

**STATE OF OREGON**

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**SUBJECT: Hwy OR 99W South Corvallis Facility Plan**  
**Existing Motor Vehicle Conditions Intersection Analysis, Task 7.2,**  
**DRAFT Technical Memorandum #9**

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This memorandum documents the 2020 existing conditions for the Highway OR 99W South Corvallis Facility Plan, including the methodology and key assumptions used in the operational analysis. The analyzed conditions found congestion issues on the southbound segment of the couplet through the interchange. Also, there are delay issues typical for two-way stop controlled minor streets attempting to make left turns onto a major through roadway. These issues are exacerbated by incomplete interchange connections as well as some closely spaced intersections and pedestrian crosswalks.

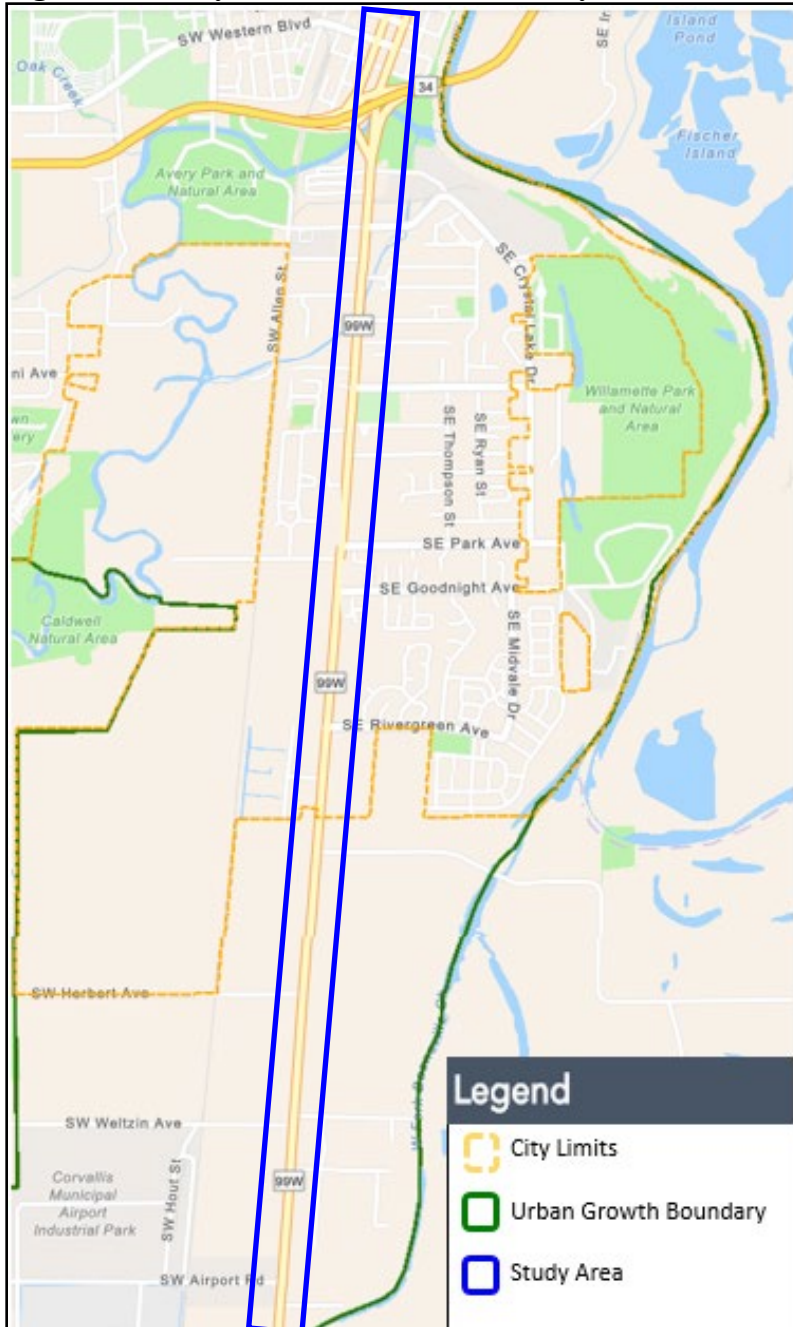
**Background**

The primary purpose of the South Corvallis Facility Plan is to make the OR 99W corridor a more safe, comfortable, and attractive place to walk and bike while also addressing traffic operations, mobility, and access. The recently completed Corvallis and Benton County Transportation System Plans cite this plan as a high and medium priority effort, respectively.

The study area encompasses the OR 99W highway corridor from SW Western Boulevard at the northern limit to the City of Corvallis southern urban growth boundary (see Figure 1). The character of the corridor changes significantly from a central business district at the north, through a mixed commercial/residential area, ending at the south project limit in a general rural context. OR 99W throughout the study area is functionally classified as an urban principal arterial, Western Boulevard is a minor arterial, and the majority of the east-west roads intersecting the corridor are functionally classified as major collectors.

The remainder of the study area roadways are classified as local streets: including SW B Avenue, SW Twin Oaks Circle/SE Chapman Place, SW Avery Avenue, SE Viewmont Avenue, SW Tunison Avenue, SE Richland Avenue, and SW Wake Robin Avenue. The posted speed on OR 99W is 25 mph at the north end of the study area and increases to 30 mph around SE Crystal Lake Drive, to 35 mph around SE Park Avenue, and finally to 50 mph around SE Goodnight Avenue. Additionally, there is a “School 20 mph” restriction zone on school days between 7 am and 5 pm around Lincoln Elementary School. The posted speed in the surrounding residential areas is generally 25 mph.

**Figure 1 – Study area, South Corvallis City limits, UGB limits**



## **2020 Existing Conditions Volume Development**

Due to the abnormal traffic patterns caused by the COVID-19 pandemic, taking new counts and applying typical analysis methodologies would not have been representative of normal traffic conditions. The traffic volumes were not only reduced relative to 2019 volumes, but also the origin/destination patterns were atypical. This was caused by a variety of governor-mandated closures of locations such as schools and restaurants, as well as remote working being much more prevalent. Specific to the study area,

- Oregon State University (OSU) was conducting classes primarily on-line;
- Lincoln Elementary School was not holding on-site classes;
- Reduced activity related to outdoor sports and traditional larger gatherings in nearby parks (Avery Park, Crystal Lake Park, and Willamette Park); and
- Occupancy capacity restrictions and/or complete closure of businesses at varying times

For that reason, the most recent historical counts available were obtained from several sources for all of the intersections available. The counts were seasonally and historically adjusted to create 2020 base year volumes. Counts from Quality Counts were in five-minute time intervals with the following vehicle classification:

- Cars (FHWA classes 1-3)
- Heavy vehicles (FHWA classes 4-13)
- Bicycles
- Pedestrians

Counts at three intersections were obtained from the Goodnight Residential Development Transportation Impact Analysis (TIA). These counts were taken in March 2020 while OSU was in session and prior to COVID-19 transportation impacts. The TIA data were in 15-minute time intervals with the following vehicle classifications:

- Cars (FHWA classes 1-3)
- Medium trucks (FHWA classes 4-7)
- Articulated trucks (FHWA classes 8-13)
- Bicycles on Road
- Bicycles on Crosswalk
- Pedestrians

At six intersections where historical counts were not available new counts were taken in April 2021. Due to the atypical traffic conditions caused by the COVID-19 pandemic a unique “COVID Factor” was developed and applied in order to integrate the count volumes into the analysis.

Bicyclist and pedestrian camera counts were taken in April 2021 at two of the four pedestrian Rectangular Rapid Flashing Beacon (RRFB) crossings within the study area:

- between SE Chapman Place & SW Avery Avenue/Crystal Lake Drive
- between SW Tunison Avenue & SE Richland Avenue

The identified study intersections are listed in Table 1.

**Table 1 – Study Intersections**

<b>Intersection</b>	<b>Full Turn Movement Historic Count Available</b>	<b>April 2021 Full Turn Movement Count</b>	<b>Turn Movements Estimated</b>
SW 4th St. at SW Western Blvd	●		
SW 3 <sup>rd</sup> St. at SW Western Blvd	●		
SW 4 <sup>th</sup> St. at SW B Ave <sup>1</sup>		●	
SW 3 <sup>rd</sup> St. at SW B Ave <sup>1</sup>		●	
SW Twin Oaks Cir / SE Chapman Pl at OR 99W <sup>1</sup>		●	
SW Avery Ave. / Crystal Lake Dr at OR 99W <sup>1</sup>	●	●	
SE Alexander Ave at OR 99W	●		
SE Viewmont Ave at OR 99W <sup>1</sup>		●	
SW Tunison Ave at OR 99W <sup>1</sup>		●	
SW Richland Ave at OR 99W			●
SE Park Ave at OR 99W	●		
SW Wake Robin Ave at OR 99W	●		
SE Goodnight Ave at OR 99W	●		
SE Rivergreen Ave at OR 99W	●		
SE Kiger Island Dr at OR 99W			●
SW Airport Ave at OR 99W			●

<sup>1</sup>New counts were taken at six intersections in April 2021 to help inform turn movements originally estimated.

In order to develop turn movement estimations at study intersections with no count data available, a number of techniques were applied. A summary is provided here and further detail is available in Appendix A.

- In order to estimate turn movements at the intersection of OR 99W with SW Richland Avenue, ITE trip generation software was used in combination with the application of comparable intersection turn movements and engineering judgment.
- At the south end of the study area, the two intersections of SE Kiger Island Drive and SW Airport Avenue with OR 99W used the directional split demonstrated at the intersection of SE Rivergreen Avenue: 49% northbound and 51% southbound. The east and west legs of these two intersections assumed a 50/50 split given no directional information was available to develop an alternative assumption.
- In order to account for traffic volume and pattern disruptions caused by the COVID-19 pandemic, the turn movements at the six intersections taken in April 2021 had a “COVID Factor” applied. This COVID factor was developed using a comparison of counts taken under typical conditions and these new 2021 counts to ascertain the magnitude of the disruption.

The system peak hour for the study area is 4:45 pm - 5:45 pm with a commuter trend. The peak hour was determined through an analysis of existing historical counts along OR 99W within the study area. Of the 18 counts reviewed, seven had a peak hour beginning at 4:45 pm, five had a peak hour beginning 15 minutes earlier at 4:30 pm, three had a peak period beginning half an hour earlier at 4:15 pm, two had a peak period beginning 15 minutes later at 5:00 pm, and there was one outlier with a peak period at 2:15 pm. The system peak period was chosen not only because it aligns with the majority of the analyzed counts, but also because it captures the majority of the peak period for most of the counts. It also aligns with the peak hour chosen for the Goodnight TIA. The intersection turn movement traffic count details are shown in Table 2.

**Table 2: Intersection Turn Movement Traffic Counts in the Study Area**

Intersection	Count Date	Count Duration	Count Type	Source
SW 4 <sup>th</sup> St / SW Western Blvd	2/12/2013	4-6 pm	Video	Quality Counts
SW 3 <sup>rd</sup> St / SW Western Blvd	2/12/2013	4-6 pm	Video	Quality Counts
	5/31/2017	3-6 pm	Video	Quality Counts
SW 4 <sup>th</sup> St / B Ave	4/13/2021	4-6 pm	Video	Quality Counts
SW 3 <sup>rd</sup> St / B Ave	4/13/2021	4-6 pm	Video	Quality Counts
OR 99W / SW Twin Oaks Cir & SE Chapman	4/13/2021	4-6 pm	Video	Quality Counts
OR 99W / SW Avery Ave & Crystal Lake Dr	5/31/2017	3-6 pm	Video	Quality Counts
	6/1/2017	6-9 am	Video	Quality Counts
	4/13/2021	4-6 pm	Video	Quality Counts
OR 99W / Alexander Ave	5/31/2017	3-6 pm	Video	Quality Counts
	6/1/2017	6-9 am	Video	Quality Counts
OR 99W / SE Viewmont Ave	4/13/2021	4-6 pm	Video	Quality Counts
OR 99W / SW Tunison Ave	4/13/2021	4-6 pm	Video	Quality Counts
OR 99W / SE Park Ave	5/31/2017	3-6 pm	Video	Quality Counts
	3/4/2020	7-9 am, 4-6 pm	Video	Goodnight TIA
OR 99W / SW Wake Robin Ave	3/4/2020	7-9 am, 4-6 pm	Video	Goodnight TIA
OR 99W / SE Goodnight Ave	3/4/2020	7-9 am, 4-6 pm	Video	Goodnight TIA
OR 99W / SE Rivergreen Ave	5/31/2017	3-6 pm	Video	Quality Counts

The study area segment traffic counts are identified in Table 3. The segment counts in Table 3 differ from the intersection counts in Table 2 in that only traffic volume data were available without the additional turn movement information.

**Table 3: Segment Traffic Counts in the Study Area**

Segment	Count Date	Count Duration	Count Type	Source
SW 4 <sup>th</sup> St north of SW Western Blvd	5/15/2019	24 hours	Video no Pedestrians	ODOT
SW 4 <sup>th</sup> St north of SW Western Blvd	5/15/2019	24 hours	Video no Pedestrians	ODOT
SW 3 <sup>rd</sup> St north of SW Western Blvd	5/15/2019	24 hours	Video no Pedestrians	ODOT
SW 3 <sup>rd</sup> St south of SW Western Blvd	5/15/2019	48 hours	Tube	ODOT
SW 4th (SB OR 99W) to WB 34/20	5/6/2019	48 hours	Tube	ODOT
WB OR 34 to SB OR 99W	9/10/2018	48 hours	Tube	ODOT
OR 99W between OR 34 ramps, on Mary's River Bridge	5/6/2019	48 hours	Tube	ODOT
SB SW 4 <sup>th</sup> St on to OR 99W	5/13/2019	48 hours	Tube	ODOT
EB 20/34 to NB 3 <sup>rd</sup> /OR 99W	9/10/2018	48 hours	Tube	ODOT
NB OR 99W to EB OR 34/20	5/6/2019	48 hours	Tube	ODOT
SW Avery Ave 0.2 miles west of OR 99W	10/25/2016	24 hours	Tube	ODOT
OR 99W north of Avery Ave/Crystal Lake Dr	5/7/2019	48 hours	Tube	ODOT
OR 99W south of Avery Ave/Crystal Lake Dr	5/7/2019	48 hours	Tube	ODOT
OR 99W south of Mayberry Ave	5/15/2019	24 hours	Tube	ODOT
OR 99W 0.07 mile north of SE Viewmont Ave	4/13/2021	24 hours	Tube	Quality Counts
OR 99W 0.05 mile north of SE Viewmont Ave	5/7/2019	48 hours	Tube	ODOT
OR 99W south of SE Goodnight Ave	5/7/2019	48 hours	Tube	ODOT
SE Goodnight Ave east of OR 99W	8/8/2017	48 hours	Tube	ODOT
OR 99W North of SE Kiger Island Dr	5/7/2019	48 hours	Tube	ODOT
SE Kiger Island Dr east of OR 99W	8/8/2017	48 hours	Tube	ODOT
OR 99W south of SW Airport Ave	5/7/2019	48 hours	Tube	ODOT

The counts used in this analysis were adjusted to the 30<sup>th</sup> highest hour conditions (30HV) pm peak hour volumes using seasonal factors. There was no ATR within the study area, so the on-site ATR method was not an option.

Because the characteristics change along the OR 99W corridor, distinct segments were identified with an appropriate seasonal factor for each. All segments have a commuter weekday traffic trend with an Oregon Highway Plan (OHP) classification of regional highway; however, the area type, number of lanes and Average Annual Daily Traffic (AADT) vary. The 2019 Transportation Volume Tables' AADT volumes for the project area along Pacific Highway West No. 91 (SW 2<sup>nd</sup> St/SW 3<sup>rd</sup> St/OR 99W) range from a low volume of 5,800 vpd (vehicles per day) at the south end of the study area to a high volume of 25,600 vpd just north of SW Avery Avenue/Crystal Lake Drive (Appendix A). There are stretches of the corridor with two through lanes, four through lanes, and a couplet with three lanes in each direction. The segmentation was delineated as identified in Table 4.

**Table 4 – Study Segments and Seasonal Factor Type**

Segment	OR 99W Lanes	AADT from 2019 TVT tables	Comparable ATR Characteristic Entry	Seasonal Trend Method
1. Couplets	3 lanes single direction	12,700-14,300		●
2. Interchange Ramps (OR 99W OR 34 and US 20)	1 lane	2,200-3,100		●
3. South end of couplet to north of Alexander Ave	4 lanes	24,100-25,600	●	
4. Alexander Ave to Goodnight Ave	4 lanes	21,700-19,600		●
5. Goodnight Ave to Kiger Island Dr	4 lanes	11,700		●
6. Kiger Island Dr to south extent of study area	2 lanes	5,800-8,200		●

### ***ATR Characteristic Table***

The ATR Characteristic Table is used when there is not an ATR available on-site to provide for the seasonal adjustment factor. It is a table that contains all the ATRs and some general characteristics that allow one to search for ATRs that are on roadways with similar characteristics.

Segment 3: South end of couplet to north of Alexander Avenue

After reviewing the ATR Characteristic Table, Salem Parkway ATR No. 24-022 (urbanized commuter weekday trends with a 2019 AADT of 25,300) was used for the study area intersections from north of Alexander Avenue north to the south end of the couplet. The ATR Trend Summary is shown in Table 5.

**Table 5: Salem Parkway ATR No. 24-022 Percent Average Weekday Traffic**

<b>Count Month</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>
Peak Month August	111	118	110	111	110
May	104	104	108	108	110
June	109	112	111	111	108

As shown in Table 5, the percentage of Average Weekday Traffic (AWDT) values listed during the peak month, August, and count months, May and June, for the past five available years were reviewed to calculate the average. The highest and lowest values, shown as shaded, were dropped from this calculation. The average monthly factors were determined as follows:

- The average peak month (August) is:  $(111\% + 110\% + 111\%) / 3 = 111\%$ .
- The average for counts taken May 31/ June 1 is:  
 $((104 + 109) / 2 + (108 + 111) / 2 + (108 + 111) / 2) / 3 = 109\%$ .
- The average for count month May is:  $(104\% + 108\% + 108\%) / 3 = 107\%$ .
- The average for count month June is:  $(109\% + 111\% + 111\%) / 3 = 110\%$ .
- The August / May seasonal adjustment =  $111\% / 107\% = 1.04$ .
- The August / June seasonal adjustment =  $111\% / 110\% = 1.01$ .
- The August / May 31-June 1 seasonal adjustment =  $111\% / 109\% = 1.02$ .

Counts taken in early to mid-May on intersections north of Alexander Avenue to the south end of the couplet were seasonally adjusted by a factor of 1.04. Counts taken May 31/June 1 along this stretch were seasonally adjusted by a factor of 1.02.



***Seasonal Trend Method***

The seasonal trend table is used when there is not an ATR nearby or in a representative area. This table provides one factor for each seasonal trend, created by averaging seasonal trend groupings from the ATR Characteristic Table. The correct values were obtained by applying the appropriate factor for the month the count was taken for the commuter trend and extrapolating when the count did not occur on the 1<sup>st</sup> or 15<sup>th</sup> of the month (see Appendix A). Note that the peak period for the commuter trend is the middle of June. Counts taken at other times were factored as identified in Tables 6 and 7.

***Historical year adjustment***

In addition to adjusting count volumes seasonally, it was necessary to adjust them to the base year of 2020. When a travel demand model (TDM) is available, the FVT indicates that the historical trend should be replaced by the model growth rate (future year divided by base year). Since a TDM was available for Corvallis Area MPO (CALM Version 3.001), the growth factors applied to existing historical counts to equate them to the 2020 base year were developed from individual model links, and are listed in Table 6 and Table 7.

**Table 6 – Intersection Seasonal and Historic Growth Factors**

<b>Intersection</b>	<b>Count Date</b>	<b>Seasonal Factor</b>	<b>Leg</b>	<b>Growth Factor to 2020</b>
SW 4 <sup>th</sup> St / SW Western Blvd <sup>1</sup>	2/12/2013	1.22	North	1.08
			South	1.10
			East	1.11
			West	1.07
SW 3 <sup>rd</sup> St / SW Western Blvd <sup>1</sup>	2/12/2013	1.22	North	1.10
			South	1.11
			East	1.07
			West	1.04
SW 3 <sup>rd</sup> St / SW Western Blvd <sup>1</sup>	5/31/2017	1.02	North	1.04
			South	1.05
			East	1.06
			West	1.02
OR 99W / SW Avery Ave & Crystal Lake Dr	5/31/17 & 6/1/17	1.02	North	1.06
			South	1.07
			East	1.14
			West	1.08

**Table 6 – Intersection Seasonal and Historic Growth Factors, continued**

Intersection	Count Date	Seasonal Factor	Leg	Growth Factor
OR 99W / Alexander Ave	5/31/17 & 6/1/17	1.02	North	1.06
			South	1.09
			East	0.99
			West	1.00
OR 99W / SE Park Ave	5/31/2017	1.02	North	1.06
			South	1.10
			East	1.03
OR 99W / SE Park Ave	3/4/2020	1.15	Count taken in 2020	1.00
OR 99W / SW Wake Robin Ave	3/4/2020	1.15	Count taken in 2020	1.00
OR 99W / SE Goodnight Ave	3/4/2020	1.15	Count taken in 2020	1.00
OR 99W / SE Rivergreen Ave	5/31/2017	1.02	North	1.15
			South	1.22
			East	1.31

<sup>1</sup>There are two counts utilized at the intersection of SW 3<sup>rd</sup> St and Western Blvd (2013 & 2017). The 2013 count was used as a reference for the only count available at SW 4<sup>th</sup> St and Western Blvd (also 2013) because this count is outside of the generally acceptable time range in non-pandemic conditions.

**Table 7 – Segment Seasonal & Historic Growth Factors**

Segment	Count Date	Seasonal Factor	Growth Factor
SW 4th St North of SW Western Blvd	5/15/2019	1.03	1.01
SW 4th St South of SW Western Blvd	5/15/2019	1.03	1.01
SW 3rd St North of SW Western Blvd	5/15/2019	1.03	1.01
SW 3rd St South of SW Western Blvd	5/15/2019	1.03	1.02
SW 4th (SB OR 99W) to WB 34/20	5/6/2019	1.04	1.02
WB OR 34 to SB OR 99W	9/10/2018	1.02	1.04
OR 99W between OR 34 ramps, on Mary’s River Bridge	5/6/2019	1.03	1.02

**Table 7 – Segment Seasonal & Historic Growth Factors, continued**

Segment	Count Date	Seasonal Factor	Growth Factor
SB SW 4th St on to OR 99W	5/13/2019	1.03	1.02
EB 20/34 to 3rd (NB OR 99W)	9/10/2018	1.02	1.00
NB OR 99W to EB 34/20	5/6/2019	1.04	1.03
SW Avery Ave 0.2 miles west of OR 99W	10/25/2016	1.05	1.10
OR 99W north of Avery Ave/Crystal Lake Dr	5/7/2019	1.04	1.02
OR 99W south of Avery Ave/Crystal Lake Dr	5/7/2019	1.04	1.02
SE Lilly Ave east of OR 99W	7/11/2018	1.02	1.01
OR 99W south of Mayberry	5/15/2019	1.03	1.02
OR 99W north of SE Viewmont Ave	5/7/2019	1.04	1.03
OR 99W south of SE Goodnight Ave	5/7/2019	1.04	1.06
SE Goodnight Ave east of OR 99W	8/8/2017	1.01	1.02
OR 99W north SE Kiger Island Dr	5/7/2019	1.04	1.05
SE Kiger Island Dr east of OR 99W	8/8/2017	1.01	1.00
SW Airport Ave west of OR 99W	10/26/2016	1.05	1.17
OR 99W south of SW Airport Ave	5/7/2019	1.04	1.01

The historical and seasonal factors that have been developed in this section were applied to the count volumes and then the segments were balanced to create the existing volumes.

### ***COVID-19 Adjustment***

Counts during a disruptive event such as the COVID-19 pandemic should only be taken when it is determined that available data is not sufficient. The intersection turn movement volume data was insufficient for the desired study area intersections. Guidance from the APM Appendix 3E was applied to modify the counts taken at six intersections in April 2021. When compared to typical conditions, the southbound volume along the corridor was found to be approximately 37% below typical volumes and the northbound direction saw volumes about 22% below typical conditions, so the 2021 counts were increased accordingly. There cannot be absolute confidence that traffic volumes and patterns will return to pre-pandemic conditions because of potential uncertainties; conditions may recover to a state currently unknown. However, increasing the 2021 counts by the identified factors is a conservative methodology and adds flexibility for a sensitivity analysis in the future no-build and build scenarios.

## **2020 Existing Condition Analysis Results**

### **Intersection Operational Standards**

The study area falls within the Corvallis Area MPO (CAMPO) boundaries and the state jurisdiction operational standards used for the existing conditions will be guided by Table 6 of the Amended 2019 Oregon Highway Plan (OHP). The volume-to-capacity (v/c) ratio is used as a standard measure of intersection operations. The OHP mobility targets assist in the planning phase and help determine future system deficiencies so are used for current conditions as well as future no-build scenario. Each roadway classification will be compared to its appropriate standard from the OHP. Table 8 shows the OHP v/c ratio targets. The entire length OR 99W within the study area is classified as an OHP Regional Highway and an OHP Freight Route. The OHP has ODOT v/c considerations under Action 1.F.1 applying to the stopped non-state approaches. As stated in the OHP, meeting the targets in Table 8 “for the state highway approaches indicates that state mobility targets are being met. In order to maintain safe operation of the intersection, non-state highway approaches are expected to meet or not to exceed the volume to capacity ratios for District/Local Interest Roads” identified as 0.95 in Table 8.

**Table 8: State v/c Ratio Targets**

<b>Roadway</b>	<b>v/c Targets</b>
	<b>OHP</b>
Freight Route on a regional or District Highway (MPO)	0.90
District/Local Interest Roads (MPO)	0.95

The City of Corvallis 2018 TSP, Chapter 6 identifies the mobility standard for facilities under City jurisdiction to be a maximum v/c ratio of 0.85. For signalized intersections, the combined intersection v/c ratio (not individual legs) must comply with the standard. For unsignalized intersections, all movements serving 20 vehicles per hour or more must comply with the standard. The Benton County 2018 TSP, Chapter 4 indicates that two-way stop and yield controlled intersections under County jurisdiction must operate with a v/c ratio not higher than 0.90. These v/c ratio standards are identified in Table 9.

**Table 9: City and County v/c Ratio Standards**

Roadway	v/c
<b>City of Corvallis</b>	
SW Western Blvd	0.85
SW B Ave	
SW Twin Oaks Cir/SE Chapman Pl	
SW Avery Ave/Crystal Lake Dr	
SE Alexander Ave	
SE Viewmont Ave	
SW Tunison Ave	
SE Richland Ave	
SE Park Ave	
SW Wake Robin Ave	
SE Goodnight Ave	
SW Goodnight Ave	
SE Rivergreen Ave	
<b>Benton County</b>	
OR 99W at Kiger Island Dr	0.90
OR 99W at Airport Ave	

***v/c Ratio and LOS***

Tables 10a and 10b show the v/c, LOS, and delay results for the unsignalized intersections in the study area. As noted in the Existing Conditions Volume Development Section, due to pandemic conditions it was not feasible to have traffic counts taken at all of the study area intersections. Table 10a presents the analysis results for intersections where historic counts were available. Table 10b presents analysis results for intersections where turn movement volumes were taken in April 2021 when COVID-19 traffic impacts were still present or where volumes were completely estimated due to lacking data. It is advisable to gather traffic counts and re-analyze these intersections when pandemic impacts are no longer present. All of the north-south major movements along OR 99W meet the OHP v/c target. Appendix C contains the Sidra intersection analysis results.

**Table 10a: Unsignalized Intersection v/c, LOS, & Delay**

Intersection <sup>1</sup>	v/c <sup>2,3</sup>	LOS	Delay (sec)
OR 99W &			
SE Park Ave	0.32 / 0.18	A / E	5 / 44
SW Wake Robin Ave	0.30 / 0.77	A / F	6 / >120
SE Goodnight Ave	0.31 / 0.37	A / C	7 / 17
SW Goodnight Ave	0.24 / 0.14	A / F	5 / 52
SE Rivergreen Ave	0.26 / 0.20	A / E	6 / 49

<sup>1</sup>Values for intersection are listed by MAJOR movement / MINOR movement.

<sup>2</sup>OHP mobility target for all MAJOR movements is 0.90; for all MINOR movements it is 0.95. The City of Corvallis mobility standard for these MINOR movements is 0.85.

<sup>3</sup>Black-shaded cells indicate that the OHP v/c target or the City or County standard has been exceeded.

**Table 10b: Estimated or COVID-19 Impacted Unsignalized Intersection v/c, LOS, & Delay**

Intersection <sup>1</sup>	v/c <sup>2,3</sup>	LOS	Delay (sec)
B Ave & 4 <sup>th</sup> St	0.34 / 0.43	A / C	3 / 22
B Ave & 3 <sup>rd</sup> St	0.24 / 0.22	A / D	4 / 32
OR 99W &			
Twin Oaks/Chapman Pl	0.66 / >2.0	B / F	11 / >120
SE Viewmont Ave	0.35 / 1.0	A / F	6 / >120
SW Tunison Ave	0.40 / >2.0	A / F	9 / >120
SE Richland Ave	0.34 / 0.46	A / F	6 / 60
SE Kiger Island Dr	0.26 / 0.10	A / C	4 / 22
SW Airport Ave	0.19 / 0.10	A / B	2 / 14

<sup>1</sup>Values for intersection are listed by MAJOR movement / MINOR movement.

<sup>2</sup>OHP mobility target for all MAJOR movements is 0.90; for all MINOR movements it is 0.95. The City of Corvallis mobility standard for these MINOR movements is 0.85. The Benton County roadways (Kiger Island Dr and Airport Ave) have a mobility standard of 0.90.

<sup>3</sup>Black-shaded cells indicate that the OHP v/c target or the City or County standard has been exceeded.

The three unsignalized intersections of the OR 99W corridor with Twin Oaks Circle/Chapman Place, SE Viewmont Avenue, and SW Tunison Avenue all exceed their respective v/c mobility targets due to the minor east-west movements. The high v/c's are due to the difficulty in finding an acceptable gap to turn left onto the mainline. A v/c greater than 1.0 indicates that the volume demand exceeds the available capacity of the roadway and that the area is highly congested. A v/c greater than 2.0 indicates that drivers are forced to accept much smaller gaps in mainline traffic which increases the risk of a collision. At the Twin Oaks Circle/Chapman Place intersection, mainline northbound vehicles are often accelerating upon approaching the OR 34 on-ramp and also the mainline southbound traffic here is one of the highest peak hour volumes in the project study area. There is also a relatively high volume of bicyclists and pedestrians crossing

the east leg of the intersection. These factors contribute to the high v/c and delay at this intersection.

It is particularly difficult to find an acceptable gap onto the mainline at the offset intersections of OR 99W with SE Viewmont Avenue and with SW Tunison Avenue due to their proximity. Traffic that might be comfortable performing a two-step maneuver using the two way left turn lane (TWLTL) median as a refuge prior to executing the full turn movement will not always be able to due to the intersections being only approximately 50 feet apart. This overlapping conflict zone is depicted in Figure 2. Furthermore, the predominant movement from the side streets during the peak hour is northbound causing the larger movement out of SW Tunison Avenue to be a left turn while the larger movement at the intersection with SE Viewmont Avenue is a right turn.

**Figure 2: Overlapping Conflict Zone between Viewmont Avenue and Tunison Avenue**



Table 11 shows the signalized intersection results. The intersection of OR 99W with SW Avery Drive/Crystal Lake Drive is the only signalized location which exceeds the v/c target. SW Avery Park Road provides a route not only for eastbound traffic from OR 34/US 20 to head southbound on OR 99W, but also for traffic from OSU to access South Town. Additionally, many drivers prefer to make a southbound left onto Crystal Lake Drive to access the residential area in South Town to avoid congestion on OR 99W. The high volume of southbound left turns coupled with high northbound through volumes contributes to the long delays at this intersection.

**Table 11: Signalized Intersection v/c, LOS, & Delay**

<b>Intersection</b>	<b>v/c<sup>1</sup></b>	<b>LOS</b>	<b>Delay (sec)</b>
Western Blvd & 4 <sup>th</sup> St	0.68	B	18
Western Blvd & 3 <sup>rd</sup> St	0.61	B	19
OR 99W & SW Avery Dr/Crystal Lake Dr	<b>0.92</b>	F	93
OR 99W & SE Alexander Dr	0.49	B	17

<sup>1</sup>Black-shaded cells indicate that the OHP v/c target of 0.90 highway or 0.95 local road or the City standard of v/c 0.85 has been exceeded. The most restrictive target or standard is applied to the intersection.

### ***95<sup>th</sup> Percentile Traffic Queuing***

The 95<sup>th</sup> percentile queues were obtained from the Sidra Intersection output. Figure 3 depicts the 95<sup>th</sup> percentile queues at the north end of the study area where the main queuing issues exist (the remainder of the study area has minimal queuing issues and the full set of study area queuing diagrams are available in Appendix B).

Queuing issues exist at both of the intersections of 3<sup>rd</sup> Street and 4<sup>th</sup> Street with Western Boulevard with longer queues in the eastbound and southbound directions. There is a relatively high eastbound left turn movement at the intersection of 3<sup>rd</sup> Street and Western Boulevard and the left turn storage extends the entire length of the segment between 3<sup>rd</sup> Street and 4<sup>th</sup> Street. When the storage lane reaches capacity at 3<sup>rd</sup> Street, it is difficult for southbound left movements to proceed during the green phase because of the need to turn into the less desirable outer lane. Similarly, the eastbound through movement at 4<sup>th</sup> Street may be forced to wait through a signal cycle until the eastbound left queue at 3<sup>rd</sup> Street clears.

At the intersections of 3<sup>rd</sup> Street and 4<sup>th</sup> Street with SW B Avenue there are no significant queues seen in the existing conditions. Although queues might be expected given the volumes and geometry, this is not demonstrated in reality. This indicates that drivers are accepting shorter gaps to enter the mainline here than would typically be assumed at an intersection with similar characteristics.

The southbound section of the couplet through the interchange ramps has been identified as a potential congestion zone which is caused by a number of factors. Turbulence is created by a speed differential as the westbound OR 34 / US 20 off-ramp merges with southbound OR 99W. Traffic traveling at a higher speed from the exit ramp is merging with slower moving traffic. Additionally, it has been noted that this section may be confusing to drivers unfamiliar with the area causing additional awkward lane-changing movements. Queues on SW Twin Oaks Circle and SE Chapman Place are delay-based as vehicles have difficulty finding gaps to either turn left onto OR 99W or to cross the highway.



The queues demonstrated at the intersection of OR 99W with SW Avery Avenue/SE Crystal Lake Drive are caused by this being a preferable east-west route as was described in the v/c discussion above. Although the posted speed through Avery Park is much lower than the speed along OR 34/US 20, some drivers prefer this route over the out-of-direction travel to head southbound on OR 99W. The only other option is to exit off of eastbound OR 34/US 20 northbound onto OR 99W and then to make a left turn at either Western Boulevard or B Avenue to ultimately head in the southbound direction.

Another area that demonstrates significant queuing is near SE Alexander Avenue. On the north leg in the southbound direction, this may be a result of disruption in smooth and consistent traffic speed caused by the two RRFB pedestrian crossings to the north. Similarly, to the south of Alexander Avenue there is another RRFB pedestrian crossings and two closely spaced side streets (SW Tunison Avenue and SE Viewmont Avenue) which might contribute to a disruption in traffic flows. The queues on these two side streets are delay-based as vehicles have difficulty in finding gaps to turn left onto OR 99W.

There are three intersections where the southbound direction on the north leg demonstrates a substantial slowdown: SW Tunison Avenue, SE Goodnight Avenue, and SE Rivergreen Avenue. At SW Tunison Avenue the slowdown is demonstrated in the southbound right/through lane so is likely caused by the high peak hour volume of southbound right turn traffic. This type of intersection operation has the potential to increase the risk of rear end collisions. As documented in Technical Memorandum #10, this intersection exceeds the 90<sup>th</sup> percentile rate and the critical crash rate for this type of intersection as well as having one of the highest number of reported crashes in the study area. It is also in the top 20% of the statewide bicycle risk analysis. For these reasons this intersection should be considered carefully as potential future mitigations are developed.

The intersections of OR 99W with SE Goodnight Avenue and SE Rivergreen Avenue are demonstrated to have slowdowns on the north legs in the southbound direction due to the high southbound left turn volumes over the pm peak hour. There has been a fatal crash at the SE Goodnight Avenue intersection and, similar to the Tunison Avenue intersection, the SE Goodnight Avenue intersection is in the top 20% of the statewide bicycle risk analysis. The SE Rivergreen Avenue intersection is in the top 20% of the statewide pedestrian risk analysis. Like the SW Tunison Avenue intersection, these two intersections should also be considered carefully for potential future mitigations due to the safety concerns.

The remainder of the queues on the east and west cross streets in the southern section of the study area are generally limited to a vehicle or two at any one time and operations are not a concern at this time.

Figure 3: 2020 95<sup>th</sup> Percentile Queues

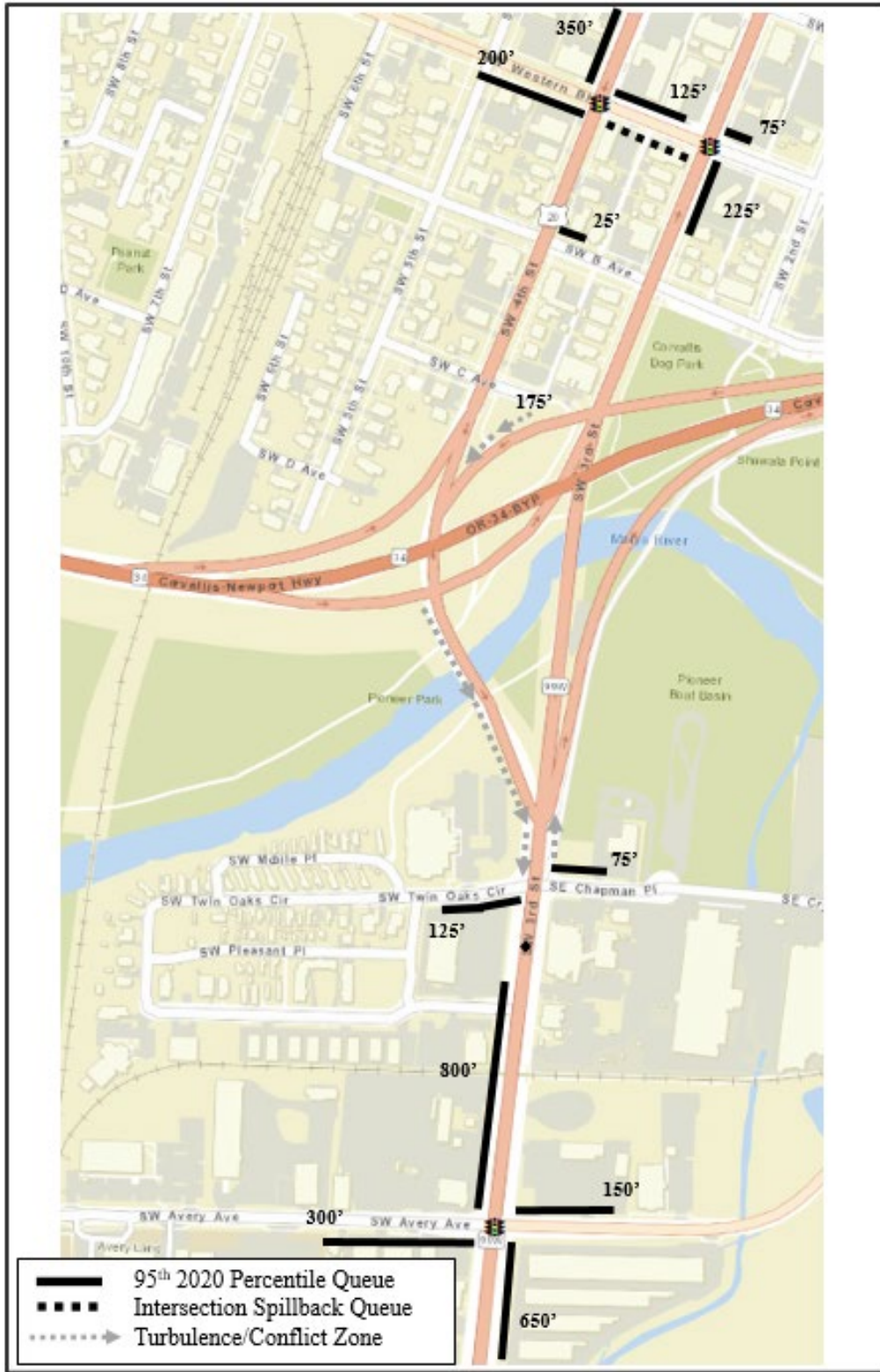


Figure 3: 2020 95<sup>th</sup> Percentile Queues, continued



Figure 3: 2020 95<sup>th</sup> Percentile Queues, continued



## **Existing Deficiencies Summary**

The following is a summary of the existing year study area deficiencies by type based on the analysis findings. These are areas that have been flagged for exceeding their respective mobility target, having a v/c ratio exceeding 1.0, or a delay-based LOS exceeding E:

- Over half of the unsignalized east-west roadways intersecting OR 99W throughout the study area have an LOS of E or worse. These intersections are clustered in the central region of the study area between south of the interchange and Goodnight Avenue. This is predominantly due to the delay experienced when making a left turn onto the highway.
- There is a zone of turbulence and conflict demonstrated on the southbound section of the couplet through the interchange causing congestion from the intersection of OR 99W with SW Twin Oaks Circle/SE Chapman Place extending to the westbound OR 34 off-ramp. This is caused by the merging of the OR 34/ US 20 ramps with the corridor which requires mixing of vehicular speeds, merging, and excessive lane weaving.
- The intersection of SE Crystal Lake Drive has the highest signalized v/c in the study area, which exceeds its OHP mobility target.
- The intersections of SE Viewmont Avenue and SW Tunison with OR 99W are in very close proximity of each other (approximately 55 feet apart) which makes it more difficult for left turning traffic to use the TWLTL median as a refuge causing longer delays on these streets.
- The intersections of OR 99W with SW Tunison Avenue, SE Goodnight Avenue, and SE Rivergreen Avenue all have a substantial slowdown in the southbound direction on the north leg due to reduced speeds for turn movements. This type of intersection operations may be a safety concern and these intersections should be considered carefully upon potential mitigation development.