

## Traffic Analysis - Heather /Mt View Intersection

## Technical Memo

**To:** Shawn Nguy, Navix  
**From:** Anne Sylvester, PTE, Senior Consultant and Ryan Shea, PTP, Senior Transportation Planner  
**Date:** December 26, 2023  
**Project:** #23-001152  
**Subject:** Heather Street/Mountain View Lane Intersection Analysis, City of Forest Grove

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### Introduction

This memorandum has been prepared to evaluate preliminary engineering feasibility and traffic operational considerations associated with an extension of Poplar Street in the City of Forest Grove eastward to connect with the existing western terminus of Heather Street at its intersection with Mountain View Lane. The project location is shown in **Figure 1**. This analysis is being conducted in conjunction with the development of a data center to be located on property to the north and west of the new Heather Street/Mountain View Lane intersection. Primary access to the new data center will be provided at a driveway on the north side of Poplar Street opposite the main driveway serving an industrial site located on the south side of Poplar Street. A preliminary site plan illustrating the data center property including site access is presented in **Figure 2**.

Figure 1. Site Vicinity Map



Figure 2. Preliminary Site Plan for Proposed Data Center





The City of Forest Grove’s Transportation System Plan includes a future alignment of Poplar Street between OR 47 and Mountain View Lane which this project would accomplish. Key issues identified by the city in making this connection included:

- To the maximum extent possible avoid adverse impacts to the heritage tree currently located to the southwest of the existing Heather Street/Mountain View Lane intersection
- Avoid property impacts to the Neil Armstrong Middle School (NAMS) to the northeast of the intersection.
- Provide acceptable traffic operations at the new three-legged intersection.
- Provide adequate sight distance and address engineering challenges including drainage and stormwater management.
- Incorporate active transportation facilities.

Each of these issues will be addressed in this memo.

## Study Area

As shown in **Figure 1**, the study area for this memo focuses on the intersection of Heather Street with Mountain View Lane, but also includes the surrounding transportation network that will influence the movement of traffic through this intersection. To the west, the study area includes traffic movement along the existing segment of Poplar Street to the east of its intersection with OR 47. To the north, the study area includes the existing segment of Mountain View Lane as it approaches Pacific Avenue. To the east, the project area recognizes the existing patterns of land use and traffic circulation but does not specifically address changes in traffic patterns that would result from the connection of Poplar Street.

## Report Content and Organization

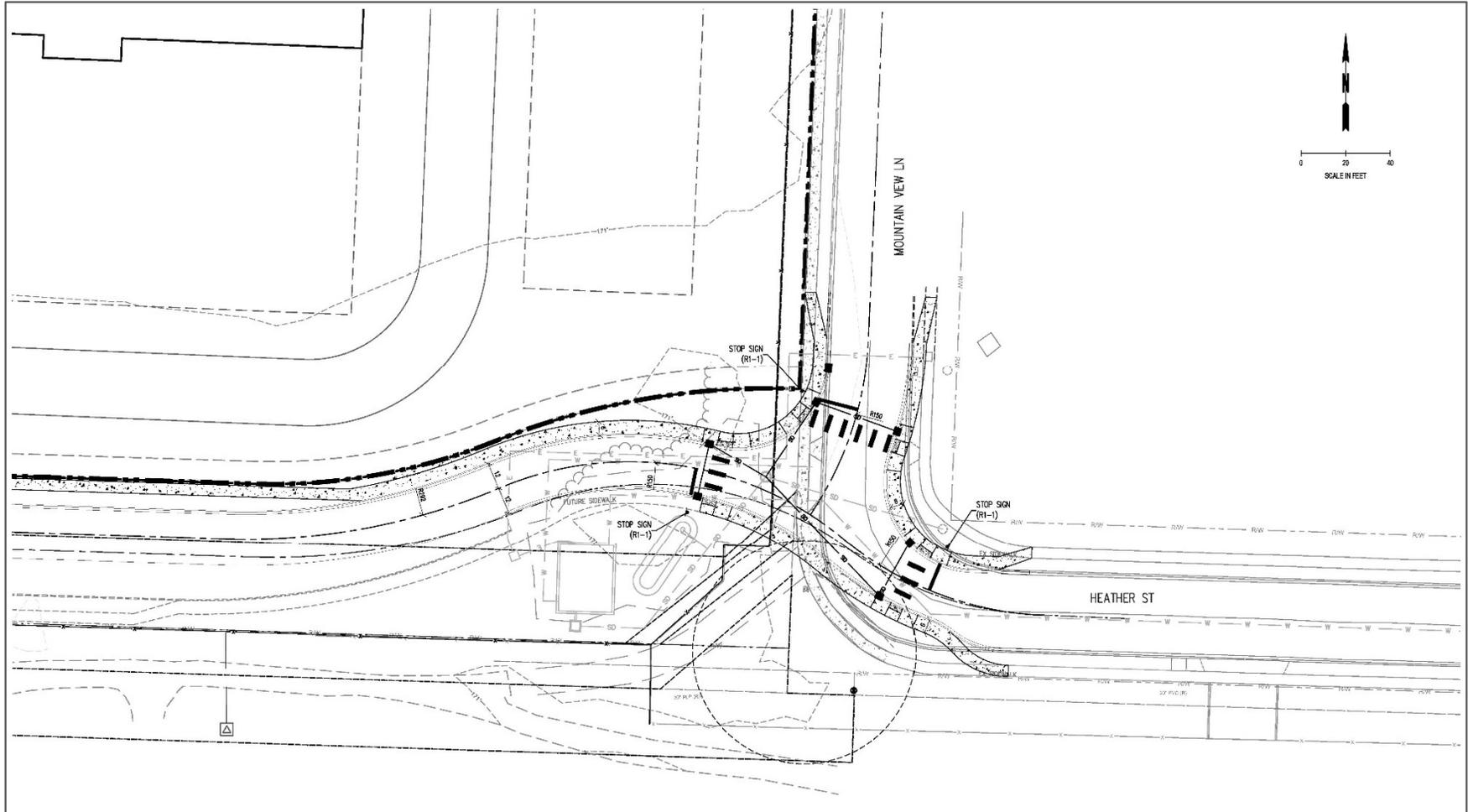
This report is organized into four major sections, the first of which is this Introduction. The second section presents a discussion related to the development of a preferred intersection concept and cost estimate. The third section discusses key transportation planning issues including the evaluation of planning horizon year traffic forecasts and operations analysis, and the effect of the new intersection on active transportation mobility. The final section presents a summary of conclusions and recommendations.

## Intersection Concept Development

This section documents the development of an intersection improvement concept to address the issues and concerns raised by the City of Forest Grove and discussed in the Introduction to this report. The concept will accommodate a connection between Heather Street and Poplar Street as prescribed in the City’s Transportation System Plan, which will minimize impacts to the heritage tree, the middle school and site development for the proposed data center to be located to the north and west of the new Heather Street/Mountain View Lane intersection. This section will also present an engineering cost estimate for the improvement project.

**Figure 3** illustrates the proposed improvement concept.

Figure 3. Preliminary Intersection Concept





## Preliminary Engineering Assumptions

Key assumptions inherent in the intersection concept include:

- Lane widths are 12 feet, with 24 feet from flow line to flow line.
- Sidewalks are 6 feet wide.
- The tee intersection is all-way stop controlled.
- Assumed design speed is 20 mph because of the recommended stop condition. A 25 mph design speed would require a minimum radius is 197 feet which is difficult to fit into the available ROW. Warning signs could be added for the curves and with speed posted for 20 mph. This speed is not inconsistent with the existing posted 20 mph speed in the adjacent school zone on school days between the hours of 7 am and 5 pm.
- Per AASHTO Green Book, Table 3-13, the minimum radii for curves in the intersection with a normal crown of 2% at design speed of 20 mph is R=107 feet. A radius of 150 feet was used in this concept.
- Roadway Structural Section is based on ODOT Drawing No. 312 and, while Poplar and Heather Streets are designated collectors in the City's TSP, an Arterial Street section was assumed to account for truck loading, particularly for the adjacent industrial site.
- Bicyclists will ride with vehicle traffic through the intersection.
- Proposed stormwater system will tie into the existing system.
- All storm pipes are 5 feet or less from the existing grade.
- Crosswalk locations from ODOT Highway Design Manual - Appendix L, Chapter 5: Street Crossing, Figure 5-2: Crosswalks Defined for T-Intersections.

## Cost Estimate

A planning level cost estimate was prepared for the improvement concept as is illustrated in Figure 3. This estimate does not include the cost of roadway extension from the existing eastern terminus to the beginning of the intersection improvement. The estimate assumes the following:

- All items were based on ODOT Bid Item List
- Cost/Unit based on ODOT Awarded Prices by Contract 2022
- Mobilization was assumed to be 7.5% of the costs of the items (not including contingency)
- Erosion Control was assumed to be 10% of the costs of the items (not including mobilization or contingency)
- Temporary Traffic Control is assumed to be 10% of the costs of the items (not including mobilization, erosion control or contingency)
- Contingency of 40% was used.

The total estimated cost of the intersection improvement is \$516,700. Details of the cost estimate are included in **Appendix A**.

## Transportation Analysis

The transportation analysis conducted for the proposed Poplar Street extension focused on three elements:

- Estimation of future (2045 PM peak hour) traffic volumes that would use the new through street after completion of the extension project.
- Future operations of the new three-legged intersection of Heather Street at Mountain View Lane and consideration of recommended traffic control based on the future year projected volumes.
- Integration of active transportation elements in the proposed project with the larger community-wide pedestrian and bicycle system.

Each of these topic areas is discussed in the relevant sections below.

### Estimation of 2045 PM Peak Hour Traffic Volumes

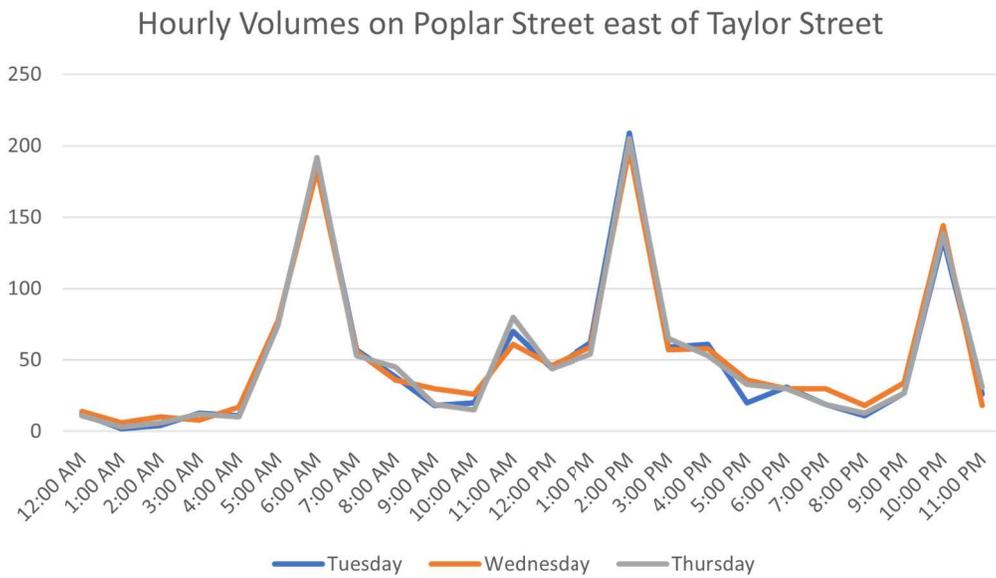
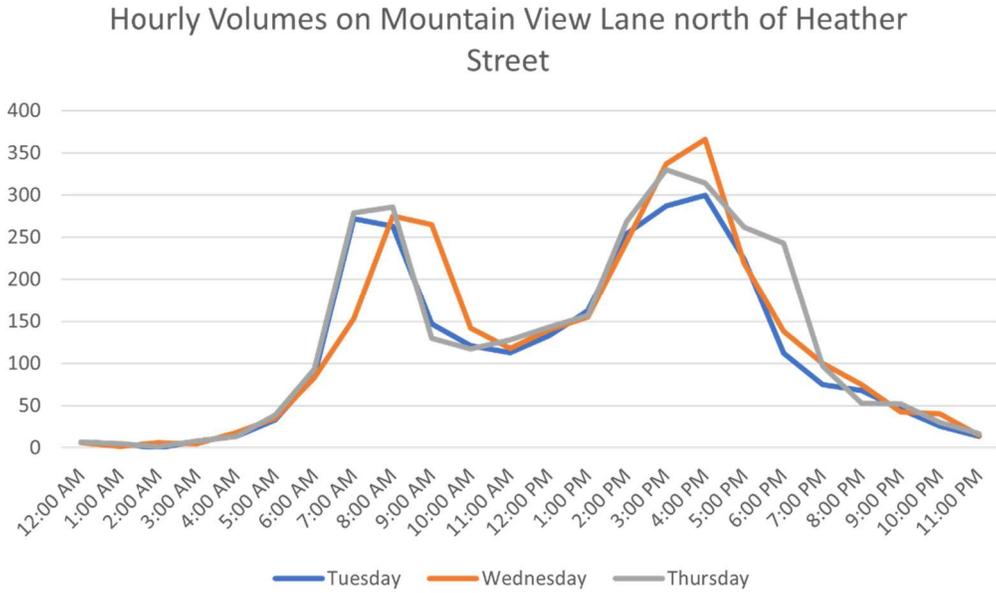
The estimation of PM peak hour traffic volumes for the proposed Poplar Street extension and development of a new three-legged intersection at Heather Street/Mountain View Lane included a multi-step process:

1. Obtaining existing hourly traffic count data for roadway links in the vicinity of the intersection and future year projections from the Washington County travel demand model that were used in preparing the City's Transportation System Plan (TSP).
2. Modify existing count data to reflect expected traffic growth on Poplar Street and Mountain View Lane as identified in the TSP which would include the extension of Poplar Street to connect with Mountain View Lane.
3. Prepare future year peak hour turning movement projections for the new three-legged intersection.
4. Incorporate traffic expected to divert from the existing industrial land use on Poplar Street and that would be generated by the new proposed data center.
5. Use final projected 2045 PM peak hour turning movement projections as the basis to evaluate expected operations of the new three-legged intersection.

### Existing Hourly Traffic Volumes

Since the existing intersection of Heather Street with Mountain View Lane constitutes only a turn in the road and not a true intersection, traffic count data collection focused on the two roadway links that would ultimately connect with the new three-legged intersection, created after the extension of Poplar Street to the east. 24-hour hose counts were taken on Mountain View Lane north of Heather Street and on Poplar Street east of Taylor Way over a three day period including November 28 through November 30, 2023, inclusive. This data is illustrated in **Figure 4**. Raw traffic count data is included in **Appendix B**.

**Figure 4. Hourly Traffic Count Data**



### Existing Hourly Vehicle Classification Counts

In addition to the total volume counts that are shown in Figure 4, data was also collected on vehicle classification to identify the mix of vehicles, including trucks, that could be attracted to the new corridor.

Vehicle classification data indicates that, over the 72-hour count period, 71.5 percent of all vehicles on Mountain View Lane north of Heather Street were cars and trailers, 19.6 percent were 2-axle trucks and 5.2

percent were 2-axle six-tire trucks. All other vehicle types each represented less than one percent of total vehicles. Eleven bicycles were included in the count.

On Poplar Street east of Taylor Way 79.9 percent of all vehicles were cars and trailers, 13.3 percent were 2-axle trucks, and 3.4 percent were 2-axle six-tire trucks. All other vehicle types each represented less than one percent of total vehicles. Eleven bicycles were included in the count.

## Existing Speed Data

Speed data was also collected at the two data locations. This data was stratified generally in five mile per hour increments between 1 and 76 mph over the three-day data collection period.

Analysis of speed data focused on identifying the 85 percentile speed, which is the maximum speed that a “reasonable” driver will travel given prevailing conditions related to the roadway, weather, etc. The posted speed for Mountain View Lane north of Heather Street is 25 mph except on school days between 7 AM and 5 PM which the school zone speed is 20 mph. The 85<sup>th</sup> percentile speed is 26 mph. The median speed is 22 mph indicating that more than half of the traveling public is traveling at less than the posted speed but more than the school zone speed. This difference may be due to the fact that the speed data includes all hours of travel and not just during school hours.

The posted speed for Poplar Street east of Taylor Way is 25 mph. The 85<sup>th</sup> percentile speed is 23 mph and the median speed is 18 mph. This indicates that the traveling public is generally moving at less than the posted speed. Only five vehicles traveling over the 72-hour study period were traveling at greater than 26 mph and all of these were traveling at less than 31 mph.

## 2045 PM Peak Hour Traffic Volumes

Based on the existing traffic volume data presented above, several analysis steps were undertaken to produce future year turning movement traffic projections at the new intersection. These projections then form the basis for the operations analysis discussed in the next section which validate the feasibility of the intersection concept and proposed traffic control.

The future year PM peak hour turning movement projections consist of existing volumes, expected growth in background traffic volumes resulting from general community growth between 2023 and 2045 as well as a redistribution of traffic resulting from the new Poplar Street connection, and traffic attributable to the new data center. Assumptions with respect to each of these elements are described below.

### Traffic Volume Growth along Poplar Street and Mountain View Lane

The estimate of future traffic growth along Poplar Street and Mountain View Lane considered expected growth in volumes between the base and future years as presented in the City’s TSP. The future year traffic volumes included in the TSP were developed using the Washington County regional travel demand model which identified the expected diversion of traffic from existing streets to the new Poplar Street connection. The model projections reflect the desirability of the new Poplar Street connection and provide a solid basis for estimating the extent of traffic that will divert from other roads to use the new facility . Existing and future year volumes at the intersection of OR 47/Poplar Street and Pacific Avenue/Mountain View Lane as included in the TSP were reviewed and the expected increase in traffic volumes was calculated.

This calculated growth was added to the 2023 PM peak hour roadway traffic counts on Mountain View Lane and Poplar Street as presented earlier in this report to estimate 2045 PM peak hour roadway traffic projections. 75-80 percent of Poplar Street growth was assumed to use Heather Street as it is unlikely that much traffic will divert from OR 47 to connect with Pacific Avenue via Mountain View Lane and vice versa.

While the calculation of future 2045 forecasts was based on the absolute growth in volumes predicted using the County’s model, this growth equates to an annualized percent growth from base year to future year of about 1 percent per year along Mountain View Lane. The annualized percentage growth rate along the Poplar Street extension is higher (ranging between 5 and 6 percent per year) due to the low level of existing traffic that was used as a starting point.

Addition of Traffic from Existing Industrial Site

PM peak hour traffic volumes for the existing industrial use on Poplar Street are captured in the counts taken on that street. Some reassignment of that volume was necessary to reflect the attractiveness of the new connection to/from the east, particularly to reach the Pacific Avenue/Baseline Road corridor. For purposes of this report, it was assumed that about ½ of outbound industrial trips would use the Poplar Street connection. At the subject intersection, it was further assumed that this traffic would split with two-thirds heading north on Mountain View Lane to Pacific Avenue and one-third continuing east on Heather Street.

Addition of Data Center Traffic

The two project-related characteristics having the most effect on area traffic conditions are peak hour trip generation and the directional distribution of traffic volumes on the surrounding roadway network. These are discussed in the following paragraphs.

Vehicle trip generation was calculated using the trip generation rates contained in the 11<sup>th</sup> edition of the *Trip Generation Manual* by the Institute of Transportation Engineers (ITE) for the proposed use. Data Center (land-use code #160) was determined to be the most applicable to this project.

The trip generation rates in the PM peak hour for this development are shown in **Table 1**.

**Table 1. PM Peak Hour Trip Generation Rates**

| Land Use    | Land Use Code (LUC) | Unit       | Trip Rate | Enter % | Exit % |
|-------------|---------------------|------------|-----------|---------|--------|
| Data Center | 160                 | 1,000 sqft | 0.10      | 30%     | 70%    |

The total trip generation expected from this project is calculated by applying the unit measure for each land use category to the appropriate trip generation rate. The PM peak hour trip generation calculations are shown in **Table 2**.

**Table 2. PM Peak Hour Trip Generation**

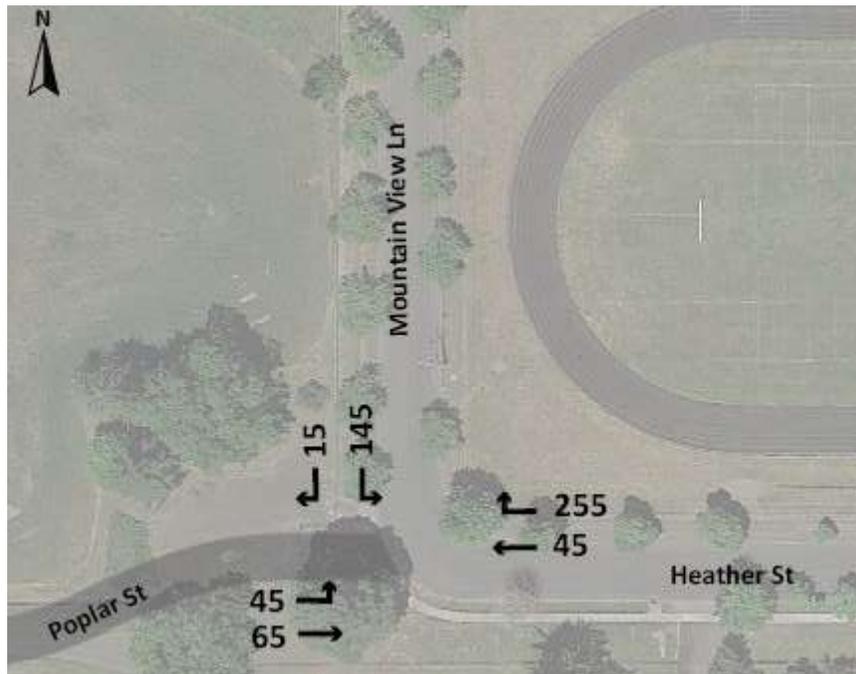
| Land Use Category | Size  | Total Trips | Enter % | Exit % |
|-------------------|-------|-------------|---------|--------|
| Data Center       | 780.0 | 80          | 24      | 56     |

These generated trips were then assigned to the surrounding street system based on the locations of residential neighborhoods and regional highway facilities in relation to the data center site. It was assumed that 40 percent of the generated trips would travel to/from the west and 60 percent would use the new intersection (with 40 percent using Mountain View Lane to reach Pacific Avenue and 20 percent continuing further along Heather Street. The distribution pattern of these trips through the intersection of Heather Street and Mountain View Lane is shown in **Appendix C**.

Total 2045 PM Peak Hour Traffic Projections

The roadway traffic volume projections produced through the process described above were converted into turning movement projections at the subject intersection. **Figure 5** illustrates the projected turning movements for the 2045 PM peak hour. This data was used to evaluate expected future traffic operations at the study area intersection to ensure that the design concept would be viable. It should be noted that it is not expected that the Poplar/Heather Street corridor will attract a significant volume of traffic once the connection is completed or that the area will experience significant growth as it is fairly well built-out. Details of the traffic estimation process are included in Appendix C.

**Figure 5. 2045 PM Peak Hour Intersection Traffic Projections**



## 2045 PM Peak Hour Traffic Operations

Two traffic control alternatives were evaluated at the newly-configured intersection of Heather Street and Mountain View Lane – two-way stop control affecting only the approach leg on Mountain View Lane and all-way stop control affecting all three legs. The results of this analysis for the 2045 PM peak hour are summarized in **Table 3**. As shown in the table, both intersections would operate substantially better than the city’s adopted mobility standard of LOS D. The two way stop control would operate at LOS B for the worst movement, while the all-way stop control would operate at LOS A for the combined average movements. Operations analysis worksheets are included in **Appendix D**.

**Table 3. 2045 PM Peak Hour Intersection Operations**

| Intersection                      | Traffic Control   | Mobility Standard | PM Peak Hour      |       |     |
|-----------------------------------|-------------------|-------------------|-------------------|-------|-----|
|                                   |                   |                   | V/C               | Delay | LOS |
| Heather Street/Mountain View Lane | TWSC <sup>1</sup> | LOS D             | 0.27 <sup>3</sup> | 12.8  | B   |
| Heather Street/Mountain View Lane | AWSC <sup>2</sup> | LOS D             | 0.36 <sup>3</sup> | 9.3   | A   |

1. Two-way Stop Control
2. All-way Stop Control
3. Worst movement

Additional sensitivity tests were conducted for this analysis by evaluating a much more significant growth in traffic through the Poplar/Heather Street corridor to identify the extent of additional capacity available with the two traffic control concepts. This analysis indicates with all-way stop control there is sufficient additional intersection capacity for projected volumes to double from the expected 2045 PM peak hour projections before the mobility standard could not be met. For two-way stop control, volumes would need to increase by about 80 percent before congestion would occur. Thus, it can be concluded that the intersection configuration shown in Figure 3 would be more than sufficient to meet the city’s operational standards with plenty of room to grow over time.

## Safety Considerations

Based on roadway curvature through the intersection necessitated by both right of way limitations and the location of the heritage tree, it is recommended that the intersection be signed for 20 mph approach speeds and that consideration be given to installing curvature warning signage. All-way stop control should be implemented to maximize safety of the new intersection. This recommendation is supported by review of Crash Modification Reduction factors published in the FHWA Crash Modification Factor (CMF) Clearinghouse that indicate an all-way stop would likely experience about 43 percent fewer crashes than a two-way stop.

## Active Transportation Connections

Review of the City’s TSP indicates that the Poplar Street corridor is recommended for pedestrian system improvements in the form of sidewalks along both sides of the existing street and the future street extension (see Pedestrian Plan map in **Appendix E**). Sidewalks already exist on both sides of Heather Street east of

Mountain View Lane and along the east side of Mountain View Lane north of Heather Street, so improvements through the new intersection will allow for a seamlessly connected system. The proposed sidewalk through the new three-legged intersection is shown in Figure 3. West of the intersection the sidewalk would run along the north side of the Poplar Street extension and would connect to a future sidewalk along the west side of Mountain View Lane. Modification to the existing sidewalks on the east side of Mountain View Lane and the south side of Heather Street would be needed while passing through the intersection and would be reconnected to existing sidewalks. Crosswalks are proposed for all three legs of the intersection to accompany the recommended all-way stop control.

The City's TSP does not include the extension of specific bicycle facilities on Poplar Street, Heather Street or Mountain View Lane. It is expected that traffic volumes and speeds are sufficiently low that bicycles would operate within the existing travel lane. Consideration could be given to indicating shared use through the installation of Sharrow pavement markings.

## Conclusions and Recommendations

This report illustrates a preliminary design concept to connect the easterly extension of Poplar Street with the current Mountain View Lane/Heather Street intersection by creating a new three-legged intersection. This intersection would have one approach lane from each direction (north, east, and west) with recommended all-way stop control and 20 mph approach speeds. The intersection would include sidewalks connecting with the existing sidewalks system to the north and east and would provide crosswalks on all approach legs. The intersection successfully avoids adverse impacts to the existing heritage tree, the Neil Armstrong Elementary School and the proposed future data center.

Traffic operations at the new intersection would operate at LOS A during the 2045 PM peak hour will all-way stop control and safety would be maximized.

If you have any questions or need additional information, please call me at 360.352.1465.

# Appendix A

## Cost Estimate

Heather Road/Mountain View Lane Intersection Modification Cost Estimate 12/26/2023

| Item Number     | Item Description                         | Unit | Quantity | Cost/Unit   | Cost         |
|-----------------|--|------|----------|-------------|--------------|
| 0210-0100000A   | MOBILIZATION                             | LS   | 1        | \$26,000.00 | \$26,000.00  |
| 0280-0100000A   | EROSION CONTROL                          | LS   | 1        | \$32,000.00 | \$32,000.00  |
| 0330-0105000K   | GENERAL EXCAVATION                       | CUYD | 830      | \$75.00     | \$62,250.00  |
| 0445-035012AF   | 12 INCH STORM SEWER PIPE, 5 FT DEPTH     | FOOT | 235      | \$100.00    | \$23,500.00  |
| 0470-0332000e   | CATCH BASINS, TYPE 3                     | EACH | 6        | \$2,000.00  | \$12,000.00  |
| 0596-A001000J   | SIDEWALK COPING                          | SQFT | 3790     | \$12.00     | \$45,480.00  |
| 0641-0110000M   | 1/2 INCH - 0 AGGREGATE BASE              | TON  | 1085     | \$40.00     | \$43,400.00  |
| 0641-0112000M   | 3/4 INCH - 0 AGGREGATE BASE              | TON  | 180      | \$40.00     | \$7,200.00   |
| 0745-0620000M   | PG 64-22 ASPHALT IN 1/2 ACP              | TON  | 275      | \$150.00    | \$41,250.00  |
| 0759-0103000F   | CONCRETE CURBS, CURB AND GUTTER          | FOOT | 725      | \$60.00     | \$43,500.00  |
| 0860-0200000F   | LONGITUDINAL PAVEMENT MARKINGS - PAINT   | Foot | 320      | \$1.00      | \$320.00     |
| 0867-0145100J   | PAVEMENT BAR, TYPE B-HS                  | SQFT | 260      | \$10.00     | \$2,600.00   |
| 0940-0202000J   | SIGNS, STANDARD SHEETING, SHEET ALUMINUM | SQFT | 27       | \$20.00     | \$540.00     |
| Nstd            | Temporary Traffic Control                | LS   | 1        | \$29,000.00 | \$29,000.00  |
| Sub Total       |  |      |          |             | \$369,040.00 |
| Contingency 40% |  |      |          |             | \$147,616.00 |
| Total           |  |      |          |             | \$516,656.00 |

# Appendix B

## Traffic Counts

| LOCATION: Mountain View Ln north of Heather St |                  |                  |                  |                  |     |                                   | QC JOB #: 16409501              |     |                                |                      |
|--|------------------|------------------|------------------|------------------|-----|-----------------------------------|---------------------------------|-----|--------------------------------|----------------------|
| SPECIFIC LOCATION:                             |                  |                  |                  |                  |     |                                   | DIRECTION: NB                   |     |                                |                      |
| CITY/STATE: Forest Grove, OR                   |                  |                  |                  |                  |     |                                   | DATE: Nov 28 2023 - Nov 30 2023 |     |                                |                      |
| Start Time                                     | Mon<br>28 Nov 23 | Tue<br>29 Nov 23 | Wed<br>30 Nov 23 | Thu<br>30 Nov 23 | Fri | Average Weekday<br>Hourly Traffic | Sat                             | Sun | Average Week<br>Hourly Traffic | Average Week Profile |
| 12:00 AM                                       |                  | 1                | 1                | 3                |     | 2                                 |                                 |     | 2                              |                      |
| 01:00 AM                                       |                  | 3                | 0                | 3                |     | 2                                 |                                 |     | 2                              |                      |
| 02:00 AM                                       |                  | 0                | 4                | 1                |     | 2                                 |                                 |     | 2                              |                      |
| 03:00 AM                                       |                  | 7                | 4                | 7                |     | 6                                 |                                 |     | 6                              |                      |
| 04:00 AM                                       |                  | 10               | 14               | 9                |     | 11                                |                                 |     | 11                             |                      |
| 05:00 AM                                       |                  | 27               | 26               | 28               |     | 27                                |                                 |     | 27                             |                      |
| 06:00 AM                                       |                  | 44               | 43               | 49               |     | 45                                |                                 |     | 45                             |                      |
| 07:00 AM                                       |                  | 172              | 76               | 180              |     | 143                               |                                 |     | 143                            |                      |
| 08:00 AM                                       |                  | 131              | 164              | 148              |     | 148                               |                                 |     | 148                            |                      |
| 09:00 AM                                       |                  | 90               | 159              | 78               |     | 109                               |                                 |     | 109                            |                      |
| 10:00 AM                                       |                  | 64               | 79               | 69               |     | 71                                |                                 |     | 71                             |                      |
| 11:00 AM                                       |                  | 58               | 66               | 65               |     | 63                                |                                 |     | 63                             |                      |
| 12:00 PM                                       |                  | 81               | 79               | 77               |     | 79                                |                                 |     | 79                             |                      |
| 01:00 PM                                       |                  | 91               | 75               | 77               |     | 81                                |                                 |     | 81                             |                      |
| 02:00 PM                                       |                  | 119              | 117              | 117              |     | 118                               |                                 |     | 118                            |                      |
| 03:00 PM                                       |                  | 170              | 194              | 194              |     | 186                               |                                 |     | 186                            |                      |
| 04:00 PM                                       |                  | 197              | 228              | 186              |     | 204                               |                                 |     | 204                            |                      |
| 05:00 PM                                       |                  | 152              | 130              | 135              |     | 139                               |                                 |     | 139                            |                      |
| 06:00 PM                                       |                  | 65               | 81               | 86               |     | 77                                |                                 |     | 77                             |                      |
| 07:00 PM                                       |                  | 41               | 53               | 58               |     | 51                                |                                 |     | 51                             |                      |
| 08:00 PM                                       |                  | 37               | 50               | 27               |     | 38                                |                                 |     | 38                             |                      |
| 09:00 PM                                       |                  | 24               | 22               | 28               |     | 25                                |                                 |     | 25                             |                      |
| 10:00 PM                                       |                  | 13               | 23               | 11               |     | 16                                |                                 |     | 16                             |                      |
| 11:00 PM                                       |                  | 6                | 4                | 4                |     | 5                                 |                                 |     | 5                              |                      |
| Day Total                                      |                  | 1603             | 1692             | 1640             |     | 1648                              |                                 |     | 1648                           |                      |
| % Weekday Average                              |                  | 97.3%            | 102.7%           | 99.5%            |     |                                   |                                 |     |                                |                      |
| % Week Average                                 |                  | 97.3%            | 102.7%           | 99.5%            |     | 100%                              |                                 |     |                                |                      |
| AM Peak Volume                                 |                  | 7:00 AM<br>172   | 8:00 AM<br>164   | 7:00 AM<br>180   |     | 8:00 AM<br>148                    |                                 |     | 8:00 AM<br>148                 |                      |
| PM Peak Volume                                 |                  | 4:00 PM<br>197   | 4:00 PM<br>228   | 3:00 PM<br>194   |     | 4:00 PM<br>204                    |                                 |     | 4:00 PM<br>204                 |                      |

Comments:

| LOCATION: Mountain View Ln north of Heather St |                  |                  |                  |                  |     |                                   | QC JOB #: 16409501              |     |                                |                      |
|--|------------------|------------------|------------------|------------------|-----|-----------------------------------|---------------------------------|-----|--------------------------------|----------------------|
| SPECIFIC LOCATION:                             |                  |                  |                  |                  |     |                                   | DIRECTION: SB                   |     |                                |                      |
| CITY/STATE: Forest Grove, OR                   |                  |                  |                  |                  |     |                                   | DATE: Nov 28 2023 - Nov 30 2023 |     |                                |                      |
| Start Time                                     | Mon<br>28 Nov 23 | Tue<br>29 Nov 23 | Wed<br>30 Nov 23 | Thu<br>30 Nov 23 | Fri | Average Weekday<br>Hourly Traffic | Sat                             | Sun | Average Week<br>Hourly Traffic | Average Week Profile |
| 12:00 AM                                       |                  | 6                | 5                | 4                |     | 5                                 |                                 |     | 5                              |                      |
| 01:00 AM                                       |                  | 2                | 2                | 2                |     | 2                                 |                                 |     | 2                              |                      |
| 02:00 AM                                       |                  | 0                | 2                | 1                |     | 1                                 |                                 |     | 1                              |                      |
| 03:00 AM                                       |                  | 1                | 1                | 1                |     | 1                                 |                                 |     | 1                              |                      |
| 04:00 AM                                       |                  | 4                | 4                | 5                |     | 4                                 |                                 |     | 4                              |                      |
| 05:00 AM                                       |                  | 6                | 9                | 11               |     | 9                                 |                                 |     | 9                              |                      |
| 06:00 AM                                       |                  | 41               | 40               | 44               |     | 42                                |                                 |     | 42                             |                      |
| 07:00 AM                                       |                  | 100              | 77               | 99               |     | 92                                |                                 |     | 92                             |                      |
| 08:00 AM                                       |                  | 132              | 111              | 138              |     | 127                               |                                 |     | 127                            |                      |
| 09:00 AM                                       |                  | 57               | 106              | 52               |     | 72                                |                                 |     | 72                             |                      |
| 10:00 AM                                       |                  | 57               | 63               | 48               |     | 56                                |                                 |     | 56                             |                      |
| 11:00 AM                                       |                  | 55               | 52               | 63               |     | 57                                |                                 |     | 57                             |                      |
| 12:00 PM                                       |                  | 52               | 61               | 66               |     | 60                                |                                 |     | 60                             |                      |
| 01:00 PM                                       |                  | 72               | 80               | 80               |     | 77                                |                                 |     | 77                             |                      |
| 02:00 PM                                       |                  | 135              | 128              | 152              |     | 138                               |                                 |     | 138                            |                      |
| 03:00 PM                                       |                  | 117              | 143              | 136              |     | 132                               |                                 |     | 132                            |                      |
| 04:00 PM                                       |                  | 103              | 138              | 128              |     | 123                               |                                 |     | 123                            |                      |
| 05:00 PM                                       |                  | 72               | 89               | 127              |     | 96                                |                                 |     | 96                             |                      |
| 06:00 PM                                       |                  | 47               | 57               | 157              |     | 87                                |                                 |     | 87                             |                      |
| 07:00 PM                                       |                  | 34               | 47               | 39               |     | 40                                |                                 |     | 40                             |                      |
| 08:00 PM                                       |                  | 31               | 25               | 26               |     | 27                                |                                 |     | 27                             |                      |
| 09:00 PM                                       |                  | 22               | 21               | 24               |     | 22                                |                                 |     | 22                             |                      |
| 10:00 PM                                       |                  | 13               | 17               | 19               |     | 16                                |                                 |     | 16                             |                      |
| 11:00 PM                                       |                  | 8                | 11               | 13               |     | 11                                |                                 |     | 11                             |                      |
| <b>Day Total</b>                               |                  | 1167             | 1289             | 1435             |     | 1297                              |                                 |     | 1297                           |                      |
| % Weekday Average                              |                  | 90%              | 99.4%            | 110.6%           |     |                                   |                                 |     |                                |                      |
| % Week Average                                 |                  | 90%              | 99.4%            | 110.6%           |     | 100%                              |                                 |     |                                |                      |
| AM Peak Volume                                 |                  | 8:00 AM<br>132   | 8:00 AM<br>111   | 8:00 AM<br>138   |     | 8:00 AM<br>127                    |                                 |     | 8:00 AM<br>127                 |                      |
| PM Peak Volume                                 |                  | 2:00 PM<br>135   | 3:00 PM<br>143   | 6:00 PM<br>157   |     | 2:00 PM<br>138                    |                                 |     | 2:00 PM<br>138                 |                      |

Comments:

Type of report: Tube Count - Volume Data

| LOCATION: Poplar St east of Taylor Wy |                  |                  |                  |                  |     |                                   | QC JOB #: 16409502              |     |                                |                      |
|---------------------------------------|------------------|------------------|------------------|------------------|-----|-----------------------------------|---------------------------------|-----|--------------------------------|----------------------|
| SPECIFIC LOCATION:                    |                  |                  |                  |                  |     |                                   | DIRECTION: EB                   |     |                                |                      |
| CITY/STATE: Forest Grove, OR          |                  |                  |                  |                  |     |                                   | DATE: Nov 28 2023 - Nov 30 2023 |     |                                |                      |
| Start Time                            | Mon<br>28 Nov 23 | Tue<br>29 Nov 23 | Wed<br>30 Nov 23 | Thu<br>30 Nov 23 | Fri | Average Weekday<br>Hourly Traffic | Sat                             | Sun | Average Week<br>Hourly Traffic | Average Week Profile |
| 12:00 AM                              |                  | 4                | 5                | 3                |     | 4                                 |                                 |     | 4                              |                      |
| 01:00 AM                              |                  | 1                | 1                | 0                |     | 1                                 |                                 |     | 1                              |                      |
| 02:00 AM                              |                  | 2                | 5                | 2                |     | 3                                 |                                 |     | 3                              |                      |
| 03:00 AM                              |                  | 7                | 3                | 7                |     | 6                                 |                                 |     | 6                              |                      |
| 04:00 AM                              |                  | 6                | 13               | 7                |     | 9                                 |                                 |     | 9                              |                      |
| 05:00 AM                              |                  | 62               | 63               | 62               |     | 62                                |                                 |     | 62                             |                      |
| 06:00 AM                              |                  | 118              | 112              | 113              |     | 114                               |                                 |     | 114                            |                      |
| 07:00 AM                              |                  | 27               | 33               | 29               |     | 30                                |                                 |     | 30                             |                      |
| 08:00 AM                              |                  | 28               | 23               | 33               |     | 28                                |                                 |     | 28                             |                      |
| 09:00 AM                              |                  | 12               | 18               | 10               |     | 13                                |                                 |     | 13                             |                      |
| 10:00 AM                              |                  | 10               | 9                | 5                |     | 8                                 |                                 |     | 8                              |                      |
| 11:00 AM                              |                  | 28               | 23               | 33               |     | 28                                |                                 |     | 28                             |                      |
| 12:00 PM                              |                  | 28               | 31               | 26               |     | 28                                |                                 |     | 28                             |                      |
| 01:00 PM                              |                  | 48               | 46               | 43               |     | 46                                |                                 |     | 46                             |                      |
| 02:00 PM                              |                  | 89               | 82               | 87               |     | 86                                |                                 |     | 86                             |                      |
| 03:00 PM                              |                  | 6                | 5                | 9                |     | 7                                 |                                 |     | 7                              |                      |
| 04:00 PM                              |                  | 6                | 9                | 9                |     | 8                                 |                                 |     | 8                              |                      |
| 05:00 PM                              |                  | 11               | 16               | 16               |     | 14                                |                                 |     | 14                             |                      |
| 06:00 PM                              |                  | 10               | 9                | 9                |     | 9                                 |                                 |     | 9                              |                      |
| 07:00 PM                              |                  | 12               | 16               | 12               |     | 13                                |                                 |     | 13                             |                      |
| 08:00 PM                              |                  | 7                | 13               | 8                |     | 9                                 |                                 |     | 9                              |                      |
| 09:00 PM                              |                  | 22               | 27               | 22               |     | 24                                |                                 |     | 24                             |                      |
| 10:00 PM                              |                  | 59               | 60               | 63               |     | 61                                |                                 |     | 61                             |                      |
| 11:00 PM                              |                  | 3                | 2                | 4                |     | 3                                 |                                 |     | 3                              |                      |
| <b>Day Total</b>                      |                  | 606              | 624              | 612              |     | 614                               |                                 |     | 614                            |                      |
| % Weekday Average                     |                  | 98.7%            | 101.6%           | 99.7%            |     |                                   |                                 |     |                                |                      |
| % Week Average                        |                  | 98.7%            | 101.6%           | 99.7%            |     | 100%                              |                                 |     |                                |                      |
| AM Peak Volume                        |                  | 6:00 AM<br>118   | 6:00 AM<br>112   | 6:00 AM<br>113   |     | 6:00 AM<br>114                    |                                 |     | 6:00 AM<br>114                 |                      |
| PM Peak Volume                        |                  | 2:00 PM<br>89    | 2:00 PM<br>82    | 2:00 PM<br>87    |     | 2:00 PM<br>86                     |                                 |     | 2:00 PM<br>86                  |                      |

Comments:

Report generated on 12/4/2023 8:43 AM

SOURCE: Quality Counts, LLC (<http://www.qualitycounts.net>)

Type of report: Tube Count - Volume Data

| LOCATION: Poplar St east of Taylor Wy |                  |                  |                  |                  |     |                                   | QC JOB #: 16409502              |     |                                |                      |
|---------------------------------------|------------------|------------------|------------------|------------------|-----|-----------------------------------|---------------------------------|-----|--------------------------------|----------------------|
| SPECIFIC LOCATION:                    |                  |                  |                  |                  |     |                                   | DIRECTION: WB                   |     |                                |                      |
| CITY/STATE: Forest Grove, OR          |                  |                  |                  |                  |     |                                   | DATE: Nov 28 2023 - Nov 30 2023 |     |                                |                      |
| Start Time                            | Mon<br>28 Nov 23 | Tue<br>29 Nov 23 | Wed<br>30 Nov 23 | Thu<br>30 Nov 23 | Fri | Average Weekday<br>Hourly Traffic | Sat                             | Sun | Average Week<br>Hourly Traffic | Average Week Profile |
| 12:00 AM                              |                  | 8                | 9                | 8                |     | 8                                 |                                 |     | 8                              |                      |
| 01:00 AM                              |                  | 1                | 5                | 3                |     | 3                                 |                                 |     | 3                              |                      |
| 02:00 AM                              |                  | 2                | 5                | 4                |     | 4                                 |                                 |     | 4                              |                      |
| 03:00 AM                              |                  | 6                | 5                | 5                |     | 5                                 |                                 |     | 5                              |                      |
| 04:00 AM                              |                  | 5                | 4                | 3                |     | 4                                 |                                 |     | 4                              |                      |
| 05:00 AM                              |                  | 14               | 14               | 12               |     | 13                                |                                 |     | 13                             |                      |
| 06:00 AM                              |                  | 71               | 71               | 79               |     | 74                                |                                 |     | 74                             |                      |
| 07:00 AM                              |                  | 30               | 23               | 24               |     | 26                                |                                 |     | 26                             |                      |
| 08:00 AM                              |                  | 10               | 13               | 12               |     | 12                                |                                 |     | 12                             |                      |
| 09:00 AM                              |                  | 6                | 12               | 9                |     | 9                                 |                                 |     | 9                              |                      |
| 10:00 AM                              |                  | 10               | 17               | 10               |     | 12                                |                                 |     | 12                             |                      |
| 11:00 AM                              |                  | 42               | 38               | 47               |     | 42                                |                                 |     | 42                             |                      |
| 12:00 PM                              |                  | 16               | 15               | 18               |     | 16                                |                                 |     | 16                             |                      |
| 01:00 PM                              |                  | 14               | 13               | 11               |     | 13                                |                                 |     | 13                             |                      |
| 02:00 PM                              |                  | 120              | 116              | 118              |     | 118                               |                                 |     | 118                            |                      |
| 03:00 PM                              |                  | 53               | 52               | 56               |     | 54                                |                                 |     | 54                             |                      |
| 04:00 PM                              |                  | 55               | 49               | 44               |     | 49                                |                                 |     | 49                             |                      |
| 05:00 PM                              |                  | 9                | 20               | 17               |     | 15                                |                                 |     | 15                             |                      |
| 06:00 PM                              |                  | 21               | 21               | 21               |     | 21                                |                                 |     | 21                             |                      |
| 07:00 PM                              |                  | 7                | 14               | 7                |     | 9                                 |                                 |     | 9                              |                      |
| 08:00 PM                              |                  | 4                | 5                | 5                |     | 5                                 |                                 |     | 5                              |                      |
| 09:00 PM                              |                  | 5                | 7                | 5                |     | 6                                 |                                 |     | 6                              |                      |
| 10:00 PM                              |                  | 76               | 84               | 76               |     | 79                                |                                 |     | 79                             |                      |
| 11:00 PM                              |                  | 23               | 16               | 27               |     | 22                                |                                 |     | 22                             |                      |
| Day Total                             |                  | 608              | 628              | 621              |     | 619                               |                                 |     | 619                            |                      |
| % Weekday Average                     |                  | 98.2%            | 101.5%           | 100.3%           |     |                                   |                                 |     |                                |                      |
| % Week Average                        |                  | 98.2%            | 101.5%           | 100.3%           |     | 100%                              |                                 |     |                                |                      |
| AM Peak Volume                        |                  | 6:00 AM<br>71    | 6:00 AM<br>71    | 6:00 AM<br>79    |     | 6:00 AM<br>74                     |                                 |     | 6:00 AM<br>74                  |                      |
| PM Peak Volume                        |                  | 2:00 PM<br>120   | 2:00 PM<br>116   | 2:00 PM<br>118   |     | 2:00 PM<br>118                    |                                 |     | 2:00 PM<br>118                 |                      |

Comments:

Report generated on 12/4/2023 8:43 AM

SOURCE: Quality Counts, LLC (<http://www.qualitycounts.net>)

# Appendix C

## Traffic Volume Estimates



# Forest Grove Data Center

PM Peak Hour Volumes

| Intersection  | Movement |   | Existing   | Background | Growth       | Baseline   | Site      | Projected  |
|---|----------|---|------------|------------|--------------|------------|-----------|------------|
|   |          |   | 2023       |            |              | 2045       | Generated | 2045       |
|   |          |   | Volumes    | Growth     | Reassignment | Volumes    | Total     | Volumes    |
| 1<br><b>Poplar St/Heather St</b><br><b>Mountain View Lane</b><br><br>TMC Date: 04/13/2021<br><br>4:30 - 5:30<br>PHF: 0.97 |          | L | 0          | 8          | 17           | 25         | 22        | 47         |
|   | EB       | T | 0          | 43         | 8            | 51         | 12        | 63         |
|   |          | R | 0          | 0          | 0            | 0          | 0         | 0          |
|   |          | L | 0          | 0          | 0            | 0          | 0         | 0          |
|   | WB       | T | 0          | 39         | 0            | 39         | 4         | 43         |
|   |          | R | 204        | 50         | 0            | 254        | 0         | 254        |
|   |          | L | 0          | 0          | 0            | 0          | 0         | 0          |
|   | NB       | T | 0          | 0          | 0            | 0          | 0         | 0          |
|   |          | R | 0          | 0          | 0            | 0          | 0         | 0          |
|   |          | L | 123        | 20         | 0            | 143        | 0         | 143        |
|   |          | T | 0          | 0          | 0            | 0          | 0         | 0          |
|   | R        | 0 | 6          | 0          | 6            | 10         | 16        |            |
|   |          |   | <b>327</b> |            |              | <b>518</b> |           | <b>566</b> |

# Appendix D

## Traffic Operations Worksheets

| Intersection             |      |      |      |      |      |      |
|--------------------------|------|------|------|------|------|------|
| Int Delay, s/veh         | 4.2  |      |      |      |      |      |
| Movement                 | EBL  | EBT  | WBT  | WBR  | SBL  | SBR  |
| Lane Configurations      |      | ↔    | ↔    |      | ↔    |      |
| Traffic Vol, veh/h       | 45   | 65   | 45   | 255  | 145  | 15   |
| Future Vol, veh/h        | 45   | 65   | 45   | 255  | 145  | 15   |
| Conflicting Peds, #/hr   | 0    | 0    | 0    | 0    | 0    | 0    |
| Sign Control             | Free | Free | Free | Free | Stop | Stop |
| RT Channelized           | -    | None | -    | None | -    | None |
| Storage Length           | -    | -    | -    | -    | 0    | -    |
| Veh in Median Storage, # | -    | 0    | 0    | -    | 0    | -    |
| Grade, %                 | -    | 0    | 0    | -    | 0    | -    |
| Peak Hour Factor         | 92   | 92   | 92   | 92   | 92   | 92   |
| Heavy Vehicles, %        | 1    | 1    | 1    | 1    | 1    | 1    |
| Mvmt Flow                | 49   | 71   | 49   | 277  | 158  | 16   |

| Major/Minor          | Major1 | Major2 | Minor2 |       |       |
|----------------------|--------|--------|--------|-------|-------|
| Conflicting Flow All | 326    | 0      | 0      | 357   | 188   |
| Stage 1              | -      | -      | -      | 188   | -     |
| Stage 2              | -      | -      | -      | 169   | -     |
| Critical Hdwy        | 4.11   | -      | -      | 6.41  | 6.21  |
| Critical Hdwy Stg 1  | -      | -      | -      | 5.41  | -     |
| Critical Hdwy Stg 2  | -      | -      | -      | 5.41  | -     |
| Follow-up Hdwy       | 2.209  | -      | -      | 3.509 | 3.309 |
| Pot Cap-1 Maneuver   | 1239   | -      | -      | 643   | 857   |
| Stage 1              | -      | -      | -      | 846   | -     |
| Stage 2              | -      | -      | -      | 863   | -     |
| Platoon blocked, %   |        | -      | -      |       |       |
| Mov Cap-1 Maneuver   | 1239   | -      | -      | 617   | 857   |
| Mov Cap-2 Maneuver   | -      | -      | -      | 617   | -     |
| Stage 1              | -      | -      | -      | 811   | -     |
| Stage 2              | -      | -      | -      | 863   | -     |

| Approach             | EB  | WB | SB   |
|----------------------|-----|----|------|
| HCM Control Delay, s | 3.3 | 0  | 12.8 |
| HCM LOS              |     |    | B    |

| Minor Lane/Major Mvmt | EBL   | EBT | WBT | WBR | SBLn1 |
|-----------------------|-------|-----|-----|-----|-------|
| Capacity (veh/h)      | 1239  | -   | -   | -   | 634   |
| HCM Lane V/C Ratio    | 0.039 | -   | -   | -   | 0.274 |
| HCM Control Delay (s) | 8     | 0   | -   | -   | 12.8  |
| HCM Lane LOS          | A     | A   | -   | -   | B     |
| HCM 95th %tile Q(veh) | 0.1   | -   | -   | -   | 1.1   |

| Intersection              |     |
|---------------------------|-----|
| Intersection Delay, s/veh | 9.3 |
| Intersection LOS          | A   |

| Movement            | EBL  | EBT  | WBT  | WBR  | SBL  | SBR  |
|---------------------|------|------|------|------|------|------|
| Lane Configurations |      |      |      |      |      |      |
| Traffic Vol, veh/h  | 45   | 65   | 45   | 255  | 145  | 15   |
| Future Vol, veh/h   | 45   | 65   | 45   | 255  | 145  | 15   |
| Peak Hour Factor    | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Heavy Vehicles, %   | 1    | 1    | 1    | 1    | 1    | 1    |
| Mvmt Flow           | 49   | 71   | 49   | 277  | 158  | 16   |
| Number of Lanes     | 0    | 1    | 1    | 0    | 1    | 0    |

| Approach                   | EB  | WB  | SB  |
|----------------------------|-----|-----|-----|
| Opposing Approach          | WB  | EB  |     |
| Opposing Lanes             | 1   | 1   | 0   |
| Conflicting Approach Left  | SB  |     | WB  |
| Conflicting Lanes Left     | 1   | 0   | 1   |
| Conflicting Approach Right |     | SB  | EB  |
| Conflicting Lanes Right    | 0   | 1   | 1   |
| HCM Control Delay          | 8.7 | 9.3 | 9.6 |
| HCM LOS                    | A   | A   | A   |

| Lane                   | EBLn1 | WBLn1 | SBLn1 |
|------------------------|-------|-------|-------|
| Vol Left, %            | 41%   | 0%    | 91%   |
| Vol Thru, %            | 59%   | 15%   | 0%    |
| Vol Right, %           | 0%    | 85%   | 9%    |
| Sign Control           | Stop  | Stop  | Stop  |
| Traffic Vol by Lane    | 110   | 300   | 160   |
| LT Vol                 | 45    | 0     | 145   |
| Through Vol            | 65    | 45    | 0     |
| RT Vol                 | 0     | 255   | 15    |
| Lane Flow Rate         | 120   | 326   | 174   |
| Geometry Grp           | 1     | 1     | 1     |
| Degree of Util (X)     | 0.159 | 0.363 | 0.24  |
| Departure Headway (Hd) | 4.778 | 4.003 | 4.978 |
| Convergence, Y/N       | Yes   | Yes   | Yes   |
| Cap                    | 750   | 900   | 720   |
| Service Time           | 2.812 | 2.026 | 3.023 |
| HCM Lane V/C Ratio     | 0.16  | 0.362 | 0.242 |
| HCM Control Delay      | 8.7   | 9.3   | 9.6   |
| HCM Lane LOS           | A     | A     | A     |
| HCM 95th-tile Q        | 0.6   | 1.7   | 0.9   |

# Appendix E

## Pedestrian Plan

Forest Grove TSP – Recommended Pedestrian Plan

