zero to one, with a score of one representing "perfect" health and a score of zero indicating very poor conditions or performance. The weights and formulas for each factor are shown in Table 17.

**Table 17 – Corridor Health Score Weights and Formulas**

| Factor | Weight | Scoring Formula |
|---|---|---|
| | | |
| Safety | 35 | =0.5/X if X ≥ 0.5; else 1<br>Where:<br>X = 0.7*(Fatal +Injury Crash Rate for Segment/ Average for Facility Category) + 0.3*(Total Crash Rate for Segment/ Average for Facility Category) |
| Geometrics | 20 | =0.2*min(Lane Width/Lane Width Standard,1)+0.8*min(Shoulder Width/Shoulder Width Standard,1) |
| Traffic Operations | 15 | =1-min(Turn Lane Need, Max. Turn Lane Need)/ Max. Turn Lane Need* |
| Bicycle/Pedestrian Facilities | 15 | =(% of Segment with Adequate Bicycle/Pedestrian Facilities)/100** |
| Mobility | 15 | =min((1-VC)/(1-VC Standard),1) |

* Turn lane need is the number of turn lanes (left-turn and right-turn) needed per segment. Since segment endpoints were defined by intersections with minor collector roadways or above, a value of four was assumed for the maximum turn lane need (i.e., the need for a left-turn lane and right-turn lane at each end of the segment).

** Bicycle/pedestrian facilities were considered to be adequate if the shoulder width standard was met.

The factor scores were multiplied by the weights to produce an overall corridor health score for each segment ranging between zero and 100, with 100 representing the best score and zero the worst score.

RESULTS

The corridor health scores are shown in Figure 23. For ease of understanding, the the segments were assigned to good, fair, and poor categories of corridor health based on the scores. The scores corresponding to each category are:

- Good – 75 – 100
- Fair – 50 – 74
- Poor - < 50

The percentages of state highway mileage by corridor health category are presented in Table 18.

**Table 18 – Corridor Health – State Highways**

| State Highway | Corridor Health | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Good | | Fair | | Poor | | Total | |
| | Miles | % | Miles | % | Miles | % | Miles | % |
| OR 18 | 10.9 | 67% | 5.3 | 33% | 0.0 | 0% | 16.2 | 100% |
| OR 18B | 2.0 | 67% | 0.0 | 0% | 1.0 | 33% | 3.0 | 100% |
| OR 22 | 0.0 | 0% | 2.9 | 22% | 10.0 | 78% | 12.9 | 100% |
| OR 47 | 3.1 | 22% | 7.3 | 51% | 3.9 | 27% | 14.3 | 100% |
| OR 99W | 11.1 | 63% | 5.4 | 30% | 1.2 | 7% | 17.7 | 100% |
| OR 153 | 1.3 | 10% | 6.0 | 45% | 6.0 | 45% | 13.3 | 100% |
| OR 154 | 0.0 | 0% | 2.4 | 38% | 3.9 | 62% | 6.3 | 100% |
| OR 219 | 1.5 | 33% | 3.0 | 67% | 0.0 | 0% | 4.5 | 100% |
| OR 221 | 0.0 | 0% | 6.1 | 62% | 3.8 | 38% | 9.9 | 100% |
| OR 233 | 2.3 | 28% | 4.4 | 54% | 1.5 | 18% | 8.2 | 100% |
| OR 240 | 1.2 | 12% | 4.0 | 38% | 5.2 | 50% | 10.4 | 100% |
| **Total** | 33.4 | 29% | 46.8 | 40% | 36.5 | 31% | 116.7 | 100% |

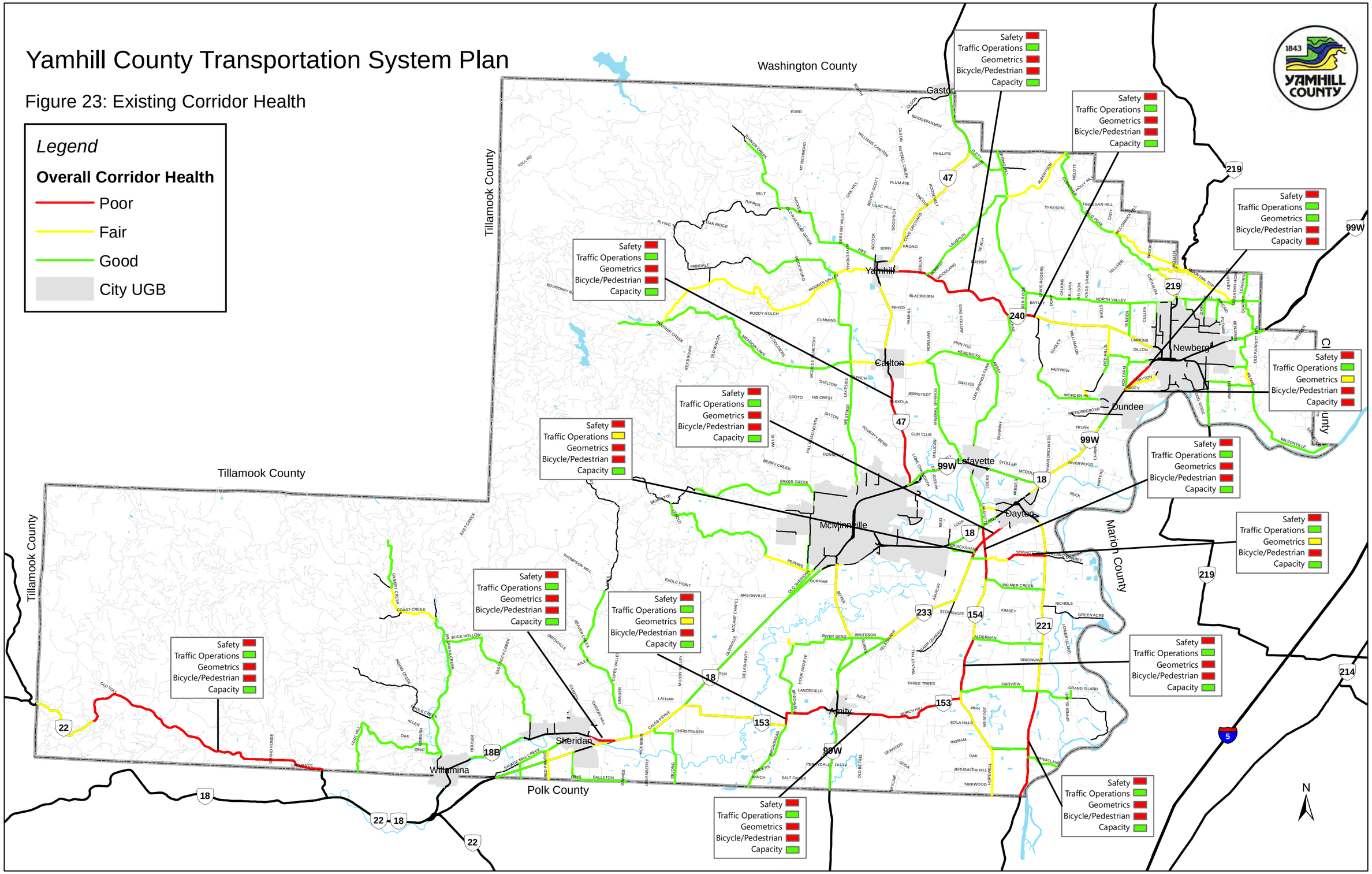
# Yamhill County Transportation System Plan

## Figure 23: Existing Corridor Health

*Legend*

**Overall Corridor Health**

- Poor
- Fair
- Good
- City UGB



The percentages of overall state highway mileage falling within each corridor health category are:

- Good – 29%
- Fair – 40%
- Poor - 31%

Nearly all of OR 99W/OR 18, the primary route within the study area, is within the good or fair categories, with only a small percentage (7%) between Newberg and Dundee within the poor category. State highways with relatively high percentages of "poor" mileage include OR 22 (78%), OR 154 (62%), and OR 240 (50%). The main factors contributing to the poor scores for almost all of the "red" state highway segments shown in Figure 23 are safety, geometrics, and bicycle/pedestrian facilities.

Nearly all of the county roadway mileage falls within the good or fair categories, as reflected in the following percentages:

- Good – 86%
- Fair – 13%
- Poor - 1%

The only county road with a portion of its mileage within the poor category is Stringtown Rd., between OR 221 and Webfoot Rd. The factors contributing to the poor score for this segment are safety and bicycle/pedestrian facilities.

**TRANSIT**

SERVICES AND FACILITIES

Yamhill County Transit Area (YCTA) provides the majority of the transit service within the county. This includes intra-city service within McMinnville and Newberg, inter-city link routes, Dial-a-Ride service, and Volunteer Medical Transportation.

The intra-city service comprises two routes in McMinnville and two routes in Newberg. It is provided at one-hour headways, Monday through Friday, with connections to the link routes. Four link routes connect McMinnville, Newberg, and other communities to destinations outside of Yamhill County. These operate along fixed routes with fixed schedules, and serve major

stops within each community. The link routes are shown in Figure 24 and summarized in Table 19.

**Table 19 – Link Route Transit Service**

| Route | Service Days | Number of Trips* | | Places Served |
|---|---|---|---|---|
| | | A.M. | P.M. | |
| 11 – McMinnville – Salem | Weekday | 2 | 3 | McMinnville, Whiteson, Amity, West Salem |
| 22 – McMinnville – West Valley | Weekday | 4 | 4 | McMinnville, Sheridan, Willamina, Grand Ronde |
| 24S – McMinnville – West Valley | Saturday | 2 | 2 | McMinnville, Sheridan, Willamina, Grand Ronde |
| 33 – McMinnville - Hillsboro | Weekday | 2 | 3 | McMinnville, Carlton, Yamhill, Gaston, Forest Grove, Hillsboro |
| 44 – McMinnville-99W Link | Weekday | 4 | 6 | McMinnville, Lafayette, Dayton, Dundee, Newberg, Sherwood, Tigard |
| 45X - McMinnville-99W Link (Express) | Weekday | 1 | 1 | McMinnville, Newberg, Sherwood, Tigard |
| 46S - McMinnville-99W Link | Saturday | 2 | 3 | McMinnville, Lafayette, Dayton, Dundee, Newberg, Sherwood, Tigard |

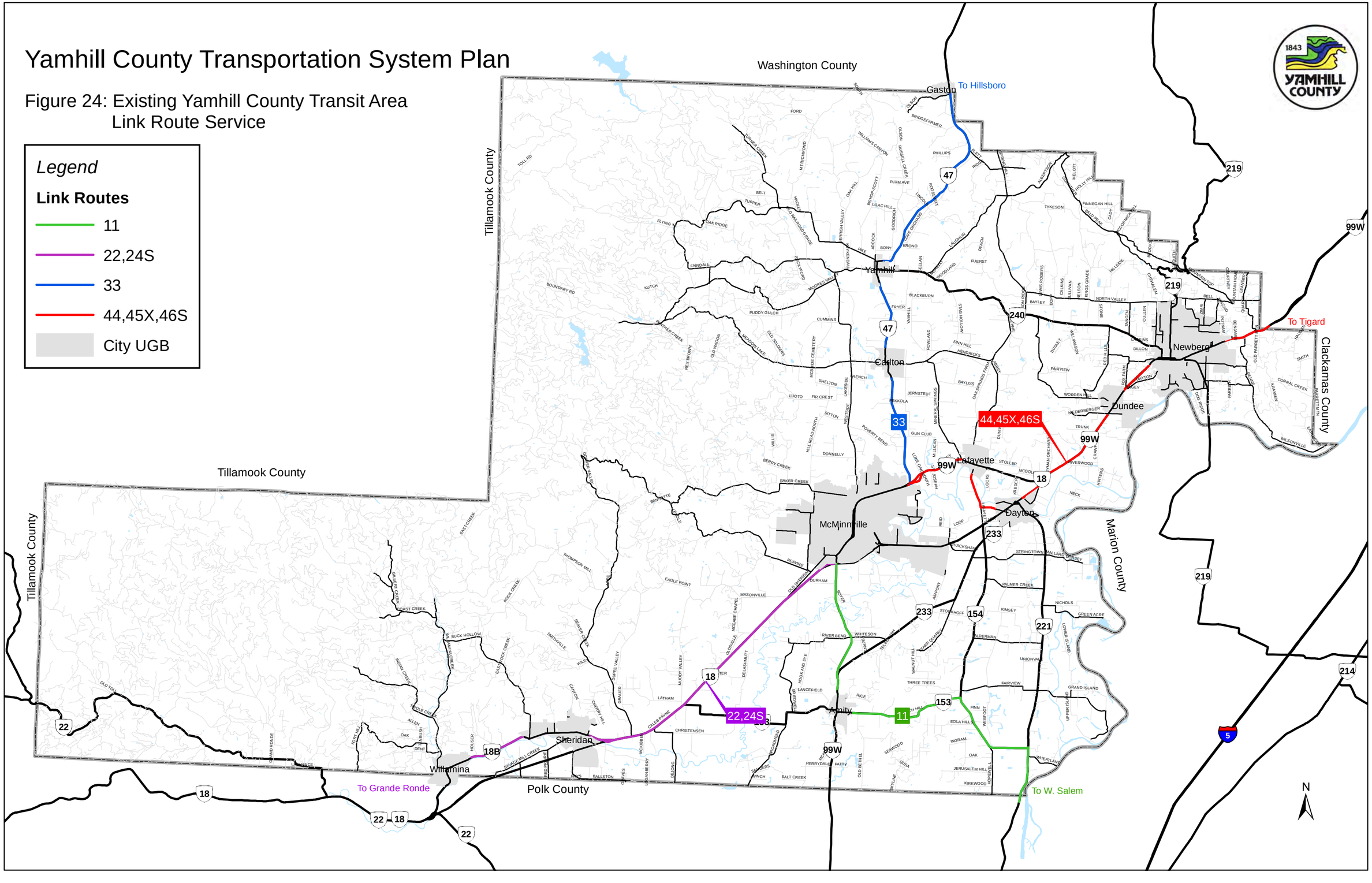
* Trips by direction (inbound/outbound).

Dial-a-Ride is a curb-to-curb transportation service operating throughout Yamhill County. It is available to anyone unable to access YCTA fixed routes because of mobility limitations, or those whose origins and/or destinations are not near YCTA fixed routes.

Volunteer Medical Transportation is a volunteer-operated van service providing Yamhill County residents access to medical appointments in the Portland area, serving over 100 medical locations including hospitals, clinics, laboratories, and doctor offices. The van is provided by YCTA and the service is funded by a yearly grant from ODOT Special Transportation Funds.

# Yamhill County Transportation System Plan

Figure 24: Existing Yamhill County Transit Area Link Route Service



In addition to the services provided by YCTA, there are a number of human services agencies whose missions include providing some form of transportation assistance to their clients. These agencies generally provide services to a specific client population and are not available to the general public.

There are no transit facilities such as bus shelters, bus pull-outs, or park-and-ride lots within the study area.

NEEDS

The Yamhill County Coordinated Human Services Public Transportation Plan: The Next Steps[27] was prepared by the Mid-Willamette Valley Council of Governments in 2007 to identify strategies to improve transportation services for people with disabilities, seniors, and individuals with lower incomes. Unmet transportation needs were identified and grouped into the following categories:

- Lack of available transportation services
  - Lack of transportation services during evenings and weekends
  - Need for more frequent bus stops
  - Need for expanded service to large employers such as the Spirit Mountain Casino and the Riverside Drive industrial area
- Gaps in transportation service to specific areas
  - Gaps in outlying areas
  - Need for inter-city transportation between Yamhill and Carlton
  - Need for inter-city transportation between Sheridan, Willamina and Grand Ronde (West Valley)
- Inadequate transit facilities
  - Need for designated bus stops with signs and posted schedules
  - Need for transit shelters for fixed routes

[27] Mid-Willamette Valley Council of Governments, Coordinated Human Services Public Transportation Plan, (2007).

- Many areas lack sidewalks, curb cuts, loading spaces, and crosswalks
- Need for better ADA accessibility

YCTA staff indicated that these still represent YCTA's needs; however, the following additional needs were also identified:[28]

- Pull-outs for buses
- Improved travel time reliability on OR 99W
- More regional connections (e.g., the Oregon coast)

**Reported Needs**

The only transit needs reported by the stakeholders were the lack of pull-outs for buses and the lack of designated stop areas.

**BRIDGES**

Existing bridge conditions and needs were analyzed based on data obtained from ODOT's PONTIS bridge management system. The database contains information on bridge sufficiency ratings, structural conditions, and height and load restrictions for both ODOT and county bridges.

SUFFICIENCY RATING

The sufficiency rating for each bridge is determined by periodic inspections performed by ODOT. The rating is a numeric value indicative of the sufficiency of a bridge to remain in service. A score of 100% would represent an entirely sufficient bridge, while a score 0% would indicate a completely deficient bridge. The rating is calculated using a formula comprising the following factors:

- Structural adequacy and safety (maximum of 55%)
- Serviceability and functional obsolescence (maximum of 30%)
- Essentiality for public use (maximum of 15%)
- Special reductions (maximum of -13%)

[28] Conversation with Tanya Saunders, YCTA, on March 5th, 2012.

The Federal Highway Administration (FHWA) uses this index in evaluating the nation's bridges for funding distribution and eligibility. Those bridges with a sufficiency rating of 80 or less are eligible for rehabilitation. Bridges with a rating of 50 or less are eligible for replacement. Bridges lose their eligibility status for a period of ten years after a federal Highway Bridge Program project is completed. Figure 25 shows the sufficiency rating for all ODOT and county bridges within the study area.

Table 20 summarizes the study area bridges by eligibility status based on their sufficiency ratings.

**Table 20 – FHWA Bridge Funding Eligibility Status**

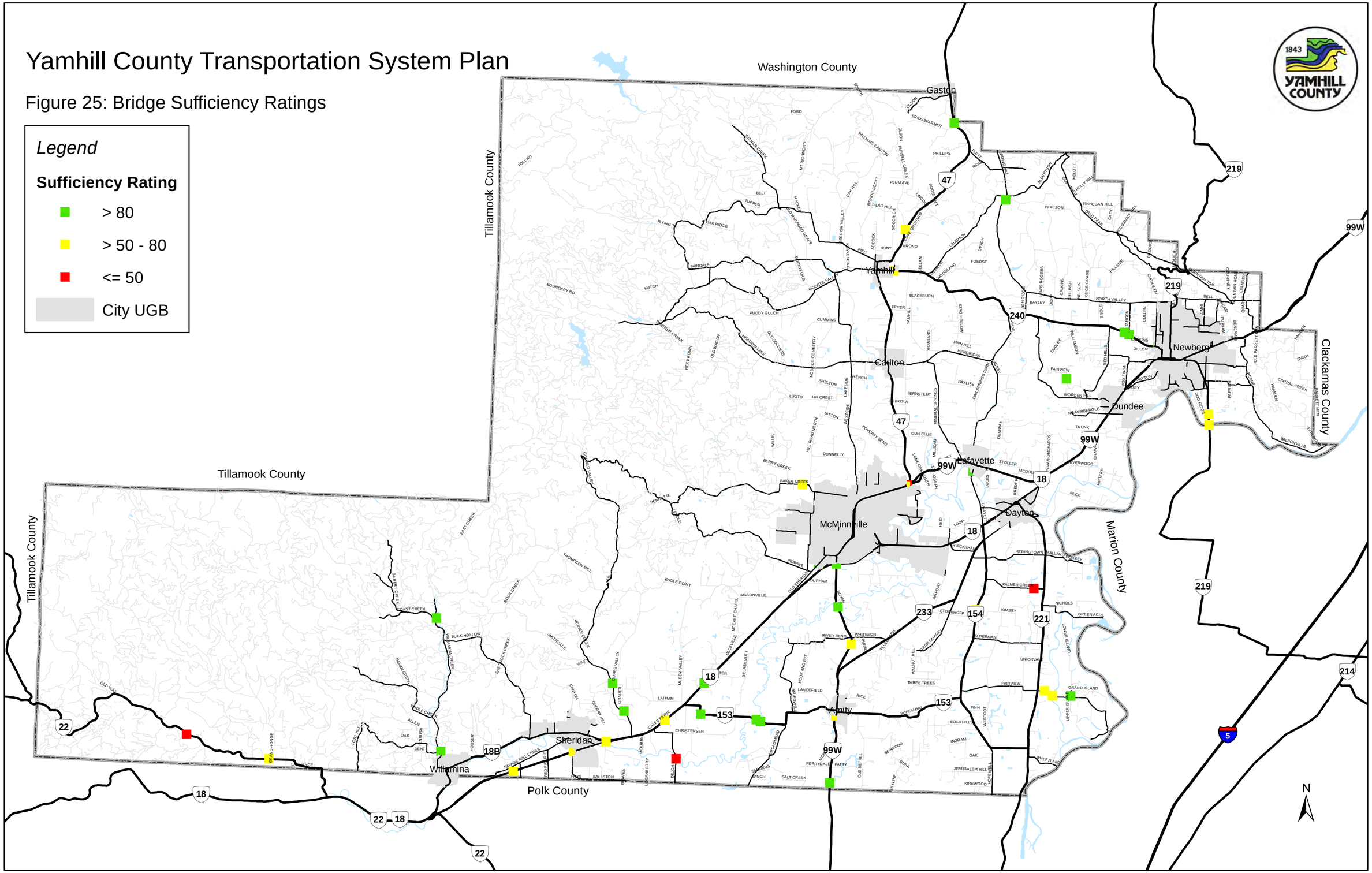
| FHWA Funding Status | ODOT Bridges | | County Bridges | | All Bridges | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| Not Eligible (Suff. Rating > 80) | 11 | 42% | 11 | 65% | 22 | 51% |
| Rehabilitation (Suff. Rating > 50 - 80) | 13 | 50% | 4 | 24% | 17 | 40% |
| Replacement (Suff. Rating <= 50) | 2 | 8% | 2 | 12% | 4 | 9% |
| **Total** | 26 | 100% | 17 | 100% | 43 | 100% |

As shown, 58% of the ODOT bridges and 36% of the county bridges are eligible for either rehabilitation or replacement (sufficiency rating of less than 80). Overall, 49% of the study area bridges are eligible for funding. The four bridges eligible for replacement (sufficiency rating of less than 50) are:

- OR 99W at North Yamhill River
- OR 22 at South Yamhill River
- Palmer Creek Rd. at Palmer Creek
- Dejong Rd. at South Yamhill River

# Yamhill County Transportation System Plan

Figure 25: Bridge Sufficiency Ratings



STRUCTURAL CONDITIONS

As part of ODOT's bridge inspection program, various bridge components are evaluated on a scale of zero-to-nine according to the National Bridge Inventory (NBI) system, including the bridge deck, superstructure, and substructure. The general condition of these components for the ODOT and county bridges within the study area are summarized in Table 21.

**Table 21 – Bridge Condition Ratings**

| Component | Bridge Condition Ratings | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Good (7-9) | | Fair (5-6) | | Poor (0-4) | | Total | |
| | No. | % | No. | % | No. | % | No. | % |
| **ODOT Bridges** | | | | | | | | |
| Bridge Deck | 9 | 35% | 17 | 65% | 0 | 0% | 26 | 100% |
| Superstructure | 9 | 35% | 17 | 65% | 0 | 0% | | |
| Substructure | 10 | 38% | 16 | 62% | 0 | 0% | | |
| **County Bridges** | | | | | | | | |
| Bridge Deck | 12 | 71% | 5 | 29% | 0 | 0% | 17 | 100% |
| Superstructure | 15 | 88% | 2 | 12% | 0 | 0% | | |
| Substructure | 5 | 29% | 10 | 59% | 2 | 12% | | |
| **All Bridges** | | | | | | | | |
| Bridge Deck | 21 | 49% | 22 | 51% | 0 | 0% | 43 | 100% |
| Superstructure | 24 | 56% | 19 | 44% | 0 | 0% | | |
| Substructure | 15 | 35% | 26 | 60% | 2 | 5% | | |

Two county bridges have a poor substructure rating. These are:

- Dejong Rd. at South Yamhill River
- Palmer Creek Rd. at Palmer Creek

All of the other bridges have a good or fair rating for all of the components.

## HEIGHT AND LOAD RESTRICTIONS

The PONTIS data indicated there are no ODOT or county bridges within the study area having height restrictions. There are, however, two railroad trestles with vertical underclearances that are less than the ODOT standard of 16 feet.[29] These are the WPRR trestle over OR 99W between Lafayette and OR 47 (15.1 feet) and the WPRR trestle over OR 99W north of Whiteson (14.8 feet). There are several bridges in Yamhill County with load restrictions, but all of these are within the incorporated areas.

[29] Oregon Department of Transportation, Bridge Design and Drafting Manual, (2012).

# APPENDIX A

REPORTED NEEDS

Attachment 8

**Table A-1**

**Yamhill County Transportation System Plan**

**Reported Needs**

| Location | Reported Need | | | | | |
|---|---|---|---|---|---|---|
| | No. | Description | Type* | Frequency** | Source | Comments |
| | | | | | | |
| Countywide | | Need better alternatives to OR 99W. | M | 1 | Stakeholder Interviews | |
| Countywide | | Not enough routes connecting communities. | M | 1 | Stakeholder Interviews | |
| Countywide | | Roadway shoulders need widening. | G | 3 | Stakeholder Interviews | |
| Countywide | | Roadways need widening. | G | 3 | Stakeholder Interviews | |
| Countywide | | Roadways need better maintenance. | Mnt | 2 | Stakeholder Interviews | |
| Countywide | | Lack of designated stop areas for buses. | O, T | 1 | Stakeholder Interviews | |
| Countywide | | Lack of pull-outs for buses. | O, T | 1 | Stakeholder Interviews | |
| Niederberger Rd. | 1 | Narrow roadway and two sharp horizontal curves. | G | 1 | RIAC | 1. Narrow roadway with horizontal and vertical curves.<br>2. Roadway width appears to be adequate to serve relatively low traffic volume.<br>3. Portion of roadway is eroding down hillside and is in need of repair. |
| Hendricks Rd./Abbey Rd./Kuehne Rd. | 2 | 1. Skewed intersection/poor sight distance from Abbey Rd. to Hendricks Rd.<br>2. Horizontal curve on Hendricks Rd.<br>3. Confusion about which movements have right-of-way.<br>4. High speed merge with yield only from NB Abbey Rd to NB Kuehne Rd. Also, angle of SB Kuehne Rd. to SB Abbey Rd. movement encourages high speeds and conflicts with high-speed NB Kuehne Rd. traffic.<br>5. Problem with connector between Hendricks Rd. and Abbey Rd. may be handled in same way as ODOT improvement at OR 18/Cruickshank Rd. | G, O | 3 | RIAC, Stakeholder Interviews, Road Maintenance Staff | 1. Sight distance does not appear to be an issue, although intersection angle at Abbey Rd./Kuehne Rd. is acute.<br>2. Remainder of reported needs confirmed through field survey. |
| Spring Hill Rd./Flett Rd. | 3 | 1. Horizontal curve.<br>2. Confusion for drivers on NB Spring Hill Rd. about whether to continue straight on Spring Hill Rd. or left on Flett Rd. | G, O | 2 | RIAC, Road Maintenance Staff | Through route is well-marked with signage. Striping could be improved to make this clearer, however. |
| Willamina Creek Rd./Tindle Creek Rd. | 4 | Horizontal curve | G | 1 | RIAC | 1. Trees, bushes, and hill in northwest quadrant of intersection limit sight distance on curve and at intersection.<br>2. At north intersection, sight distance to southeast is limited from 14.5’ from edge of traveled way.<br>3. At south intersection, sight distance to northwest is limited to 275’ from 14.5’ from edge of traveled way. |

Attachment 8

**Table A-1**

**Yamhill County Transportation System Plan**

**Reported Needs**

| Location | Reported Need | | | | | |
|---|---|---|---|---|---|---|
| | No. | Description | Type* | Frequency** | Source | Comments |
| | | | | | | |
| Bell Rd./Springbrook Rd. | 5 | 1. Horizontal curves on Bell Rd and Springbrook Rd.<br>2. Vertical curve on Bell Rd.<br>3. Limited sight distance from Springbrook Rd (both eastbound and westbound).<br>4. Utility pole near edge of pavement not visible to westbound vehicles on Bell Road. | G | 1 | RIAC | 1. Horizontal and vertical curves on Bell Rd., combined with skewed intersection angle and relatively high speeds, limit sight distance and create safety concern.<br>2. Speed reduction is not signed in advance of intersection on Bell Rd.; advance signage does, however, indicate atypical intersection geometry and need to slow down. |
| OR 233/Cruickshank Rd. | 6 | Improved safety. | S | 1 | RIAC | 1. No apparent sight distance or geometric issues.<br>2. May be confusing to drivers due to three conflict locations, although each location is stop controlled. |
| OR 154/Stringtown Rd. | 7 | 1. Atypical intersection configuration - separated right turn lanes (connectors) require drivers to turn their heads sharply to see on-coming traffic.<br>2. Problems with free northbound left-turn and free eastbound right-turn movements. | G, O | 3 | RIAC, Stakeholder Interviews, Road Maintenance Staff | 1. Free NB to WB movement may be confusing to drivers unfamiliar with right-of-way rules.<br>2. EB to SB movement requires drivers to turn their heads sharply to see SB traffic.<br>3. No apparent sight distance deficiencies. |
| OR 219/Mountain Top Rd. | 8 | Sight distance/skewed intersection – "can't see over hump". | G | 2 | RIAC, Road Maintenance Staff | 1. Mountain Top Rd. approaches OR 219 at well over 3% grade and at an awkward skew.<br>2. Sight distance from Mountain Top Rd. to north was measured as 325'. This is below standard of 335'. |
| Bell Rd./Zimri Rd. | 9 | 1. Sight distance problem for northbound traffic turning eastbound.<br>2. High speeds on Bell Rd. | G | 1 | RIAC | 1. Vertical curve west of Zimri Rd. restricts sight distance, which was measured as 300' from northbound approach to west. Posted speed of 45 mph would require 500' of sight distance.<br>2. Additional sight distance (up to 550') would be available with removal of obstructions along south side of Bell Rd. (utility box, mail boxes, trees, etc.). |
| Bell Rd./Aspen Way | 10 | 1. Sight distance problem for northbound drivers looking westbound.<br>2. Vertical curve on Bell Rd. | G | 1 | RIAC | 1. Vertical curve on Bell Rd. west of Aspen Way limits sight distance from northbound approach of Aspen Way to west to 200-225' compared to 500' standard.<br>2. Aspen Way approaches Bell Rd. at grade of steeper than 3%. |
| OR 240/Worden Hill Rd. | 11 | Sight distance problem/skewed intersection. | G | 2 | RIAC, Road Maintenance Staff | 1. Worden Hill Rd. is a gravel road that provides access to several wineries. It approaches OR 240 at a grade of well over 3% and on a skew. Sight distance was measured as 325' from northbound approach to east, which does not meet the standard of 610'.<br>2. House would have to be acquired to straighten intersection. |

**Table A-1**
**Yamhill County Transportation System Plan**
**Reported Needs**

| Location | Reported Need | | | | | |
|---|---|---|---|---|---|---|
| | No. | Description | Type* | Frequency** | Source | Comments |
| | | | | | | |
| Mineral Springs Rd./Gun Club Rd. | 12 | Sight distance problem on Gun Club Rd. due to horizontal curve on Mineral Springs Rd. | G | 1 | RIAC | 1. Sight distance from eastbound approach of Gun Club Rd. at Mineral Springs Rd. is 390' to north.<br>2. Sight distance from northbound approach of connector road is 390' to southeast and 690' to the north.<br>3. Advisory speed for curve on Mineral Springs Rd. is 35 mph. Based on this speed, sight distances from both eastbound approach of Gun Club Rd. and northbound approach of Gun Club Rd. connector road are adequate.<br>4. No control at intersection of connector road and Gun Club Rd. Need for stop or yield sign on southbound approach of connector road or westbound approach of Gun Club Rd. should be investigated. |
| North Valley Rd./Chehalem Dr. | 13 | Sight distance problem. | G | 2 | RIAC, Stakeholder Interviews | 1. Vertical curve on North Valley Rd. west of Chehalem Dr. restricts sight distance, which was measured as 325' from northbound approach of Chehalem Dr. to west and 350' from southbound approach to west. North Valley Rd. posted speed is 45 mph, requiring 500' of sight distance.<br>2. Adequate sight distance is available to east. |
| Schaad Rd./Parrett Mountain Rd. | 14 | Large vehicles have difficulty getting started on gravel approach of Schaad Rd. even in best conditions. Worse with snow and ice. | G | 1 | RIAC | 1. Schaad Rd. approaches Parrett Mountain Rd. at severe grade (over 10%) and there are horizontal and vertical curves on Parrett Mountain Rd. immediately south of intersection. While first 75' of Schaad Rd. is paved, it is gravel road beyond that. Sight distance on Schaad Rd. was measured as 100' to south, which is inadequate.<br>2. Speeds on both roadways are relatively low due to geometric constraints. |
| OR 99W between Lafayette and McMinnville | 15 | Roadway is in poor condition. | Mnt | 1 | Stakeholder Interviews | |
| Cunningham Ln. | 16 | Needs maintenance (poor condition). | Mnt | 1 | Stakeholder Interviews | |

**Table A-1**
**Yamhill County Transportation System Plan**
**Reported Needs**

| Location | Reported Need | | | | | |
|---|---|---|---|---|---|---|
| | No. | Description | Type* | Frequency** | Source | Comments |
| | | | | | | |
| OR 154/Hopewell Rd. | 17 | Very dangerous – high speeds. | G | 1 | Stakeholder Interviews | 1. Intersection is located on horizontal curve which limits sight distance to east. Sight distance was measured as:<br>• Southbound approach - 385' to east and 550' to west.<br>• Northbound approach - 575' to east and > 610' to west.<br>2. Trimming/removal of vegetation would help for all sight distance restrictions. Removal of trees would likely be required to improve sight distance to east in order to meet standards. |
| Turner's Creek Rd. | 18 | Roadway is in poor condition. | Mnt | 1 | Stakeholder Interviews | Roadway is severely rutted with potholes. |
| Moore's Valley Rd. | 19 | Roadway is in poor condition. | Mnt | 1 | Stakeholder Interviews | 1. In general, condition of road seems adequate for level of traffic observed.<br>2. Near Yamhill, road has been newly paved and there are no major roadside obstructions.<br>3. Further to west, quality of pavement is degraded and section of road is marked as being part of slow slide area. Beyond paved section, road turns to gravel. Gravel seems to be in good condition, with no rutting or washboarding. |
| OR 18/Lafayette Hwy. | 20 | Dangerous intersection. | S | 3 | Stakeholder Interviews | 1. High speeds and high volume on OR 18 make turning onto or crossing highway difficult.<br>2. No geometric or sight distance issues identified. |
| OR 99W/OR 18/McDougall Rd. | 21 | Dangerous intersection - safety and traffic operations problems. | S,O | 3 | Stakeholder Interviews, Road Maintenance Staff | 1. Intersection configuration is not standard and may be confusing to drivers.<br>2. High speeds and high traffic volumes on both OR 99W and OR 18 create safety concern.<br>3. No geometric or sight distance problems identified. |
| OR 18 | 22 | Need four lanes all the way to coast. | M | 3 | Stakeholder Interviews | |
| OR 18 – S. Yamhill River Bridge (Sheridan) | 23 | Needs replacement/improvement – critical in case of disaster. | S | 1 | Stakeholder Interviews | Bridge is narrow. |
| OR 18/Gopher Valley Rd. | 24 | 1. Poor sight distance from Gopher Valley Rd.<br>2. High volume of traffic on OR 18 combined with merging traffic from adjacent business access.<br>3. Poor geometrics. | G | 2 | Stakeholder Interviews, Road Maintenance Staff | Adequate intersection sight distance available in both directions from Gopher Valley Rd. (660' to east and west). |
| High Heaven Rd. | 25 | Roadway is in poor condition. | Mnt | 1 | Stakeholder Interviews | |

Attachment 8

**Table A-1**

**Yamhill County Transportation System Plan**

**Reported Needs**

| Location | Reported Need | | | | | |
|---|---|---|---|---|---|---|
| | No. | Description | Type* | Frequency** | Source | Comments |
| | | | | | | |
| Peavine Rd. | 26 | Roadway is in poor condition. | Mnt | 1 | Stakeholder Interviews | 1. Pavement is in good to excellent condition for first few miles of road (Old Sheridan Rd. to Bennett Rd.). Pavement markings are in good condition.<br>2. After this section, pavement quality drops and there is some patching; pavement is still smooth and in relatively good shape, however. Guardrail is in good condition. Pavement markings are a little worn, but still visible.<br>3. Pavement is more patched in section where slow slide has been gradually deforming face of slope and adjacent road. |
| OR 153 w/o S. Yamhill River Bridge | 27 | Sharp corner, steep shoulder, narrow road - feels unsafe. | G | 1 | Stakeholder Interviews | 1. Area is mostly flat. There are four curves, two of which are 90-degree curves between OR 18 and SW Broadmead Rd. All curves are marked and have speed warning signs.<br>2. Bridge is as wide as road and has shoulders. |
| OR 18 | 28 | Needs turn lanes. | O | 1 | Stakeholder Interviews | |
| Delashmutt Ln. | 29 | Very dangerous due to lack of turn lanes. | O | 1 | Stakeholder Interviews | |
| Hidden Springs Rd./Fox Farm Rd. | 30 | Poor sight distance from Hidden Springs Rd. | G | 1 | Stakeholder Interviews | 1. Horizontal and vertical curves along Fox Farm Rd. create poor sight distance from Hidden Springs Rd. Measured sight distance to east is 350', compared to sight distance requirement of 610'. Sight distance from stop bar to south is zero.<br>2. Trimming of vegetation would help, but probably would not eliminate sight distance need. |
| Sheridan/WIllamina | 31 | Traffic signal is needed along OR 18 for safe access/crossing. | S | 1 | Stakeholder Interviews | Interchange already exists at OR 18/Ballston Rd. |
| OR 153/OR 221 | 32 | 1. Atypical intersection configuration – separated right turn lanes (connectors) require drivers to turn their heads sharply to see on-coming traffic.<br>2. Free movement from northbound OR 221 to westbound OR 153 is confusing to some drivers. | G, O | 1 | Stakeholder Interviews | 1. Free NB to WB turn movement may be confusing.<br>2. No sight distance issues identified, although drivers must turn their heads sharply to see on-coming traffic because of sharp angle of connector road approaches at OR 153 and OR 221. |
| OR 18/Christensen Rd. | 33 | 1. Safety and traffic operations issues.<br>2. Conflicting movements from accesses at or near intersection. | O | 1 | Road Maintenance Staff | 1. This is visually busy intersection.<br>2. Sight distance does not appear to be problem.<br>3. Project to add westbound left turn lane on OR 18 is underway. Caleb Payne Rd. also to be cul-de-sac'd. |

**Table A-1**
**Yamhill County Transportation System Plan**
**Reported Needs**

| Location | Reported Need | | | | | |
|---|---|---|---|---|---|---|
| | No. | Description | Type* | Frequency** | Source | Comments |
| | | | | | | |
| OR 18/Ash Rd. | 34 | Safety, geometric and traffic operations issues. | S | 1 | Road Maintenance Staff | 1. Ash Rd. intersects OR 18 at skew; sight distance is not restricted, however.<br>2. High speeds and traffic volumes on OR 18 make turns onto and crossing of OR 18 difficult. |
| OR 18/Cruickshank Rd. | 35 | Safety and geometric problems remain even after reconstruction of intersection. Drivers don't realize that eastbound right-turn lane is not a through lane. | O | 1 | Road Maintenance Staff | Intersection has atypical channelization for WB OR 18 left-turns onto Cruickshank Rd. and NB Cruickshank Rd. left-turns onto WB OR 18. In addition, Loop Rd. intersects OR 18 about 300' west of Cruickshank Rd., further complicating intersection operations. |
| OR 240/Kuehne Rd. | 36 | Merge from Kuehne Rd. to OR 240 is confusing - drivers on Kuehne Rd. are required to stop, but only have to yield further south at Abbey Rd./Kuehne Rd. intersection. | O | 1 | Road Maintenance Staff | 1. Intersection has three conflict points which are all stop-controlled.<br>2. Sight distance was measured and found to be adequate, except on connector road to SB Kuehne Rd., where sight distance to north/east is 240'. This is due to vegetation which could be trimmed. |
| Abbey Rd. between Oak Spring Farms Rd. and Millican Creek | 37 | Poor horizontal alignment. | G | 1 | Road Maintenance Staff | 1. Several sharp horizontal curves - all are signed in advance and well-marked.<br>2. County will be adding shoulders in this area. |
| OR 18/OR 153/Muddy Valley Rd. | 38 | Sight distance problem to north. | G | 1 | Road Maintenance Staff | Measured sight distance is adequate in both directions from both OR 153 and Muddy Valley Rd. approaches. |
| OR 240/Stiller's Mill Rd. | 39 | Sharp turns for trucks using Stiller's Mill Rd. to bypass Yamhill. | G | 1 | Road Maintenance Staff | 1. Stiller's Mill Rd. is roughly 27' wide, which could make turning difficult for trucks that use it to bypass downtown Yamhill.<br>2. Vertical curve on OR 240, combined with fixed objects (power pole, mailbox), limit sight distance from southbound approach of Stiller's Mill Rd. to west to roughly 200'. Without fixed objects, sight distance would be about 600', which would be adequate. |
| OR 47 | 40 | This is a main commuter route for bicyclists and walkers – needs improvement to accommodate them. | B, P | 1 | Stakeholder Interviews | |
| OR 99W/Old Parrett Mountain Rd., OR 99W/Corral Creek Rd., OR 99W/Quarry Rd. | 41 | 1. High speeds and multiple lanes of traffic on OR 99W make it very difficult to turn onto highway.<br>2. One or more of these intersections is or has been SPIS site. | O,S | 1 | Road Maintenance Staff | Reported needs were confirmed through field survey. |

Attachment 8

**Table A-1**

**Yamhill County Transportation System Plan**

**Reported Needs**

| Location | Reported Need | | | | | |
|---|---|---|---|---|---|---|
| | No. | Description | Type* | Frequency** | Source | Comments |
| | | | | | | |
| OR 99W/Cherry Rd. | 42 | 1. Poor sight distance at Cherry Rd.<br>2. Cherry Rd. needs widening | G | 1 | Road Maintenance Staff | 1. From 14.5' behind stop bar, sight distance is restricted by medium-sized pine tree in southeast quadrant of intersection. This limits sight distance to south to approximately 200'.<br>2. Sight distance improves to over 1,000' from 10' from traveled way.<br>3. Removal of tree would improve sight distance. |
| OR 99W between Dundee and Newberg | 43 | 1. This is SPIS site.<br>2. Highway changes from two lanes to one lane in WB direction. | S | 1 | Road Maintenance Staff | There are multiple warning signs starting at 1,000' before merge. |
| OR 233/Starr Quarry Rd. | 44 | 1. This is SPIS site.<br>2. Sharp corner – drivers on SB OR 233 are confused about which way to go. Signs are now posted. | S | 1 | Road Maintenance Staff | 1. Confusing to drivers.<br>2. Signs indicate through movement is on OR 233. |
| OR 221/Wheatland Rd. | 45 | Multiple accidents – may be caused by driver inattention or rolling stops. | S | 1 | Road Maintenance Staff | Cause of safety problem not clear. No apparent sight distance or geometric needs. |
| OR 18/Harmony Rd. | 46 | 1. This is SPIS site.<br>2. Drivers don't realize OR 18 is approaching – disorienting/confusing.<br>3. There is flasher at OR 18.<br>4. There is high demand for traffic crossing OR 18 at this location. | S, O | 1 | Road Maintenance Staff | 1. Intersection is clearly visible from OR 18 and Harmony Rd.<br>2. There are "Intersection Ahead" and "Stop Ahead" warning signs on Harmony Rd.<br>3. Sight distance is adequate for all approaches at this intersection. |
| OR 99W/Durham Ln. | 47 | 1. This is SPIS site.<br>2. Durham Ln. is used as cutoff between OR 18 and OR 99W. There is turn lane on OR 18, but not on OR 99W. | S, O | 1 | Road Maintenance Staff | 1. Durham Ln. is newly paved and in good condition.<br>2. Intersection is easy to miss from SB OR 99W. |
| OR 47/Goodin Creek Rd. | 48 | Northbound turn lane may be needed on OR 47. | O | 1 | Road Maintenance Staff | 1. Traffic counts required to confirm this need.<br>2. Goodin Creek Rd. is gravel at OR 47. |
| OR 47/Cove Orchard Rd. (north intersection) | 49 | Poor sight distance, skewed intersection. | G | 1 | Road Maintenance Staff | 1. Cove Orchard Rd. intersects OR 47 at a skew.<br>2. Sight distance is adequate to north.<br>3. Sight distance to south is limited to 425' by horizontal and vertical curves on OR 47. Sight distance requirement for 55-mph roadway is 610'.<br>4. Speeds on OR 47 may be higher at this location. |

**Table A-1**
**Yamhill County Transportation System Plan**
**Reported Needs**

| Location | Reported Need | | | | | |
|---|---|---|---|---|---|---|
| | No. | Description | Type* | Frequency** | Source | Comments |
| | | | | | | |
| OR 47/Pekkola Rd. | 50 | Intersection on curve, possible poor sight distance. | G | 1 | Road Maintenance Staff | 1. Intersection sight distance was measured from 14.5' from edge of traveled way.<br>2. Sight distance from westbound approach to south is restricted to 300' by vegetation and embankment. Sight distance to north is limited to 275' by vegetation and roadside obstructions (utility pole and fence).<br>3. Intersection sight distance from eastbound approach is not limited. |
| OR 47/OR 99W | 51 | Poor intersection configuration. | G | 1 | Road Maintenance Staff | 1. Intersection configuration is somewhat confusing.<br>2. Possible improvement would be to separate movements and eliminate highway crossing movements:<br>• Restrict access/egress to right-in/right-out only.<br>• Provide SB left-turn movement as WB U-turn 300' to west.<br>• Provide EB left-turn movement as EB U-turn 450' to east. |
| OR 99W Bridges w/o OR 47 | 52 | Bridges need to be replaced – very narrow. | G | 1 | Road Maintenance Staff | Reported need was confirmed through field survey. |
| OR 18/Red Prairie Rd. | 53 | Red Prairie Rd. has sharp curves to south of intersection and then is straight as drivers approach intersection. No flasher to indicate approach to OR 18 – confusing. | O | 1 | Road Maintenance Staff | 1. Flashing beacons provided at intersection for all approaches.<br>2. Red Prairie Rd. approaches to highway are adequately signed with advance "stop ahead" signs.<br>3. There is adequate intersection and stopping sight distance.<br>4. There is a series of 90-degree curves south of intersection. These are marked with warning signs. |
| OR 47/Gun Club Rd. | 54 | Intersection on curve, poor visibility. | G | 1 | Road Maintenance Staff | 1. Intersection is on curve.<br>2. Sight distance is adequate.<br>3. Intersection is easy to miss when traveling along OR 47.<br>4. An "intersection ahead" sign would increase driver awareness of upcoming intersection. |
| Westside Rd. (McMinnville to Yamhill and Carlton) | 55 | This is a main commuter route for bicyclists and pedestrians – needs improvement to accommodate them. | B, P | 1 | Stakeholder Interviews | |
| OR 99W, Madison St. (Lafayette)/Lafayette Hwy. | 56 | These roads need to be included in County's bicycle plan. | B | 1 | Stakeholder Interviews | |
| OR 99W | 57 | Should accommodate all modes of transportation. | B, P | 1 | Stakeholder Interviews | |
| North Valley Rd. | 58 | Heavy use by pedestrians and bicyclists. | B, P | 1 | Stakeholder Interviews | |

**Table A-1**
**Yamhill County Transportation System Plan**
**Reported Needs**

| Location | Reported Need | | | | | |
|---|---|---|---|---|---|---|
| | No. | Description | Type* | Frequency** | Source | Comments |
| | | | | | | |
| OR 233 | 59 | Bike improvements needed - could use better shoulders. | B | 1 | Stakeholder Interviews | |
| Old Sheridan Rd. | 60 | Has large volume of pedestrian traffic with no sidewalks. | P | 1 | Stakeholder Interviews | 1. Multiple pedestrians were observed walking along edge of road.<br>2. There are locations where there is little or no shoulder. Some sections of road do not have marked fog line. There is also a narrow bridge that would limit potential for shoulder widening to accommodate pedestrians.<br>3. Separated path and bridge would benefit pedestrians and bicyclists. This improvement has already been started at north end of Old Sheridan Rd. |
| OR 18B between Sheridan and Willamina | 61 | Sidewalk and shoulder should be extended between two towns. | B, P | 1 | Stakeholder Interviews | 1. Multiple pedestrians were observed walking along edge of road within or near both towns.<br>2. There are several locations where shoulder is gravel and only a foot or so wide.<br>3. Wider paved shoulders or multi-use path would benefit pedestrians and bicyclists. |
| Fox Farm Rd. | 62 | Poor conditions for bicyclists and pedestrians. | B, P | 1 | Stakeholder Interviews | |
| Worden Hill Rd. | 63 | Poor conditions for bicyclists and pedestrians. | B, P | 1 | Stakeholder Interviews | |
| Bald Peak Rd./Mountain Top Rd. | 64 | Safety concern due to sight distance problem, skewed intersection. | S | 1 | RIAC | |
| OR 99W/Riverbend Rd. | 65 | Potential safety problem for NB left turning vehicles – storage for only one vehicle if train is present. | S | 1 | County staff | Proposed county park to west will generate more traffic, worsening this problem. |

* A = Access, M = Mobility, G = Geometric, O = Traffic Operations, Mnt = Maintenance, S = Safety, B = Bike, P = Pedestrian, T = Transit
** Number of comments received.

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# MEMORANDUM

**TO**: Bill Gille, Yamhill County
John Phelan, Yamhill County
Terry Cole, ODOT Region 2

**FROM**: Bob Schulte, PTP
Julie Sosnovske, P.E.

**DATE**: March 28, 2013

**SUBJECT:** **YAMHILL COUNTY TRANSPORTATION SYSTEM PLAN** **P# 11086-04**
Technical Memorandum #4 – Future Transportation Conditions

This memo documents the analysis of future transportation conditions for the Yamhill County Transportation System Plan. The findings of the analysis will be used in the development of proposed improvements to address transportation needs within the county. The analysis was conducted for the future No Build scenario.

A 2035 forecast year was selected, consistent with the Transportation Planning Rule requirement that a 20-year planning horizon from the time of plan adoption must be used. The 2035 time frame is also consistent with the forecast year used in the Newberg-Dundee Bypass planning.

## ROADWAYS

### TRAFFIC FORECASTS

#### State Highways

ODOT's Analysis Procedures Manual (APM)[1] describes three main traffic forecasting methods. The historical trends method uses previous traffic volumes to estimate future volumes, based

[1] Oregon Department of Transportation, Analysis Procedures Manual, (2011).

on the assumption that the future growth trend will be similar to the historical trend. It is applied primarily in rural or small urban areas where significant growth is not anticipated. Trendline volumes are obtained from ODOT's Future Volume Table.[2]

The cumulative analysis method is generally used to forecast volumes for small urban areas that are growing at a fairly uniform rate and for areas where only minor changes are expected to take place. This method layers future background traffic and traffic from expected future development on existing traffic volumes to obtain an overall future traffic volume estimate. Application of this method is generally limited to small urban areas or subareas of larger regions because of the complexity of tracking traffic changes across larger areas.

Urban travel demand models use projected land use and transportation network data to estimate future travel demand. The data is obtained from many different sources, including census data, state employment data, origin-destination surveys, household travel surveys, traffic counts and field surveys. Models are the most sophisticated tool for forecasting future traffic volumes, but the data needs and development costs are high, so they are typically available only in urban areas where travel patterns are more complex.

For the state highway traffic forecasts, the trendline method was selected, because there is no travel forecasting model available for the study area and traffic volumes were anticipated to increase at a low rate over the planning period. The cumulative analysis method was not considered because the future development level in the unincorporated portion of Yamhill County is expected to be low.

Future State Highway Traffic Volumes

ODOT's 2030 Future Volume Table contains, for each highway segment, the most recent traffic count for the 2008 – 2010 period, as well as an estimated 2030 volume. The 2030 volumes are obtained from a travel demand model if a local model is available or derived using regression analysis of historical count data at the location. Because a travel forecasting model is not available for the unincorporated part of Yamhill County, the 2030 volumes in the Future Volume Table for state highway segments within the study area are based on regression analysis.

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[2] Oregon Department of Transportation, Technical and Analysis Tools website, http://www.oregon.gov/ODOT/TD/TP/pages/tools.aspx, accessed September 7, 2012.

The traffic counts and 2030 volumes were used to calculate the average annual traffic growth rates shown in Table 1.

**Table 1 – Summary of Growth Rates for State Highway Segments**

| State Highway | Range of Annual Growth Rates | Average |
|---|---|---|
| OR 47 | 1.43 – 2.16 | 1.68 |
| OR 22 | 0.95 – 1.81 | 1.26 |
| OR 18 | 1.75 – 2.77 | 2.51 |
| OR 99W | 0.37 – 2.54 | 1.52 |
| OR 219 | 2.65 – 3.70 | 3.36 |
| OR 221 | 1.86 – 2.84 | 2.31 |
| OR 240 | 1.22 – 2.89 | 2.13 |
| OR 153 | 0.81 – 2.39 | 1.72 |
| OR 154 | 2.02 – 2.58 | 2.46 |
| OR 233 | 1.78 – 1.94 | 1.87 |
| OR 18B | 1.63 – 1.74 | 1.70 |
| **Average** | | **1.94** |

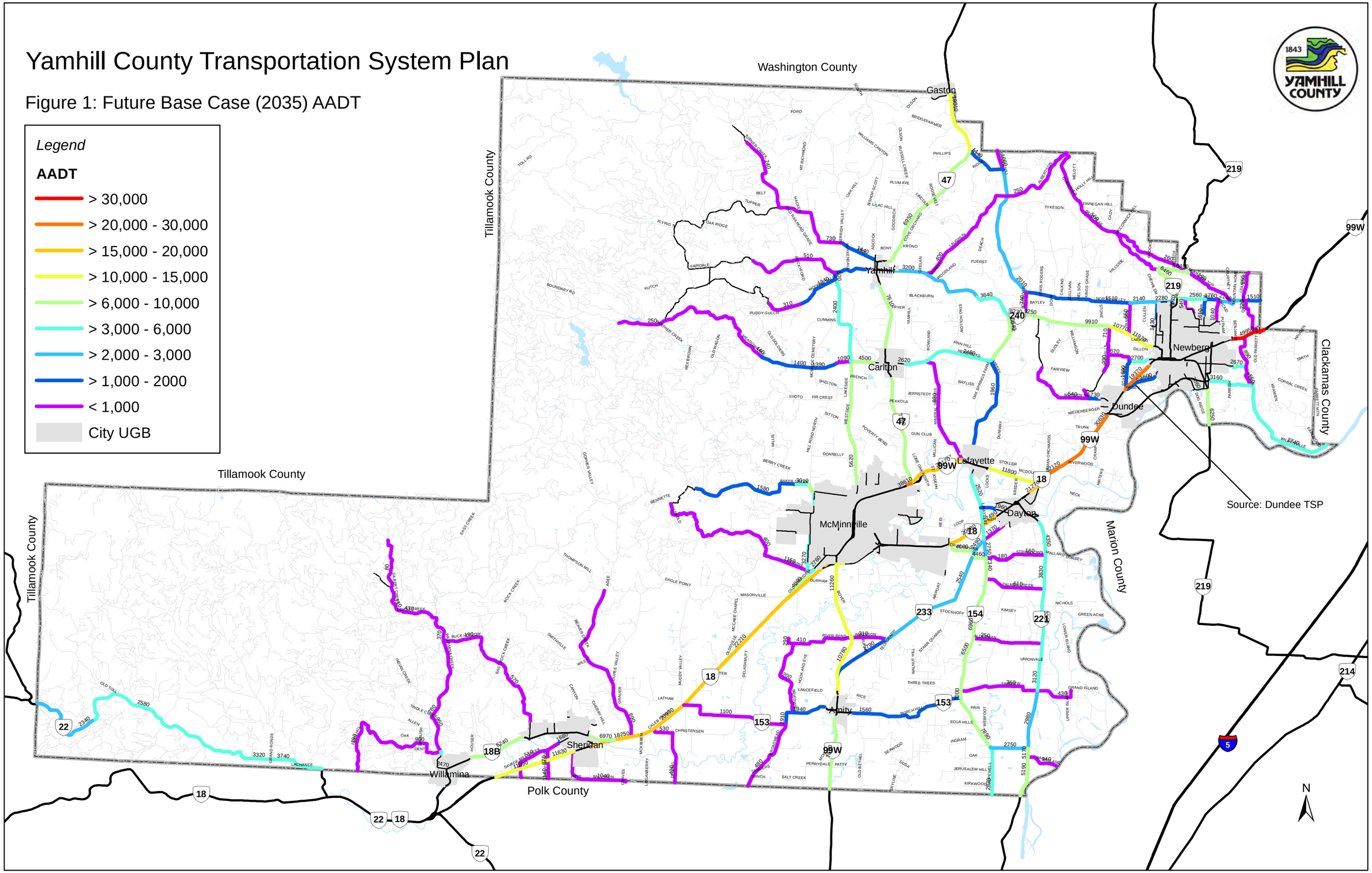
The segment growth rates were applied to the existing volumes to produce the forecasts of 2035 AADT and design hour volumes (DHVs) shown in Figures 1 and 2. For each highway, the segment volumes were compared for consistency to the volumes for the adjacent segments, and adjustments were made where necessary.

The only exception to this approach was for the OR 99W segments between Newberg and Dundee. To maintain consistency with the TSPs currently being developed for Newberg and Dundee, the future volumes for these segments were obtained from the TSP's.

As for the highway segments, the intersection volume forecasts were developed by applying the growth factors to the existing intersection approach volumes.

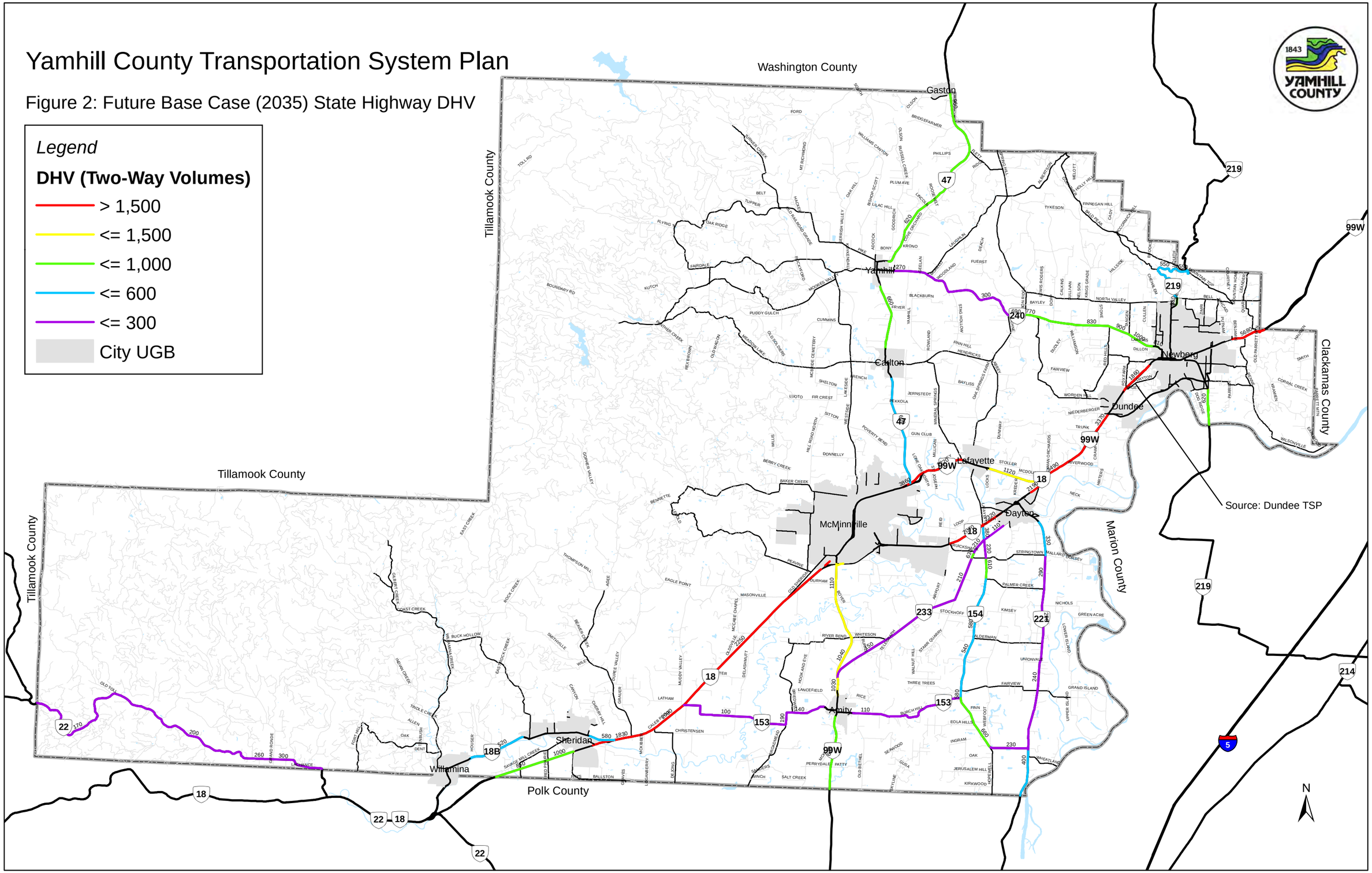
# Yamhill County Transportation System Plan

## Figure 1: Future Base Case (2035) AADT



# Yamhill County Transportation System Plan

Figure 2: Future Base Case (2035) State Highway DHV



**County Roads**

Similar to state highways, historical counts were used as the basis for forecasting county road traffic volumes. Limitations of the count data, however, required that a different approach be taken. The county's count database covers the period from 1999 to 2011. Twenty-four hour and 48-hour counts are collected for selected roads each year. Within the database, there are generally three to four counts available for each road. For a particular road, however, the interval between count years can vary, as can the count location. Because of this variation, trendline or average growth rates could not be calculated for county roads or individual county road segments.

Therefore, for county roads having counts for multiple years at the same location, average linear growth rates were calculated. The average growth rates were grouped across roads in different ways, such as by functional classification and volume range. For each group or category, such as major collectors, the average growth rates were averaged, with the resulting "average of the averages" used as an average growth factor in calculating future traffic volumes for all county road segments within that category.

This method did not produce average growth factors that were satisfactory, however. In some cases, there were too few count locations within a category or the locations were limited to a small number of roads, so that the average growth factor was not representative of all roads within the category. In other cases, there was significant variation between the average growth rates for the individual locations, which could also result in an average growth factor that was representative of the category.

Therefore, another method was applied, in which the average growth rates for all county roads were grouped by the beginning and ending count years. Groups were defined for all unique combinations of beginning and ending count years. For example, if the counts for a particular road location were for the years 2003 and 2009, an average linear growth rate was calculated for that period and added to the group of locations for the same period. Once this had been done for all count locations, an average growth rate was calculated for each group based on the rates for the individual locations.

The average growth rates for the groups were summarized in a table showing, for each group, the beginning and ending year, average growth rate, number of count locations in the group, and number of years covered by the time period. Various methods were considered for

developing an overall growth factor based on the average growth rates for each group. It was decided that this factor should be calculated as a weighted average of the group rates, with the number of count locations and number of years for the groups serving as the weights.

Only those groups with a minimum of five count locations and covering a period of at least five years were included in the calculation. Also, examination of the count data indicated that many of the counts conducted in 2008 were significantly lower than the counts for the other years, which was likely the related to the economic downturn during that year. Therefore, groups with a beginning or ending count year of 2008 were not included in the calculation.

Using this approach, an overall annual growth factor of 0.61% was obtained. This factor was applied to the volumes from the existing conditions analysis to produce 2035 volume estimates for county roadways. The estimated 2035 AADT and P.M. peak hour volumes are shown in Figures 1 and 3.

Reasonableness Checks of County Traffic Forecasts

Because traffic volumes on county roads are influenced much more by local land uses than state highways, which carry a higher percentage of external traffic, the estimated county traffic growth factor was compared to information on future land use characteristics. This information was available from the following sources:

- Population forecasts from Portland State University
- Employment forecasts from the Oregon Department of Economic Analysis (OEA)
- Yamhill County Agri-Business Economic and Community Development Plan
- Yamhill County Planning Department

Portland State University's Population Research Center recently produced long-term population forecasts for the county, its ten incorporated cities, and the unincorporated portion of the county.[3] The forecast horizon extended 24 years from 2011 to 2035, with forecasts produced in five-year intervals between 2010 and 2035. A summary of the forecasts is shown in Table 2.

[3] Portland State University Population Research Center, Population Forecasts for Yamhill County, Its Cities and Unincorporated Area 2011-2035, (2012).

# Yamhill County Transportation System Plan

Figure 3: Future County Road Base Case (2035) Weekday P.M. Peak Hour Volumes

*Legend*

**Peak Hour Volume (Two-Way)**

- > 300
- > 200 - 300
- > 100 - 200
- <= 100
- City UGB

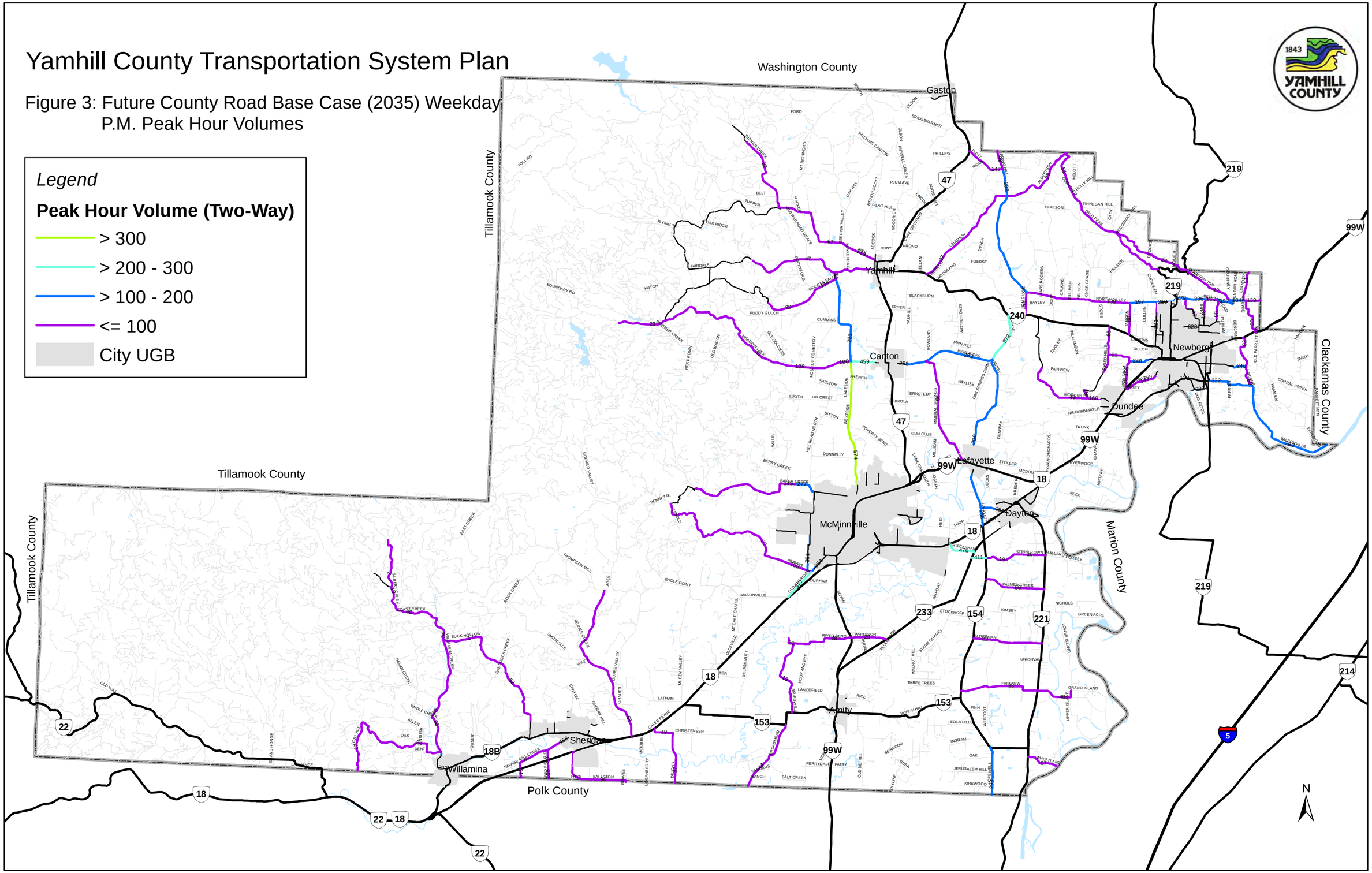


**Table 2 – Yamhill County Population Forecasts**
**Portland State University Population Research Center**

| Location | 2011 | 2035 | Growth | Relative Growth | Annual Growth | Annual Rate |
|---|---|---|---|---|---|---|
| McMinnville | 32,808 | 49,983 | 17,175 | 52.4% | 716 | 2.1% |
| Newberg | 22,730 | 38,490 | 15,760 | 69.3% | 657 | 2.8% |
| Amity | 1,635 | 2,097 | 462 | 28.3% | 19 | 1.1% |
| Carlton | 2,036 | 2,890 | 854 | 41.9% | 36 | 1.7% |
| Dayton | 2,731 | 3,765 | 1,034 | 37.9% | 43 | 1.5% |
| Dundee | 3,210 | 4,985 | 1,775 | 55.3% | 74 | 2.2% |
| Lafayette | 3,745 | 5,797 | 2,052 | 54.8% | 86 | 2.2% |
| Sheridan | 6,228 | 8,657 | 2,429 | 39.0% | 101 | 1.6% |
| Willamina (Yamhill County portion) | 1,180 | 1,241 | 61 | 5.2% | 3 | 0.2% |
| Yamhill | 1,037 | 1,403 | 366 | 35.3% | 15 | 1.4% |
| Unincorp. Yamhill County | 22,510 | 23,338 | 828 | 3.7% | 35 | 0.1% |
| **Total County** | 99,850 | 142,646 | 42,796 | 42.9% | 1,783 | 1.7% |

While the population of the county overall is expected to grow at about 1.7% annually, growth in the unincorporated area will be much slower, at closer to 0.1% annually. This is related to Oregon land use law, which restricts most development to areas within urban growth boundaries (UGBs). Population growth in the urban areas will, however, contribute to traffic growth on county roads in the rural areas.

The OEA is responsible for developing economic and employment forecasts for the State of Oregon. For this study, a request was made to the OEA for an employment forecast for Yamhill County. The OEA applied statewide growth projections to the current industry structure and historic growth to develop unofficial countywide employment forecasts by industry sector. The forecasts indicated that average annual employment growth will range between 1.16% to 2.01% for the various sectors between 2012 and 2035.

The Yamhill County Agri-Business Economic and Community Development Plan[4] examined the current status and future of the county's agriculture and tourism industries. The study found that infrastructure is a limitation to growth in these industries, including the water, sewer, and transportation systems, with water being the biggest issue. OR 99W was mentioned as a concern for the transportation system. Changes in the current zoning will also be needed to allow development to occur, particularly in the rural areas. Specific growth forecasts were not included in the study.

Yamhill County Planning Department staff indicated that they do not expect significant growth in the rural/unincorporated portion of the county.[5] Residential and employment development are generally restricted to urban areas. While there has been the development of wineries in the rural areas of the county and there is the capacity for this to continue, there is no way to predict how much of this activity will occur or where. Therefore, there are no specific future growth forecasts for the winery industry or similar land uses.

Based on the information from these sources, it appears that the future rate of development in the rural areas of the county will be slow. Population in the unincorporated area is expected to increase by only 0.1% annually. While the predicted total county employment growth rate is higher, most of this growth will occur within the cities. Infrastructure will also be a limitation to development in the rural areas. Therefore, the relatively low estimated traffic growth factor of 0.61% per year for rural county roads is consistent with this outlook.

NEEDS

Future roadway needs were examined in the areas of mobility, traffic operations, safety, and geometrics for the same facilities included in the existing conditions analysis.

**Mobility Needs**

Future mobility needs were identified by comparing volume-to-capacity (v/c) ratio estimates for roadway segments and intersections to the applicable targets. The targets for state highways

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[4] Yamhill County, Yamhill County Agri-Business Economic and Community Development Plan, (2009).

[5] Conversation with Ken Friday, Yamhill County Planning Department on September 6, 2012.

within the study area are shown in Table 3. They reflect the revisions to the Oregon Highway Plan (OHP) Policy 1F[6] that went into effect in January, 2012.

**Table 3 – State Highway Mobility Targets (Volume-to-Capacity Ratio)**

| Area/Highway Category | Segments and Signalized Intersections | Unsignalized Intersections* |
|---|---|---|
| **Outside Urban Growth Boundary/Rural Lands** | | |
| Statewide Expressways (OR 99W, OR 18) | 0.70 | 0.75 |
| Regional Highways (OR 22, OR 47, OR 99W, OR 154) | 0.70 | 0.75 |
| District Highways (OR 18B, OR 153**, OR 219, OR 221, OR 233, OR 240) | 0.75 | 0.75 |

Source: Table 6 of the OHP Policy 1F Revisions, adopted by the Oregon Transportation Commission on December 21, 2011.
* For unsignalized intersections, the v/c ratio target applies to the controlled approaches.
** The portion of OR 153 south of OR 154 is a Regional Highway, for which the applicable mobility targets were used.

For county roadways, a v/c ratio target of 0.75 was applied for both roadway segments and intersections.[7]

Segment Mobility

Segment capacity analysis was conducted for all state highways and county roads classified as a major collector or higher.[8] V/C ratios were calculated using the estimated 2035 DHVs for state highways and the 2035 average weekday peak hour volume estimates for county roads. The

[6] Oregon Department of Transportation, OHP Policy 1F Revisions, (2011).
[7] Based on discussions with county staff, it was decided that the state highway mobility targets should be used for county roadways. In this regard, it was assumed that county roadways are most similar to ODOT's District level highways.
[8] The analysis was not performed for roadways below this classification because it was assumed that the low volumes for these roadways would not result in mobility needs.

analysis was performed according to the methodology for two-lane rural highways outlined in the 2000 Highway Capacity Manual (HCM2000)[9] and the APM.

Figure 4 shows the estimated v/c ratios for state highways and county roads within the study area. Figure 5 shows the segments not meeting the mobility standards. As can be seen, a majority of the segments operate within the mobility standard. State highway segments having v/c ratios exceeding the mobility target are:

- OR 99W east of Newberg
- OR 99W between Dundee and OR 18
- OR 99W between OR 47 and McMinnville
- OR 18 between Dayton and OR 154
- OR 18 between McMinnville and OR 153

Future mobility for state highway segments is summarized in Table 4. The percentage of

**Table 4 – Future Mobility Summary - State Highway Segments**

| State Highway | V/C Target | Total Miles | % Deficient |
|---|---|---|---|
| OR 18 | 0.70 | 16.2 | 47% |
| OR 18B | 0.75 | 3.0 | 0% |
| OR 22 | 0.70 | 12.9 | 0% |
| OR 47 | 0.70 | 14.3 | 0% |
| OR 99W | 0.70 | 17.7 | 25% |
| OR 153 (west of OR 154) | 0.75 | 9.9 | 0% |
| OR 153 (south of OR 154) | 0.70 | 3.4 | 0% |
| OR 154 | 0.70 | 6.3 | 0% |
| OR 219 | 0.75 | 4.5 | 0% |
| OR 221 (north of OR 153) | 0.75 | 8.2 | 0% |
| OR 221 (south of OR 153) | 0.70 | 1.7 | 0% |
| OR 233 | 0.75 | 8.2 | 0% |
| OR 240 | 0.75 | 10.4 | 0% |
| **Total** | | **116.7** | **10%** |

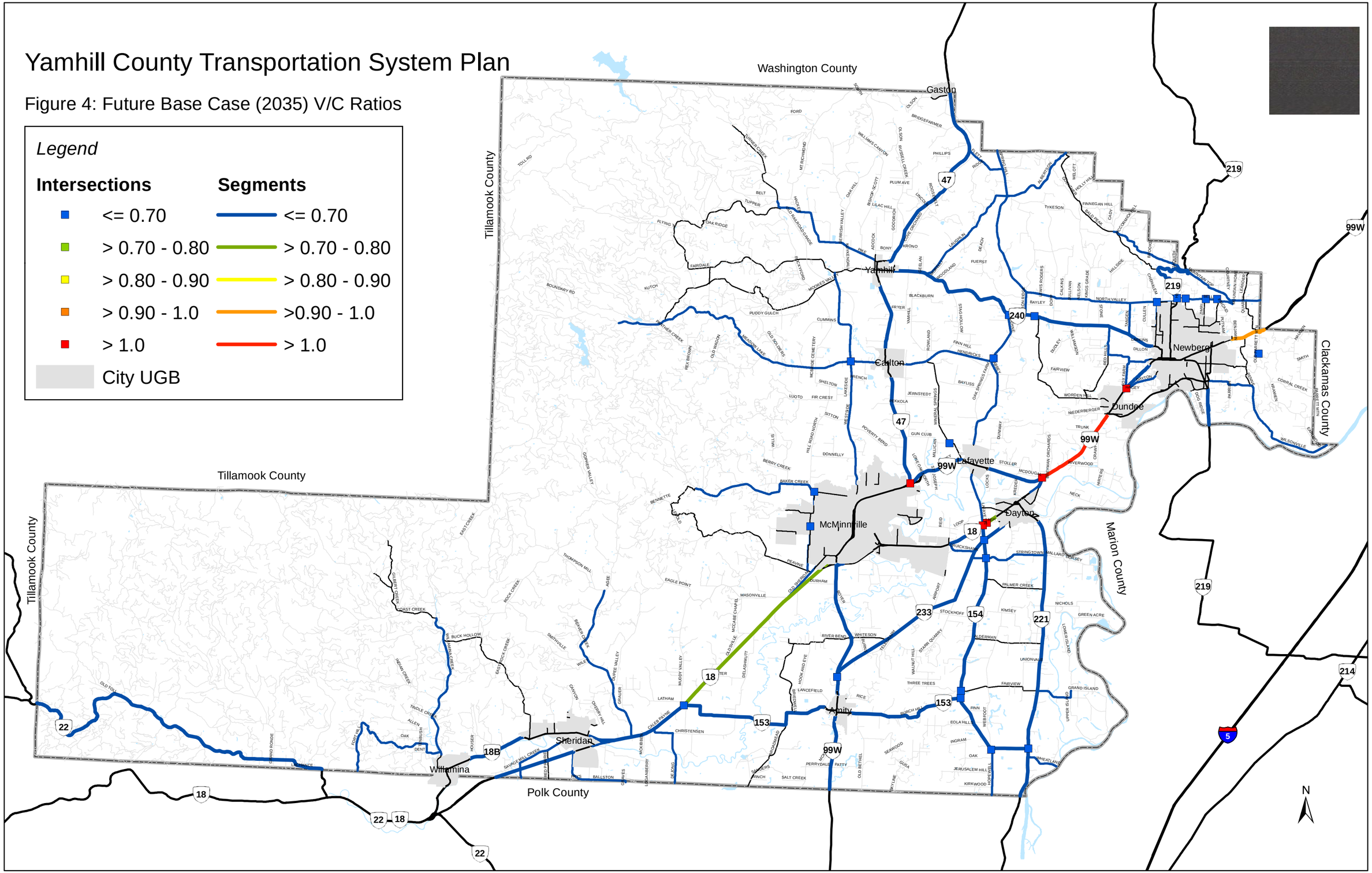
[9] Transportation Research Board, Highway Capacity Manual, Special Report 209, (2000).

# Yamhill County Transportation System Plan

Figure 4: Future Base Case (2035) V/C Ratios

*Legend*

| Intersections | Segments |
|---|---|
| <= 0.70 | <= 0.70 |
| > 0.70 - 0.80 | > 0.70 - 0.80 |
| > 0.80 - 0.90 | > 0.80 - 0.90 |
| > 0.90 - 1.0 | >0.90 - 1.0 |
| > 1.0 | > 1.0 |
| City UGB | |

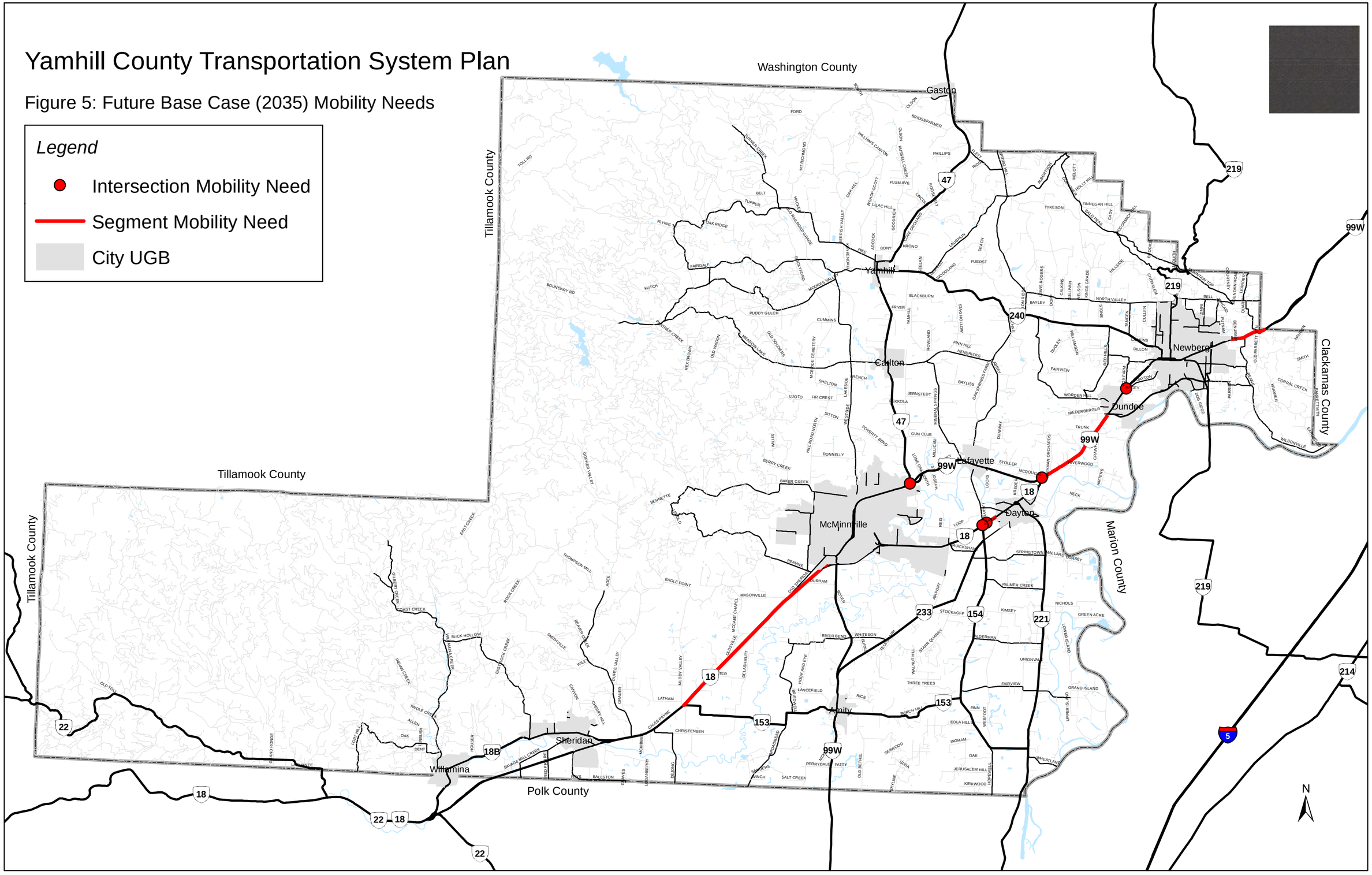


# Yamhill County Transportation System Plan

Figure 5: Future Base Case (2035) Mobility Needs

*Legend*

- Intersection Mobility Need
- Segment Mobility Need
- City UGB



deficient miles along OR 18 increases from 0% for existing conditions to 47% for 2035, but decreases from 27% to 25% along OR 99W. The reason for the decrease along OR 99W is that the mobility target is met for the segments between Newberg and Dundee with the addition of the bypass. None of the remaining state highway segments have mobility deficiencies. Compared to existing conditions, this results in an increase in the overall percentage of deficient miles from 4% to 10%.

Consistent with the relatively low traffic growth for county roads, all county roadway segments will operate well within the mobility standard.

Intersection Mobility

Capacity analysis was conducted for all intersections of state highways, as well as the intersections with suspected level of service problems identified for the existing conditions analysis. The intersection v/c ratio estimates (see Figure 4) were developed using the HCM2000 methodology for unsignalized intersections.

As shown in Table 5 and Figure 5, all of the intersections meet the mobility targets, with the following exceptions:

- OR 18/ OR 99W/McDougall Rd.
- OR 18/Ash Rd.
- OR 18/Lafayette Hwy.
- OR 47/OR 99W
- OR 99W/Fox Farm Rd.

The reported intersection v/c ratio is for the worst movement, which is typically the left-turn movement from the minor road. Thus, while the v/c ratios for the worst movements at the four intersections listed above do not meet the target, the v/c ratios for the mainline (state highway) turning movements are within the target. The only exception to this is the intersection of OR 99W/McDougall Rd./OR 18, where the v/c ratio for the westbound left-turn movement on OR 99W is 0.82.

**Table 5 – Future Mobility Summary – Intersections**

| Intersection | Mobility Target (Major/Minor V/C Ratio) | V/C Ratio* (Major) | V/C Ratio* (Minor) |
|---|---|---|---|
| NW Hill Rd./SW 2nd St. | 0.75/0.75 | 0.35 | 0.05 |
| NW Hill Rd./NW Baker Creek Rd. | 0.75/0.75 | 0.31 | 0.13 |
| NW Westside Rd./NW Meadow Lake Rd. | 0.75/0.75 | 0.38 | 0.31 |
| NE Abbey Rd./NE Hendricks Rd. | 0.75/0.75 | 0.27 | 0.13 |
| OR 240/NE Kuehne Rd. | 0.75/0.75 | 0.45 | 0.31 |
| N. Aspen Way/NE Bell Rd. | 0.75/0.75 | 0.06 | 0.02 |
| OR 18/OR 99W/McDougall Rd. | 0.70/0.75 | **0.82** | **>1.0** |
| OR 18/SE Ash Rd. | 0.70/0.75 | 0.01 | **>1.0** |
| OR 18/SE Lafayette Hwy. | 0.70/0.70 | 0.54 | **>1.0** |
| OR 154/OR 233 | 0.70/0.75 | 0.35 | 0.21 |
| OR 154/Stringtown Rd. | 0.70/0.75 | 0.21 | 0.30 |
| OR 153/Hopewell Rd. | 0.70/0.75 | 0.33 | 0.00 |
| OR 154/SE Fairview Rd. | 0.70/0.75 | 0.02 | 0.01 |
| OR 240/Worden Hill Rd. | 0.75/0.75 | 0.01 | 0.00 |
| Zimri Rd./Bell Rd. | 0.75/0.75 | 0.06 | 0.10 |
| Springbrook Rd./Bell Rd. | 0.75/0.75 | 0.04 | 0.03 |
| Parrett Mountain Rd./Schaad Rd. | 0.75/0.75 | 0.01 | 0.00 |
| Gun Club Rd./Mineral Springs Rd. | 0.75/0.75 | 0.04 | 0.01 |
| Chehalem Dr./North Valley Rd. | 0.75/0.75 | 0.10 | 0.01 |
| OR 18/OR 153 | 0.70/0.75 | 0.58 | 0.26 |
| OR 99W/OR 233 | 0.70/0.75 | 0.38 | 0.54 |
| OR 47/OR 99W | 0.70/0.70 | 0.44 | **>1.0** |
| OR 154/OR 153 | 0.70/0.70 | 0.26 | 0.15 |
| OR 221/OR 153 | 0.75/0.75 | 0.18 | 0.10 |
| OR 99W/Fox Farm Rd. | 0.70/0.75 | 0.66 | **>1.0** |

* V/C ratio for the worst movement is reported. Bold/shaded cells indicate intersections not meeting the mobility target.

**Traffic Operations Needs**

As for existing conditions, turn lane needs were determined for unsignalized intersections using the turn lane criteria contained in the APM.[10] The volume criterion for left-turn lanes is based on the hourly opposing plus advancing volume per lane, hourly turning volume, and posted speed limit at an intersection. Thus, as the opposing plus advancing volume and/or turning volume increases, or as the speed limit increases, the volume threshold at which a turn lane should be considered decreases. The volume criterion for right-turn lanes is based on the hourly approaching volume in the outside lane (through plus right-turn volume), hourly turning volume, and speed limit. As any of these factors increases, the volume threshold for a right-turn lane decreases. Table 6 shows the intersections where future left-turn lane needs were found. The left-turn volume is listed along with the threshold for which a turn lane would be warranted based on the advancing/opposing traffic volumes. Table 7 shows similar data for intersections where future right-turn lane needs were found.

**Table 6 – Future Left-Turn Lane Needs**

| Roadway | Intersection | Direction | Left-Turn Volume | Left-Turn Volume Threshold |
|---|---|---|---|---|
| **State Highways** | | | | |
| OR 240 | Kuehne Rd. | WB | 614 | 11 |
| OR 219 | Bell Rd. | NB | 40 | 13 |
| OR 219 | Bell Rd. | SB | 50 | 12 |
| OR 154 | Stringtown Rd. | NB | 248 | 13 |
| OR 154 | Fairview Rd. | NB | 19 | 10 |
| OR 154 | Fairview Rd. | SB | 10 | 10 |
| OR 99W | OR 47 | EB | 334 | 10 |
| OR 154 | OR 153 | NB | 49 | 10 |
| OR 221 | OR 153 | NB | 123 | 17 |
| OR 99W | Fox Farm Rd. | NB | 105 | 46 |
| **County Roadways** | | | | |
| Hill Rd. | 2nd St. | SB | 63 | 23 |
| Hill Rd. | Baker Creek Rd. | WB | 172 | 19 |
| Kuehne Rd. | Hendricks Rd. | SB | 241 | 15 |

[10] Oregon Department of Transportation, Analysis Procedures Manual, (2011).

**Table 7 – Future Right-Turn Lane Needs**

| Roadway | Intersection | Direction | Right Turn Volume | Right-Turn Volume Threshold |
|---|---|---|---|---|
| **State Highways** | | | | |
| OR 18 | Ash Rd. | EB | 83 | 0 |
| OR 18 | OR 154 | NB | 95 | 87 |
| OR 18 | OR 154 | WB | 22 | 0 |
| OR 18 | OR 154 | EB | 18 | 0 |
| OR 153 | Hopewell Rd. | EB | 252 | 28 |
| OR 18 | OR 153 | NB | 20 | 20 |
| OR 18 | OR 153 | SB | 31 | 20 |
| OR 99W | OR 47 | WB | 49 | 20 |
| OR 99W | Fox Farm Rd. | SB | 195 | 85 |
| OR 99W | Fox Farm Rd. | EB | 60 | 0 |

Table 8 summarizes intersections where either a left-turn or a right-turn lane would be warranted based on future volumes and posted speeds. The results of the analysis are shown in Figure 6. A majority of the future turn lane needs are on state highways.

**Table 8 – Future Turn Lane Need Summary**

| Intersection | Northbound | | Southbound | | Eastbound | | Westbound | |
|---|---|---|---|---|---|---|---|---|
| | LT | RT | LT | RT | LT | RT | LT | RT |
| **State Highways** | | | | | | | | |
| OR 240/Kuehne Rd. | | | | | | | √ | |
| OR 219/Bell Rd. | √ | | √ | | | | | |
| OR 18/Ash Rd. | | | | | | √ | | |
| OR 154/Stringtown Rd. | √ | | | | | √ | | |
| OR 153/Hopewell Rd. | | | | | | √ | | |
| OR 99W/OR 47 | | | | | √ | | | √ |
| OR 154/OR 153 | √ | | | | | | | |
| OR 221/OR 153 | √ | | | | | √ | | |
| OR 154/Fairview Rd. | √ | | √ | | | | | |
| OR 18/OR 154 | | √ | | | | √ | | √ |

| Intersection | Northbound | | Southbound | | Eastbound | | Westbound | |
|---|---|---|---|---|---|---|---|---|
| | LT | RT | LT | RT | LT | RT | LT | RT |
| OR 18/OR 153 | | √ | | √ | | | | |
| OR 99W/Fox Farm Rd. | √ | | | √ | | √ | | |
| **County Roadways** | | | | | | | | |
| Kuehne Rd./Hendricks Rd. | | | √ | | | | | |
| Hill Rd./2nd St. | | | √ | | | | | |
| Hill Rd./Baker Creek Rd. | | | | | | | √ | |

**Safety Needs**

The Highway Safety Manual (HSM)[11] contains Crash Modification Factors (CMFs) which can be used to estimate future crash rates. The CMFs are used to adjust estimates of average crash frequency for the effects of specific geometric design and traffic control features for local sites. Some of the CMFs are based on traffic volume. Therefore, to estimate the effect of higher future traffic volumes on crash rates, the CMFs can be applied using the following procedure:

- Calculate CMF values for the base year and future year, using existing and future traffic volumes for the CMFs that are volume-based.
- Calculate composite CMF values for the base and future years by multiplying the individual CMF values.
- Estimate future crash rate by multiplying the ratio of the future year composite CMF to the base year composite CMF by the base year crash rate. Any resulting difference between the base year and future year crash rates is due to the volume differences.

CMFs are available for both roadway segments and intersections.

[11] American Association of State Highway and Transportation Officials, Highway Safety Manual, (2010).

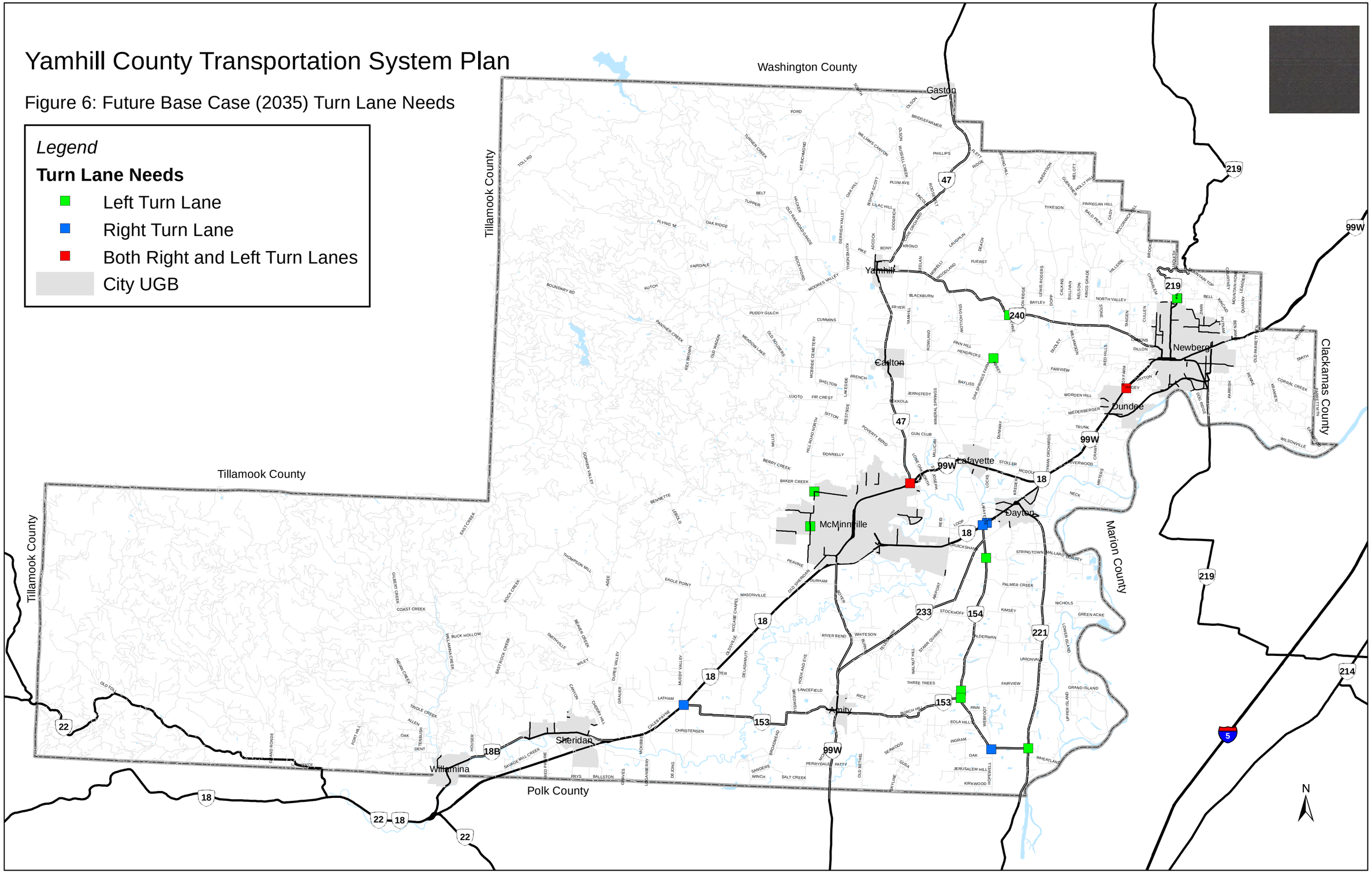
# Yamhill County Transportation System Plan

Figure 6: Future Base Case (2035) Turn Lane Needs

*Legend*

**Turn Lane Needs**

- Left Turn Lane
- Right Turn Lane
- Both Right and Left Turn Lanes
- City UGB



Use of this procedure to estimate future crash rates for the seven locations examined in the existing conditions analysis was investigated. These locations are:

- Abbey Rd./Hendricks Rd. intersection
- Stringtown Rd. between OR 154 and OR 221
- Worden Hill Rd. from OR 240 to the beginning of pavement
- OR 99W/OR 18/McDougall Rd. intersection
- OR 18 between OR 154/Lafayette Hwy. and Ash Rd.
- OR 18/SW Red Prairie Rd. intersection
- OR 99W/OR 47 intersection

For the roadway segments, the volume-based CMFs for which data were available were the lane width CMF and shoulder width CMF. The CMF values for both of these geometric features do not vary below 400 vehicles per day (vpd) or above 2,000 vpd. The existing and future volumes for the Stringtown Rd. segment between OR 154 and OR 221 are below 400 vpd. Therefore, there would be no difference between the base year and future year composite CMFs for this segment. The ratio of the composite CMFs would be 1.0, with no change in the estimated future crash rate compared to the base year rate based on these factors. Similarly for the OR 18 segment between OR 154/Lafayette Hwy. and Ash Rd., the existing and future year volumes are above 2,000 vpd, so that the ratio of the composite CMFs would be 1.0, with no change in the estimated future crash rate.

The segment on Worden Hill Rd. between OR 240 and the beginning of pavement is gravel, so there are no defined lane or shoulder widths. Therefore, the lane and shoulder width CMFs could not be applied for this segment.

There are no volume-based CMFs for intersections, so the future crash rate estimation procedure could not be applied for the intersections.

**Geometric Needs**

Future geometric needs for state highways may differ from existing needs depending on the level of future traffic volumes. Such a difference may occur where an existing geometric feature is adequate for lower volumes, but falls below the standard for higher future volumes.

Potential volume-based differences for geometrics were investigated for lane and shoulder widths. Based on the standards in the Highway Design Manual,[12] future lane width needs were identified at the following locations where there are no existing needs:

- OR 219 – Yamhill County line to North Valley Rd. (M.P. 15.61 – M.P. 17.92)
- OR 153 – east of OR 18 to west of Deer Creek Flats Rd. (M.P. 0.0 – M.P. 0.76)
- OR 153 – east of Deer Creek Flats Rd. to Yamhill River (M.P. 0.97 – M.P. 2.84)
- OR 153 – Yamhill River to Broadmead Rd. (M.P. 3.35 – M.P. 3.98)

The lane width need would apply to both sides of the highway at each of these locations.

There would no differences in shoulder width needs along state highways due to the higher future volumes.

The lane width and shoulder width standards for county roads are based strictly on functional classification and do not consider traffic volume. Therefore, future lane and shoulder width needs for county roads would be the same as existing needs.

Figure 7 shows the future geometric needs on both state highways and county roads.

**BICYCLE AND PEDESTRIAN**

Because traffic volumes will remain low on most county roads and some state highways, shared roadways will continue to be adequate for bicycle use along these facilities. For roadways with existing bicycle needs, the level of need will become higher as traffic volumes increase. These are roadways with higher bicycle and vehicle volumes and:

- The shoulder width standard is not met; or
- The shoulder is not paved.

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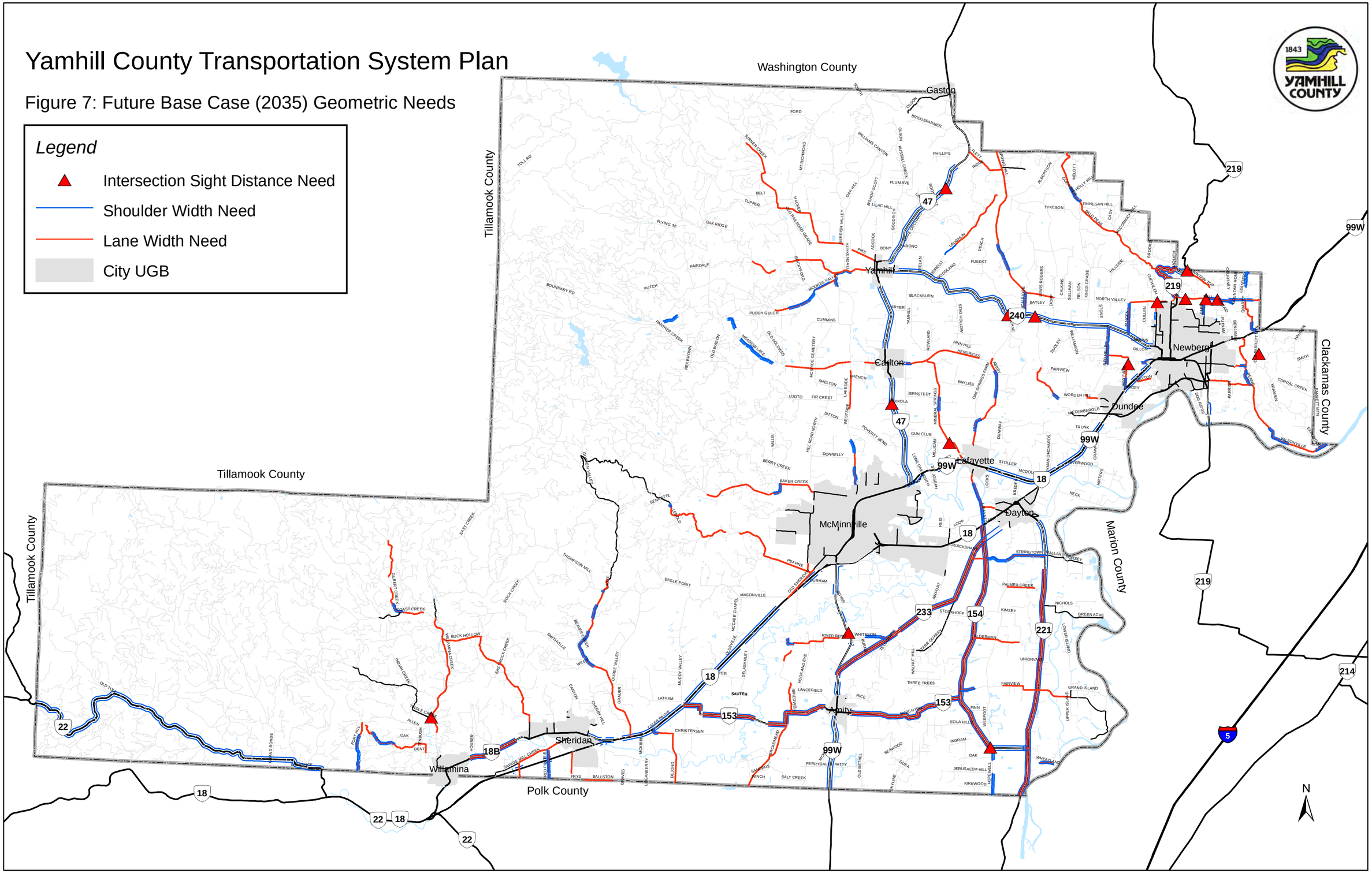
[12] Oregon Department of Transportation, Highway Design Manual, (2003).

# Yamhill County Transportation System Plan

## Figure 7: Future Base Case (2035) Geometric Needs

*Legend*

- Intersection Sight Distance Need
- Shoulder Width Need
- Lane Width Need
- City UGB



The locations identified in the existing conditions analysis meeting these criteria were:

- OR 47
- OR 99W
- OR 154/Lafayette Hwy.
- Westside Rd.
- Old Sheridan Rd.

Due to higher traffic volumes, the level of need will also be higher at those locations with pedestrian needs identified in the existing conditions analysis. These are largely the same as the locations with bicycle needs, in addition to OR 18B between Sheridan and Willamina.

YAMHELAS WESTSIDER TRAIL

Yamhill County Parks Department has been working with the Friends of Yamhelas Westsider Trail, citizens, and local businesses on a proposal to acquire the abandoned Union Pacific Railroad right-of-way for the Yamhelas Westsider Trail. The trail will eventually run from OR 99W through the cities of Carlton, Yamhill, and Gaston, linking with the state highway bicycle trail to Forest Grove and Hagg Lake (see Figure 8). Access will be available from intersecting county roads and nearby OR 47.

The trail will connect urban neighborhoods to regional open spaces, serving pedestrians, joggers, equestrians and bicyclists. The Friends of Yamhelas Westsider Trail has been awarded $1.4 million in grant money by the Oregon Transportation Commission – enough to pay for almost 13.5 miles of the 17 miles of Union Pacific right-of-way needed.[13]

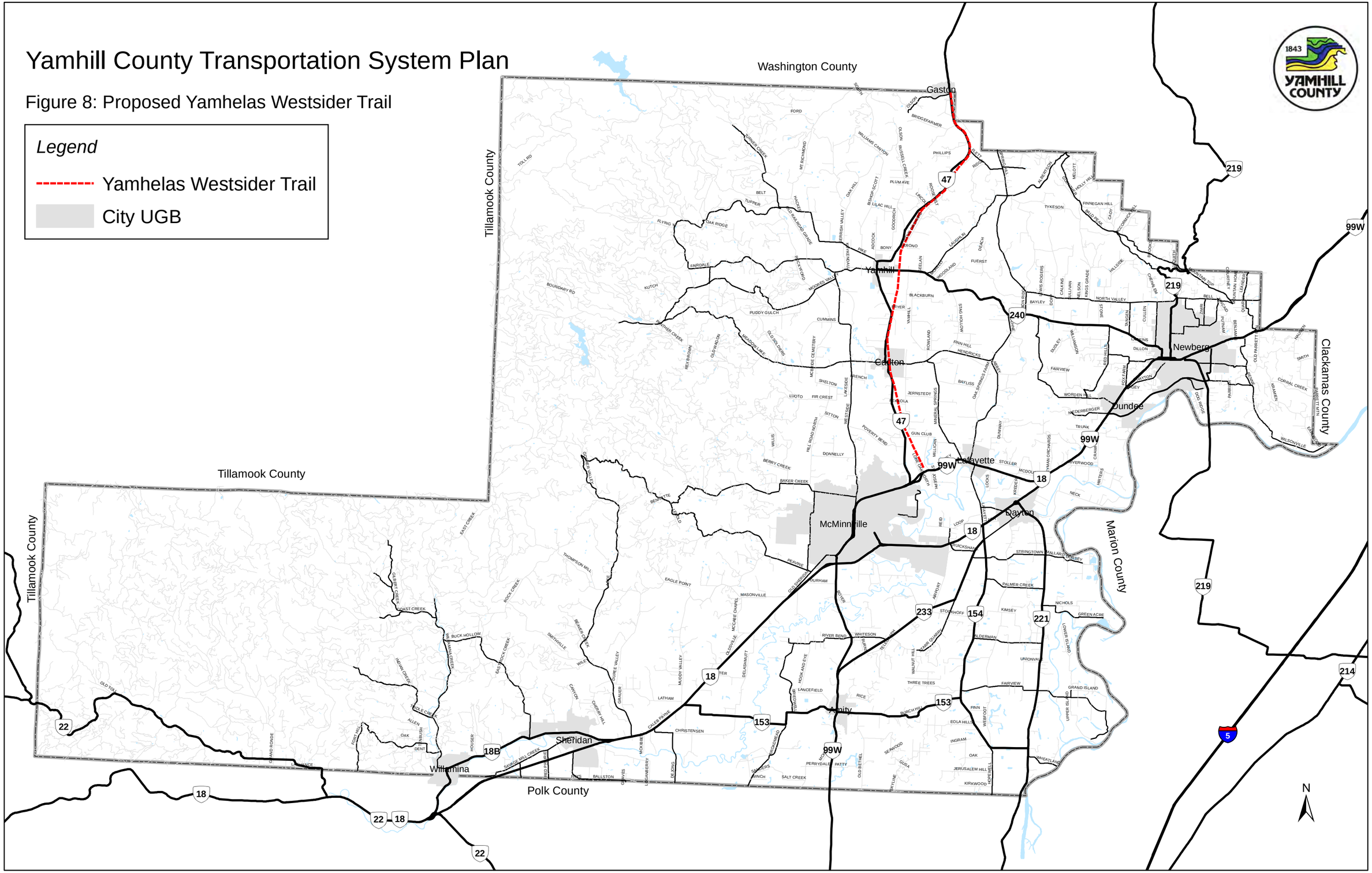
[13] www.yamhelaswestsidetrail.org website, accessed July 24, 2013.

# Yamhill County Transportation System Plan

Figure 8: Proposed Yamhelas Westsider Trail

*Legend*

- Yamhelas Westsider Trail
- City UGB



**CORRIDOR HEALTH**

The Corridor Health Tool was used to calculate a future corridor health score for each corridor segment by applying the same set of factors, weights, and formulas used for the existing conditions analysis. The factors correspond to the same areas of need described in the previous sections, i.e., mobility, traffic operations, safety, geometrics, and bicycle and pedestrian facilities.

The sum of the weights for the factors is equal to 100. The formulas were set up to produce scores for each factor ranging from zero to one, with a score of one representing "perfect" health and a score of zero indicating very poor conditions or performance. The weights and formulas for each factor are shown in Table 9.

**Table 9 – Corridor Health Score Weights and Formulas**

| Factor | Weight | Scoring Formula |
|---|---|---|
| | | |
| Safety | 35 | =0.5/X if X ≥ 0.5; else 1<br>Where:<br>X = 0.7*(Fatal +Injury Crash Rate for Segment/ Average for Facility Category) + 0.3*(Total Crash Rate for Segment/ Average for Facility Category) |
| Traffic Operations | 15 | =1-min(Turn Lane Need, Max. Turn Lane Need)/ Max. Turn Lane Need* |
| Geometrics | 20 | =0.2*min(Lane Width/Lane Width Standard,1)+0.8*min(Shoulder Width/Shoulder Width Standard,1) |
| Bicycle/Pedestrian Facilities | 15 | =(% of Segment with Adequate Bicycle/Pedestrian Facilities)/100** |
| Mobility | 15 | =min((1-VC)/(1-VC Standard),1) |

* Turn lane need is the number of turn lanes (left-turn and right-turn) needed per segment. Since segment endpoints were defined by intersections with minor collector roadways or above, a value of four was assumed for the maximum turn lane need (i.e., the need for a left-turn lane and right-turn lane at each end of the segment).

** Bicycle/pedestrian facilities were considered to be adequate if the shoulder width standard was met.

The factor scores were multiplied by the weights to produce an overall corridor health score for each segment ranging between 0 and 100, with 100 representing the best score attainable and 0 being the worst score.

Results

The segments were assigned to good, fair, and poor categories of corridor health based on the scores. The scores corresponding to each category are:

- Good – 75 – 100
- Fair – 50 – 74
- Poor - < 50

The future corridor health category for each state highway and county roadway segment is shown Figure 9. The percentages of state highway mileage by corridor health category are presented in Table 10.

**Table 10 – Future Corridor Health – State Highways**

| State Highway | Corridor Health | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Good | | Fair | | Poor | | Total | |
| | Miles | % | Miles | % | Miles | % | Miles | % |
| OR 18 | 10.3 | 64% | 5.9 | 36% | 0 | 0% | 16.2 | 100% |
| OR 18B | 2.0 | 67% | 0 | 0% | 1.0 | 33% | 3.0 | 100% |
| OR 22 | 0 | 0% | 2.9 | 22% | 10.0 | 78% | 12.9 | 100% |
| OR 47 | 3.1 | 22% | 7.3 | 51% | 3.9 | 27% | 14.3 | 100% |
| OR 99W | 10.5 | 59% | 7.2 | 41% | 0 | 0% | 17.7 | 100% |
| OR 153 | 0 | 0% | 7.4 | 56% | 5.9 | 44% | 13.3 | 100% |
| OR 154 | 0 | 0% | 2.4 | 38% | 3.9 | 62% | 6.3 | 100% |
| OR 219 | 1.5 | 33% | 0.7 | 16% | 2.3 | 51% | 4.5 | 100% |
| OR 221 | 0 | 0% | 6.1 | 62% | 3.8 | 38% | 9.9 | 100% |
| OR 233 | 2.3 | 28% | 4.4 | 54% | 1.5 | 18% | 8.2 | 100% |
| OR 240 | 1.2 | 12% | 4.0 | 38% | 5.2 | 50% | 10.4 | 100% |
| **Total** | 30.9 | 27% | 48.3 | 41% | 37.5 | 32% | 116.7 | 100% |

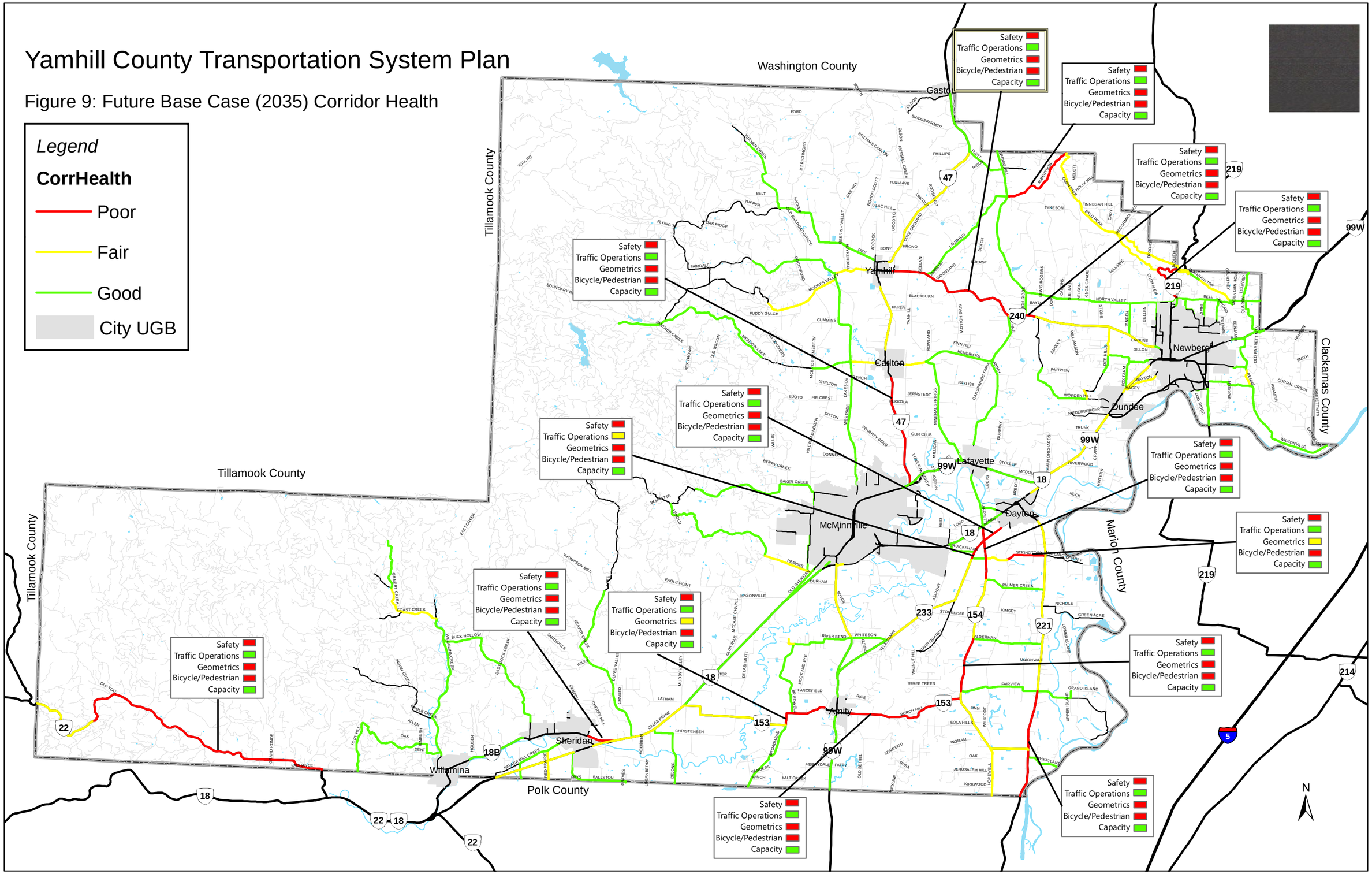
# Yamhill County Transportation System Plan

## Figure 9: Future Base Case (2035) Corridor Health

*Legend*

**CorrHealth**

- Poor
- Fair
- Good
- City UGB



The percentages of overall state highway mileage falling within each corridor health category are:

- Good – 27%
- Fair – 41%
- Poor - 32%

Corridor health remains the same in the future for most state highway segments. Along OR 99W, the segments between Newberg and Dundee improve from poor to fair because of the improved mobility with the construction of the Newberg-Dundee Bypass. The segment of OR 153 from Hopewell Rd. to OR 221 changes from good to fair because of the shoulder width needs associated with the higher future volumes along this segment. The segment of OR 18 from Red Prairie Rd. to the Yamhill County line and the segment of OR 219 north of North Valley Rd. both change from fair to poor because of the additional turn lane needs resulting from higher future volumes.

As for existing conditions, nearly all of the county roadway mileage falls within the good or fair categories, as reflected in the following percentages:

- Good – 88%
- Fair – 7%
- Poor - 5%

The Corridor Health category would not change for any of the county road segments.

**TRANSIT**

Based on the anticipated slow rates of population and employment growth within the rural portion of the county, the type and level of future needs for Yamhill County Transit Area (YCTA) transit services will likely be similar to the existing needs. These include the need for:

- Improved transportation services
    - Transportation services during evenings and weekends
    - More frequent bus stops
    - Service to large employers such as the Spirit Mountain Casino and the Riverside Drive industrial area
    - Improved travel time reliability on OR 99W

- Expanded transportation service to specific areas
    - Outlying areas of Yamhill County
    - Inter-city transportation between Yamhill and Carlton
    - Inter-city transportation between Sheridan, Willamina and Grand Ronde (West Valley)
    - More regional connections (e.g., the Oregon coast)
- Improved transit facilities
    - Designated bus stops with signs and posted schedules
    - Transit shelters for fixed routes
    - Sidewalks, curb cuts, loading spaces, and crosswalks
    - Better ADA accessibility
    - Transit center in McMinnville
    - Bus pull-outs

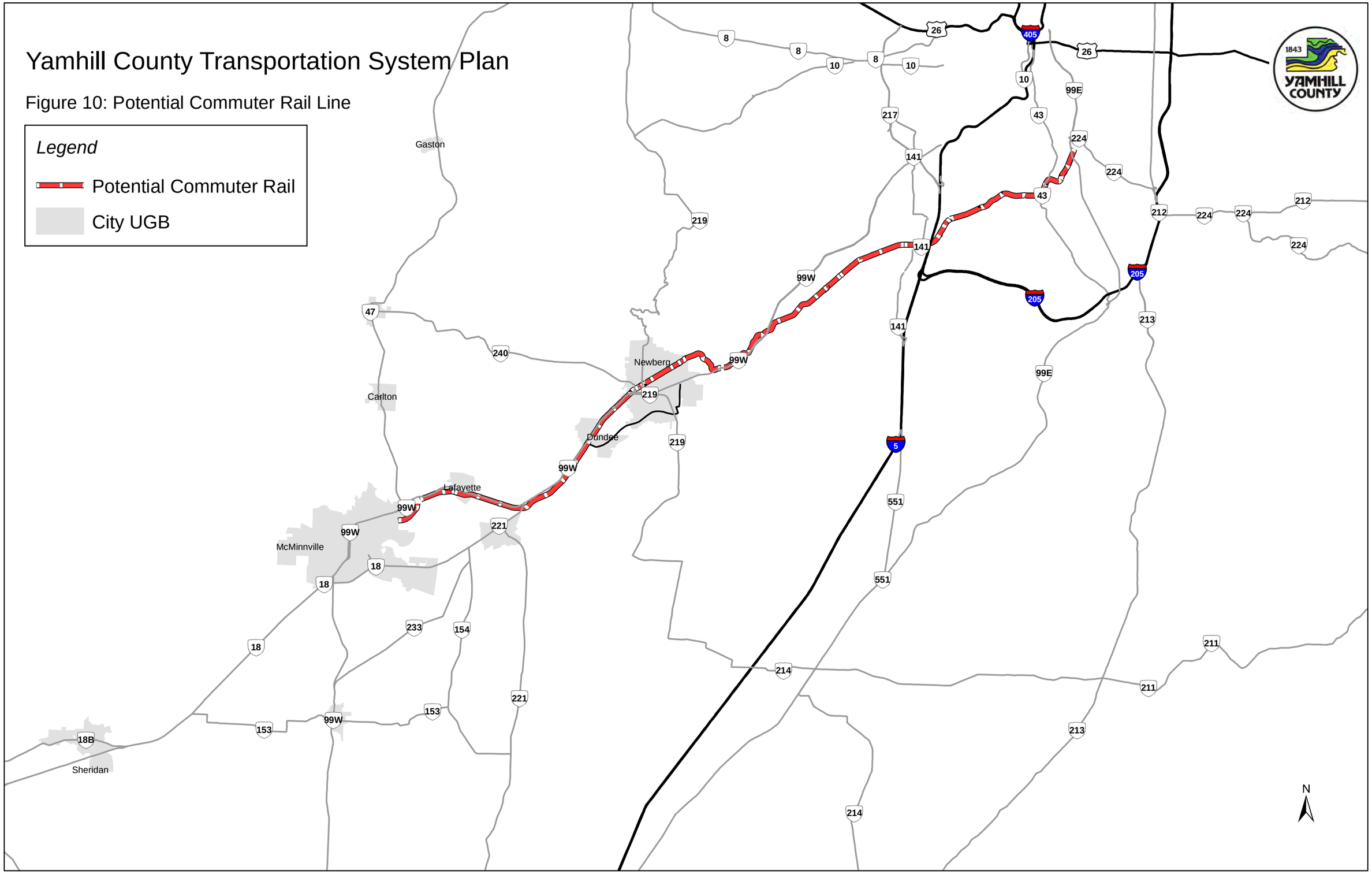
In addition to the future YCTA needs, future commuter rail needs were identified in the Yamhill County Commuter Rail Study.[14] The study evaluated the potential for commuter rail operation from McMinnville to Milwaukie utilizing existing freight railroad lines which generally parallel OR 99W (see Figure 10). Key findings from the study include the following:

- Assuming an upgrade of the line and a maximum 60-mph operation, travel time would be 68 minutes from McMinnville to Milwaukie and 46 minutes from Newberg to Milwaukie.
- A schedule of five inbound trips in the morning peak period and five outbound trips in the evening peak based on 30-minute frequencies appears realistic. Two trains in each peak would run to and from McMinnville, with the remainder operating to and from Newberg.

[14] Oregon Department of Transportation, Yamhill County Commuter Rail Study, (1998).

# Yamhill County Transportation System Plan

Figure 10: Potential Commuter Rail Line



- Although adequate for low-speed freight service, the line would require considerable upgrading to accommodate commuter rail operations safely and cost-effectively. In particular, most of the bridges and trestles would require replacement or substantial upgrading, a significant number of ties would require replacement, much of the rail would have to be replaced, and many grade crossings would require upgraded protection to accommodate the increased speeds.
- The estimated capital cost to place a McMinnville-to-Milwaukie commuter rail line into operation would be $112.2 million (1997 dollars). The estimated costs include the upgrading of track, replacement of trestles, upgrading of crossing protection, vehicles, maintenance facilities, centralized train control, stations, and park-and-ride lots.
- The estimated operating cost would be $3.0 million annually.
- Daily boardings for 2015 are estimated to be 1,580. With the travel patterns heavily oriented towards the metropolitan area in the morning and away in the evening, there appears to be limited rationale for providing reverse commute service.
- Given the number of riders with trip destinations in the OR 217 corridor and Wilsonville, a timed connection with a Beaverton to Wilsonville line would be important.
- Aside from regular commute functions, the line would provide opportunities to develop excursion travel to other attractions in the corridor.