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I. EXECUTIVE SUMMARY

This Traffic Impact Study (TIS) has been prepared in support of the proposed relocation of the Lake Oswego School District (LOSD) bus barn to 6333 Lakeview Boulevard in Lake Oswego, Oregon. This study addresses requirements established by the Lake Oswego Community Development Code (LOC), Section 50.07.003(iii), and the Lake Oswego Traffic Impact Study (TIS) Guidelines.

Project Description
- The existing LOSD bus barn will be relocated from 3701 SW Beasley Way to 6333 Lakeview Boulevard.
- The bus barn houses and maintains the LOSD buses serving the district’s schools. All bus routes start and end at the bus barn.

Existing Conditions
- The proposed project site is approximately 2.41 acres and is currently zoned Industrial Park District (IP).
- Lakeview Boulevard which abuts the site is designated a Neighborhood Collector with a posted speed of 25 mph.
- Sidewalks are only partially provided on the study area roadways. There are sidewalks on the north side of Lakeview Boulevard along the site frontage, but not on the south side.
- Dedicated bike lanes are provided on Lower Boones Ferry Road and shared lane markings are provided on Pilkington Road. No bike lanes are provided on Lakeview Boulevard.
- Traffic volumes were collected for the AM and PM peak periods and summarized for morning and afternoon peak hours that correspond with peak site activity as well as hours that correspond with peak vehicle activity on the adjacent streets.
- All intersections meet the City’s mobility target, level of service (LOS) E or better, under existing conditions except for the Jean Road/Pilkington Road intersection. During the PM street peak hour, this intersection has LOS F conditions on the southbound approach.
- Queuing is not a concern for most travel lanes but several approaches have 95th percentile queues that sometimes block driveways. The only location where 95th percentile queues exceed the available storage is on the northbound approach of Bryant Avenue at Jean Road.

Pre-Development Conditions
- A linear 1% annual growth rate over one (1) year was applied to 2018 traffic volumes to reflect 2019 background traffic.
- In-process trips from the River Grove Elementary School expansion and the Lakeview Business Park were added to 2019 background traffic to reflect 2019 pre-development traffic.
- The City’s 2017-2023 Capital Improvement Program (CIP) includes projects to realign the intersection of Lakeview Boulevard at Jean Road and install traffic signals at the intersections of Jean Road/Pilkington Road and Jean Road/Bryant Road. Although fully funded, only the realignment is certain to be complete before the bus barn begins operation in 2019.
- Under pre-development conditions, all intersections will continue to meet the City’s mobility target except for the Jean Road/Pilkington Road intersection during the PM street peak. The southbound approach is anticipated to be at capacity with delays averaging over a minute.
Under pre-development conditions, queuing is expected to be the same as or one vehicle (25 feet) more than existing 95th percentile queues.

Site Development
- The LOSD bus barn serves Lake Oswego elementary, middle, and high schools and currently has 26 elementary school routes, 28 middle school routes, and 15 high school routes.
- The bus barn currently generates a 102 AM trips and 87 PM trips during the busiest hours at the site. This includes 50 outbound bus trips in the morning and 47 inbound bus trips in the afternoon.
- The trip generation corresponding the street system peak hours is 54 AM trips and 69 PM trips including 34 outbound buses and nine (9) inbound buses in the morning and 30 inbound buses in the afternoon.
- Site trip distribution assumes that all traffic will use the City’s arterial and collector street network. None of the buses are expected to use the nearby local streets except for those that travel the routes serving the abutting neighborhood.

Site Access and Circulation
- The site will include two full-movement accesses to Lakeview Boulevard spaced approximately 130 feet apart, measured between driveway centerlines.
- The site will meet access spacing standards on Lakeview Boulevard.
- Adequate intersection and stopping sight distance will be provided for both proposed site driveways on Lakeview Boulevard.

Post-Development Conditions
- All intersections will continue to meet the City’s mobility target except for the Jean Road/Pilkington Road intersection during PM street peak. The southbound approach is anticipated to be over capacity with delays over a minute. During most of the peak hour, delays will be long but the approach will have adequate capacity to process demand; it is only the peak 15 minutes where conditions may be over capacity. The intersection will meet the City’s target during the peak period of site activity.
- Queuing is expected to be the same as or one vehicle (25 feet) more than pre-development 95th percentile queues. The greatest queue increase is two vehicles (50 feet on the southbound approach of Pilkington Road at Jean Road during the PM peak hour. This queue increase will not block any public street intersections.
- The on-site queuing is estimated at up to four vehicles during the site peak hour which is estimated at 200 feet assuming an average bus storage of 50 feet.
- With construction of the two planned and funded traffic signals in the study area, overall operations will improve and both intersections will meet the City’s mobility target under post-development conditions.

Mitigation and Recommendations
- No mitigation beyond the City’s existing planned and funded improvements is recommended.
II. INTRODUCTION

This Traffic Impact Study (TIS) has been prepared in support of the proposed relocation of the Lake Oswego School District (LOSD) bus barn in Lake Oswego, Oregon. Figure 1 in Appendix A presents a vicinity map indicating the project location.

Project Description

The existing LOSD bus barn is located at 3701 SW Beasley Way, adjacent to Lake Grove Elementary School in Lake Oswego. The bus barn houses and maintains the LOSD buses serving the district’s Elementary, Middle, and High schools.

The bus barn’s proposed location is 6333 Lakeview Boulevard, replacing the existing Steelhead Manufacturing facility. The existing manufacturing building on the east side of the site will remain and will serve as the maintenance facility for LOSD buses. The existing warehousing building on the west side of the site will be demolished and replaced with a paved parking area.

Figure 2 presents the site plan of the proposed bus barn.

Scope of Analysis

This TIS has been prepared in accordance with the Lake Oswego Community Development Code (LOC), Section 50.07.003(iii), the Lake Oswego Traffic Impact Study (TIS) Guidelines, and pre-application comments provided by the City and dated November 2, 2017.

Several roadways south of the site are Clackamas County jurisdiction. Therefore, this TIS has also been prepared in accordance with the Clackamas County Roadway Standards, dated December 2013.

Scoping correspondence for the project is included in Appendix B.

This study includes a summary of existing traffic conditions, crash review, proposed trip generation, and an analysis of intersection operations, sight distance, and queuing.

Study Area

The City requires that intersections within one-half mile of the site that are impacted by 25 or more peak-hour trips be included in the study area. In addition, all site access points, should be included in the study area. Based on these criteria, and pre-application comments provided by the City, the following intersections were included in the study area:

- Lower Boones Ferry Road/Pilkinson Road
- Jean Road/Lakeview Boulevard
- Jean Road/Pilkinson Road
- Jean Road/Bryant Road
- Lakeview Boulevard/West Driveway
- Lakeview boulevard/East Driveway

All intersections in the study area are located within City of Lake Oswego jurisdiction.
Analysis Scenarios

Analysis will be provided for all study area intersections. This TIS will address transportation conditions for the following analysis scenarios:

- 2018 Existing
- 2019 Pre-Development without LOSD Bus Barn
- 2019 Post-Development with LOSD Bus Barn

Because the peak activity at the site does not correspond with the peak activity on the adjacent streets, both morning and afternoon analysis will include a site peak and street peak evaluation.
III. EXISTING CONDITIONS

The existing conditions analysis is based on a current year 2018 inventory of transportation facilities and traffic data.

Site Conditions

The project site is located on the northwest side of Lakeview Boulevard just before it transitions to SW 65th Avenue in Lake Oswego, Oregon. The 2.41-acre site is currently zoned Industrial Park District (IP) and comprises of tax lot 21E18CC03200. The site is currently developed and contains two manufacturing and warehousing buildings currently operated by Steelhead Manufacturing.

Vehicular Transportation Facilities

Table 1 summarizes the characteristics of the study area roadways. Figure 3 presents the existing lane configurations and traffic control devices for the study area intersections.

<table>
<thead>
<tr>
<th>Roadway</th>
<th>Jurisdiction</th>
<th>Functional Classification</th>
<th>Posted Speed (mph)</th>
<th>Travel Lanes</th>
<th>Bike Lanes</th>
<th>On-Street Parking</th>
<th>Sidewalks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lakeview Boulevard</td>
<td>City of Lake Oswego</td>
<td>Neighborhood Collector</td>
<td>25</td>
<td>2</td>
<td>No</td>
<td>No</td>
<td>Partial</td>
</tr>
<tr>
<td>Jean Road</td>
<td>City of Lake Oswego</td>
<td>Major Collector</td>
<td>25</td>
<td>2</td>
<td>Partial</td>
<td>Yes</td>
<td>Partial</td>
</tr>
<tr>
<td>Pilkington Road (north of Tree Street)</td>
<td>City of Lake Oswego</td>
<td>Major Collector</td>
<td>30/35</td>
<td>2</td>
<td>No¹</td>
<td>No</td>
<td>Partial</td>
</tr>
<tr>
<td>Pilkington Road (south of Tree Street)</td>
<td>Clackamas County</td>
<td>Major Collector</td>
<td>30</td>
<td>2</td>
<td>Partial₂</td>
<td>No</td>
<td>Partial</td>
</tr>
<tr>
<td>Lower Boones Ferry Road</td>
<td>City of Lake Oswego</td>
<td>Major Arterial</td>
<td>35</td>
<td>4/5</td>
<td>Yes</td>
<td>No</td>
<td>Partial</td>
</tr>
<tr>
<td>Bryant Road</td>
<td>City of Lake Oswego</td>
<td>Major Collector</td>
<td>25/30</td>
<td>2</td>
<td>Partial</td>
<td>No</td>
<td>Partial</td>
</tr>
</tbody>
</table>

Notes:
1. A shoulder is striped on the southbound approach at Jean Road.
2. Shared Lane Markings (SLMs) for bikes and vehicles are striped south of Jean Road.

Pedestrian and Bicycle Facilities

Sidewalks are only partially provided on the study area roadways. Many sidewalks have missing segments in the residential neighborhoods. There are sidewalks on the north side of Lakeview Boulevard along the site frontage.

Dedicated bike lanes are provided on Lower Boones Ferry Road between the I-5 interchange and Madrona Street, just west of Bryant Road. Partial bike lane striping is provided on Jean Road and Bryant...
Road. Shared lane markings (SLMs), or “sharrows” are striped on Pilkington Road just south of Jean Road. No bike lanes are provided on Lakeview Boulevard along the site frontage.

**Transit Facilities**

The study area is served by TriMet Bus Lines 36 and 37. The closest transit stops to the site are located approximately 0.5 miles on Jean Road and 0.6 miles on Lower Boones Ferry Road.

Bus Line 36 extends between the Lake Oswego Transit Center and the Tualatin Park & Ride, with rush hour service provided between Portland City Center and the Lake Oswego Transit Center between 4:15 and 6:30 PM. Service is provided Monday through Friday between 8:00 AM and 7:00 PM with half-hour headways during peak hours.

Bus Line 37 extends between the Lake Oswego Transit Center and the Tualatin Park & Ride. Service is provided Monday through Friday between 7:00 AM and 4:45 PM with 1.5-hour headways all day.

Copies of the TriMet Bus Line maps and schedules are provided in Appendix C.

**Existing Traffic Counts**

Turning movement counts at study area intersections were collected on February 1, 2018 during the AM and PM peak periods.

Driveway counts for purposes of determining existing LOSD bus barn trip generation were conducted on three weekday mornings (February 1, 2, and 6) and three weekday afternoons (January 31 and February 1 and 5, 2018).

Four sets of peak hour volumes were developed for analysis:

- **AM Peak Hour of Site** – The AM peak hour of the site (i.e., the bus barn) was determined from the activity at the existing location. It corresponds to the one-hour period when the arrivals of staff and departures of buses was greatest, which occurred between 6:45 and 7:45 AM.
- **PM Peak Hour of Site** – The PM peak hour of the site was determined to be the one-hour period between 4:00 and 5:00 PM, when the arrivals of buses and the departure of staff was greatest.
- **AM Peak Hour of Street** – The street peak hour corresponds to the one-hour period of greatest activity for the study area street system. In the morning, this was determined to occur between 7:30 and 8:30 AM.
- **PM Peak Hour of Street** – The afternoon street peak hour was determined to occur between 4:25 and 5:25 PM.

Figure 4 presents the existing peak hour of site traffic volumes and Figure 5 presents the existing peak hour of street traffic volumes. The count data is provided in Appendix D.

**Crash Analysis**

Historical crash data reported for the study area intersections was evaluated for safety. Crash data for the five-year period of 2011 through 2015 was obtained from ODOT’s online crash database and used to review crash patterns and estimate crash rates at the study area intersections. The crash evaluation is summarized in Table 2. The raw crash data is provided in Appendix E.
TABLE 2 – INTERSECTION CRASH RATES

<table>
<thead>
<tr>
<th>Intersection (ODOT Traffic Control Type)</th>
<th>Year 2011</th>
<th>Year 2012</th>
<th>Year 2013</th>
<th>Year 2014</th>
<th>Year 2015</th>
<th>Total Crashes</th>
<th>ADT</th>
<th>Crash Rate</th>
<th>ODOT’s 90th Percentile Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower Boones Ferry Road/ Pilkington Road (4SG)</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>6</td>
<td>21,300</td>
<td>0.15</td>
<td>0.860</td>
</tr>
<tr>
<td>Jean Road/ Lake View Boulevard (4ST)</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>6,900</td>
<td>0.08</td>
<td>0.408</td>
</tr>
<tr>
<td>Jean Road/ Pilkington Road (4ST)</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>11,600</td>
<td>0.19</td>
<td>0.408</td>
</tr>
<tr>
<td>Jean Road/ Bryant Road (3ST)</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>11,500</td>
<td>0.05</td>
<td>0.293</td>
</tr>
</tbody>
</table>

**Crash Data Summary**

Twelve (12) crashes were reported at the study area intersections in the five-year analysis period. None resulted in a fatality or severe injury (type A).

One (1) pedestrian-related crash was reported at the Jean Road/Pilkington Road intersection in 2014 resulting in a Type B injury. A westbound driver reportedly struck a pedestrian while crossing southbound on Jean Road. Obstructed sight distance was reported to be the cause of the crash, although no details are provided on where the sight obstruction was located.

All crashes at the Pilkington Road and Bryant Road intersections with Jean Road were reported as angle and turning movement collisions, all caused by drivers disregarding the all-way stop sign, except the pedestrian crash reported at Pilkington. Three (3) crashes at Pilkington Road were reported as Type B injury and one (1) was reported as a Type C injury.

Only one (1) crash was reported at the Jean Road/Lakeview Boulevard intersection in 2012 and was reported to be caused by an improper overtaking resulting in a sideswipe crash.

Five (5) crashes were reported at the Lower Boones Ferry Road/ Pilkington Road intersection. Four (4) of the crashes were reported as rear-end crashes, which is typical at signalized intersections. One (1) angle crash was reported at this intersection in 2013. Only one (1) crash resulted in a Type B injury and the remaining four (4) crashes resulted in property damage only (PDO) and Type C injuries.

**Intersection Crash Rates**

When evaluating the relative safety of an intersection, consideration is given not only to the total number and types of crashes occurring, but also to the number of vehicles entering the intersection. This concept, referred to as a “crash rate”, is usually expressed in terms of the number of crashes occurring per one million entering vehicles (MEV) for the intersection per year. Intersections having a crash rate higher than 1.0 crashes/MEV should be reviewed for opportunities to improve safety.

The intersection crash rate is calculated by dividing the average number of crashes per year by the MEV per year. A daily traffic volume was estimated by dividing the PM peak hour volume at each intersection by a peak-to-daily factor, or k-factor. A k-factor of 0.10 was derived using City of Lake Oswego’s 2017
ADT and PM peak hour volume on Pilkington Road south of Jean Way, and PM peak hour turning movement count data at the same location. This factor was applied to all study area intersections to estimate ADT.

All intersections were calculated to have a crash rate below 1.0 crashes/MEV. Additionally, all intersections were compared with ODOT’s 90th percentile crash rates by type of intersection. All intersections resulted in a crash rate below ODOT’s 90th percentile rate for each intersection type.
IV. PRE-DEVELOPMENT CONDITIONS

The pre-development condition reflects a build-out year scenario without the proposed development. This scenario includes traffic from the 2018 existing condition, background traffic growth to year 2019, and in-process traffic from other approved developments that have not yet been constructed.

Planned Transportation Improvements

Three documents were reviewed to identify planned and funded transportation improvements that should be included in the future conditions analysis.

Capital Improvement Plan

The City of Lake Oswego Capital Improvement Plan 2017-2023 (CIP) was reviewed for scheduled transportation projects. Four transportation projects could affect study area intersections:

▪ Bryant Rd/Jean Rd: Signal Installation (TSP 67) – This project will install a traffic signal at the intersection but does not include any widening although curb ramps will be reconstructed. It project is funded with completion anticipated in 2019. Because the bus barn operations may begin before project construction is completed, signalization was not assumed to be in place for the opening year post-development scenario although it is considered in a separate signalized scenario.

▪ Jean Rd/Pilkington: Signal Installation (TSP 62) – This project will install a traffic signal at the intersection and reconstruct all four roadway approaches to include curb, gutter, bike lanes, and sidewalks within 150 feet of the intersection. It is funded with completion anticipated in 2020. Because the bus barn operations may begin before this project is constructed, signalization was not assumed to be in place for the opening year post-development scenario although it is considered in a separate signalized scenario.

▪ Lakeview Blvd/Jean Rd Intersection Realignment (TSP 300) – The realignment will eliminate the skewed intersection geometry and improve truck turning radii. It is funded with completion anticipated in 2018; therefore, it was assumed in the roadway network for future development conditions.

▪ Citywide Intersection Signalization Improvements – This project will develop and implement a citywide timing updates and upgrades. It is funded and improvements are anticipated to occur annually. Since the programming for this project is unknown, no changes were assumed for the one signalized intersection in the study area, Pilkington Road and Lower Boones Ferry Road.

The project descriptions for these improvements are included in Appendix F.

Southwest Employment Area Plan

The Southwest Employment Area Plan (SWEA) was reviewed to determine any transportation improvement projects located within the study area. All study area intersections except the Jean Road/Bryant Road intersection are located within the SWEA.
In addition to the Lakeview Boulevard Realignment project, two other projects were identified in the study area:

- Lakeview Boulevard/65th Avenue/McEwan Road is planned to be widened to a right-of-way (ROW) width between 44 feet and 60 feet.
- Jean Road, and Pilkington Road are also planned to be widened to a 60-foot ROW to include sidewalks and bike lanes on both sides of the street.

Neither of these projects have been funded; therefore, neither is assumed in any of the future analysis scenarios.

**Transportation System Plan**

The City of Lake Oswego 2015-2035 Transportation System Plan (TSP) was also reviewed for planned transportation improvements.

Map ID projects 062, 067, and 071 were all found within the study area. Details for the three projects include the following:

- Map ID 062, Jean Road/Pilkington: Intersection Geometry improvement – The TSP description includes restriping intersection to realign turn lanes for efficiency and safety, rebuilding ADA ramps, and sidewalk improvements. No signalization was assumed. As noted under the CIP discussion, this intersection will be signalized with some geometric improvements.
- Map ID 067, Bryant Road/Jean Road: Signal Installation – The TSP description includes installing a traffic signal and addressing aerial wires running diagonally across intersection. This project is included in the CIP.
- Map ID 071, Boones Ferry Road Signal Interconnect: I-5 to Bryant – The TSP description describes completing interconnection for seven signals and requires coordinating with ODOT and Tualatin/Washington County signals. This project may be included in the CIP citywide intersection project.

All three of these projects are included in the CIP but this TIS assumes that none will be implemented prior to the opening of the Bus Barn. The two new signals are evaluated in a separate signalized scenario.

**Background Traffic Growth**

Background traffic growth is applied to existing traffic volumes to forecast future traffic demand. Historical ADT from 2005, 2016, and 2017 for Jean Road and Pilkington Road was reviewed to determine the appropriate background growth in the area. Based on this data, a 1% annual growth rate was applied to existing peak hour traffic volumes over one (1) year to estimate 2019 background traffic.

Figure 6 presents the background growth from 2018 to 2019 for the site peak hours and Figure 7 presents the background growth for the street peak hours.
In-Process Traffic

In-process traffic volumes account for developments that have been approved or that are under construction at the time of a traffic study. These traffic volumes account for traffic that will be added to the external roadway network before build-out of the proposed development.

Traffic volumes for the following developments were included in the analysis to account for in-process traffic:

- Lakeview Business Park on Jean Road just west of Lakeview Boulevard.
- River Grove Elementary School Expansion

Figure 8 presents the in-process traffic volumes for the study area. These volumes were used for both the peak of site and peak of street.

Pre-Development Traffic

The pre-development analysis scenario is a combination of existing traffic, background growth, and in-process traffic. The pre-development traffic with the project trips will indicate if traffic issues are present before the addition of the proposed development.

Figure 9 presents the 2019 pre-development traffic volumes corresponding to the site peak hours and Figure 10 presents the volumes corresponding to the street peak hours for the study area intersections.
V. SITE DEVELOPMENT

The trip-making characteristics of the proposed site development are described below.

Trip Generation

Trip generation at the subject site will consist of removing the existing trips associated with Steelhead Manufacturing from the roadway network and adding the proposed trips associated with the LOSD bus barn.

Existing

The existing Steelhead Manufacturing facility consists of approximately 16,000 SF of manufacturing and approximately 11,000 SF of warehousing.

Trip generation estimates for the existing facility were prepared with the use of the Institute of Transportation Engineer’s (ITE) Trip Generation Manual, 10th Edition. Data for ITE’s “Manufacturing” (LUC 140) and “Warehousing” (LUC 150) land uses were utilized to develop the trip estimates. Table 3 presents the trip generation estimates for the existing Steelhead Manufacturing facility.

<table>
<thead>
<tr>
<th>Land Use</th>
<th>ITE Code</th>
<th>Size</th>
<th>AM Peak Hour</th>
<th>PM Peak Hour</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>In</td>
<td>Out</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>140</td>
<td>16 KSF</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Warehousing</td>
<td>150</td>
<td>11 KSF</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>27 KSF</td>
<td>10</td>
<td>2</td>
</tr>
</tbody>
</table>

As presented in Table 3, the existing manufacturing facility generates 12 AM peak hour and 13 PM peak hour trips.

Proposed

The proposed new location for the LOSD Bus Barn will house all buses serving elementary, middle, and high schools within the LOSD. The trip generation for the LOSD Bus Barn consists of two components:

- Trips made by staff entering and exiting the bus barn in personal vehicles
- Trips made by the buses on their school routes

Driveway counts at the existing site on SW Beasley Drive were used to determine the staff and bus trip generation for the peak hours. These counts were collected on three weekday mornings (February 1, 2, and 6) and three weekday afternoons (January 31 and February 1 and 5, 2018). Data from the count days were averaged for each 5-minute increment and then used to determine activity levels corresponding to the AM and PM peak hours for the site and AM and PM peak hours of the study area street system.

During a field visit, staff were observed to park across the street from the facility at a nearby church and walk to the bus barn. Therefore, pedestrians captured in the traffic counts walking to and from the
facility were assumed to be vehicular trips to and from the site made by staff. No carpooling was assumed and bicycles were also conservatively assumed to be auto trips at the new site.

The currently LOSD has 26 routes for its elementary schools, 28 routes for its middle schools, and 15 routes for its high schools. The buses serving the middle school routes do not exit the facility during the AM peak hour, and instead start their bus routes immediately after dropping students off at the elementary and high schools. Conversely, some buses serving the elementary and high schools return directly to the bus barn while others continue to middle school routes.

A few heavy vehicle trips were counted entering or exiting the site over the course of the data collection but these vehicles accounted for one (1) trip in and out during the morning two-hour period and no trips in the afternoon. These trips were grouped with the staff activity.

The total trip generation at the LOSD bus barn is presented in Table 4. The traffic counts supporting the trip generation estimates are presented in Appendix H.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Component</th>
<th>AM Peak Hour</th>
<th>PM Peak Hour*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>In</td>
<td>Out</td>
</tr>
<tr>
<td>Peak Hour of Site (AM: 6:45-7:45) (PM: 4:00-5:00)</td>
<td>Staff</td>
<td>51</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Bus</td>
<td>0</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>51</td>
<td>51</td>
</tr>
<tr>
<td>Peak Hour of Street (AM: 7:30-8:30) (PM: 4:45-5:25)</td>
<td>Staff</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Bus</td>
<td>9</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>14</td>
<td>40</td>
</tr>
</tbody>
</table>

* One of the survey days corresponded with scheduled early school closures (first Thursday of the month). The results were excluded from the PM estimates, which reflect two days of data rather than three.

As presented in Table 4, the LOSD currently generates 102 AM trips and 87 PM trips during the busiest hours at the site. The trip generation corresponding the street system peak hours is 54 AM trips and 69 PM trips.

**Net New**

The net new trips reflect the removal of the existing manufacturing trips from the roadway network and the addition of the total LOSD bus barn trips. As presented in Table 5, the net new trips added is a maximum of 90 AM trips and 74 PM trips during the busiest hours at the site. The net new trip generation corresponding the street system peak hours is 42 AM trips and 56 PM trips.
### TABLE 5 – NET NEW TRIP GENERATION

<table>
<thead>
<tr>
<th>Condition</th>
<th>Component</th>
<th>AM Peak Hour</th>
<th>PM Peak Hour*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>In</td>
<td>Out</td>
</tr>
<tr>
<td>Peak Hour of Site</td>
<td>Existing</td>
<td>-10</td>
<td>-2</td>
</tr>
<tr>
<td>(AM: 6:45-7:45)</td>
<td>Proposed</td>
<td>51</td>
<td>51</td>
</tr>
<tr>
<td>(PM: 4:00-5:00)</td>
<td>Net New</td>
<td>41</td>
<td>49</td>
</tr>
<tr>
<td>Peak Hour of Street</td>
<td>Existing</td>
<td>-10</td>
<td>-2</td>
</tr>
<tr>
<td>(AM: 7:30-8:30)</td>
<td>Proposed</td>
<td>14</td>
<td>40</td>
</tr>
<tr>
<td>(PM: 4:45-5:25)</td>
<td>Net New</td>
<td>4</td>
<td>38</td>
</tr>
</tbody>
</table>

### Trip Distribution and Assignment

Trip distribution assumptions for the existing and proposed site uses is described below.

**Existing**

Trip distribution for the existing manufacturing use was based on the general travel patterns in the area and surrounding land uses. The following trip distribution was assumed for the staff during the AM and PM peak hour:

- 35% to/from the north and east on Lower Boones Ferry Road
- 15% to/from the west on Jean Road
- 10% to/from the north on Bryant Road
- 10% to/from the south on Bryant Road
- 30% to/from the south on Lakeview Road (to/from McEwan Road or Childs Road)

Figure 11 presents the trip distribution and assignment for the existing site use during the AM and PM peak hours. The distribution is used for both the site peak hour and street peak hour.

**Proposed Bus Barn - Staff**

Trip distribution for the staff was based on the general travel patterns in the area and surrounding land uses. The following trip distribution was assumed for the staff during the AM and PM peak hour:

- 35% to/from the north and east on Lower Boones Ferry Road
- 15% to/from the west on Jean Road
- 10% to/from the north on Bryant Road
- 10% to/from the south on Bryant Road
- 30% to/from the south on Lakeview Road (to/from McEwan Road or Childs Road)

Figure 12 presents the staff trip distribution and assignment corresponding to the site peak hours and Figure 15 presents the volumes corresponding to the street peak hours for the study area intersections.
**Proposed Bus Barn - Buses**

Trip distribution for the buses was based on the general travel patterns to the first stops for the elementary and high school bus routes exiting the facility during the AM peak hour and the last stops for all bus routes entering the facility during the PM peak hour. Based on the bus routes’ first and last stops, the following trip distribution was applied to bus trips during the AM and PM peak hour:

- 55% to/from the north and east on Lower Boones Ferry Road
- 10% to/from the east on Lakeview Boulevard
- 20% to/from the north on Bryant Road
- 5% to/from the south on Bryant Road
- 10% to/from the south on Lakeview Road (to/from McEwan Road or Childs Road)

None of the buses are assumed to use the nearby local streets except for those that travel the routes serving the abutting neighborhood.

Figure 13 presents the bus trip distribution and assignment corresponding to the site peak hours and Figure 16 presents the volumes corresponding to the street peak hours for the study area intersections.

**Total Trips**

The total trips in this study represent the removal of existing manufacturing trips and the addition of the LOSD staff and bus trips. Figure 14 presents the bus trip distribution and assignment corresponding to the site peak hours and Figure 17 presents the volumes corresponding to the street peak hours for the study area intersections.

**Post-Development Traffic**

Post-development traffic volumes are the sum of the project trips and the pre-development traffic volumes. Figure 18 presents the bus trip distribution and assignment corresponding to the site peak hours and Figure 19 presents the volumes corresponding to the street peak hours for the study area intersections.
VI. SITE ACCESS AND CIRCULATION

The on-site evaluation of traffic access and circulation along with the sight distance are presented below.

Site Access

The proposed location for the LOSD bus barn will provide access via two existing driveways on Lakeview Boulevard:

- The east driveway is located approximately 180 feet (centerline to centerline) west of the closest driveway (opposite Don Lee Way). This driveway is for outbound traffic only. All buses are assumed to exit using this driveway.
- The west driveway is located approximately 130 feet west of the east driveway and approximately 230 feet east of the closest driveway to the west. This driveway will serve all inbound traffic and outbound staff.

Access Spacing

The City’s access spacing standard for a Neighborhood Collector is 100 feet for private driveways as presented in Table 50.06.003-2 of the Lake Oswego Community Development Code (CDC). Table 6 presents the access spacing summary for the existing west and east site driveways.

<table>
<thead>
<tr>
<th>Driveway</th>
<th>Measured (feet)</th>
<th>Standard (feet)</th>
<th>Standard Met?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>To East</td>
<td>To West</td>
<td></td>
</tr>
<tr>
<td>East</td>
<td>180</td>
<td>130</td>
<td>100</td>
</tr>
<tr>
<td>West</td>
<td>130</td>
<td>230</td>
<td>100</td>
</tr>
</tbody>
</table>

As presented in the table, both existing site accesses meet the City’s driveway spacing standard on a Neighborhood Collector.

Driveway Widths

Both driveways will be reconstructed with new concrete aprons. Each will be 24-feet wide and designed to accommodate bus movements.

On-Site Circulation

Under the current layout, approximately 34 standard bus parking spaces will be provided on the west side of the building while approximately 35 standard and 11 short bus parking spaces will be provided east of the building. Buses will enter using the west driveway and circulate through the site, behind the building, to exit the site.

Staff parking will all be located on the west side of the building. Approximately 36 compact parking or ADA spaces will be provided. Staff is assumed to enter and exit the site via the west driveway only.
Sight Distance Evaluation

Both intersection sight distance (ISD) and stopping sight distance (SSD) were evaluated at the existing site driveways on Lakeview Boulevard.

Lakeview Boulevard continues as SW 65th Avenue to the south, just after the roadway curves west of the site. The posted speed on Lakeview Boulevard and SW 65th Avenue is 25 mph, except around the curve west of the site, where an advisory speed of 15 mph is posted due to the sharp bend. As a conservative estimate, we assumed a design speed of 20 mph around the curve.

Intersection sight distance (ISD) measurements are typically taken 14.5 feet behind the edge of the travel way, consistent with AASHTO methodology. SSD measurements are also taken from 14.5 feet behind the edge of travel way.

The resulting sight distance evaluation for the driveways is presented in Table 7.

<table>
<thead>
<tr>
<th>Driveway</th>
<th>Design Speed (mph)</th>
<th>Recommended ISD (feet)</th>
<th>Required SSD (feet)</th>
<th>Available Sight Distance (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>To West</td>
<td>To East</td>
<td>To West</td>
<td>To East</td>
</tr>
<tr>
<td>West</td>
<td>20</td>
<td>30</td>
<td>225</td>
<td>335</td>
</tr>
<tr>
<td>East</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As presented in Table 7, both driveways meet the ISD and SSD based on the assumed design speeds.
VII. OPERATIONAL ANALYSIS

Two aspects of operational analysis were evaluated: 1) intersection operations analysis, which evaluates how well an intersection processes traffic demand; and 2) queuing analysis, which compares intersection queues with available storage for different travel lanes.

Intersection Operations Analysis

Intersection operations are generally measured by three mobility factors: volume-to-capacity (v/c) ratio, level of service (LOS), and delay (measured in seconds). Signalized intersections are measured by one overall v/c ratio, LOS, and delay. Unsignalized intersections are typically measured by a single v/c ratio, LOS, and delay representative of the worst stopped movement.

Performance Measures

All study area intersections in this study lie within City limits. Lake Oswego Code (LOC) 50.07.003(3)(f) requires all intersections to operate at LOS E or better during the peak hour of the day. This standard applies to all signalized and unsignalized intersections within the study area.

Methodology

Intersection operations were analyzed with the use of Synchro 9 software, which utilizes the Transportation Research Board’s (TRB) Highway Capacity Manual (HCM) 2000 and 2010 methodologies. All unsignalized study area intersections were reported using HCM 2010 outputs, and all signalized study area intersections were reported using HCM 2000 outputs. HCM 2010 does not report a v/c for the overall intersection; therefore, the overall v/c was manually calculated for Jean Road at Pilkington Road and Bryant Road.

Signal timing information was obtained from City staff and is provided in Appendix I. Signal Information.

Findings

The critical movements (either overall intersection for signalized and all-way stop-controlled [AWSC] or worst movement for two-way, stop-controlled [TWSC]) for the AM and PM peak hour are provided in Table 8 for the site peak hours and Table 9 for the street peak hours. Synchro output sheets are provided in Appendix J for reference.

As presented in Table 8 and Table 9, all intersections meet the City’s mobility target under existing conditions except for the Jean Road/Pilkington Road intersection. During the PM street peak hour (Table 9), this intersection has LOS F conditions on the southbound approach. Field observations show that demand at this intersection is affected by the flow of traffic from the signals upstream from this intersection. Platoons of traffic arrive at the southbound approach on Pilkington Road and eastbound approach of Jean Road. Initially, a queue builds as these vehicles arrive and then it dissipates with short delays and queues until the next platoons arrive.
### TABLE 8 – INTERSECTION OPERATIONS FOR SITE PEAK HOURS

<table>
<thead>
<tr>
<th>Intersection (Control)</th>
<th>Analysis Period</th>
<th>Critical Movement</th>
<th>Analysis Results (V/C Ratio-LOS-Delay in seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower Boones Ferry Road/ Pilkington Road (Signalized)</td>
<td>AM</td>
<td>Overall</td>
<td>2018 Existing: 0.32-A-9, 2019 Pre-Development: 0.33-A-10, 2019 Post-Development: 0.34-A-10</td>
</tr>
<tr>
<td></td>
<td>PM</td>
<td>Overall</td>
<td>2018 Existing: 0.55-A-10, 2019 Pre-Development: 0.57-B-10, 2019 Post-Development: 0.63-B-11</td>
</tr>
<tr>
<td>Jean Road/ Lakeview Boulevard (TWSC)</td>
<td>AM</td>
<td>NB</td>
<td>2018 Existing: 0.09-B-11, 2019 Pre-Development: 0.09-B-12, 2019 Post-Development: 0.18-B-12</td>
</tr>
<tr>
<td></td>
<td>PM</td>
<td>NB</td>
<td>2018 Existing: 0.14-B-13, 2019 Pre-Development: 0.15-B-14, 2019 Post-Development: 0.22-C-15</td>
</tr>
<tr>
<td>Jean Road/ Pilkington Road (AWSC)</td>
<td>AM</td>
<td>WB Through</td>
<td>2018 Existing: 0.49-B-14, 2019 Pre-Development: 0.52-B-15, 2019 Post-Development: 0.56-C-17</td>
</tr>
<tr>
<td></td>
<td>PM</td>
<td>SB</td>
<td>2018 Existing: 0.71-D-25, 2019 Pre-Development: 0.75-D-29, 2019 Post-Development: 0.83-E-39</td>
</tr>
<tr>
<td>Jean Road/ Bryant Road (AWSC)</td>
<td>AM</td>
<td>NB Left</td>
<td>2018 Existing: 0.36-B-11, 2019 Pre-Development: 0.38-B-11, 2019 Post-Development: 0.39-B-12</td>
</tr>
<tr>
<td></td>
<td>PM</td>
<td>SB Through</td>
<td>2018 Existing: 0.72-C-23, 2019 Pre-Development: 0.74-C-25, 2019 Post-Development: 0.74-C-25</td>
</tr>
<tr>
<td>Lakeview Boulevard/ Combined Driveway (TWSC)</td>
<td>AM</td>
<td>SB</td>
<td>2018 Existing: 0.01-A-9, 2019 Pre-Development: 0.01-A-9, 2019 Post-Development: 0.10-B-11</td>
</tr>
<tr>
<td></td>
<td>PM</td>
<td>SB</td>
<td>2018 Existing: 0.01-A-9, 2019 Pre-Development: 0.01-A-9, 2019 Post-Development: 0.05-A-9</td>
</tr>
</tbody>
</table>

### TABLE 9 – INTERSECTION OPERATIONS FOR STREET PEAK HOURS

<table>
<thead>
<tr>
<th>Intersection (Control)</th>
<th>Analysis Period</th>
<th>Critical Movement</th>
<th>Analysis Results (V/C Ratio-LOS-Delay in seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower Boones Ferry Road/ Pilkington Road (Signalized)</td>
<td>AM</td>
<td>Overall</td>
<td>2018 Existing: 0.44-B-11, 2019 Pre-Development: 0.45-B-11, 2019 Post-Development: 0.46-B-11</td>
</tr>
<tr>
<td></td>
<td>PM</td>
<td>Overall</td>
<td>2018 Existing: 0.65-B-11, 2019 Pre-Development: 0.67-B-11, 2019 Post-Development: 0.71-B-12</td>
</tr>
<tr>
<td>Jean Road/ Lakeview Boulevard (TWSC)</td>
<td>AM</td>
<td>NB</td>
<td>2018 Existing: 0.15-B-13, 2019 Pre-Development: 0.15-B-13, 2019 Post-Development: 0.22-B-14</td>
</tr>
<tr>
<td></td>
<td>PM</td>
<td>NB</td>
<td>2018 Existing: 0.21-B-14, 2019 Pre-Development: 0.23-B-15, 2019 Post-Development: 0.30-C-16</td>
</tr>
<tr>
<td>Jean Road/ Pilkington Road (AWSC)</td>
<td>AM</td>
<td>WB Through</td>
<td>2018 Existing: 0.77-D-33, 2019 Pre-Development: 0.81-E-38, 2019 Post-Development: 0.84-E-43</td>
</tr>
<tr>
<td></td>
<td>PM</td>
<td>SB</td>
<td>2018 Existing: <strong>0.93-F-55</strong>, 2019 Pre-Development: <strong>0.99-F-72</strong>, 2019 Post-Development: <strong>1.04-F-85</strong></td>
</tr>
<tr>
<td>Jean Road/ Bryant Road (AWSC)</td>
<td>AM</td>
<td>NB Left</td>
<td>2018 Existing: 0.63-C-19, 2019 Pre-Development: 0.65-C-20, 2019 Post-Development: 0.65-C-20</td>
</tr>
<tr>
<td></td>
<td>PM</td>
<td>SB Through</td>
<td>2018 Existing: 0.88-E-39, 2019 Pre-Development: 0.89-E-42, 2019 Post-Development: 0.90-E-43</td>
</tr>
<tr>
<td>Lakeview Boulevard/ Combined Driveway (TWSC)</td>
<td>AM</td>
<td>SB</td>
<td>2018 Existing: 0.01-A-9, 2019 Pre-Development: 0.01-A-9, 2019 Post-Development: 0.07-B-11</td>
</tr>
<tr>
<td></td>
<td>PM</td>
<td>SB</td>
<td>2018 Existing: 0.01-A-9, 2019 Pre-Development: 0.01-A-9, 2019 Post-Development: 0.05-A-10</td>
</tr>
</tbody>
</table>
Under pre-development conditions, all intersections will continue to meet the City’s mobility target except for the Jean Road/Pilkington Road intersection during the same period (PM street peak). The southbound approach is anticipated to be at capacity with delays averaging over a minute.

With the proposed project (post-development conditions), all intersections will continue to meet the City’s mobility target except for the Jean Road/Pilkington Road intersection during the same period (PM street peak). The southbound approach is anticipated to be over capacity with delays over a minute. Although this condition is anticipated when traffic peaks on the street, during the peak period of site activity, the intersection will meet the City’s target. Furthermore, the analysis reflects conditions for the worst 15 minutes in the worst hour of the day. During the rest of the peak hour, delays will be long but the approach will have adequate capacity to process demand.

**Intersection Queuing Analysis**

An intersection queuing analysis was conducted for the study area intersections during the AM and PM peak hour to evaluate any potential queue spillbacks. The 95th percentile queues were estimated using SimTraffic software. Queue demand results were rounded to the nearest 25 feet to represent average vehicle lengths.

**Methodology**

Available queue storage lengths were estimated using Google Earth Pro software and rounded to the nearest 5 feet. For turn lanes, two available storage values are stated: the first represents the striped storage and the second is the effective storage, or the length physically available regardless of striping, such as a center turn lane upstream of striped left-turn lane at an intersection. Although through travel lanes have no storage defined by striping, two values are reported for storage: the first is the distance to an upstream driveway; the second is the distance to an upstream intersection.

**Findings**

The AM and PM peak hour 95th percentile queues are presented in Table 10 for the site peak hours and Table 11 for the street peak hours. Bold text indicates that the calculated queue exceeds the storage for the travel lane. SimTraffic output sheets are provided in Appendix K.

As presented in Table 10 and Table 11, queuing is not a concern for most travel lanes. Several approaches have 95th percentile queues that sometimes block driveways but this is mostly a temporary condition. The only location where 95th percentile queues exceed the available storage is on the northbound approach of Bryant Avenue at Jean Road.

Under pre-development conditions, queuing is expected to be the same as or one vehicle (25 feet) more than existing 95th percentile queues.

With the proposed project (post-development conditions), queuing is expected to be the same as or one vehicle (25 feet) more than pre-development 95th percentile queues. The greatest queue increase is two vehicles (50 feet on the southbound approach of Pilkington Road at Jean Road during the PM peak hour. This queue increase will not block any public street intersections.

The on-site queuing is estimated at up to four vehicles during the site peak hour which is estimated at 200 feet assuming an average bus storage of 50 feet.
<table>
<thead>
<tr>
<th>Intersection</th>
<th>Approach/Movement</th>
<th>Striped/Effective Storage (feet)</th>
<th>Analysis Results (v/c-LOS-Delay in seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>2018 Existing</td>
</tr>
<tr>
<td>Lower Boones Ferry Road/ Pilkington Road</td>
<td>EBL</td>
<td>100/165</td>
<td>25/0</td>
</tr>
<tr>
<td></td>
<td>EBT</td>
<td>230/+1,000</td>
<td>100/125</td>
</tr>
<tr>
<td></td>
<td>EBT+R</td>
<td>230/+1,000</td>
<td>75/125</td>
</tr>
<tr>
<td></td>
<td>WBL</td>
<td>85/145</td>
<td>75/125</td>
</tr>
<tr>
<td></td>
<td>WBT</td>
<td>265/+1,000</td>
<td>75/100</td>
</tr>
<tr>
<td></td>
<td>WBT+R</td>
<td>235/+1,000</td>
<td>75/115</td>
</tr>
<tr>
<td></td>
<td>NBL</td>
<td>80/185</td>
<td>75/100</td>
</tr>
<tr>
<td></td>
<td>NBT+R</td>
<td>50/475</td>
<td>50/75</td>
</tr>
<tr>
<td></td>
<td>SB</td>
<td>25</td>
<td>0/25</td>
</tr>
<tr>
<td>Jean Road/ Lakeview Boulevard</td>
<td>WB</td>
<td>100/255</td>
<td>25/50</td>
</tr>
<tr>
<td></td>
<td>NB</td>
<td>220/400</td>
<td>75/75</td>
</tr>
<tr>
<td>Jean Road/ Pilkington Road</td>
<td>EBL</td>
<td>95/270</td>
<td>50/50</td>
</tr>
<tr>
<td></td>
<td>EBT+R</td>
<td>95/200</td>
<td>75/125</td>
</tr>
<tr>
<td></td>
<td>WBL</td>
<td>85/140</td>
<td>25/50</td>
</tr>
<tr>
<td></td>
<td>WBT</td>
<td>115/280</td>
<td>125/100</td>
</tr>
<tr>
<td></td>
<td>WBR</td>
<td>95/125</td>
<td>50/50</td>
</tr>
<tr>
<td></td>
<td>NB</td>
<td>315</td>
<td>75/75</td>
</tr>
<tr>
<td></td>
<td>SB</td>
<td>95/300</td>
<td>75/125</td>
</tr>
<tr>
<td>Jean Road/ Bryant Road</td>
<td>EBL</td>
<td>70/350</td>
<td>50/50</td>
</tr>
<tr>
<td></td>
<td>EBR</td>
<td>70/95</td>
<td>50/100</td>
</tr>
<tr>
<td></td>
<td>NBL</td>
<td>55/75</td>
<td>75/75</td>
</tr>
<tr>
<td></td>
<td>NBT</td>
<td>240</td>
<td>75/75</td>
</tr>
<tr>
<td></td>
<td>SBT</td>
<td>105/390</td>
<td>75/200</td>
</tr>
<tr>
<td></td>
<td>SBR</td>
<td>70/105</td>
<td>50/125</td>
</tr>
<tr>
<td>Lakeview Boulevard/ Combined Driveway</td>
<td>EB</td>
<td>110/730</td>
<td>0/0</td>
</tr>
<tr>
<td></td>
<td>SB</td>
<td>35</td>
<td>25/25</td>
</tr>
</tbody>
</table>
### TABLE 11 – 95TH PERCENTILE QUEUING ANALYSIS FOR STREET PEAK HOURS

<table>
<thead>
<tr>
<th>Intersection</th>
<th>Approach/Movement</th>
<th>Striped/Effective Storage (feet)</th>
<th>Analysis Results (v/c-LOS-Delay in seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>2018 Existing</td>
</tr>
<tr>
<td><strong>Lower Boones Ferry Road/Pilkington Road</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EBL</td>
<td>100/165</td>
<td>25/0</td>
<td>25/0</td>
</tr>
<tr>
<td>EBT</td>
<td>230/+1,000</td>
<td>125/150</td>
<td>125/150</td>
</tr>
<tr>
<td>EBT+R</td>
<td>230/+1,000</td>
<td>125/150</td>
<td>100/150</td>
</tr>
<tr>
<td>WBL</td>
<td>85/145</td>
<td>100/150</td>
<td>100/150</td>
</tr>
<tr>
<td>WBT</td>
<td>265/+1,000</td>
<td>75/150</td>
<td>75/150</td>
</tr>
<tr>
<td>WBT+R</td>
<td>235/+1,000</td>
<td>75/125</td>
<td>75/125</td>
</tr>
<tr>
<td>NBL</td>
<td>80/185</td>
<td>100/125</td>
<td>100/125</td>
</tr>
<tr>
<td>NBT+R</td>
<td>50/475</td>
<td>75/75</td>
<td>75/75</td>
</tr>
<tr>
<td><strong>Jean Road/Lakeview Boulevard</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WB</td>
<td>100/255</td>
<td>50/50</td>
<td>50/50</td>
</tr>
<tr>
<td>NB</td>
<td>220/400</td>
<td>75/75</td>
<td>75/75</td>
</tr>
<tr>
<td><strong>Jean Road/Pilkington Road</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EBL</td>
<td>95/270</td>
<td>50/50</td>
<td>50/75</td>
</tr>
<tr>
<td>EBT+R</td>
<td>95/200</td>
<td>100/125</td>
<td>100/150</td>
</tr>
<tr>
<td>WBL</td>
<td>85/140</td>
<td>50/50</td>
<td>75/50</td>
</tr>
<tr>
<td>WBT</td>
<td>115/280</td>
<td>150/100</td>
<td>175/100</td>
</tr>
<tr>
<td>WBR</td>
<td>95/125</td>
<td>75/75</td>
<td>75/50</td>
</tr>
<tr>
<td>NB</td>
<td>315</td>
<td>125/75</td>
<td>150/75</td>
</tr>
<tr>
<td>SB</td>
<td>95/300</td>
<td>100/150</td>
<td>100/150</td>
</tr>
<tr>
<td><strong>Jean Road/Bryant Road</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EBL</td>
<td>70/350</td>
<td>50/50</td>
<td>50/125</td>
</tr>
<tr>
<td>EBR</td>
<td>70/95</td>
<td>75/125</td>
<td>75/150</td>
</tr>
<tr>
<td>NBL</td>
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<td>125/75</td>
</tr>
<tr>
<td>NBT</td>
<td>240</td>
<td>100/75</td>
<td>100/75</td>
</tr>
<tr>
<td>SBT</td>
<td>105/390</td>
<td>75/400</td>
<td>100/350</td>
</tr>
<tr>
<td>SBR</td>
<td>70/105</td>
<td>75/175</td>
<td>75/150</td>
</tr>
<tr>
<td><strong>Lakeview Boulevard/Combined Driveway</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EB</td>
<td>110/730</td>
<td>25/0</td>
<td>25/0</td>
</tr>
<tr>
<td>SB</td>
<td>35</td>
<td>25/25</td>
<td>25/25</td>
</tr>
</tbody>
</table>
VIII. OPERATIONS WITH PLANNED TRAFFIC SIGNALS

The City’s CIP includes the construction of traffic signals at two intersections in the study area. The signal at Jean Road and Bryant Road is expected to begin construction soon with completion anticipated in 2019. The signal at Jean Road and Pilkington Road is planned for completion in 2020.

The intersection operations analysis shows some congestion at both these currently unsignalized intersections under the 2019 pre-development scenario with operations worsening under the post-development scenario. Since construction of both signals is expected within the next two (2) years, the intersections were also evaluated with post-development volumes and traffic signals in place.

The intersections were analyzed assuming existing lane configurations with one exception, the westbound approach of Jean Road at Pilkington Road was assumed to have two approach lanes in the future (westbound left and westbound through-right) rather than three approach lanes. The traffic signals were assumed to be actuated but uncoordinated with protected left-turn phasing where separate turn lanes are present. Table 12 summarizes the intersection operations with the planned traffic signals under these assumptions.

<table>
<thead>
<tr>
<th>Intersection (Control)</th>
<th>Analysis Period</th>
<th>Critical Movement</th>
<th>Site Peak</th>
<th>Street Peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jean Road/ Pilkington Road (Signalized)</td>
<td>AM</td>
<td>Overall</td>
<td>0.54-B-16</td>
<td>0.70-C-21</td>
</tr>
<tr>
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<td>PM</td>
<td>Overall</td>
<td>0.66-B-18</td>
<td>0.72-C-22</td>
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<tr>
<td>Jean Road/ Bryant Road (Signalized)</td>
<td>AM</td>
<td>Overall</td>
<td>0.37-A-9</td>
<td>0.47-B-13</td>
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<tr>
<td></td>
<td>PM</td>
<td>Overall</td>
<td>0.50-B-15</td>
<td>0.55-B-16</td>
</tr>
</tbody>
</table>

As shown in Table 12, the installation of the traffic signals will improve overall operations and both intersections will meet the City’s mobility target under post-development conditions.
IX. MITIGATION AND RECOMMENDATIONS

The proposed development of the bus barn is anticipated to have minimal impacts on intersection operations near the site. Only one location will not meet the City’s mobility target because of the project traffic. The southbound approach of Pilkington Road at Jean Road will have LOS F conditions and be near capacity during the PM street peak hour with pre-development volumes. The addition of site traffic may create an over-capacity condition on this approach.

As noted in the summary of operations, this condition is anticipated when traffic peaks on the street. Furthermore, the analysis reflects conditions for the worst 15 minutes in the worst hour of the day. During the rest of the peak hour, delays will be long but the approach will have adequate capacity to process demand. Additionally, during the peak period of site activity, the intersection will meet the City’s target.

The City’s CIP includes the construction of traffic signals at two intersections in the study area. The signal at Jean Road and Bryant Road is expected to begin construction soon with completion anticipated in 2019. The signal at Jean Road and Pilkington Road is planned for completion in 2020. The installation of the traffic signals will improve overall operations and both intersections will meet the City’s mobility target under post-development conditions.

Therefore, no mitigation beyond the City’s existing planned and funded improvements is recommended.
X. APPENDIX

Appendix A. Figures
Appendix B. Scoping Material
Appendix C. Transit Information
Appendix D. Traffic Count Summaries
Appendix E. Crash Data
Appendix F. Capital Improvement Projects
Appendix G. In-Process Data
Appendix H. Bus Barn Trip Generation Estimates
Appendix I. Signal Information
Appendix J. Operations Calculations
Appendix K. Queuing Analysis
AM PEAK HOUR
Entering - 10
Exiting - 2
Total - 12

EXISTING TRIP DISTRIBUTION AND TRIP ASSIGNMENT - AM PEAK HOUR
LOSID BUS BARN
LAKE OSWEGO, OREGON

DATE: 4.6.2018
DRAWN BY: JTJ
CHECKED BY: JED
JOB NO: 2170476.00
PM PEAK HOUR

Entering - 4
Exiting - 9
Total - 13

EXISTING TRIP DISTRIBUTION AND TRIP ASSIGNMENT - PM PEAK HOUR

LOSID BUS BARN
LAKE OSWEGO, OREGON
AM PEAK HOUR

Entering - 51
Exiting - 1
Total - 52
PM PEAK HOUR
Entering - 1
Exiting - 39
Total - 40

STAFF TRIP DISTRIBUTION AND TRIP ASSIGNMENT - PM PEAK HOUR OF SITE
LOSED BUS BARN
LAKE OSWEGO, OREGON

DATE: 4.6.2018
DRAWN BY: JTJ
CHECKED BY: JED
JOB NO: 2170476.00

FIGURE 12B
AM PEAK HOUR

Entering - 0
Exiting - 50
Total - 50

BUS TRIP DISTRIBUTION
AND TRIP ASSIGNMENT - AM PEAK HOUR OF SITE

LOSD BUS BARN
LAKE OSWEGO, OREGON

DATE: 4.6.2018
DRAWN BY: JTJ
CHECKED BY: JED
JOB NO: 2170476.00

FIGURE 13A
AM PEAK HOUR

Entering – 5
Exiting – 6
Total – 11
PM PEAK HOUR
Entering – 1
Exiting – 38
Total – 39
AM PEAK HOUR

Entering - 9
Exiting - 34
Total - 43
PM PEAK HOUR
Entering - 30
Exiting - 0
Total - 30

BUS TRIP DISTRIBUTION
AND TRIP ASSIGNMENT -
PM PEAK HOUR OF STREET
LOSID BUS BARN
LAKE OSWEGO, OREGON