

Transportation Impact Analysis

Langer Farms - Phase 7

Sherwood, Oregon

July 2012

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Langer Farms – Phase 7

Sherwood, Oregon

Prepared For:
Langer Gramor, LLC
19767 SW 72nd Avenue, Suite 100
Tualatin, OR 97062
(503) 245-1976

Prepared By:
Kittelson & Associates, Inc.
610 SW Alder Street, Suite 700
Portland, OR 97205
(503) 228-5230

Project Manager: Dave Daly, P.E.
Project Principal: Chris Brehmer, P.E.

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TABLE OF CONTENTS

Executive Summary 2

 Findings 2

 Recommendations 5

Introduction 7

 Project Description 7

 Scope Of The Report..... 7

Existing Conditions 12

 Site Conditions and Adjacent Land Uses 12

 Transportation Facilities 12

 Traffic Volumes And Peak Hour Operations 14

 Current Levels of Service 17

Transportation Impact Analysis 21

 Year 2013 Background Traffic Conditions 21

 Proposed Development Plan 25

 Adams north Concept Plan Traffic Re-Route 26

 Year 2013 Total Traffic Conditions 26

 Queueing analysis..... 33

 On-Site Circulation/Site-Access Operations 35

Conclusions and Recommendations 38

 Findings 38

 Recommendations 40

References 42

Seasonal Adjustment 2

Description of Level-of-Service Methods and Criteria..... 4

 Level-of-Service Concept 4

 Signalized Intersections 4

 Unsignalized Intersections 5



LIST OF FIGURES

| | | |
|-----------|--|----|
| Figure 1 | Site Vicinity Map | 8 |
| Figure 2 | Concept Site Plan | 9 |
| Figure 3 | Existing Lane Configurations and Traffic Control Devices | 13 |
| Figure 4 | Existing Traffic Conditions, Weekday PM Peak Hour..... | 15 |
| Figure 5 | Existing Traffic Conditions, Saturday Mid-Day Peak Hour | 16 |
| Figure 6 | Year 2013 Background Traffic Conditions, Weekday PM Peak Hour..... | 23 |
| Figure 7 | Year 2013 Background Traffic Conditions, Weekday PM Peak Hour..... | 24 |
| Figure 8 | Estimated Net New Site-Generated Trips, Weekday PM Peak Hour..... | 28 |
| Figure 9 | Estimated Net New Site-Generated Trips, Saturday Mid-Day Peak Hour | 29 |
| Figure 10 | Year 2013 Lane Configurations and Traffic Control Devices..... | 30 |
| Figure 11 | Year 2013 Total Traffic Conditions, Weekday PM Peak Hour..... | 31 |
| Figure 12 | Year 2013 Total Traffic Conditions, Saturday Mid-day Peak Hour | 32 |

LIST OF TABLES

| | | |
|---------|--|----|
| Table 1 | Existing Transportation Facilities | 12 |
| Table 2 | Intersection Crash History (January 1, 2006 – December 31, 2010) | 18 |
| Table 3 | Proposed Langer Farms Phase 7 Trip Generation | 25 |
| Table 4 | 95th Percentile SimTraffic Queuing Analysis, | 33 |

APPENDICES

- Appendix A Development Agreement
- Appendix B Preliminary Traffic Scoping Memorandum
- Appendix C Traffic Count Data
- Appendix D Seasonal Adjustment
- Appendix E Description of Level-of-Service Methods and Criteria
- Appendix F ODOT 99W Mobility Standards Letter
- Appendix G Year 2012 Existing Traffic Conditions
- Appendix H Crash Data
- Appendix I County Model Data
- Appendix J Year 2013 Background Traffic Level-of-Service Worksheets
- Appendix K Internal Trip Capture Worksheets
- Appendix L Year 2013 Total Traffic Level-of-Service Worksheets
- Appendix M Turn Lane Warrants

Section 1
Executive Summary

EXECUTIVE SUMMARY

Langer Gramor, LLC is proposing to develop the 19.7-acre parcel located in the southeast corner of the SW Langer Farms Parkway/SW Tualatin-Sherwood Road intersection in Sherwood, Oregon. The proposed development plan assumed for this analysis includes a total of 197,800 square feet of building area. Included in this total is 180,800 square feet of retail space (including a 145,000 square foot anchor tenant and three retail buildings), a 3,500 square-foot bank with drive-thru, a 10,000 square-foot quality restaurant, and a 3,500 square-foot fast food restaurant with drive-thru. This plan was developed with conservative site build out assumptions for the purpose of identifying and mitigating traffic impacts associated with the highest trip generation potential for the site. The actual development program for the site may vary as tenants are identified in accordance with the alternative development plans approved as part of the Phase 7 Site Plan Review application. However, each of these alternatives is estimated to result in lower trip generation potential for the site than the plan assumed in this analysis.

Access to the proposed development is planned via four separate driveways, including one full-access driveway located along SW Langer Farms Parkway approximately 500-feet south of SW Tualatin-Sherwood Road and one right-in/right-out driveway and two full-access driveways located along the new SW Century drive extension.

Per the terms of a development agreement between Langer Family, LLC and the City of Sherwood, Langer Gramor, LLC will develop the SW Century Drive extension as part of the proposed development along with an extension of SW Langer Farms Parkway between SW Tualatin-Sherwood Road and 99W. Langer Gramor, LLC is also proposing to signalize the SW Langer Farms Parkway/SW Tualatin-Sherwood Road intersection as part of the proposed development in conjunction with constructing or providing “fee-in-lieu” for site frontage improvements along SW Tualatin-Sherwood Road. Construction of the proposed development, future roadway extensions, traffic signal and other improvements is expected to begin in late 2012 with anticipated build-out and occupation in 2013.

In accordance with the City of Sherwood Zoning and Community Development Code 16.90.030.D.6, the results of this study indicate that the proposed Langer Farms Phase 7 can be developed while maintaining acceptable traffic operations and safety at the study intersections with inclusion of the recommended mitigation measures.

FINDINGS

Year 2012 Existing Conditions

- All of the study intersections operate acceptably during the weekday p.m. and Saturday mid-day peak hours.
- A review of historical crash data did not reveal any patterns or trends that require mitigation associated with this project for all but one of the study intersections.

- The 99W/SW Roy Rogers Road-Tualatin-Sherwood Road intersection experiences a crash rate of 1.06 crashes per million entering vehicles (MEV) based on the recent 5 years of crash data reviewed. Construction of the SW Langer Farms Parkway extension, in accordance with the project development agreement, will provide an alternate adjacent route for traffic on 99W resulting in a change in future travel patterns at the 99W/SW Roy Rogers Road-SW Tualatin-Sherwood Road intersection.

Year 2013 Background Traffic Conditions

- The year 2013 background traffic volumes were developed by applying a 1.5 percent annual growth rate to the 30th highest hour design volumes during the weekday p.m. and Saturday mid-day peak hours.
- During the year 2013 weekday p.m. and Saturday mid-day peak hour background traffic conditions, all of the study intersections are forecast to operate acceptably during the weekday p.m. and Saturday mid-day peak hours.

Proposed Development Plan

- The proposed development is estimated to generate approximately 8,070 net new weekday daily trips; including 760 trips (385 inbound, 375 outbound) during the weekday p.m. peak hour and 1,025 trips (550 inbound, 475 outbound) during the Saturday mid-day peak hour.
- The trip estimate for the weekday p.m. peak hour is less than the Highway 99W Capacity Allocation Program trip cap of 43 p.m. peak hour trips per acre for this site. (43 trips per acre x 19.7 acres = 847 net p.m. peak trips).
- A trip distribution pattern for the proposed development was developed based on information provided by City of Sherwood staff and is based on data contained in the City's travel demand model.

Year 2013 Total Traffic Conditions

- Transportation improvements identified in the development agreement between Langer Gramor, LLC and the City of Sherwood were included in the year 2013 total traffic conditions analysis. The improvements are as follows:
 - SW Century Drive Extension (from the SW Langer Farms Parkway/Century Drive roundabout to the existing Industrial Way connection);
 - SW Langer Farms Parkway Extension (from the SW Langer Farms Parkway/Tualatin-Sherwood Road intersection to the OR 99W/Home Depot Driveway), and
 - SW Langer Famers Parkway/SW Tualatin-Sherwood Road Traffic Signal

- Each of the above mentioned improvements were included in the year 2013 total traffic conditions analysis. Some background traffic was re-routed to account for the change in travel patterns from the Langer Farms Parkway Extension Project.
- Site-generated traffic was assigned to the study area roadways based on the assumed trip distribution pattern.
- All of the study intersections and site-access driveways are forecast to operate acceptably during the weekday p.m. and Saturday mid-day peak hours with the exception of the Langer Farms Parkway/Site Access Driveway.
 - Upon full build out of the proposed development, all movements at this intersection will operate well below capacity during both time periods; however, vehicles in the shared left/through lane exiting the site at this driveway will experience delay resulting in a LOS F during the weekday p.m. peak hour and Saturday mid-day peak hour. The site has been designed to accommodate the resulting on-site queues and other site driveways with less delay are available on Century Drive. Each of the driveways to Century Drive are forecast to operate at LOS A and B during the weekday p.m. peak hour. Additionally, these intersections operate at v/c ratios below 0.10 during the p.m. peak hour and maintain adequate additional capacity to accommodate potential internal reroute of traffic.

On-Site Circulation/Site-Access Operations/Queuing Analysis

- All of the access points will function acceptably with stop control.
- Findings of the SimTraffic 95th percentile queuing analysis are:
 - There are locations within the study area where 95th percentile queue lengths are forecast to exceed the available storage during peak conditions. For locations at the 99W/Tualatin Sherwood Road intersection, where the forecast queue length exceeds the available storage, it is important to note that the reported queues represent conditions that persist from the background traffic conditions. Further, the mobility standard for this intersection allows for conditions exceeding capacity, thus accepting a moderate level of traffic congestion that occurs during the peak 15 minutes of the typical weekday.
 - Other locations along Tualatin Sherwood Road also experience congestion during the weekday p.m. peak hour. The MSTIP 3D improvement project along Tualatin-Sherwood Road, planned for construction in 2014, will provide additional capacity improvements along this section of Tualatin Sherwood Road and at the 99W/Tualatin Sherwood Road intersection, thus improving overall traffic operations.
 - Given the future transportation improvement identified through the MSTIP 3D project at this location, no additional mitigation is recommended along this corridor.

RECOMMENDATIONS

The following list provides a summary of the mitigation measures recommended as part of this proposed development.

- Construct the transportation improvements identified in the development agreement between Langer Gramor, LLC and the City of Sherwood. The improvements are as follows:
 - SW Century Drive Extension (from the SW Langer Farms Parkway/Century Drive roundabout to the existing Industrial Way connection);
 - SW Langer Farms Parkway Extension (from the SW Langer Farms Parkway/Tualatin-Sherwood Road intersection to the OR 99W/Home Depot Driveway), and
 - SW Langer Farms Parkway/SW Tualatin-Sherwood Road Traffic Signal.
- Develop the western most site access driveway to SW Century Drive as a right-in/right-out access to minimize potential vehicle queuing conflicts with traffic at the SW Langer Farms Parkway/SW Century Drive roundabout. Extension of the splitter island at the roundabout (east leg) will be necessary to properly restrict movements at this driveway.
- Develop the full-access driveway to Langer Farms Parkway to align the westbound through lane with the receiving lane at the opposing driveway.
- Langer Gramor, LLC should work with City staff to determine a plan for outright construction, or a “fee-in-lieu” for site frontage improvements along SW Tualatin-Sherwood Road.
- Shrubbery and landscaping, as well as above ground utilities and signage near the site access points should be located and maintained to ensure adequate sight distance.

Additional details of the study methodology, findings, and recommendations are provided within this report.

Section 2
Introduction

INTRODUCTION

PROJECT DESCRIPTION

Langer Gramor, LLC is proposing to develop the 19.7-acre parcel located in the southeast corner of the SW Langer Farms Parkway/SW Tualatin-Sherwood Road intersection in Sherwood, Oregon. The proposed development plan assumed for this analysis includes a total of 197,800 square feet of building area. Included in this total is 180,800 square feet of retail space (including a 145,000 square foot anchor tenant and three retail buildings), a 3,500 square-foot bank with drive-thru, a 10,000 square-foot quality restaurant, and a 3,500 square-foot fast food restaurant with drive-thru. This plan was developed with conservative site build out assumptions for the purpose of identifying and mitigating traffic impacts associated with the highest trip generation potential for the site. The actual development program for the site may vary as tenants are identified in accordance with the alternative development plans approved as part of the Phase 7 Site Plan Review application. However, each of these alternatives is estimated to result in lower trip generation potential for the site than the plan assumed in this analysis.

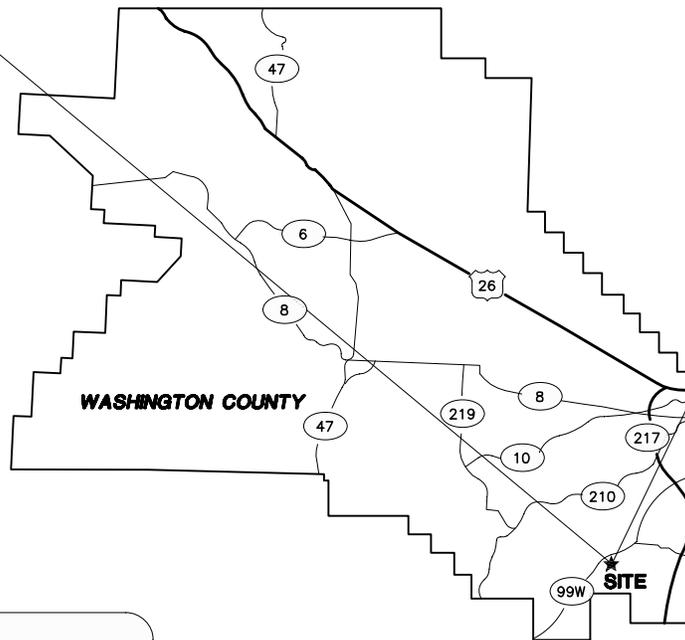
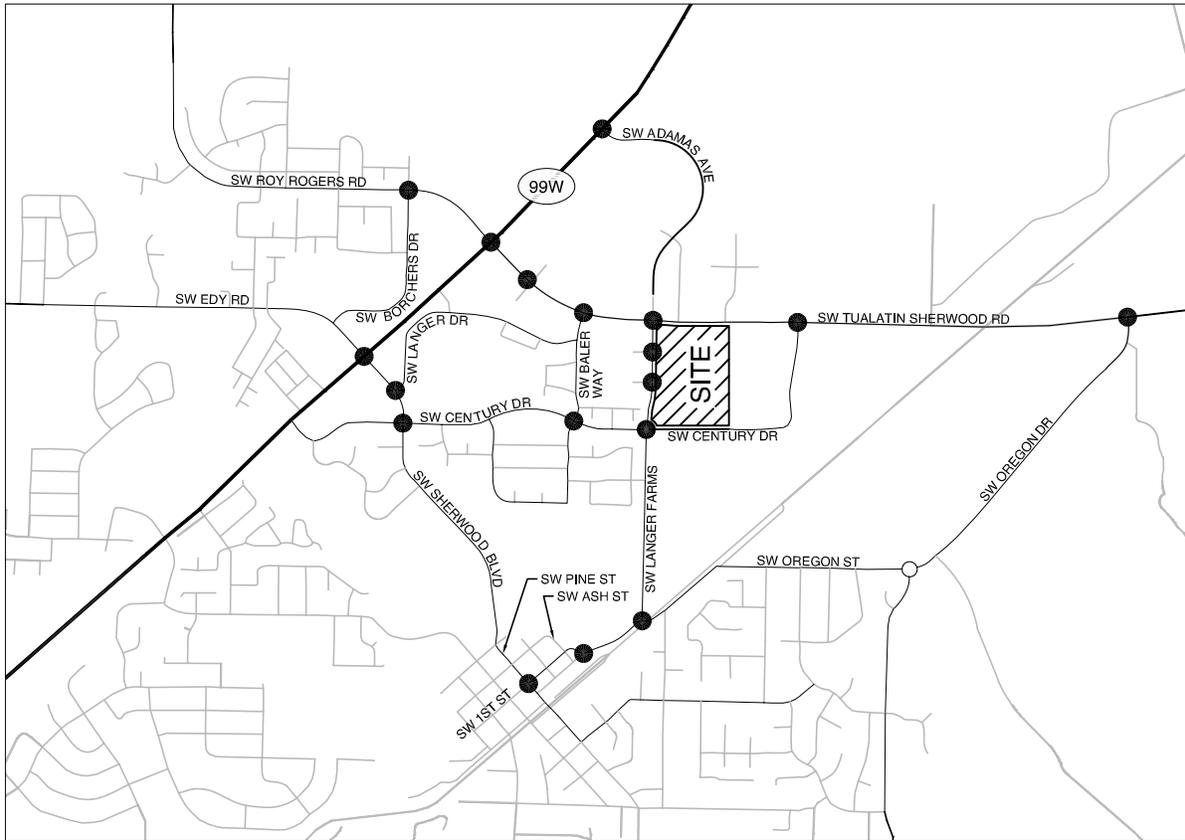
Per the terms of a development agreement between Langer Family, LLC and the City of Sherwood, Langer Gramor, LLC will develop the SW Century Drive extension as part of the proposed development along with an extension of SW Langer Farms Parkway between SW Tualatin-Sherwood Road and 99W. Langer Gramor, LLC is also proposing to signalize the SW Langer Farms Parkway/SW Tualatin-Sherwood Road intersection as part of the proposed development in conjunction with constructing or providing “fee-in-lieu” for site frontage improvements along SW Tualatin-Sherwood Road. *Appendix “A” contains a copy of the development agreement.* Construction of the proposed development, future roadway extensions, traffic signal and other improvements is expected to begin in late 2012 with anticipated build-out and occupation in 2013.

SCOPE OF THE REPORT

This analysis determines the transportation-related impacts associated with the proposed Langer Farms Phase 7 development and was prepared in accordance with the City of Sherwood, Washington County, and the Oregon Department of Transportation’s (ODOT) requirements for traffic impact studies. The study intersections and scope of this project were developed with City of Sherwood, Washington County and ODOT staff. The scope was also developed based on the criteria contained in the City of Sherwood Zoning and Community Development Code 16.106.070.E.3 related to the Highway 99w CAP trip analysis requirement. Operational analyses were performed at the following study intersections and site-access driveways:

ODOT Study Intersections

- 99W/SW Adams Road (Home Depot Driveway)
- 99W/SW Roy Roger Road-SW Tualatin-Sherwood Road
- 99W/SW Edy Road-SW Sherwood Boulevard



LEGEND

- - PLANNED FUTURE ROADWAY
- - STUDY INTERSECTIONS

**SITE VICINITY MAP
SHERWOOD, OREGON**

**FIGURE
1**

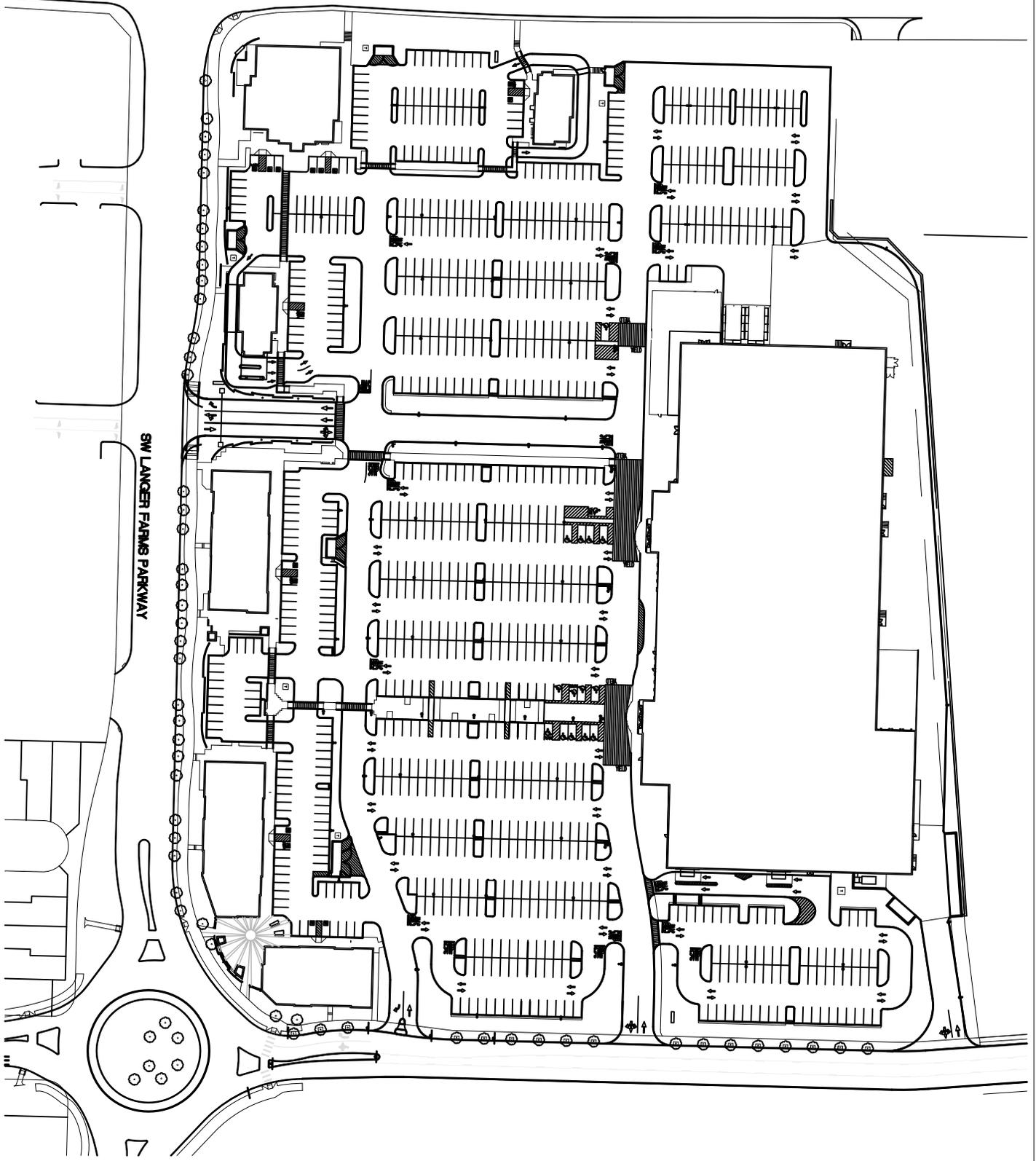
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(NO SCALE)

SW TUALATIN-SHERWOOD ROAD

SW LANGER FARMS PARKWAY



SITE PLAN PROVIDED BY TILAND/SCHMIDT ARCHITECTS - DATED 2012-07-19

PROPOSED SITE PLAN
SHERWOOD, OREGON

FIGURE

2

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County Study Intersections

- SW Borchers Drive/SW Roy Rogers Road
- Sherwood Marketplace Driveway/SW Tualatin-Sherwood Road
- SW Baler Way/SW Tualatin-Sherwood Road
- SW Langer Farms Parkway/SW Tualatin-Sherwood Road
- SW Century Drive/SW Tualatin-Sherwood Road
- SW Oregon Street/SW Tualatin-Sherwood Road

City Study Intersections

- SW Sherwood Boulevard/SW Langer Drive
- SW Sherwood Boulevard/SW Century Drive
- SW Baler Way/SW Century Drive
- SW Langer Farms Parkway/SW Century Drive (roundabout)
- SW Langer Farms Parkway/SW Oregon Street
- SW Oregon Street/SW 1st-SW Ash Street (oblong roundabout)
- SW 1st Street/SW Pine Street

Site-Access Driveways

- Langer Farms Parkway/North Target Driveway (Existing)
- Site-access Driveway 1 (Langer Farms Parkway)
- Site-access Driveway 2 (SW Century Drive west)
- Site-access Driveway 3 (SW Century Drive east)
- Site-access Driveway 4 (SW Century Drive east)

This analysis evaluates transportation conditions during the following analysis time periods:

- Year 2012 existing traffic conditions within the site vicinity during the weekday p.m. and Saturday mid-day peak periods;
- Year 2013 background traffic conditions (without the proposed development) during the weekday p.m. and Saturday mid-day peak periods;
- Trip generation and distribution estimates for the proposed development;
- Year 2013 total traffic conditions (with full build-out of the proposed development) during the weekday p.m. and Saturday mid-day peak periods;
- On-site traffic operations and circulation.

Appendix "B" contains the preliminary transportation scoping memorandum prepared for this analysis, with the jurisdictional responses.

Section 3
Existing Conditions

EXISTING CONDITIONS

The existing conditions analysis identifies the site conditions and current operational and geometric characteristics of the roadways within the study area. These conditions will be compared with future conditions later in this report.

Kittelson & Associates, Inc. (KAI) staff visited and inventoried the proposed Langer Farms Phase 7 development site and surrounding study area in February 2012. At that time, KAI collected information regarding site conditions, adjacent land uses, existing traffic operations, and transportation facilities in the study area.

SITE CONDITIONS AND ADJACENT LAND USES

The proposed site is located within the City of Sherwood, is currently vacant, and is zoned as a Planned Unit Development within a Light Industrial area (PUD-LI). The land uses in the vicinity of the site include retail/commercial, residential homes, and farmland.

TRANSPORTATION FACILITIES

Table 1 provides a summary of the study area roadway characteristics.

Table 1 Existing Transportation Facilities

| Roadway | Functional Classification ¹ | Number of Lanes | Posted Speed (mph ²) | Sidewalks | Bicycle Lanes | On-Street Parking |
|---------------------------|--|-----------------|----------------------------------|-----------|---------------|-------------------|
| 99W | Principal Arterial | 4-6 | 45 | Yes | Yes | No |
| SW Tualatin-Sherwood Road | Arterial | 2-4/5 | 35 | Yes | Yes | No |
| SW Langer Farms Parkway | Collector | 2 | 25 | Yes | Yes | No |
| SW Century Drive | Collector | 2 | 25 | Yes | Yes | Yes |

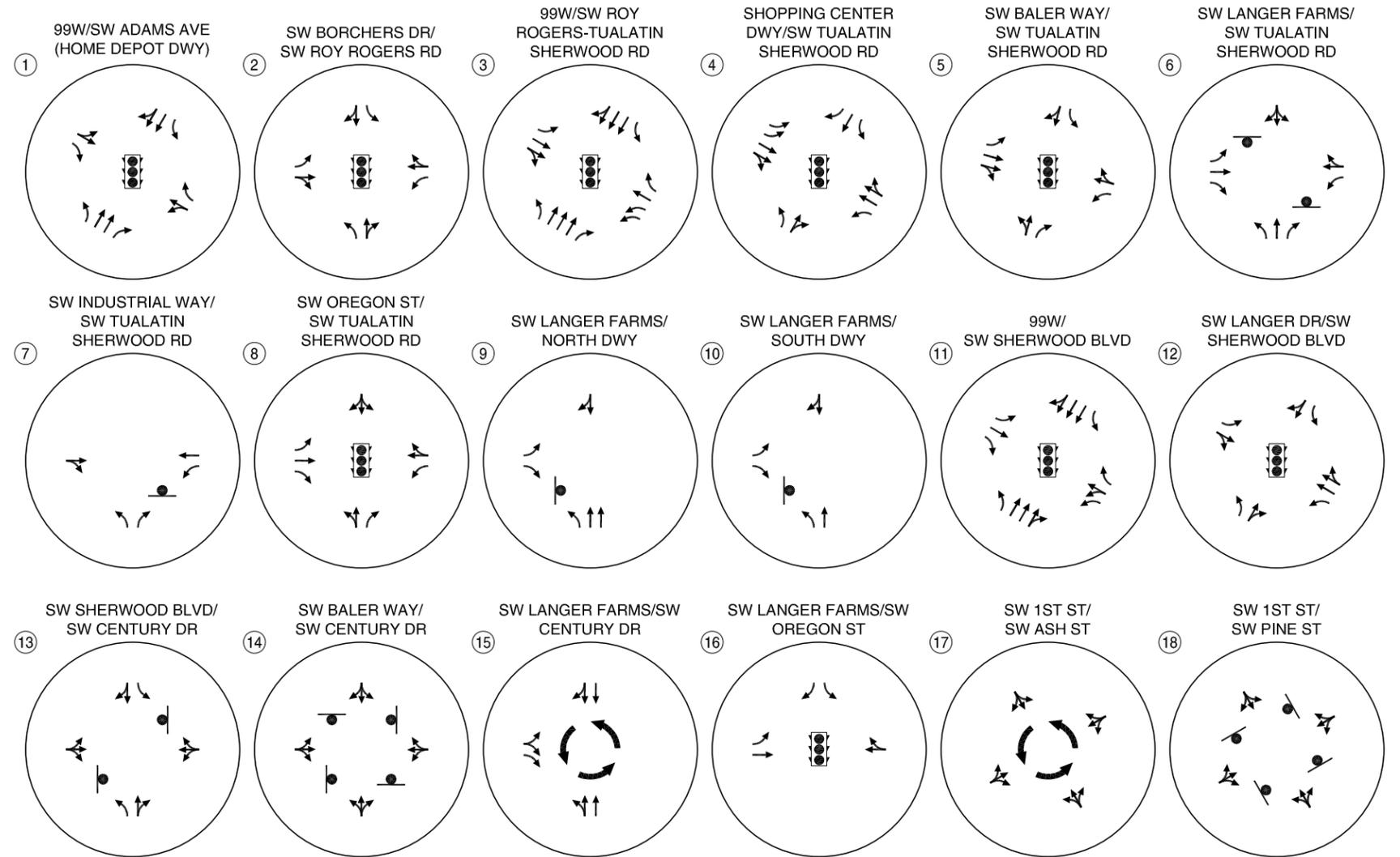
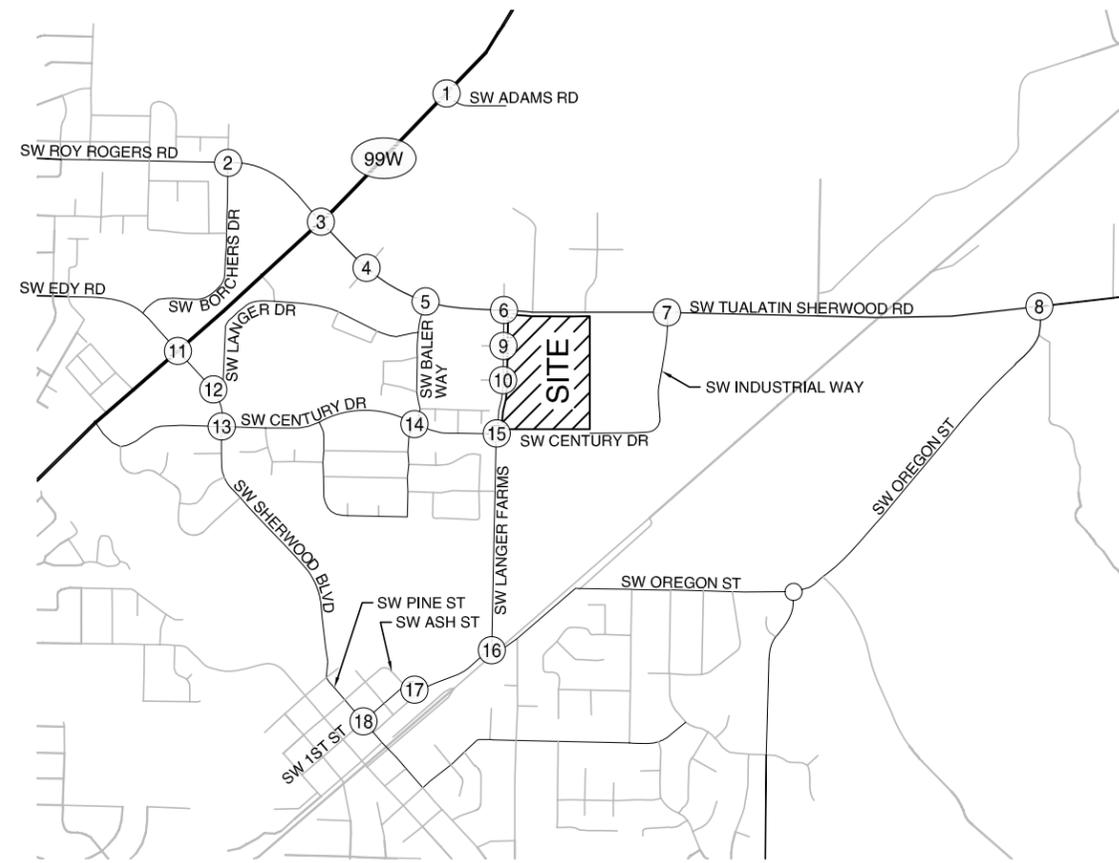
¹ Per City of Sherwood Transportation System Plan (Reference 1)

² MPH represents miles per hour

SW Tualatin-Sherwood Road and SW Langer Farms Parkway are the only two existing roadways that border the site. As shown in Table 1, the City of Sherwood classifies SW Tualatin-Sherwood Road as an arterial and SW Langer Farms Parkway as a collector. As an arterial, SW Tualatin-Sherwood Road is intended to provide local connectivity and support the principal arterial system, providing access to major commercial, residential, industrial, and institutional areas. As a collector, SW Langer Farms Parkway is intended to provide both access and circulation within and between residential and commercial/industrial areas. Both roadways currently meet their design standards and operate according to their functional classifications. Figure 3 illustrates the existing lane configurations and traffic control devices at the study intersections.



(NO SCALE)



LEGEND

- ROUNDABOUT
- OVERLAP
- STOP SIGN
- TRAFFIC SIGNAL

EXISTING LANE CONFIGURATIONS & TRAFFIC CONTROL DEVICES SHERWOOD, OREGON

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Pedestrian and Bicycle Facilities

Also shown in Table 1, both SW Tualatin-Sherwood Road and SW Langer Farms Parkway currently have sidewalks and bicycle lanes within the site vicinity. Further review indicates that a majority of the roadways within the site vicinity have continuous sidewalks as well as marked crosswalks at many major crossing locations.

Transit Facilities

Local transit service is currently provided within the site vicinity by TriMet. TriMet Bus Line #12 provides service between Sherwood and the Gresham Transit Center via SW Sherwood Boulevard, SW Langer Drive, SW Baler Way, and SW Tualatin-Sherwood Road (west of SW Baler Way) Monday through Friday from 4:30 a.m. to 3:30 p.m. on 30-60 minute headways and Saturdays and Sundays from 4:30 a.m. to 12:00 p.m. on 30-60 minute headways. TriMet Bus Line #94 provides service between Sherwood and the Portland City Center along the same route Monday through Friday from 6:00 to 7:30 a.m. on 10-15 minute headways. Service is not provided on Saturdays and Sundays. The closest transit stops are currently located along SW Langer Drive and SW Tualatin-Sherwood Road approximately $\frac{1}{4}$ mile from the site.

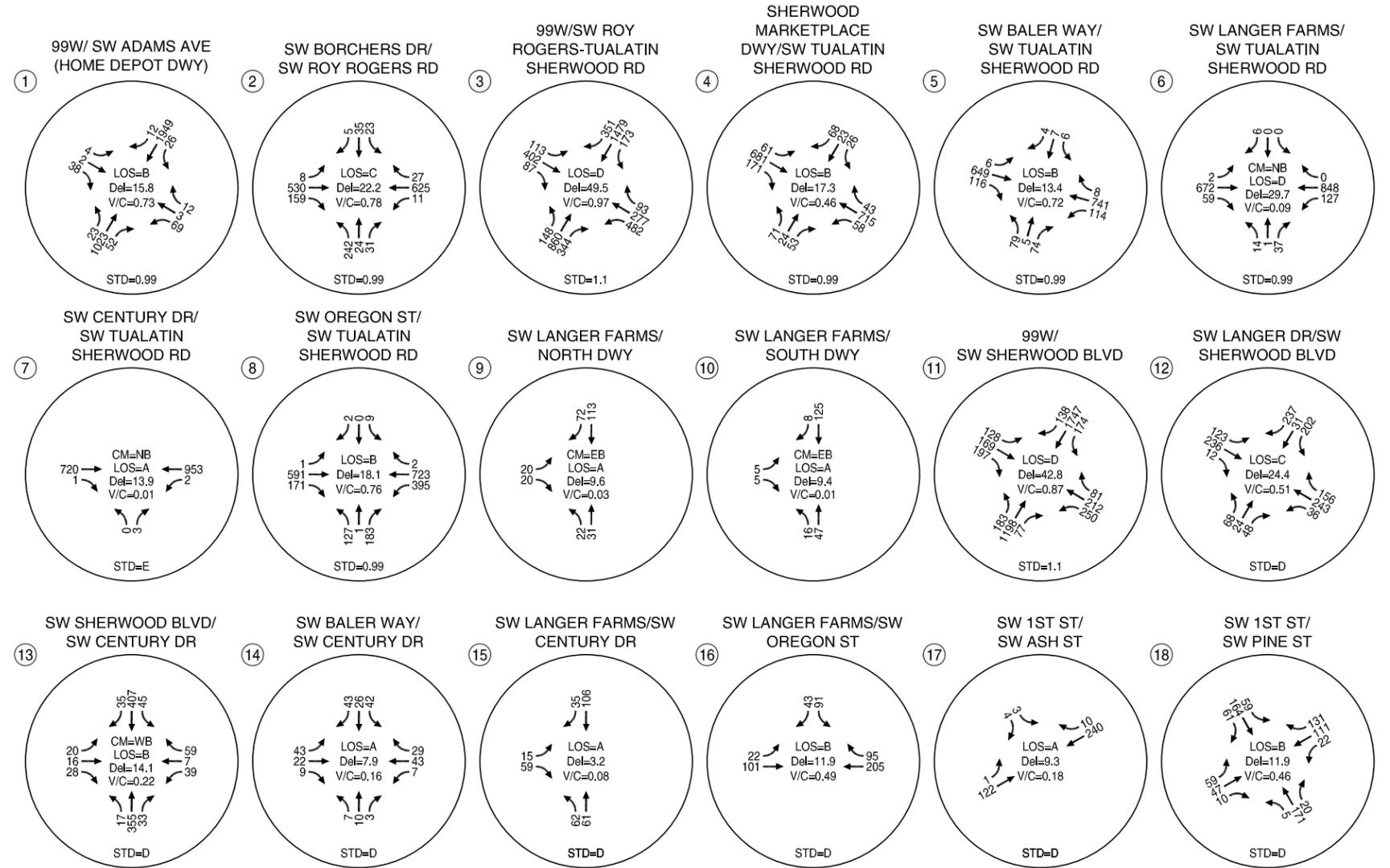
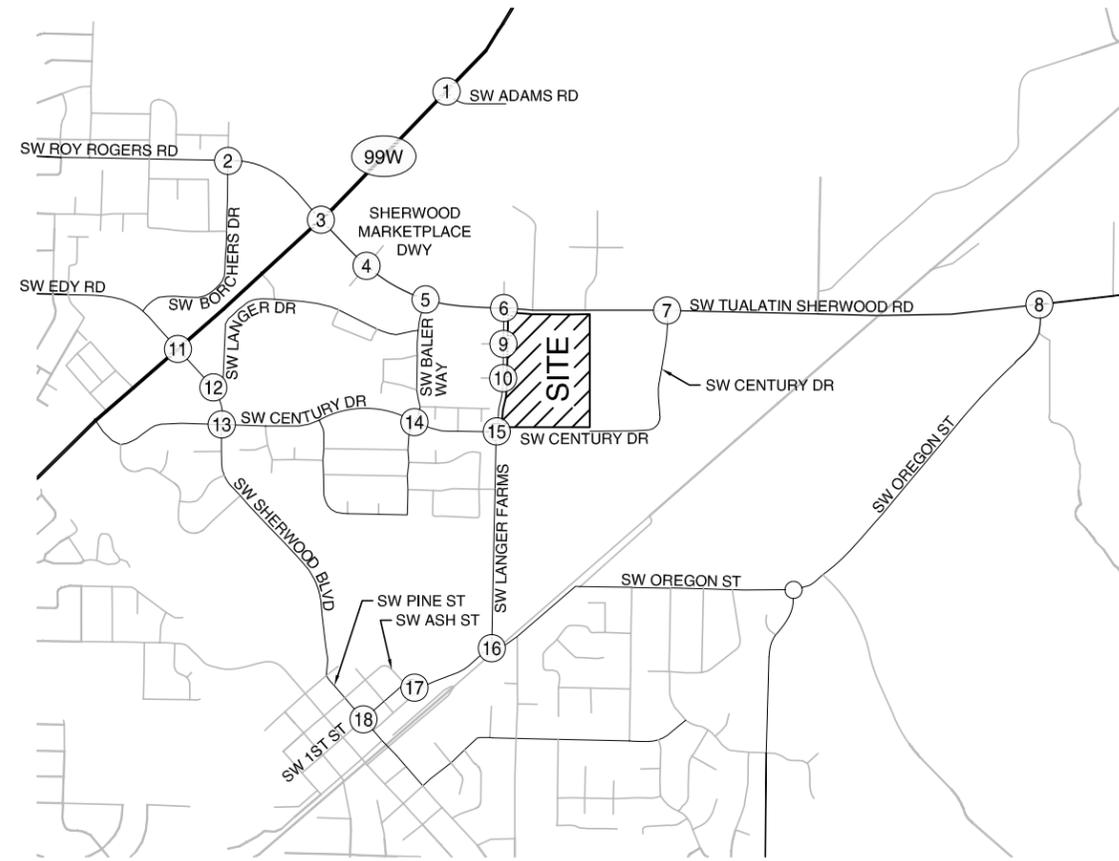
TRAFFIC VOLUMES AND PEAK HOUR OPERATIONS

Manual turning-movement counts were conducted at the study intersections in January 2012. All the weekday counts were conducted on a typical mid-week day during the evening (4:00 to 6:00 p.m.) peak time period while the weekend counts were conducted on a Saturday during the mid-day (12:00 to 2:00 p.m.) peak time period. The weekday system-wide peak hour was found to occur from 4:35 to 5:35 p.m. while the Saturday mid-day peak hour was found to occur from 12:15 to 1:15 p.m. along 99W and the adjacent intersections and from 12:55 to 1:55 p.m. at the remaining intersections (both Saturday peak hours are reflected in the traffic operations analyses). Figures 4 and 5 provide a summary of the year 2012 turning-movement counts at the study intersections, which are rounded to the nearest five vehicles per hour for the weekday p.m. and Saturday mid-day peak hours, respectively. *Appendix "C" contains the traffic count worksheets used in this study.*

The traffic volumes shown in Figures 4 and 5 along 99W were adjusted to 30th highest hour design volumes based on historical traffic data collected from an Automatic Traffic Recorder (ATR) located along 99W approximately 0.01 miles west of Brutscher Street in Newberg, Oregon. This ATR was selected based on its proximity to the site and the assumption that variations in traffic along this segment of 99W will likely match variations along the segment of 99W within the vicinity of the site. The seasonal adjustment factor was developed based on the On-Site ATR methodology described in the ODOT Analysis Procedures Manual (APM – Reference 2) and includes a 16 percent volume increase along the 99W. It is important to note that the 30th highest hour traffic volumes developed for 99W are consistent with traffic volumes used for other previous traffic analyses completed in the area. *Appendix "D" contains additional data on the seasonal adjustment.*



(NO SCALE)



LEGEND

- STD = MOBILITY STANDARD
- CM = CRITICAL MOVEMENT (UNSIGNALIZED)
- LOS = INTERSECTION LEVEL OF SERVICE (SIGNALIZED)/CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALIZED)
- Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED)/CRITICAL MOVEMENT CONTROL DELAY (UNSIGNALIZED)
- V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

**EXISTING TRAFFIC CONDITIONS
WEEKDAY PM PEAK HOUR
SHERWOOD, OREGON**

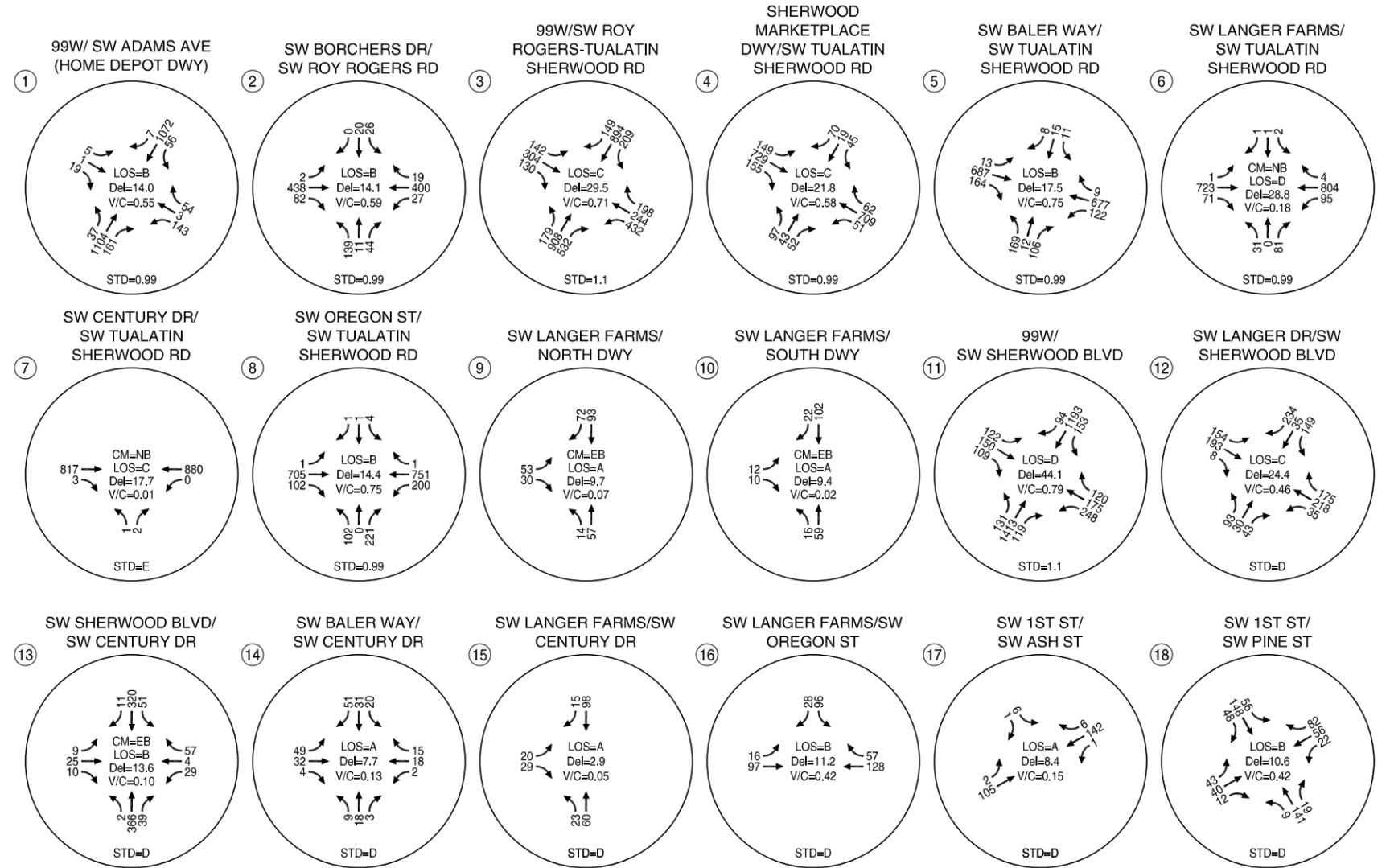
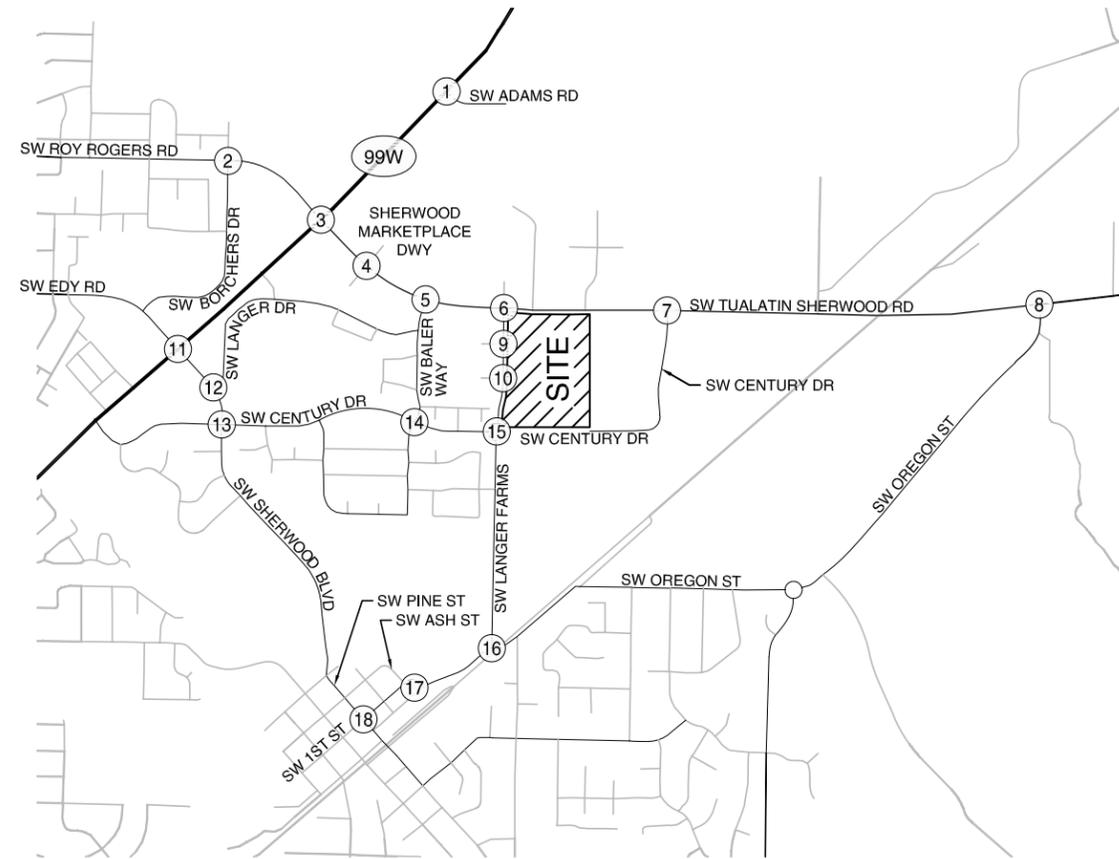
FIGURE

4

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LEGEND

- STD = MOBILITY STANDARD
- CM = CRITICAL MOVEMENT (UNSIGNALIZED)
- LOS = INTERSECTION LEVEL OF SERVICE (SIGNALIZED)/CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALIZED)
- Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED)/CRITICAL MOVEMENT CONTROL DELAY (UNSIGNALIZED)
- V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

**EXISTING TRAFFIC CONDITIONS
SATURDAY MID-DAY PEAK HOUR
SHERWOOD, OREGON**

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The adjusted traffic volumes shown in Figures 4 and 5 were found to be consistent with traffic volumes shown from the *Adams Avenue North Concept Plan* prepared by HPR and DKS Associates (Reference 3).

CURRENT LEVELS OF SERVICE

All level-of-service analyses described in this report were performed in accordance with the procedures stated in the 2000 *Highway Capacity Manual* (Reference 4). A description of level of service and the criteria by which they are determined is presented in Appendix "E". Appendix "E" also indicates how level of service is measured and what is generally considered the acceptable range of level of service (LOS).

The *City of Sherwood TSP* identifies minimum operational standard for an intersection to be LOS D. The *Washington County 2020 Transportation Plan* specifies the maximum volume-to-capacity (v/c) ratio for signalized intersections to be 0.99. Unsignalized intersections within the county are held to a minimum standard of LOS E. According to the *1999 Oregon Highway Plan (OHP)*, 99W is classified as a Statewide Urban Highway. North of Tualatin Sherwood Road the highway has a maximum volume to capacity (v/c) ratio of 0.99 (Table 7, Corridors) and a v/c ratio of 1.1 from Tualatin Sherwood Road intersection south through Edy Road. (Table 7, Town Centers)¹.

All intersection level-of-service evaluations used the peak 15-minute flow rate during the weekday p.m. and Saturday mid-day peak hours. Using the peak 15-minute flow rate ensures that this analysis is based on a reasonable worst-case scenario. For this reason, the analysis reflects conditions that are only likely to occur for 15 minutes out of each average peak hour. The transportation system will likely operate under conditions better than those described in this report during all other time periods.

Two study intersections were evaluated using the software application SIDRA, which is commonly used to model roundabouts and intersections with unique lane configurations. The analysis models used the US HCM (Customary) model, which incorporates the appropriate HCM values for this analysis. The SW Langer Farms Parkway/SW Century Drive intersection is a traditional two-lane roundabout with four approaches, while the SW Ash-Oregon Street/SW 1st Street intersection combines three roadways with a large truck yard driveway. The southbound approach along SW Ash Street and eastbound approach along SW 1st Street are stopped controlled while the westbound approach along SW Oregon Street is a free-flow movement to/from SW 1st Street. The results of the SIDRA analysis were compared to observations made at the intersections and found to be consistent with existing operations. The remaining study intersections were evaluated using Synchro 7.

Figures 4 and 5 summarize the operational analysis for the study intersections under the weekday p.m. and Saturday mid-day peak hour existing traffic conditions, respectively. As shown, all of the study

¹ Based on information contained in the June 8, 2009 Adams Avenue north Concept Plan Letter. *Provided in Appendix F.*

intersections currently operate acceptably. Appendix "G" includes the level-of-service worksheets under year 2012 existing traffic conditions.

Traffic Safety

The crash history at the study intersections was reviewed in an effort to identify potential safety issues. ODOT provided crash records for the study intersections for the most recent five-year period, from January 1, 2006, through December 31, 2010. Table 2 summarizes the crash data at the study intersections over the five-year period. Table 2 also illustrates the calculated crash rates for each study intersection. Generally a location experiencing a crash rate greater than 1.00 per million entering vehicles (MEV) suggests further review for safety should be considered.

Table 2 Intersection Crash History (January 1, 2006 – December 31, 2010)

| Intersection | Collision Type | | | | Severity | | | Total | Crash Rate (per MEV) |
|---|----------------|------|-------|-------|----------|--------|-------|-------|-------------------------|
| | Rear | Turn | Angle | Other | PDO | Injury | Fatal | | |
| 99W/ SW Adams Road (Home Depot Driveway) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| 99W/SW Roy Roger Road-SW Tualatin-Sherwood Road | 44 | 9 | 6 | 3 | 31 | 31 | 0 | 62 | 1.06 |
| 99W/SW Edy Road-SW Sherwood Boulevard | 10 | 10 | 0 | 6 | 14 | 12 | 0 | 26 | 0.31 |
| SW Borchers Drive/ SW Roy Rogers Road | 1 | 1 | 0 | 0 | 0 | 2 | 0 | 2 | 0.06 |
| Sherwood Marketplace Driveway/ SW Tualatin-Sherwood Road | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| SW Baler Way/ SW Tualatin-Sherwood Road | 4 | 6 | 1 | 1 | 7 | 5 | 0 | 12 | 0.36 |
| SW Langer Farms Parkway/ SW Tualatin-Sherwood Road | 0 | 2 | 0 | 0 | 1 | 1 | 0 | 2 | 0.06 |
| SW Century Drive/ SW Tualatin-Sherwood Road | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| SW Oregon Street/ SW Tualatin-Sherwood Road | 12 | 10 | 0 | 3 | 12 | 13 | 0 | 25 | 0.62 |
| SW Sherwood Boulevard/ SW Langer Drive | 5 | 4 | 0 | 0 | 7 | 2 | 0 | 9 | 0.35 |
| SW Sherwood Boulevard/ SW Century Drive | 3 | 1 | 0 | 1 | 2 | 3 | 0 | 5 | 0.26 |
| SW Baler Way/ SW Century Drive | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| SW Langer Farms Parkway/ SW Century Drive | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0.16 |
| SW Langer Farms Parkway/ SW Oregon Street | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| SW Oregon Street/ SW 1st-SW Ash Street | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 |
| SW 1st Street/ SW Pine Street | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0.06 |

PDO = Property Damage Only

N/A = Data not available.

As shown in Table 2, a majority of the study intersections have relatively low crashes rates based on the last five-years of crash data, the 99W/SW Roy Rogers Road-Tualatin-Sherwood Road intersection experiences a crash rate of 1.06 crashes/MEV and this was further examined as described below.

99W/SW Roy Rogers Road-SW Tualatin-Sherwood Road

Further review of the crash data at the 99W/SW Roy Rogers Road-SW Tualatin-Sherwood Road intersection indicates that a majority of the crashes were rear-end crashes, including several recorded as turn-movement crashes (i.e. seven of the crashes identified as turn-movement crashes were rear-end crashes that occurred in the westbound right-turn lane). Of the 51 rear-end crashes, 15 occurred at the northbound approach, 11 occurred at the southbound approach, 5 occurred at the eastbound approach, and 19 occurred at the westbound approach (seven were in the right-turn lane). Based on the crash data, a majority of the rear-end crashes were attributed to drivers failing to avoid slowed or stopped vehicles in the roadway, while a few were attributed to careless driving, driving too fast for roadway conditions, or inattention.

With relatively low travel speeds, adequate sight-distance, separate left and right-turn lanes at the northbound approach, and a separate left-turn lane at the southbound approach, there are relatively few mitigation measures to address safety at the intersection. In accordance with the development agreement between Gramor Development and the City of Sherwood, this development proposal will result in construction of the SW Langer Farms Parkway extension, connecting SW Langer Farms Parkway to 99W at the existing 99W/Home Depot intersection. Construction of this roadway will provide an alternate adjacent route for traffic on 99W resulting in a change in travel patterns at the 99W/SW Roy Rogers Road-SW Tualatin-Sherwood Road intersection.

Appendix "H" contains the crash data obtain from ODOT.

Section 4
Transportation Impact Analysis

TRANSPORTATION IMPACT ANALYSIS

The transportation impact analysis identifies how the study area's transportation system will operate in the year the proposed Langer Farms Phase 7 development is expected to be fully built, year 2013. The impact of traffic generated by the proposed development during the typical weekday p.m. and Saturday mid-day peak hours was examined as follows:

- Developments and transportation improvements planned in the site vicinity were identified and incorporated into the model.
- Year 2013 background traffic conditions (without the proposed Langer Farms Phase 7 development) were analyzed at each of the study intersections during the weekday p.m. and Saturday mid-day peak hours.
 - Background conditions were developed by applying a 1.5 percent annual growth rate to existing traffic volumes to account for regional growth in the site vicinity between years 2012 and 2013.
- Site-generated trips were estimated for build-out of the site.
- Site trip-distribution patterns were derived after the existing traffic patterns, the major trip origins and destinations in Sherwood, and input from City and County staff.
- Year 2013 total traffic conditions (with full build-out and occupation of the proposed Langer Farms Phase 7 development) were analyzed at each of the study intersections and site-access points during the weekday p.m. and Saturday mid-day peak hours.
- On-site circulation issues and site-access operations were evaluated.

YEAR 2013 BACKGROUND TRAFFIC CONDITIONS

The year 2013 background traffic conditions analysis identifies how the study area's transportation system will operate without the proposed Langer Farms Phase 7 development. This analysis includes traffic attributed to general growth in the region, but does not include traffic from the proposed development.

Planned Developments and Transportation Improvements

KAI identified and reviewed the transportation improvements planned within the site vicinity.

- Currently, Washington County has identified through the Major Streets Transportation Improvement Program – 3D (MSTIP) project #10 which includes widening Tualatin-Sherwood Road to a five-lane cross section between SW Langer Farms Parkway and SW Borchers Drive. This project has been short-listed by the Washington County Board of County Commissioners with the intent to receive funding for design and construction by 2014. For the purposes of this analysis, this project has not been included in the year 2013

background conditions to ensure a conservative analysis. A discussion of this project relative to the proposed development is provided later in this report.

Traffic Volumes

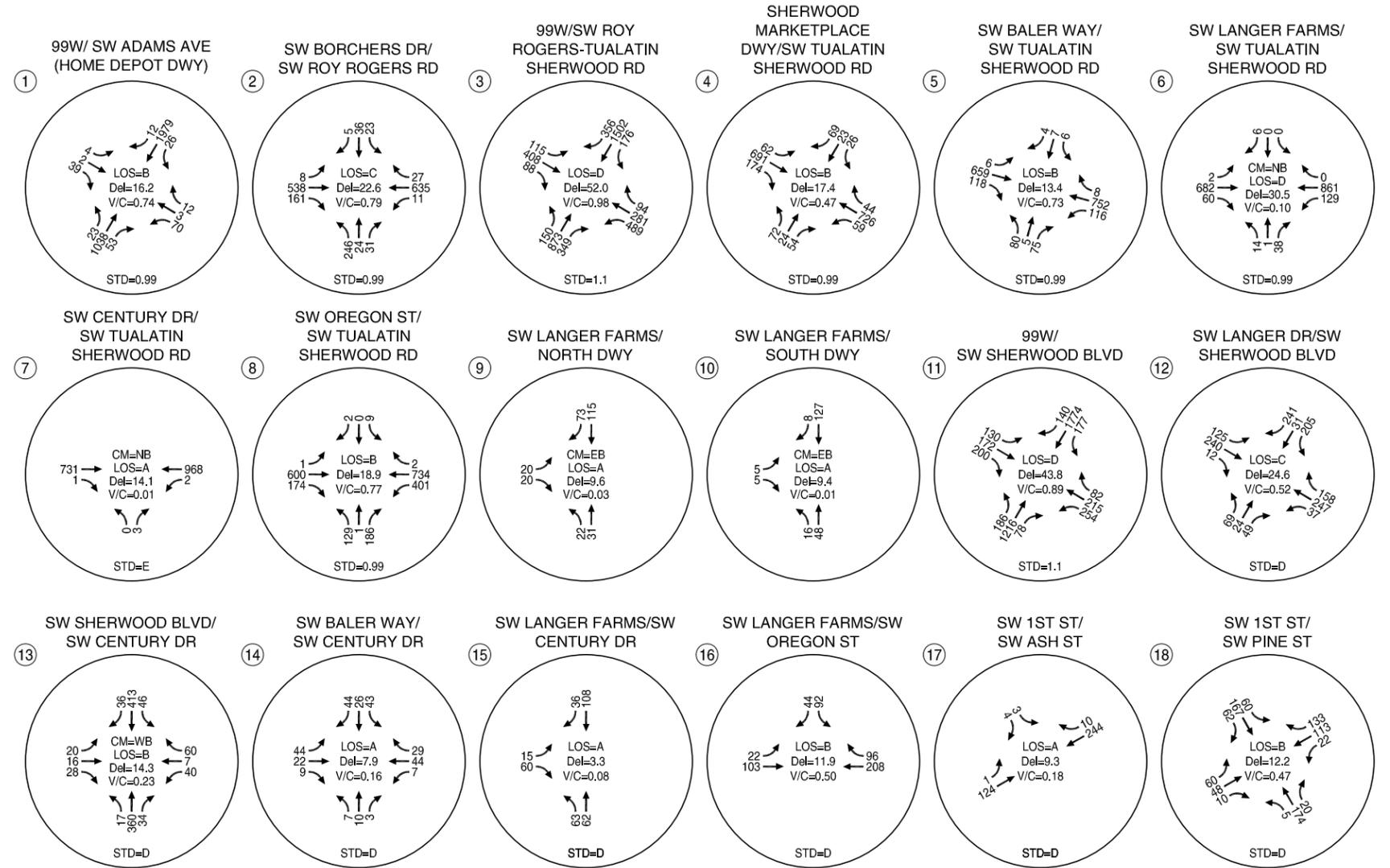
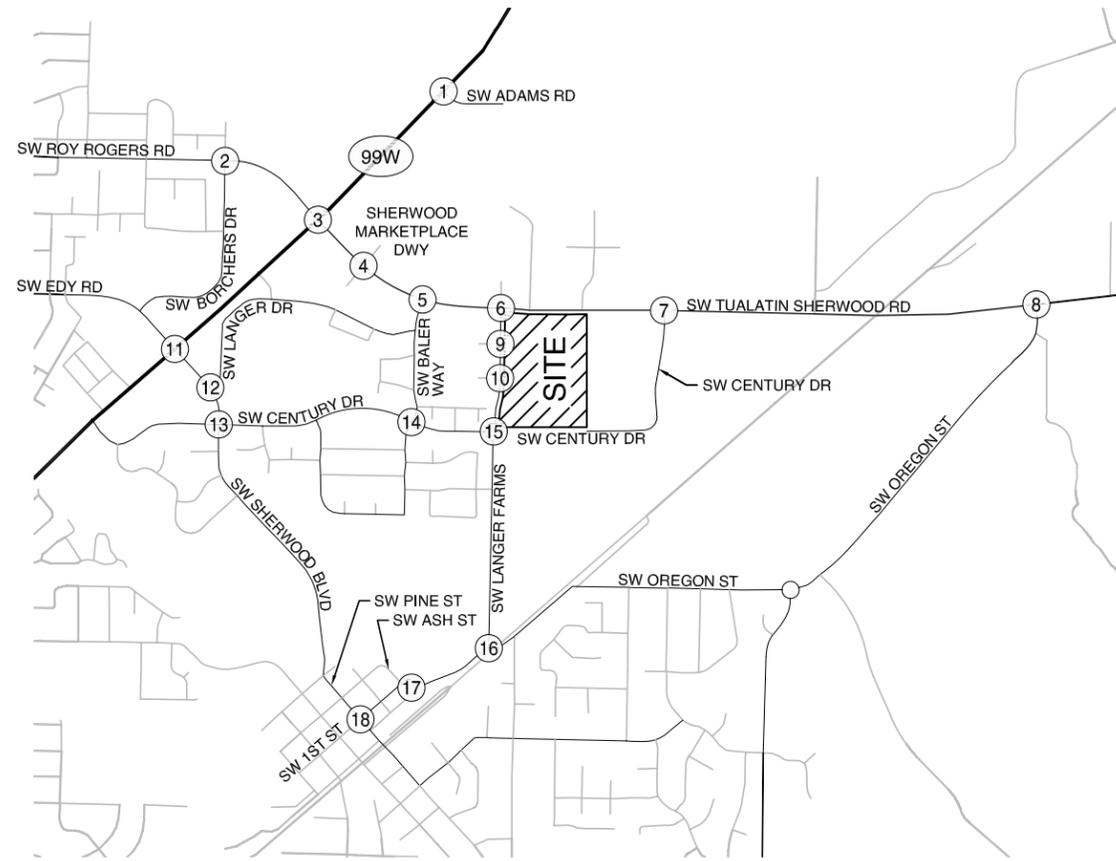
The growth rate used in this analysis was derived from a review of the County's regional model of 99W and the Sherwood area. Existing base year 2010 and future year 2035 (assuming State RTP network projects) model runs were provided by the County that identified a 1.5 percent annual growth rate at the 99W/SW Tualatin-Sherwood Road intersection. Ultimately, the year 2013 background traffic volumes were developed by applying a 1.5 percent annual growth rate to the existing traffic volumes shown in Figures 4 and 5. Figure 6 and 7 illustrate the resulting forecast year 2013 background traffic volumes during the weekday p.m. and Saturday mid-day peak hours, respectively. *Appendix "I" contains the model data provided by the County.*

Level-of-Service Analysis

The weekday p.m. and Saturday mid-day peak-hour turning-movement volumes shown in Figures 6 and 7 were used to conduct an operational analysis at each study intersection to determine the year 2013 background traffic levels of service. As indicated by the respective figures, the background traffic analysis determined that all of the study intersections are forecast to operate acceptably during both the weekday p.m. and Saturday mid-day peak hours. *Appendix J" contains the year 2013 background traffic level-of-service worksheets.*



(NO SCALE)



LEGEND

- STD = MOBILITY STANDARD
- CM = CRITICAL MOVEMENT (UNSIGNALIZED)
- LOS = INTERSECTION LEVEL OF SERVICE (SIGNALIZED)/CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALIZED)
- Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED)/CRITICAL MOVEMENT CONTROL DELAY (UNSIGNALIZED)
- V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

**YEAR 2013 BACKGROUND TRAFFIC CONDITIONS
WEEKDAY PM PEAK HOUR
SHERWOOD, OREGON**

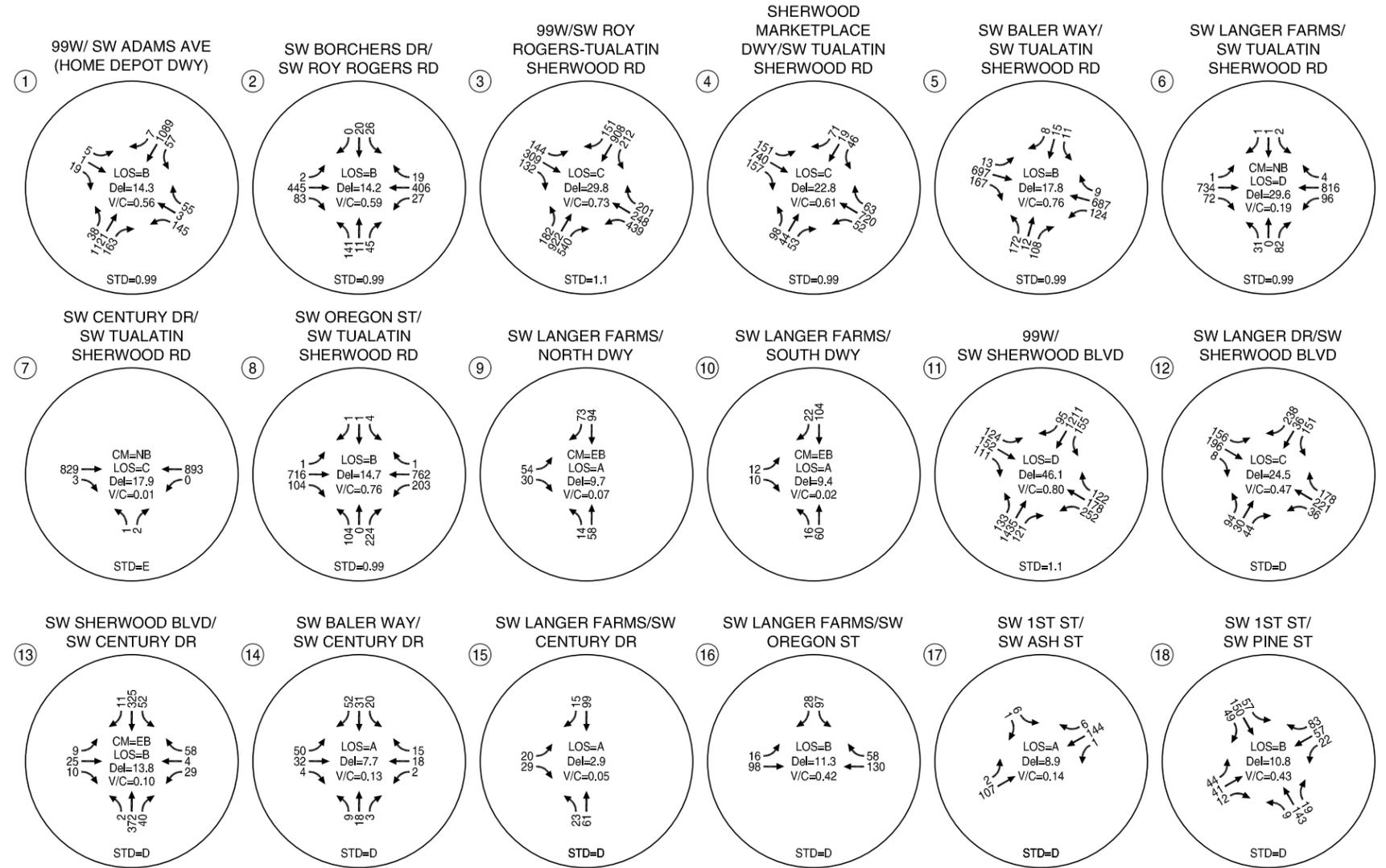
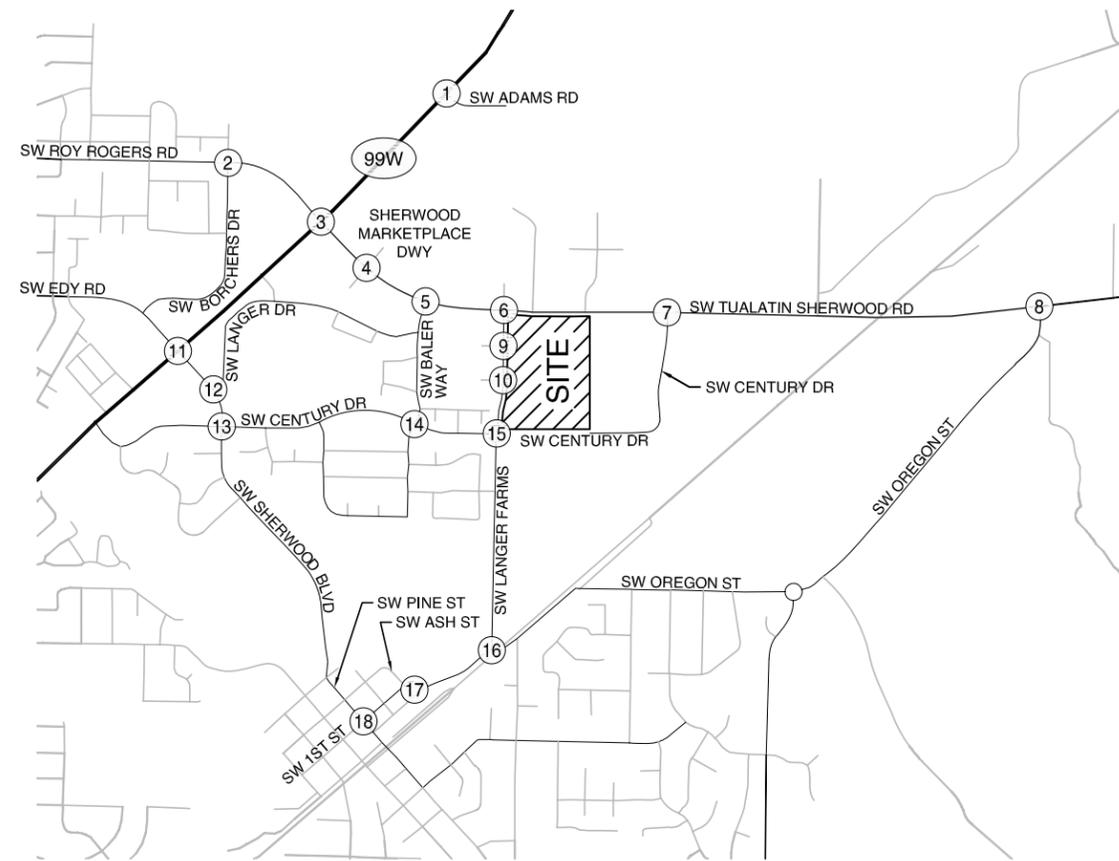
FIGURE

6

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(NO SCALE)



LEGEND

- STD = MOBILITY STANDARD
- CM = CRITICAL MOVEMENT (UNSIGNALIZED)
- LOS = INTERSECTION LEVEL OF SERVICE (SIGNALIZED)/CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALIZED)
- Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED)/CRITICAL MOVEMENT CONTROL DELAY (UNSIGNALIZED)
- V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

**YEAR 2013 BACKGROUND TRAFFIC CONDITIONS
SATURDAY MID-DAY PEAK HOUR
SHERWOOD, OREGON**

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PROPOSED DEVELOPMENT PLAN

The proposed development plan assumed for this analysis includes a total of 197,800 square feet of building area. Included in this total is 180,800 square feet of retail space (including a 145,000 square foot anchor tenant and three retail buildings), a 3,500 square-foot bank with drive-thru, a 10,000 square-foot quality restaurant, and a 3,500 square-foot fast food restaurant with drive-thru. This plan was developed with conservative site build out assumptions for the purpose of identifying and mitigating traffic impacts associated with the highest trip generation potential for the site. The actual development program for the site may vary as tenants are identified in accordance with the alternative development plans approved as part of the Phase 7 Site Plan Review application. However, each of these alternatives is estimated to result in lower trip generation potential for the site than the plan assumed in this analysis.

Trip Generation

Trip generation estimates for the proposed Langer Farms Phase 7 development were developed based on information provided in the standard reference manual *Trip Generation, 8th Edition* published by the Institute of Transportation Engineers (ITE-References 5). The internal and pass-by trip rates applied to each land use were determined by ITE's *Trip Generation Handbook* (Reference 6). Table 3 summarizes the daily, weekday p.m., and Saturday mid-day peak-hour trips for the proposed development. All daily trips have been rounded to the nearest ten and all peak hour trips have been rounded to the nearest five trips².

Table 3 Proposed Langer Farms Phase 7 Trip Generation

| Land Use | ITE Code | Size (Sq Ft) | Daily | Weekday PM Peak Hour | | | Saturday Mid-day Peak Hour | | |
|--|----------|--------------|-------------------------|----------------------|-------------------|-------------------|----------------------------|---------------------|---------------------|
| | | | | Total | In | Out | Total | In | Out |
| Shopping Center <i>Pass-By Trips (pm -34%, Sat -26%)</i> | 820 | 180,800 | 9,980 (3,390) | 945 (320) | 465 (160) | 480 (160) | 1,260 (330) | 655 (165) | 605 (165) |
| Bank w/ drive-thru <i>Internalization (10%)</i> <i>Pass-By Trips (47%)</i> | 912 | 3,500 | 520 (50) (220) | 90 (10) (40) | 45 (5) (20) | 45 (5) (20) | 90 (10) (40) | 45 (5) (20) | 45 (5) (20) |
| Quality Restaurant <i>Internalization (10%)</i> <i>Pass-By Trips (44%)</i> | 931 | 10,000 | 900 (90) (360) | 75 (10) (30) | 50 (5) (15) | 25 (5) (15) | 110 (10) (40) | 65 (5) (20) | 45 (5) (20) |
| Fast-food Restaurant w/ Drive-thru <i>Internalization (10%)</i> <i>Pass-By Trips (50%)</i> | 934 | 3,500 | 1,740 (180) (780) | 120 (10) (50) | 60 (5) (25) | 60 (5) (25) | 205 (20) (90) | 105 (10) (45) | 100 (10) (45) |
| Total Trips | | | 13,140 | 1,230 | 620 | 610 | 1,665 | 870 | 795 |
| <i>Less Internalization</i> | | | (320) | (30) | (15) | (15) | (40) | (20) | (20) |
| <i>Less Pass-by trips</i> | | | (4,750) | (440) | (220) | (220) | (500) | (250) | (250) |
| <i>New Trips</i> | | | 8,070 | 760 | 385 | 375 | 1,125 | 600 | 525 |

² The trip generation estimate for the shopping center land use was calculated using the fitted curve equation for ITE 820 instead of the average rate. This was done to provide a conservative estimate of trips associated with the retail components of the site.

Table 3 shows that the proposed development is estimated to generate 8,070 daily trips, including 760 trips (385 inbound, 375 outbound) during the weekday p.m. peak hour and 1,125 trips (600 inbound, 525 outbound) during the Saturday mid-day peak hour. *Appendix "K" contains the internal trip capture worksheets for the weekday p.m. and Saturday mid-day peak hours.* As shown in Appendix "K" the rates include a 12 percent reduction during the weekday p.m. peak hour and an 18 percent reduction during the Saturday mid-day peak hour. However, in order to ensure a conservative analysis, an internal trip capture rate of 10 percent was used for both time periods.

The trip estimate shown in Table 3 for the weekday p.m. peak hour is less than the Highway 99W Capacity Allocation Program trip cap of 43 p.m. peak hour trips per acre for this site. (43 trips per acre x 19.7 acres = 847 net p.m. peak trips).

Site Trip Distribution/Trip Assignment

The site-generated trips were distributed onto the study area roadway system according to the existing traffic patterns, the location of major trip origins and destinations in Sherwood and Washington County, and input from City and County staff. Figures 8 and 9 illustrate the estimated trip distribution pattern for the proposed development along with the new site-generated trips during the weekday p.m. and Saturday mid-day peak hours, respectively. Figures L1 and L2 in Appendix L illustrate the pass-by trips to and from the site for the weekday p.m. peak hour and Saturday mid-day peak hours respectively.

ADAMS NORTH CONCEPT PLAN TRAFFIC RE-ROUTE

A portion of the background traffic on the adjacent roadway network was assumed to re-route to utilize the SW Langer Farms Parkway Extension (formerly the Adams North Extension). Traffic volumes assumed for this reroute were estimated based on information provided in the *Adams North Concept Plan* (Reference 3). Figures L3 and L4 in Appendix L illustrate the estimated volume of re-routed traffic during the weekday p.m. and Saturday mid-day peak hour conditions, respectively. Approximately 57% of southbound left-turning traffic, and 53% of westbound right turning traffic was assumed to reroute during the weekday p.m. peak hour. During the Saturday midday peak hour, approximately 24% of southbound lefts, and 12% of westbound rights were re-routed.

YEAR 2013 TOTAL TRAFFIC CONDITIONS

The total traffic conditions analysis forecasts how the study area's transportation system will operate with the traffic generated by the proposed Langer Farms Phase 7 development. The year 2013 background traffic volumes for the weekday p.m. and Saturday mid-day peak hours (shown in Figures 6 and 7) were added to the net new and pass-by site-generated traffic (shown in Figures 8 and 9 and I1 and I2) to arrive at the total traffic volumes that are shown in Figures 11 and 12. These volumes also take into account traffic re-routed as a result of the Langer Farms Parkway extension project, shown in

Figures I3 and I4. Figure 10 illustrates the lane configurations and traffic control devices assumed in the year 2013 total traffic conditions analysis.

It is important to note on Figure 10 that the SW Langer Farms Parkway/SW Tualatin Sherwood Road intersection is shown operating with a second eastbound through lane at the intersection. This analysis assumes the site frontage to SW Tualatin Sherwood Road to be developed to accommodate two eastbound through lanes. The development team will work with the City of Sherwood to determine if outright construction or “fee-in-lieu” will be acceptable related to development frontage improvements. If a “fee-in-lieu” is the agreed mitigation and thus the second eastbound through lane not developed, the intersection will continue to meet acceptable operations standards (Weekday PM = LOS B, v/c = 0.65, Delay = 13.7 seconds, Saturday mid-day = LOS B, v/c = 0.69, Delay = 15.5 seconds).

Intersection Level of Service

The weekday p.m. and Saturday mid-day peak hour turning-movement volumes shown in Figure 11 and 12 were used to conduct an operational analysis at each study intersection to determine the year 2013 total traffic conditions. The results of the total traffic analysis shown in Figures 11 and 12 indicate that all of the study intersections and site access points are forecast to operate acceptably during the weekday p.m. and Saturday mid-day peak hours, with the exception of the site access driveway along SW Langer Farms Parkway. *Appendix “L” contains the year 2013 total traffic level-of-service worksheets.*

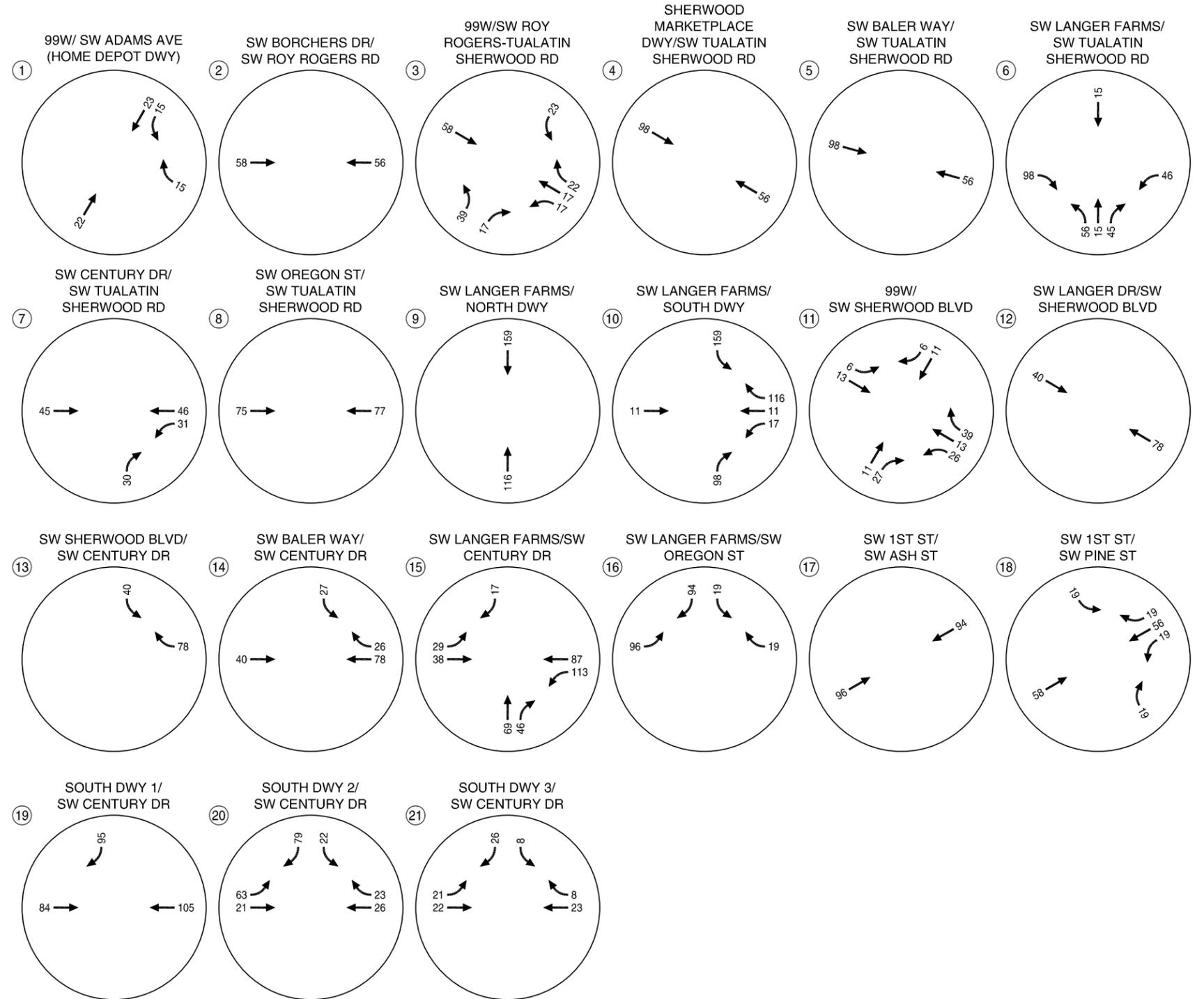
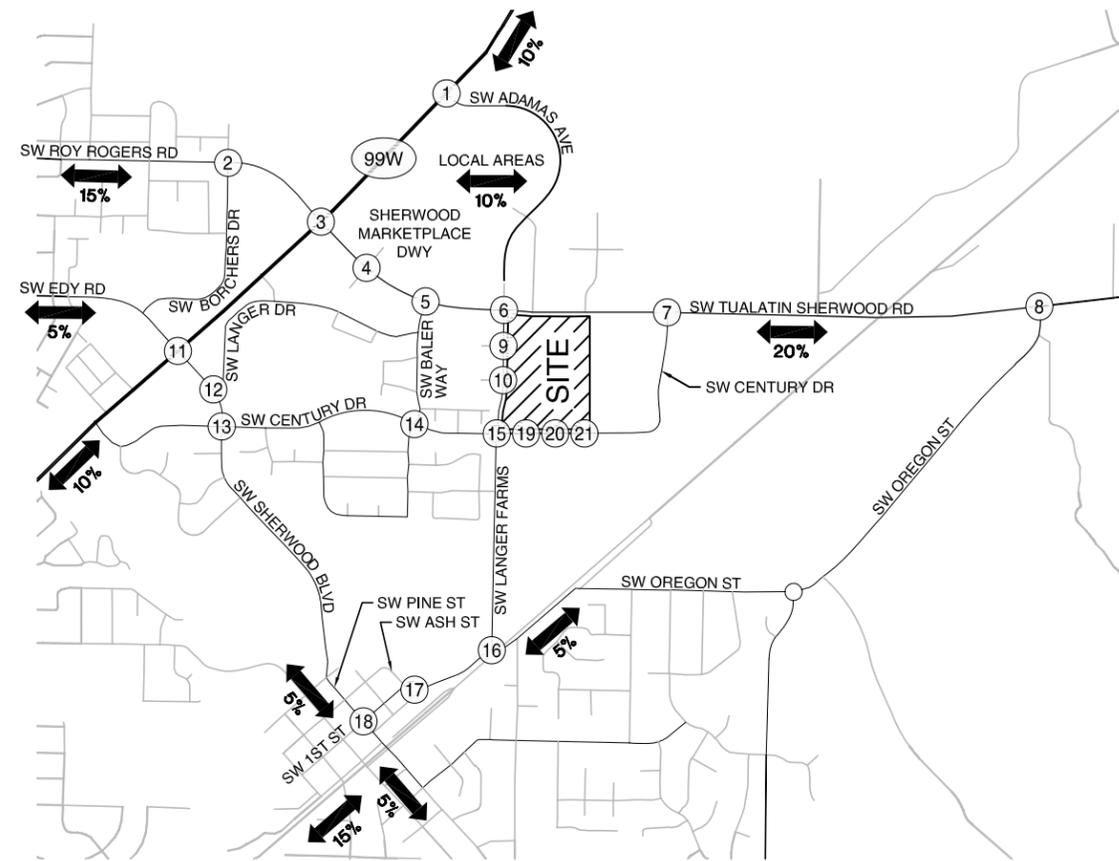
99W/SW Roy Rogers-SW Tualatin-Sherwood Road Intersection

As shown in Figure 11, the 99W/SW Roy Rogers-SW Tualatin-Sherwood Road intersection is forecast to operate at capacity during the weekday p.m. peak hour. As discussed earlier in this report, the MSTIP 3D Project #10 has recently been “short-listed” to receive funding for design and construction by 2014. While design of this intersection is not yet completed, a review of previous traffic analysis completed in the area indicates that this project will provide capacity improvements including construction of an additional separate westbound through lane, along with some modifications to the intersections signal timing.

This project is not necessary to mitigate the impacts of the proposed development but is important for the surrounding transportation system. The inclusion of these improvements assuming the proposed development traffic would result in below-capacity operations at this intersection.



(NO SCALE)

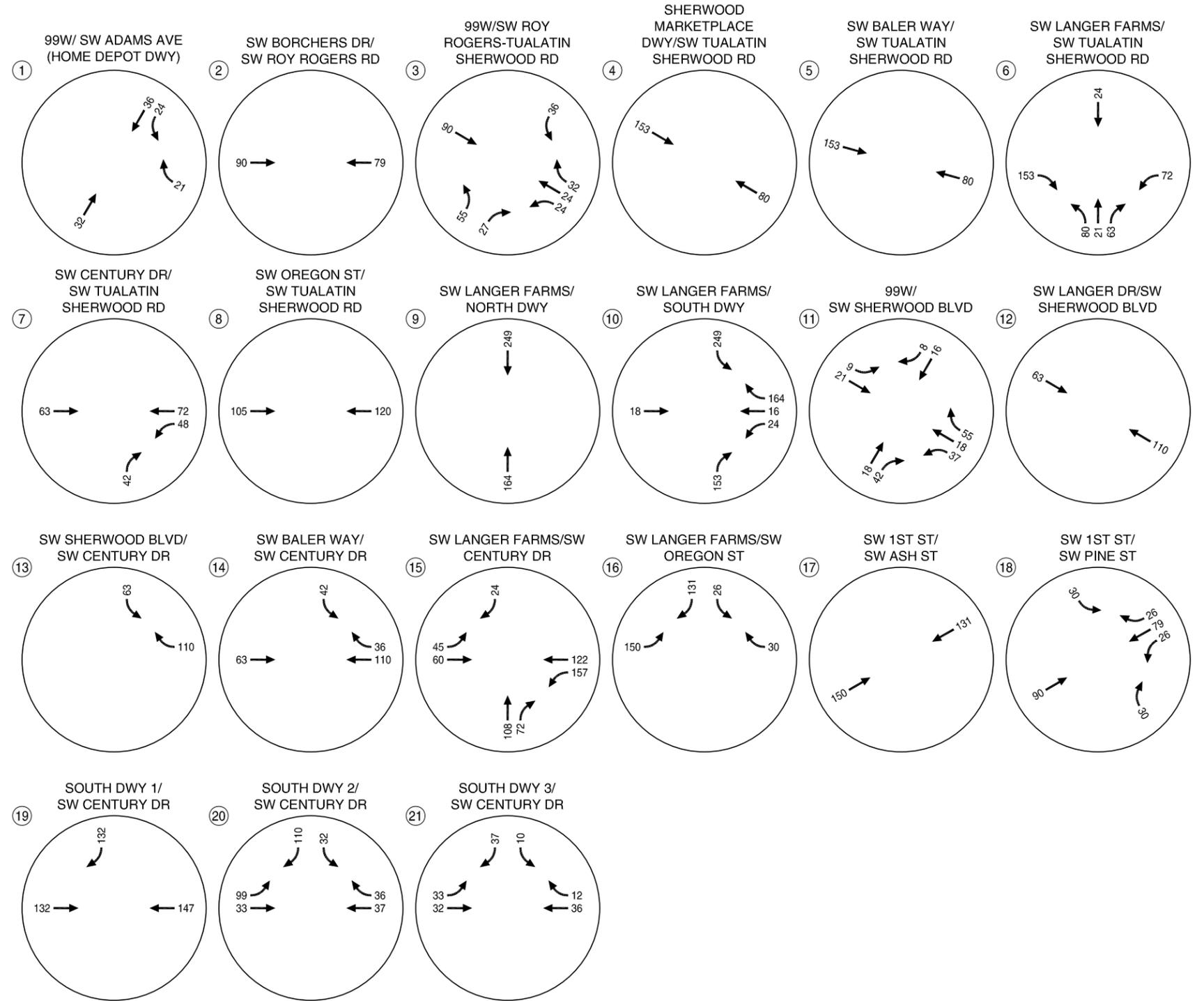
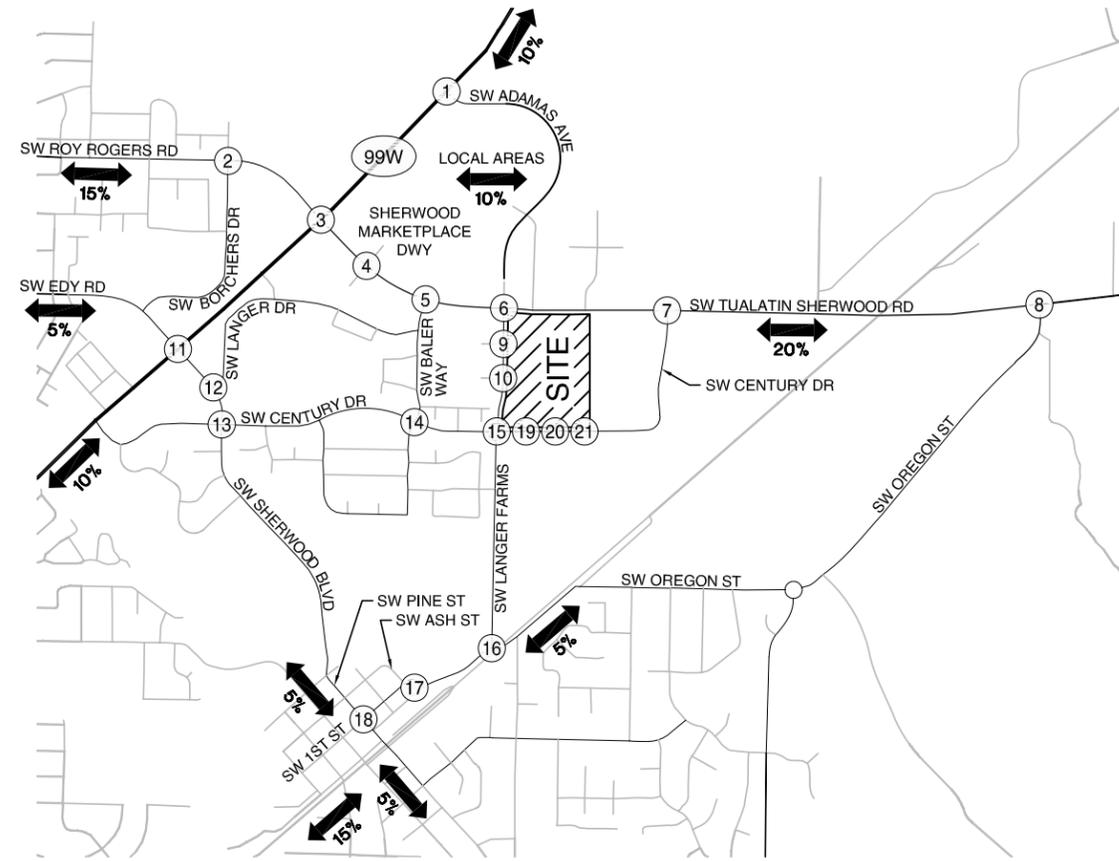


ESTIMATED TRIP DISTRIBUTION PATTERN & NET NEW SITE-GENERATED TRIPS WEEKDAY PM PEAK HOUR SHERWOOD, OREGON

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**ESTIMATED TRIP DISTRIBUTION PATTERN & NET NEW SITE-GENERATED TRIPS
SATURDAY MI-DAY PEAK HOUR
SHERWOOD, OREGON**

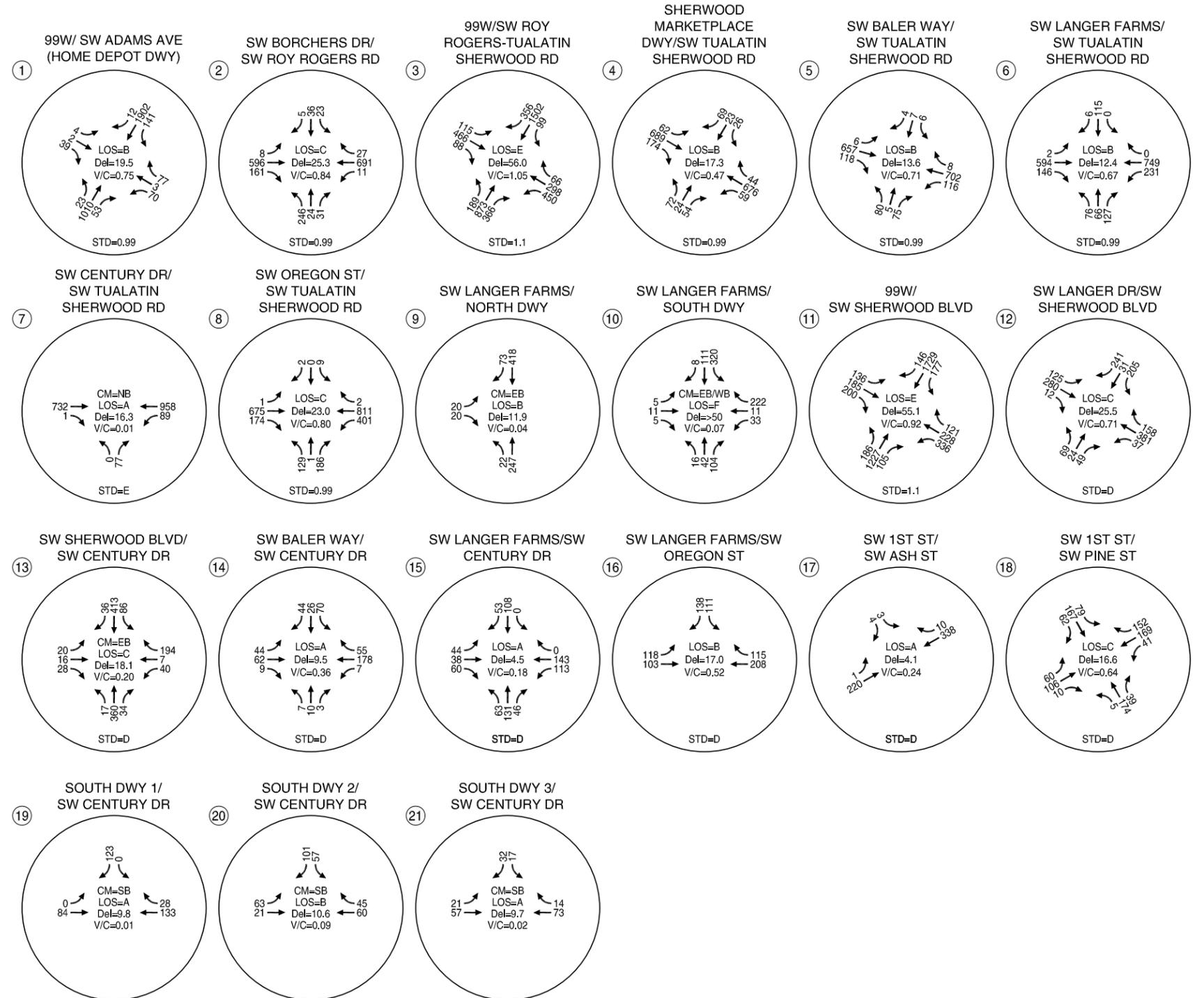
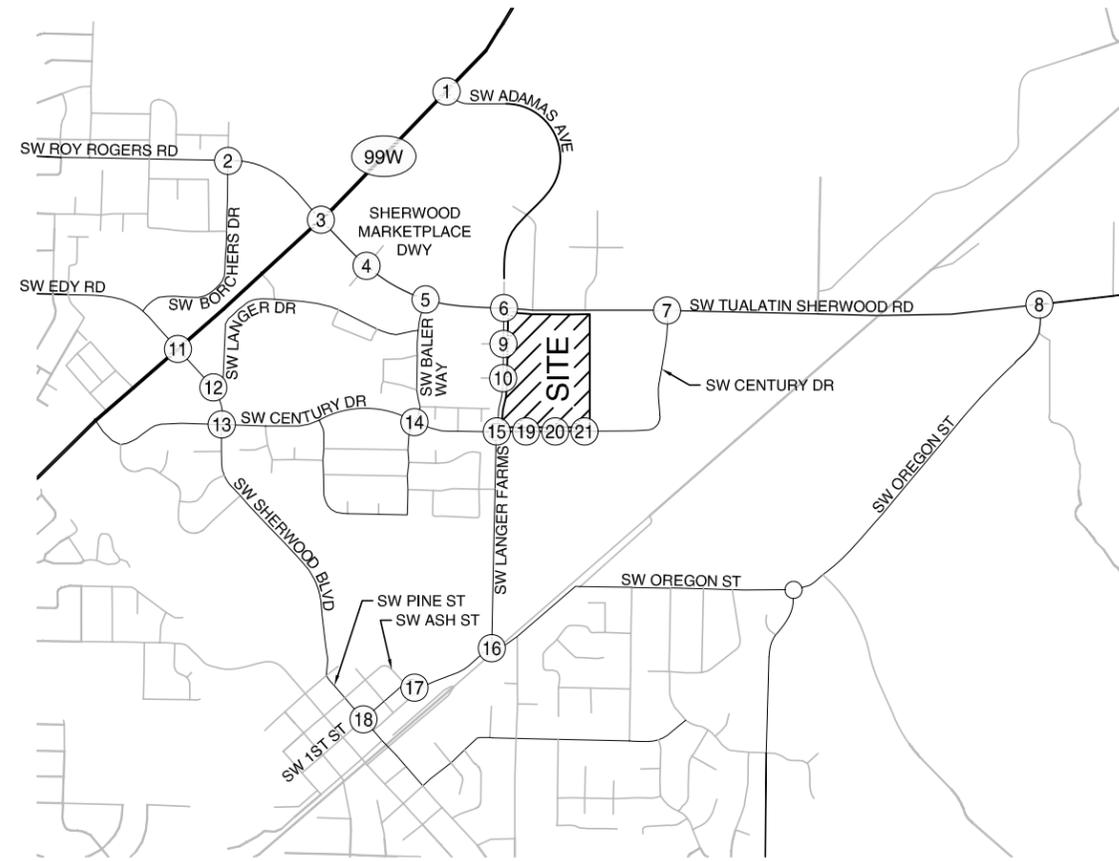
FIGURE

9

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LEGEND

- STD = MOBILITY STANDARD
- CM = CRITICAL MOVEMENT (UNSIGNALIZED)
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- Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED)/CRITICAL MOVEMENT CONTROL DELAY (UNSIGNALIZED)
- V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

**YEAR 2013 TOTAL TRAFFIC CONDITIONS
WEEKDAY PM PEAK HOUR
SHERWOOD, OREGON**

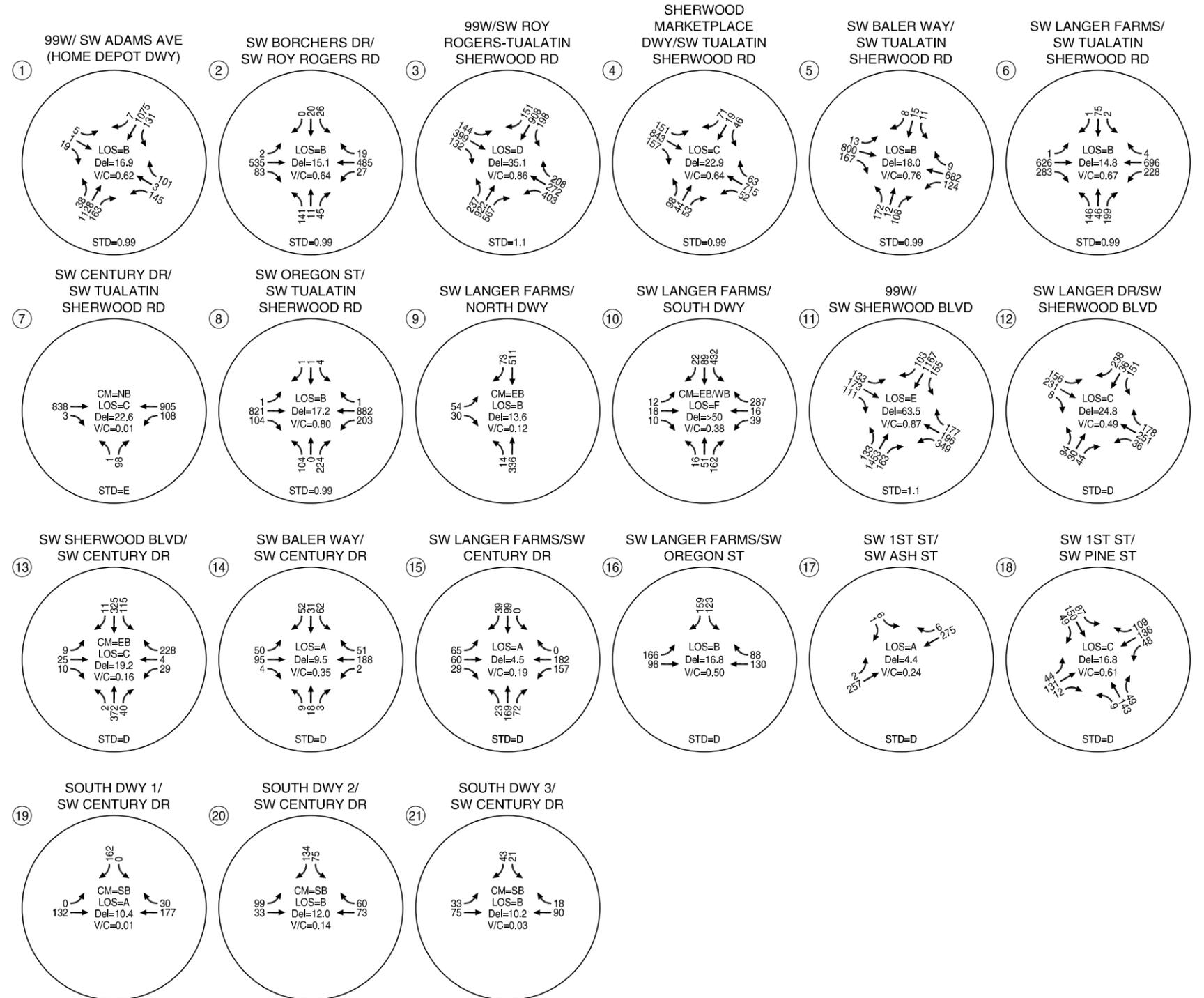
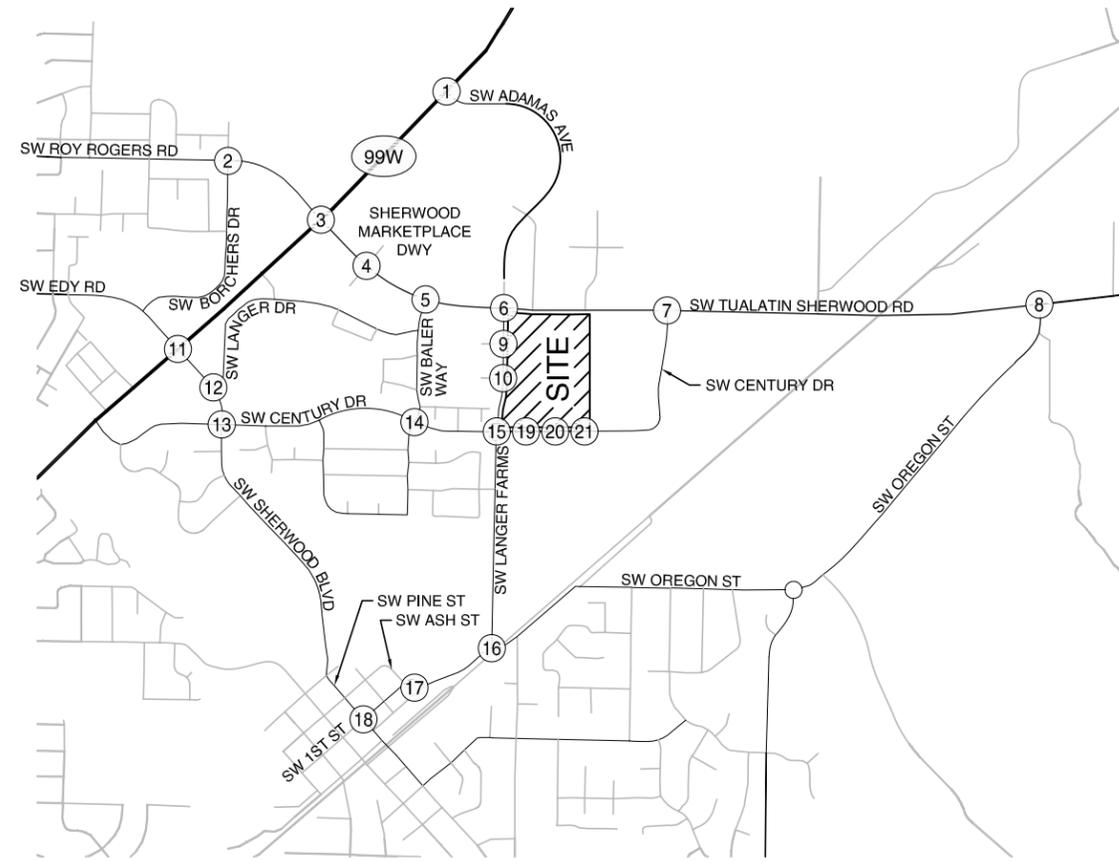
FIGURE

11

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(NO SCALE)



LEGEND

- STD = MOBILITY STANDARD
- CM = CRITICAL MOVEMENT (UNSIGNALIZED)
- LOS = INTERSECTION LEVEL OF SERVICE (SIGNALIZED)/CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALIZED)
- Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED)/CRITICAL MOVEMENT CONTROL DELAY (UNSIGNALIZED)
- V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

YEAR 2013 TOTAL TRAFFIC CONDITIONS SATURDAY MID-DAY PEAK HOUR SHERWOOD, OREGON

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QUEUEING ANALYSIS

A 95th percentile vehicle queuing analysis was performed for the study intersections using SimTraffic software. The queuing analysis was completed in accordance with the assumptions stipulated in the ODOT Analysis Procedures manual (APM).

Table 4 provides a summary of the queuing analysis findings. The queue distances shown have been rounded to the nearest car length assuming each vehicle requires 25 feet of storage.

Table 4 95th Percentile SimTraffic Queuing Analysis,

| Intersection | Movement | 95th Percentile Queue Length (feet) | | | | | | Available Storage (feet) ¹ |
|---|---------------|-------------------------------------|---|--------------------------------------|--|----------------------|-----------------------|---------------------------------------|
| | | Weekday PM Peak Hour (Background) | Saturday Mid-day Peak Hour (Background) | Weekday PM Peak Hour (Total Traffic) | Saturday Mid-day Peak Hour (Total Traffic) | PM Peak (Difference) | Saturday (Difference) | |
| 99W/SW Adams Avenue (Home Depot Dwy) | NB Left | 75 | 75 | 50 | 75 | -25 | 0 | 240 |
| | NB Thru | 350 | 125 | 325 | 150 | -25 | 25 | 860 |
| | NB Thru | 375 | 150 | 350 | 175 | -25 | 25 | 860 |
| | NB Right | 150 | 25 | 50 | 50 | -100 | 25 | 275 |
| | SB Left | 100 | 100 | 225 | 200 | 125 | 100 | 225 |
| | SB Thru | 675 | 200 | 675 | 200 | 0 | 0 | 815 |
| | SB Thru/Right | 675 | 200 | 675 | 200 | 0 | 0 | 815 |
| 99W/SW Roy Roger Road-SW Tualatin-Sherwood Road | EB Left | 275 | 225 | 300 | 250 | 25 | 25 | 300 |
| | EB Thru | 850 | 300 | 1100 | 525 | 250 | 225 | 1,000 |
| | EB Thru/Right | 825 | 325 | 1100 | 525 | 275 | 200 | 1,000 |
| | WB Left | 275 | 225 | 275 | 225 | 0 | 0 | 300 |
| | WB Left | 750 | 400 | 825 | 550 | 75 | 150 | 580 |
| | WB Thru | 750 | 550 | 700 | 650 | -50 | 100 | 580 |
| | WB Right | 225 | 225 | 225 | 375 | 0 | 150 | 225 |
| | NB left | 325 | 275 | 525 | 375 | 200 | 100 | 490 |
| | NB Thru | 150 | 275 | 825 | 350 | 675 | 75 | 1,750 |
| | NB Thru | 175 | 325 | 675 | 350 | 500 | 25 | 1,750 |
| | NB Thru | 75 | 250 | 100 | 350 | 25 | 100 | 1,750 |
| | NB Right | 75 | 200 | 100 | 225 | 25 | 25 | 330 |
| | SB Left | 325 | 200 | 250 | 300 | -75 | 100 | 300 |
| | SB Thru | 975 | 200 | 950 | 350 | -25 | 150 | 985 |
| | SB Thru | 925 | 200 | 875 | 350 | -50 | 150 | 920 |
| SB Thru/Right | 925 | 225 | 900 | 350 | -25 | 125 | 935 | |
| 99W/SW Edy Road | NB Left | 500 | 350 | 525 | 375 | 25 | 25 | 440 |
| | NB Thru | 750 | 900 | 900 | 900 | 150 | 0 | 2,000+ |
| | NB Thru | 625 | 900 | 800 | 900 | 175 | 0 | 2,000+ |
| | NB Thru/Right | 450 | 900 | 625 | 875 | 175 | -25 | 415 |
| | SB Left | 225 | 200 | 225 | 225 | 0 | 25 | 1,750 |

| | | | | | | | | |
|---|---------------|------|-----|------|-----|------|-----|------------|
| | SB Thru | 375 | 300 | 350 | 275 | -25 | -25 | 1,750 |
| | SB Thru | 400 | 350 | 375 | 300 | -25 | -50 | 1,750 |
| | SB Thru/Right | 425 | 375 | 400 | 325 | -25 | -50 | 1,750 |
| Sherwood Marketplace Dwy/ SW Tualatin-Sherwood Road | EB Left | 50 | 75 | 50 | 75 | 0 | 0 | 170 |
| | EB Left | 125 | 125 | 100 | 125 | -25 | 0 | 170 |
| | EB Thru | 300 | 250 | 300 | 250 | 0 | 0 | 310 |
| | EB Thru/Right | 275 | 225 | 300 | 250 | 25 | 25 | 300 |
| | WB Left | 200 | 75 | 200 | 75 | 0 | 0 | 225 |
| | WB Thru | 675 | 250 | 675 | 325 | 0 | 75 | 510 |
| | WB Thru/Right | 325 | 250 | 350 | 275 | 25 | 25 | 510 |
| SW Baler Way/ SW Tualatin-Sherwood Road | EB Left | 25 | 75 | 25 | 50 | 0 | -25 | 120 |
| | EB Thru | 225 | 250 | 200 | 250 | -25 | 0 | 520 |
| | EB Thru/Right | 175 | 175 | 175 | 225 | 0 | 50 | 520 |
| | WB Left | 200 | 125 | 200 | 125 | 0 | 0 | 200 |
| | WB Thru/Right | 875 | 350 | 875 | 375 | 0 | 25 | 680 |
| SW Langer Farms Parkway/SW Tualatin-Sherwood Road | EB Left | 25 | 0 | 0 | 0 | -25 | 0 | 100 |
| | EB Thru | 150 | 75 | 275 | 275 | 125 | 200 | 675 |
| | EB Thru/Right | 0 | 0 | 200 | 225 | 200 | 225 | 675 |
| | WB Left | 125 | 75 | 150 | 150 | 25 | 75 | 100 |
| | WB Thru/Right | 1500 | 25 | 1000 | 500 | -500 | 475 | 1,500 |
| | NB Left | 100 | 75 | 125 | 125 | 25 | 50 | 100 |
| | NB Thru | 25 | 25 | 150 | 125 | 125 | 100 | 150 |
| | NB Right | 50 | 75 | 75 | 75 | 25 | 0 | 150 |
| | SB Left | - | - | 0 | 25 | 0 | 25 | 390 |
| SB Thru/Right | - | - | 150 | 100 | 150 | 100 | 390 | |
| SW Langer Farms Parkway/South Dwy | EB Left | 25 | 50 | 25 | 50 | 0 | 0 | 50 |
| | EB Thru/Right | 25 | 50 | 50 | 50 | 25 | 0 | 180 |
| | WB Thru/Left | - | - | 50 | 75 | 50 | 75 | 215 |
| | WB Right | - | - | 75 | 100 | 75 | 100 | 215 |
| | NB Left | 25 | 25 | 25 | 25 | 0 | 0 | 50 |
| | NB Thru | 0 | 0 | 0 | 0 | 0 | 0 | 260 |
| | NB Thru/Right | - | - | 25 | 50 | 25 | 50 | 260 |
| | SB Left | - | - | 75 | 125 | 75 | 125 | 200 |
| | SB Thru/Right | 0 | 0 | 50 | 75 | 50 | 75 | 190 |

As shown in Table 4, via bold text, there are locations within the study area where 95th percentile queue lengths are forecast to exceed the available storage during peak conditions. For locations at the 99W/Tualatin Sherwood Road intersection, where the forecast queue length exceeds the available

storage, it is important to note that the reported queues represent conditions that persist from the background traffic conditions. Further, the mobility standard for this intersection allows for conditions exceeding capacity, thus accepting a moderate level of traffic congestion that occurs during the peak 15 minutes of the typical weekday.

Other locations along Tualatin Sherwood Road also experience congestion during the weekday p.m. peak hour. The MSTIP 3D improvement project along Tualatin-Sherwood Road, planned for construction in 2014, will provide additional capacity improvements along this section of Tualatin Sherwood Road and at the 99W/Tualatin Sherwood Road intersection, thus improving overall traffic operations.

Given the future transportation improvement identified through the MSTIP 3D project at this location, no additional mitigation is recommended along this corridor.

ON-SITE CIRCULATION/SITE-ACCESS OPERATIONS

The project team evaluated internal site circulation to ensure that the site provides sufficient on-site circulation for pedestrian movements vehicle and truck internal traffic. Sheet C4.0 of the development application provides a preliminary circulation plan for delivery, pedestrian and general site circulation.

Access is planned via four separate driveways, including one full-access driveway located along SW Langer Farms Parkway approximately 500-feet south of SW Tualatin-Sherwood Road and one right-in/right-out driveway and two full-access driveways located along the new SW Century drive extension. All four access points will function acceptably under stop control. In addition, sufficient sight distance is available at the site-access driveway along SW Langer Farms Parkway and is expected to be available along the future SW Century Drive extension.

Langer Farms Parkway/Site Access Driveway

Upon full build out of the proposed development, all movements at this intersection will operate well below capacity during both time periods; however, vehicles in the shared left/through lane exiting the site at this driveway will experience delay resulting in a LOS F during the weekday p.m. peak hour and Saturday mid-day peak hour. The site has been designed to accommodate the resulting on-site queues and other site driveways with less delay are available on Century Drive. Each of the driveways to Century Drive are forecast to operate at LOS A and B during the weekday p.m. peak hour. Additionally, these intersections operate at v/c ratios below 0.10 during the p.m. peak hour and maintain adequate additional capacity to accommodate potential internal reroute of traffic.

Shrubbery and landscaping, as well as above ground utilities and signage near the site access points should be located and maintained to ensure adequate sight distance at each of the site access driveways.

Left/Right-Turn Lanes

Left and right turn lane warrant analyses were performed at each of the site access driveways under total traffic conditions. The results of the analyses indicate that a separate right turn lane is warranted at the northbound approach to the main access driveway located along SW Langer Farms Parkway during the Saturday mid-day peak hours, but not during the weekday p.m. peak hour. The future lane configuration of Langer Farms Parkway at Tualatin Sherwood Road will result in the northbound curb lane becoming a separate right turn lane. As such, this lane operates as a de-facto right turn lane and therefore create minimal impedence to northbound traffic. A separate northbound right-turn lane is not recommended at this time. None of the other intersections warranted the need for separate left and/or right-turn lanes. *Appendix "M" contains the warrant analysis worksheets.*

Pedestrian Circulation

Sidewalks extend east from SW Langer Farms Parkway along the main access driveway and north from SW Century Drive along the two westernmost access driveways. Several additional sidewalks extend south from Tualatin Sherwood road and east from SW Langer Farms Parkway. Combined the sidewalks provide access to the proposed on-site building locations and parking areas as well as the adjacent sidewalk network. The proposed on-site pedestrian facilities are sufficient to accommodate pedestrian access and circulation, while minimizing potential conflicts with vehicles and out-of-direction travel for pedestrians.

Vehicular Circulation

Figure 2 illustrates the location of the proposed site access driveways. Vehicles entering the site at all driveways appear to have unobstructed free-flow entry, thus eliminating any congestion spilling onto the adjacent public roadway system. In addition, adequate queue storage lengths have been provided to accommodate egress from the site.

Truck Circulation

The easternmost driveway located along SW Century Drive will serve as the primary access for delivery trucks and will accommodate deliveries for the anchor tenant. This location is preferential due to proximity to loading area, and minimal conflicts with other transportation modes on the site. Deliveries for other smaller buildings on site will be accommodated through the vehicle circulation roadways on site.

Section 5
Conclusions and Recommendations

CONCLUSIONS AND RECOMMENDATIONS

In accordance with the City of Sherwood Zoning and Community Development Code 16.90.030.D.6, the results of this study indicate that the proposed Langer Farms Phase 7 can be developed while maintaining acceptable traffic operations and safety at the study intersections with inclusion of the recommended mitigation measures. The findings of this analysis and our recommendations are discussed below.

FINDINGS

Year 2012 Existing Conditions

- All of the study intersections operate acceptably during the weekday p.m. and Saturday mid-day peak hours.
- A review of historical crash data did not reveal any patterns or trends that require mitigation associated with this project for all but one of the study intersections.
 - The 99W/SW Roy Rogers Road-Tualatin-Sherwood Road intersection experiences a crash rate of 1.06 crashes per million entering vehicles (MEV) based on the recent 5 years of crash data reviewed. Construction of the SW Langer Farms Parkway extension, in accordance with the project development agreement, will provide an alternate adjacent route for traffic on 99W resulting in a change in future travel patterns at the 99W/SW Roy Rogers Road-SW Tualatin-Sherwood Road intersection.

Year 2013 Background Traffic Conditions

- The year 2013 background traffic volumes were developed by applying a 1.5 percent annual growth rate to the 30th highest hour design volumes during the weekday p.m. and Saturday mid-day peak hours.
- During the year 2013 weekday p.m. and Saturday mid-day peak hour background traffic conditions, all of the study intersections are forecast to operate acceptably during the weekday p.m. and Saturday mid-day peak hours.

Proposed Development Plan

- The proposed development is estimated to generate approximately 8,070 net new weekday daily trips; including 760 trips (385 inbound, 375 outbound) during the weekday p.m. peak hour and 1,025 trips (550 inbound, 475 outbound) during the Saturday mid-day peak hour.
- The trip estimate for the weekday p.m. peak hour is less than the Highway 99W Capacity Allocation Program trip cap of 43 p.m. peak hour trips per acre for this site. (43 trips per acre x 19.7 acres = 847 net p.m. peak trips).

- A trip distribution pattern for the proposed development was developed based on information provided by City of Sherwood staff and is based on data contained in the City's travel demand model.

Year 2013 Total Traffic Conditions

- Transportation improvements identified in the development agreement between Langer Gramor, LLC and the City of Sherwood were included in the year 2013 total traffic conditions analysis. The improvements are as follows:
 - SW Century Drive Extension (from the SW Langer Farms Parkway/Century Drive roundabout to the existing Industrial Way connection);
 - SW Langer Farms Parkway Extension (from the SW Langer Farms Parkway/Tualatin-Sherwood Road intersection to the OR 99W/Home Depot Driveway), and
 - SW Langer Famers Parkway/SW Tualatin-Sherwood Road Traffic Signal
- Each of the above mentioned improvements were included in the year 2013 total traffic conditions analysis. Some background traffic was re-routed to account for the change in travel patterns from the Langer Farms Parkway Extension Project.
- Site-generated traffic was assigned to the study area roadways based on the assumed trip distribution pattern.
- All of the study intersections and site-access driveways are forecast to operate acceptably during the weekday p.m. and Saturday mid-day peak hours with the exception of the Langer Farms Parkway/Site Access Driveway.
 - Upon full build out of the proposed development, all movements at this intersection will operate well below capacity during both time periods; however, vehicles in the shared left/through lane exiting the site at this driveway will experience delay resulting in a LOS F during the weekday p.m. peak hour and Saturday mid-day peak hour. The site has been designed to accommodate the resulting on-site queues and other site driveways with less delay are available on Century Drive. Each of the driveways to Century Drive are forecast to operate at LOS A and B during the weekday p.m. peak hour. Additionally, these intersections operate at v/c ratios below 0.10 during the p.m. peak hour and maintain adequate additional capacity to accommodate potential internal reroute of traffic.

On-Site Circulation/Site-Access Operations/Queuing Analysis

- All of the access points will function acceptably with stop control.
- Findings of the SimTraffic 95th percentile queuing analysis are:
 - There are locations within the study area where 95th percentile queue lengths are forecast to exceed the available storage during peak conditions. For locations at the

99W/Tualatin Sherwood Road intersection, where the forecast queue length exceeds the available storage, it is important to note that the reported queues represent conditions that persist from the background traffic conditions. Further, the mobility standard for this intersection allows for conditions exceeding capacity, thus accepting a moderate level of traffic congestion that occurs during the peak 15 minutes of the typical weekday.

- Other locations along Tualatin Sherwood Road also experience congestion during the weekday p.m. peak hour. The MSTIP 3D improvement project along Tualatin-Sherwood Road, planned for construction in 2014, will provide additional capacity improvements along this section of Tualatin Sherwood Road and at the 99W/Tualatin Sherwood Road intersection, thus improving overall traffic operations.
- Given the future transportation improvement identified through the MSTIP 3D project at this location, no additional mitigation is recommended along this corridor.

RECOMMENDATIONS

The following list provides a summary of the mitigation measures recommended as part of this proposed development.

- Construct the transportation improvements identified in the development agreement between Langer Gramor, LLC and the City of Sherwood. The improvements are as follows:
 - SW Century Drive Extension (from the SW Langer Farms Parkway/Century Drive roundabout to the existing Industrial Way connection);
 - SW Langer Farms Parkway Extension (from the SW Langer Farms Parkway/Tualatin-Sherwood Road intersection to the OR 99W/Home Depot Driveway), and
 - SW Langer Famers Parkway/SW Tualatin-Sherwood Road Traffic Signal.
- Develop the western most site access driveway to SW Century Drive as a right-in/right-out access to minimize potential vehicle queuing conflicts with traffic at the SW Langer Farms Parkway/SW Century Drive roundabout. Extension of the splitter island at the roundabout (east leg) will be necessary to properly restrict movements at this driveway.
- Develop the full-access driveway to Langer Farms Parkway to align the westbound through lane with the receiving lane at the opposing driveway.
- Langer Gramor, LLC should work with City staff to determine a plan for outright construction, or a “fee-in-lieu” for site frontage improvements along SW Tualatin-Sherwood Road.
- Shrubbery and landscaping, as well as above ground utilities and signage near the site access points should be located and maintained to ensure adequate sight distance.

Section 6
References

REFERENCES

1. City of Sherwood. *Transportation System Plan*. 2005
2. Oregon Department of Transportation. *Analysis Procedures Manual*. 2011
3. HHPR. *Adams Avenue North Concept Plan*. 2009
4. Transportation Research Board. *Highway Capacity Manual*. 2000.
5. Institute of Transportation Engineers. *7th Edition, Trip Generation Manual*. 2003.
6. Institute of Transportation Engineers. *Trip Generation Handbook*. 2003.