



## ANALYSIS SUMMARY

DATE: October 5, 2022

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SUBJECT: Highway 211/Gunderson Road Improvement Study

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This memorandum presents the traffic and safety analysis conducted for the Highway 211/Gunderson Road intersection and adjacent Highway 211 segments. The analysis evaluated a range of potential improvements to accommodate future traffic volumes and safety needs and made recommendations based on the findings. The project background, analysis findings and recommendations are summarized in the following sections.

### BACKGROUND

The Shaylee Meadows subdivision was recently developed west of Highway 211. It included the construction of a segment of the Gunderson Road extension project that is identified in the Sandy Transportation System Plan (TSP). The Gunderson Road segment created a new intersection on Highway 211 that is currently controlled by a stop sign on the side street approach. The intersection is located on a segment of Highway 211 with a moderate grade and near a horizontal curve. The developer of the subdivision was required to contribute partial funding to construct improvements at the new intersection. The specific improvements were not identified with the development approval.

### INTERSECTION CONTROL ANALYSIS

#### ANALYSIS FRAMEWORK

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Operations analysis of the Gunderson Road/Highway 211 intersection was completed for the following scenarios:

- 5-year (2027) to identify short-term improvements (AM and PM peak hour)
- 20-year (2042) to identify long-term improvements (AM and PM peak hour)

A Vistro model of the study area was created that included the Highway 211/Gunderson Road intersection and connections to SE 362<sup>nd</sup> Drive, Dubarko Road, and Highway 211 for each scenario. The model was used to estimate the traffic growth on each major access point that connects to the new intersection. This model was also used to evaluate intersection operations (following Highway Capacity Manual methodology) and report estimated delay, level of service, and volume to capacity ratios.

The 5-year scenario was based on the existing street network with no new road connections south of US 26 that may influence regional or local travel patterns. Traffic volume growth at the intersection was limited to the trips generated by approved development at Shaylee Meadows (north of Highway 211) and a portion of the expected growth in the Cascadia Village development (south of Highway 211).

The travel demand model developed for the 2011 Sandy TSP was used to inform the expected distribution of traffic through the study street network. This travel demand model has not been calibrated to existing 2022 conditions and the distributions that were used were somewhat modified based on engineering judgement.

Volumes for the 20-year scenario were developed assuming the following new connections in the network:

- Sockeye Street extension west to Deming Road providing access to 362<sup>nd</sup> Drive
- Cascadia Village Drive extension between Highway 211/Gunderson Road and Arletha Court and between Village Boulevard and Pine Street, providing a connection from Highway 211 to Jacoby Road

Trip generation was estimated assuming all planned growth in the 2029 travel demand model would occur by 2040. Since much of the growth assumed in the 2029 model for the areas in question has not occurred yet, no additional growth was included for 2042 conditions. The final 2042 volumes were adjusted to be consistent with the expected future volumes from the Oregon Department of Transportation's TransGIS website.<sup>1</sup>

For both the 2027 and 2042 analysis years, a low diversion and high diversion scenario was analyzed. The low diversion scenario only included expected local trips accessing the adjacent zones where residential development is expected. The high diversion scenario included additional traffic that may shift off Highway 211, Dubarko Road, and/or 362<sup>nd</sup> Drive with the full connection of Gunderson Road.

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<sup>1</sup> <https://gis.odot.state.or.us/transgis/>

## OPERATION ANALYSIS

Table 1 shows the expected operations of Gunderson Road/Highway 211 intersection in 2027 with the existing two-way stop control (TWSC). Table 2 shows the expected operations in 2042 with TWSC. In 2027, both the low diversion and high diversion scenarios resulted in acceptable intersection operations. In 2042, expected operations in the PM peak hour high diversion scenario reach Level of Service (LOS) F due to the high delay experienced by drivers making a southbound left from Gunderson Road to Highway 211. This movement was expected to grow due to potential diversion from SE 362<sup>nd</sup> Drive and Dubarko Road accessing the Cascadia Village neighborhood. Some of that traffic volume was expected to access the neighborhood via the Cascadia Village Drive extension, which would form the (future) southeast leg of the study intersection, but other traffic was expected to use Highway 211 to access the eastern side of Cascadia Village.

**TABLE 1: YEAR 2027 TWO-WAY STOP CONTROL OPERATIONS AT HIGHWAY 211/GUNDERSON RD**

| ALTERNATIVE                        | MOVEMENT        | VOLUME TO CAPACITY | LEVEL OF SERVICE | AVERAGE DELAY (SECONDS) |
|------------------------------------|-----------------|--------------------|------------------|-------------------------|
| <b>AM PEAK HOUR LOW DIVERSION</b>  | Southbound left | 0.02               | B                | 10.9                    |
| <b>PM PEAK HOUR LOW DIVERSION</b>  | Southbound left | 0.05               | B                | 13.5                    |
| <b>AM PEAK HOUR HIGH DIVERSION</b> | Southbound left | 0.02               | B                | 11.0                    |
| <b>PM PEAK HOUR HIGH DIVERSION</b> | Southbound left | 0.10               | B                | 14.5                    |

**TABLE 2: YEAR 2042 TWO-WAY STOP CONTROL OPERATIONS AT HIGHWAY 211/GUNDERSON RD**

| ALTERNATIVE                        | MOVEMENT        | VOLUME TO CAPACITY | LEVEL OF SERVICE | AVERAGE DELAY (SECONDS) |
|------------------------------------|-----------------|--------------------|------------------|-------------------------|
| <b>AM PEAK HOUR LOW DIVERSION</b>  | Southbound left | 0.06               | B                | 14.4                    |
| <b>PM PEAK HOUR LOW DIVERSION</b>  | Southbound left | 0.14               | C                | 21.0                    |
| <b>AM PEAK HOUR HIGH DIVERSION</b> | Southbound left | 0.18               | C                | 18.7                    |
| <b>PM PEAK HOUR HIGH DIVERSION</b> | Southbound left | 0.40               | F                | 51.5                    |

## SAFETY AND SPEED EVALUATION

The Highway 211/Gunderson Road intersection was evaluated further to explore the need for improvements to address safety concerns. Even though the results of the HCM analysis in Table 1 and Table 2 above indicate that the vehicles turning left off Highway 211 are not expected to experience significant delay, there may be additional safety considerations that warrant the construction of turn lanes at the intersection.

There is no crash data available for Highway 211 and Gunderson Road due to its recent construction. Speed data collected for this analysis in June 2022 found significant speeding issues. The posted speed limit on Highway 211 is 45 miles per hour north of Gunderson Road and 55 miles per hour south of Gunderson Road. The speed data showed the 85th percentile speeds were 68 miles per hour in the southbound direction and 60 miles per hour in the northbound direction. The 85th percentile speed is defined as the speed at or below which 85 percent of all vehicles are observed to travel under free-flow conditions.

### ODOT ANALYSIS PROCEDURES MANUAL CRITERIA

Intersection control and turn lane configuration guidelines are discussed in Chapter 12 of ODOT's Analysis Procedures Manual (APM). Figure 1 highlights the left turn lane evaluation criteria with the future 2042 PM peak hour Highway 211 southbound approach volume in green and the northbound approach volume in red. Both the northbound and southbound left turn volumes exceed the criteria and trigger the need for an exclusive left turn lane.

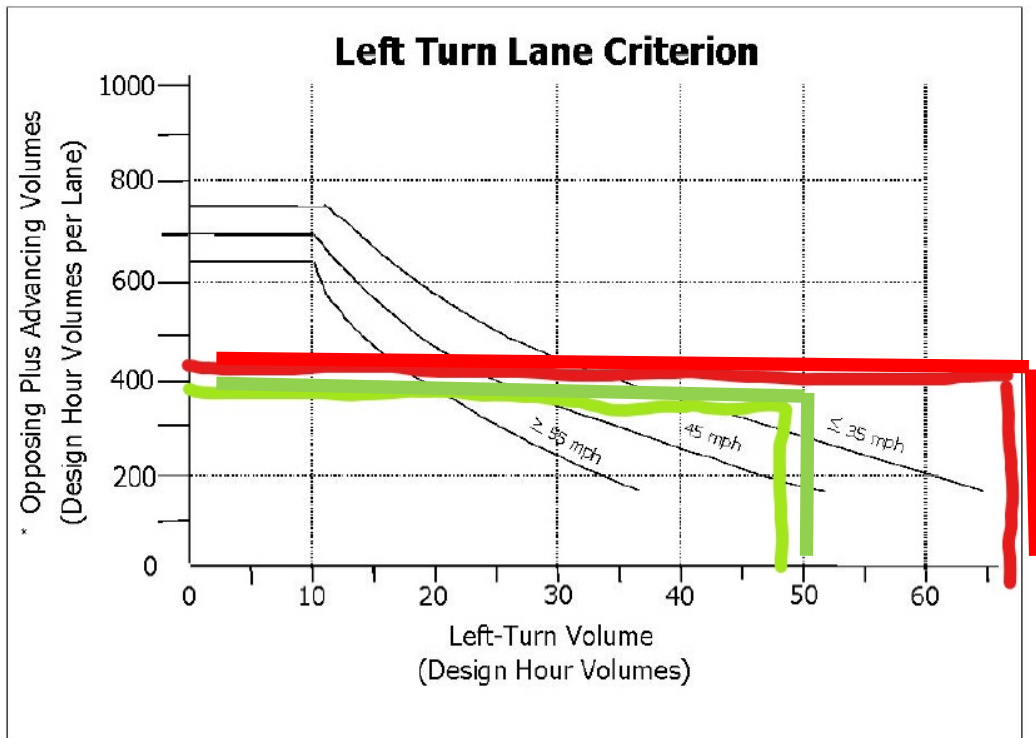
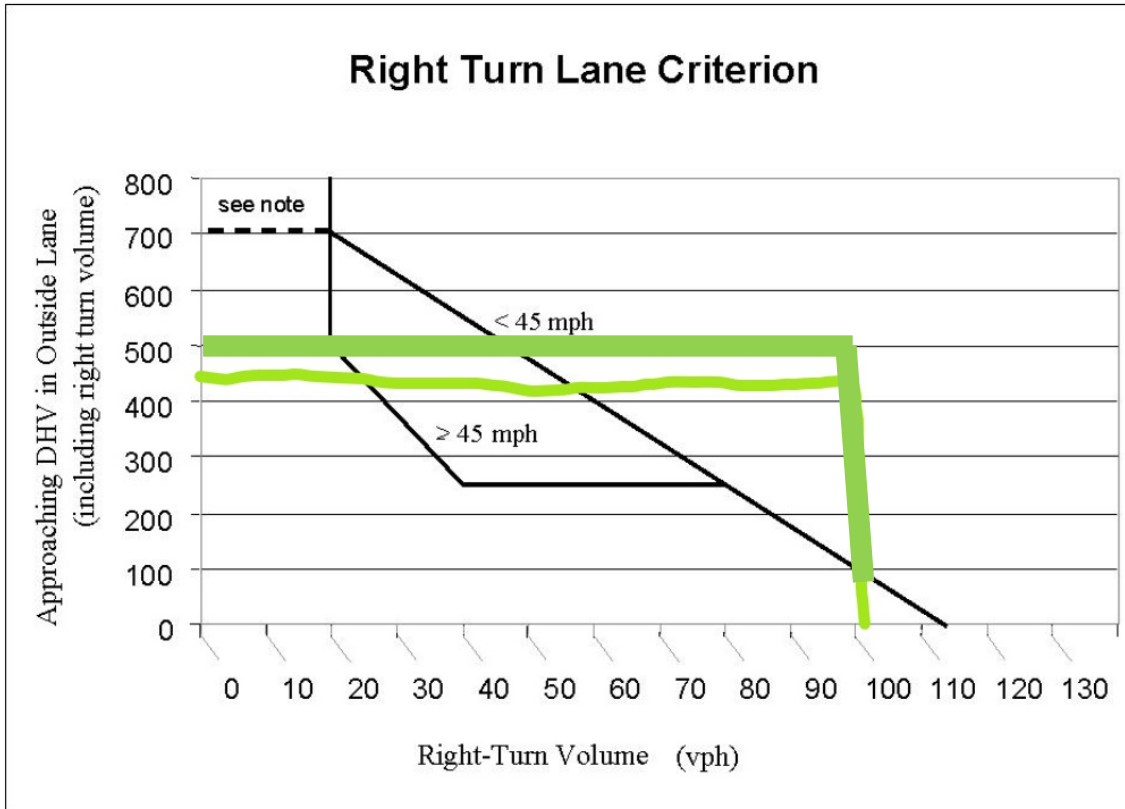


FIGURE 1: LEFT TURN LANE EVALUATION FOR 2042 PM PEAK HOUR HIGH DIVERSION VOLUMES

Figure 2 highlights the right turn lane volume criteria for the southbound approach in green. The northbound approach was not evaluated due to the low expected right turning volume. As shown below, the Highway 211 southbound right turning volume would exceed the criteria for providing an exclusive right turn lane.



**FIGURE 2: RIGHT TURN LANE EVALUATION FOR PM 2042 HIGH DIVERSION VOLUMES**

Figure 3 shows the ODOT planning level evaluation for appropriate intersection control based on two-way major and minor street volumes. As shown below with the red line, the estimated planning control for Highway 211 at Gunderson Road is two-way stop control or a single lane roundabout.

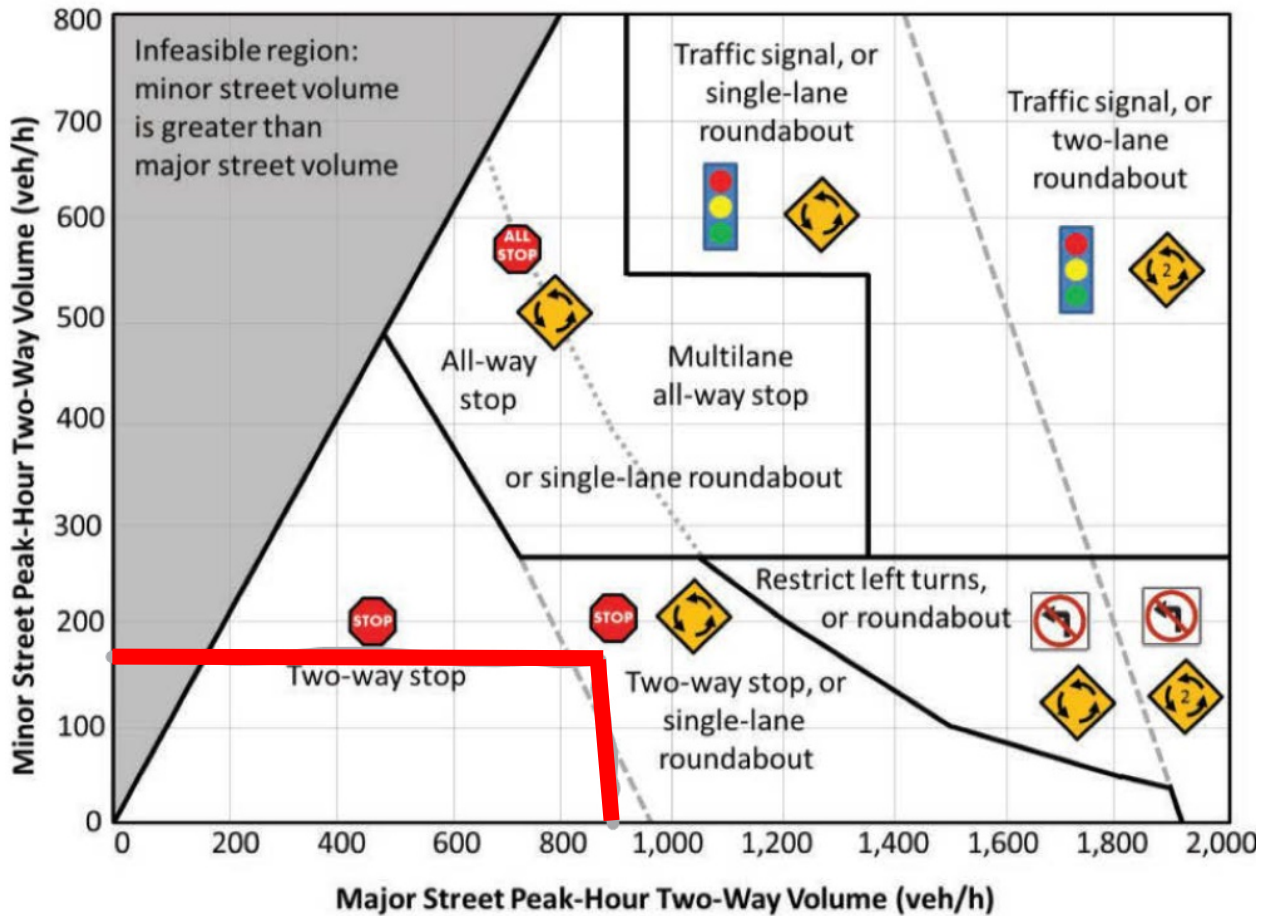


FIGURE 3: PLANNING LEVEL INTERSECTION CONTROL EVALUATION

**ODOT TRAFFIC MANUAL GUIDELINES**

The ODOT Traffic Manual<sup>2</sup> recommends exclusive left-turn bays should be considered at all high-speed rural intersections for safety concerns. Based on the speed data, it would be appropriate to provide left turn lanes at intersections on Highway 211.

<sup>2</sup> ODOT Traffic Manual, Section 405, July 2022 Edition.

## SOLUTIONS EVALUATION

Based on the results of the HCM analysis, safety considerations and the guidance from the APM, the following improvement alternatives were analyzed for the 2042 AM and PM peak hour high diversion scenarios.

- Left turn lanes – this solution evaluates the expected intersection operations with an exclusive left turn lane for the southbound, eastbound, and westbound approaches.
- Turn lanes – this solution modifies the “Left turn lanes” solution by adding an additional exclusive turn lane for the westbound right turn movement.
- Roundabout – this solution evaluates the expected intersection operations with roundabout control at the study intersection.

Table 3 summarizes the results of this analysis.

**TABLE 3: POTENTIAL IMPROVEMENT OPERATION RESULTS**

| POTENTIAL IMPROVEMENT  | ALTERNATIVE                 | MOVEMENT             | VOLUME TO CAPACITY | LEVEL OF SERVICE | AVERAGE DELAY (SECONDS) |
|------------------------|-----------------------------|----------------------|--------------------|------------------|-------------------------|
| <b>LEFT TURN LANES</b> | AM peak hour low diversion  | Southbound left      | 0.17               | C                | 18.3                    |
| <b>TURN LANES</b>      | AM peak hour high diversion | Southbound left      | 0.17               | C                | 17.8                    |
| <b>ROUNDABOUT</b>      | AM peak hour high diversion | Intersection average | -                  | A                | 5.2                     |
| <b>LEFT TURN LANES</b> | PM peak hour low diversion  | Southbound left      | 0.38               | E                | 37.0                    |
| <b>TURN LANES</b>      | PM peak hour high diversion | Southbound left      | 0.35               | D                | 33.0                    |
| <b>ROUNDABOUT</b>      | PM peak hour high diversion | Intersection average | -                  | A                | 6.6                     |

## FINDINGS

A single-lane roundabout at Highway 211/Gunderson Road would provide many benefits based on the analysis results.

- The best LOS that the turn lane solutions provide is D while the roundabout operates at LOS A in the AM and PM high diversion alternative analysis.
- High 85<sup>th</sup> percentile speeds along Highway 211 result in significant safety concerns, A roundabout will provide an additional benefit as a traffic calming measure. Most roundabout designs limit drivers to 15 to 20 miles per hour.
- Based on traffic volumes, there are multiple exclusive turn lanes needed which makes the right-of-way required for a roundabout treatment comparable to the other alternatives.

## ACCESS MANAGEMENT

Highway 211 is classified as a Minor Arterial in the City of Sandy's functional classification. A minor arterial should have 5,280 feet spacing between public streets and 300 feet spacing between private driveway accesses or private driveways and public streets.<sup>3</sup> Spacing was evaluated for Arletha Court/Ponder Lane, Gunderson Road, and the private driveway access at 37730 Highway 211.

- At Arletha Court/Ponder Lane:
  - The spacing to the private driveway (to the south) is approximately 640 feet, greater than the minimum access spacing.
  - The spacing to Gunderson Road is approximately 840 feet, less than the minimum access spacing.

This minimum access spacing for public facilities is larger than recommended and will be reviewed during the ongoing TSP update. Recommended access spacing standards should reflect a hierarchy of functional classifications, with larger spacing requirements for higher classifications and lower spacing requirements for lower classifications. With this in mind, the current spacing is adequate compared to other similarly sized cities.

## ACCESS SAFETY

The last five years of available crash data (2016 to 2020) on the Oregon Transportation Safety Data Explorer<sup>4</sup> was reviewed to identify any crash trends. There were four crashes that occurred in that interval ranging in severity from property damage only to moderate injury. The conditions ranged from dry to icy. None of the crashes were related to an intersection. Based on the above, data there is no systemic safety issue along the segment of Highway 211 from Gunderson Road to

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<sup>3</sup> City of Sandy Transportation System Plan 2011

<sup>4</sup> <https://geo.maps.arcgis.com/apps/webappviewer/index.html?id=df0b3cdb2f1149d3bd43436bc1dd4eac>



Arletha Court. It is important to point out the Gunderson Road intersection was constructed after the available crash data through 2020.

## **SOLUTIONS**

To meet the access spacing standard for public streets, the closest public street intersection from Gunderson Road should be where Sandy Heights Street would cross Highway 211. To meet this standard, the intersections at Arletha Court/Ponder Road, Village Boulevard, Bornstedt Road, and Dubarko Road would be closed. This is not a feasible improvement and as noted above the spacing standard is longer than recommended; however, access along Highway 211 from these intersecting roads can be managed. The following project is identified in the solutions for the current Sandy TSP update and will complement the extension of Cascadia Village Drive to Highway 211, which will provide access for the closed movement.

- Arletha Court – Project D11: Reduce northbound congestion. Project may include signage and approach modifications to prohibit left turns from the minor street approach.
  - In addition to the project proposed in the TSP, it is also recommended to restrict access to the north leg of the intersection (Ponder Lane) to only emergency vehicles. With the completion of the street network in the Shaylee Meadows subdivision, vehicles from Ponder Lane now have access to Dubarko Road and Highway 211 via Melissa Avenue and Gunderson Road. This crossing can now provide bicycle and pedestrian access from Cascadia Village to downtown Sandy without using Highway 211.

This project would funnel left turning movements out of the Cascadia Village subdivision onto Village Boulevard and the Cascadia Village Drive extension. As noted above, the Cascadia Village Drive extension is recommended to be roundabout controlled and provides an LOS improvement compared to two-way stop control. This control type would work better with the additional traffic volume that is expected to shift from Arletha Court. At the Village Boulevard intersection, there is already a westbound left turn pocket of approximately 380 feet that should attract most left turning movements, as opposed to Arletha Court. The intersection also falls along a straight stretch of Highway 211 with greater driver visibility compared to the curves at Arletha Court and Bornstedt Road.

## SPEED ANALYSIS

The recently collected speed data indicated that most vehicles are travelling in excess of the posted speed near the intersection of Highway 211 and Gunderson Road. Table 4 shows those results. The posted speed limit on Highway 211 is 45 miles per hour north of Gunderson Road and 55 miles per hour south of Gunderson Road.

**TABLE 4: SPEED CLASSIFICATION RESULTS AT HIGHWAY 211 AND GUNDERSON ROAD<sup>5</sup>**

| DIRECTION  | AADT (VEHICLES) | 85 <sup>TH</sup> PERCENTILE SPEED (MPH) | EXCESS OF POSTED SPEED | AVERAGE SPEED (MPH) |
|--|-----------------|---|------------------------|---------------------|
| <b>SOUTHBOUND<br/>HIGHWAY 211<br/>SOUTH OF<br/>GUNDERSON</b> | 2,486           | 62                                      | 93%                    | 54                  |
| <b>SOUTHBOUND<br/>HIGHWAY 211<br/>NORTH OF<br/>GUNDERSON</b> | 2,477           | 68                                      | 96%                    | 59                  |
| <b>NORTHBOUND<br/>HIGHWAY 211<br/>SOUTH OF<br/>GUNDERSON</b> | 2,553           | 60                                      | 95%                    | 54                  |

The NACTO Urban Street Design Guide<sup>6</sup> and FHWA Engineering Speed Management Countermeasures<sup>7</sup> were reviewed to identify potential speed reduction treatments on Highway 211 both north and south of Gunderson Road. Treatments to consider that are appropriate for rural high-speed roadway segments are summarized below.

- Roundabout control at key intersections would reduce vehicle speeds and limit severe injury and fatality collisions.
- Reduced lane width with pavement markings would narrow travel lanes and encourage drivers to slow down.
- Raised or painted islands in the median area can narrow travel lanes and be combined with access management treatments to provide additional safety benefits. A raised median on Highway 211 west of Village Boulevard could reduce lane widths and channelize drivers.
- Rumble strips are raised or grooved patterns installed to prevent drivers from leaving the roadway and drawing attention to lane position. Highway 211 has a rumble strip along the centerline both north and south of Gunderson Road. Additional rumble strips could be installed along the shoulders to improve speed management.

<sup>5</sup> Data for northbound Highway 211 north of Gunderson is not available.

<sup>6</sup> <https://nacto.org/publication/urban-street-design-guide/design-controls/design-speed/speed-reduction-mechanisms>

<sup>7</sup> [https://safety.fhwa.dot.gov/speedmgt/ref\\_mats/eng\\_count/2014/reducing\\_speed.cfm](https://safety.fhwa.dot.gov/speedmgt/ref_mats/eng_count/2014/reducing_speed.cfm)

- Driver speed feedback sign would provide drivers with information about their speed in relationship to the posted speed limit.

If a roundabout is constructed at Gunderson Road, additional speed reduction treatments like installing rumble strips and raised medians are no longer needed. In addition to constructing physical improvements, a speed study should be conducted on Highway 211 to determine the appropriate posted speed limit. The roadway is under city jurisdiction which provides flexibility in setting the posted speed limit.

## IMPROVEMENT RECOMMENDATIONS

The following improvements are recommended for Highway 211 near Gunderson Road to address safety and operational concerns.

- Construct a single-lane roundabout at Gunderson Road to provide adequate capacity to accommodate future growth and reduce vehicle speeds on Highway 211.
- With future development, extend Cascadia Village Drive west to serve as the fourth leg of the Highway 211/Gunderson Road intersection.
- Close the Ponder Lane approach to Highway 211, open to emergency vehicles/pedestrian/bicycle access only.
- Prohibit northbound left turn movements at Highway 211/Arletha Court.
- Conduct a speed study on Highway 211 to set the appropriate posted speed.

