



## TECHNICAL MEMORANDUM

### South End Road at Gentry Way Intersection

#### Safety Assessment

**Date:** December 13, 2010

Project #: 10323.3

**To:** Nancy Kraushaar, City of Oregon City

**From:** Hermanus Steyn, Pr.Eng., P.E. and Charles Radosta, P.E.

This memorandum provides a summary of the existing roadway and operational characteristics of South End Road near the intersection with Gentry Way and addresses safety concerns due to three similar collisions in the last 17 months.

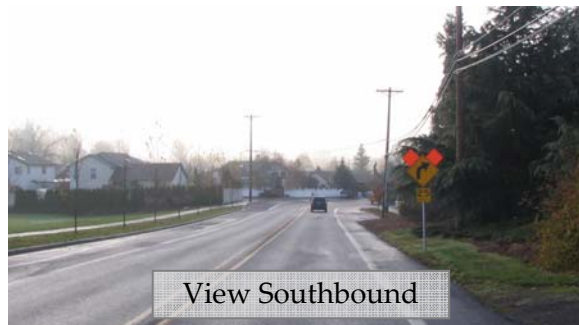
#### ***Safety Concern***

There have been three recent southbound collisions on 5/19/2009, 9/19/2009, and 10/21/2010, all of which featured impaired drivers (i.e., two alcohol- and one drug-related). Two occurred around 2:00 am while a third around 5:30 pm.

#### ***Existing Conditions***

##### **Roadway Characteristics**

South End Road is a minor arterial that serves as a north-south corridor connecting rural Clackamas County to the south with the Oregon City downtown to the north. Figure 1 shows a vicinity map of the project site. South End Road is a two-lane facility with bike lanes and also provides on-street parallel parking within the project. The surrounding land uses are R-8 and R-10 single family houses. The posted speed is 35 miles-per-hour (mph) along this section of the corridor. There is a 250-foot curve at the Gentry Way intersection with advance CURVE AHEAD warning signs with 25-mph advisory plaques.



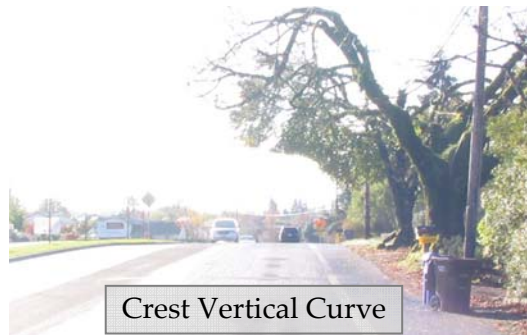
Two speed studies were completed in October 2008, one north and one south of the curve. *The speed data is provided in Attachment "A".* Although the data is dated; it is consistent with the Oregon City Police observations.

- North of the curve the 85<sup>th</sup>-percentile speed was identified as 36 mph in the southbound direction and 35 mph in the northbound direction.
- South of the curve the 85<sup>th</sup>-percentile speed was identified as 44 mph in the southbound direction and 43 mph in the northbound direction.

### Field Observations

The project area was visited on November 12<sup>th</sup> around 9:00 am during the day and on November 17<sup>th</sup> around 8:00 pm during the night. The project team met with concerned property owners, Public Works staff, as well as a representative of the Oregon City Police. The following key observations are worth highlighting, because they relate to southbound traffic.

- Leaving the all-way stop controlled Warner Parrott Road intersection, there is a perception that the context of the surroundings are changing, and that one naturally starts accelerating. This is consistent with the speed studies' findings.
- There is a vertical crest curve north of the subject curve and the curve may come as a surprise for non-attentive drivers.
- There is no roadway lighting north of the Gentry Way intersection and during the night time coming over the crest curve there are limited clues of the upcoming tight curve.
- The no-passing double yellow center striping is discontinuous along the curve due to the gap for Gentry Way intersection. The lack of continuous striping provides limited guidance, especially for southbound drivers approaching the curve.



### Considerations for Potential Improvements

There are a variety of possible considerations to address the safety concerns at this horizontal curve. The City has already provided the following modifications to address the safety concerns:

- Posted permanent orange reflective markers on the advance "CURVE AHEAD" sign to increase driver awareness.
- Placed highly reflective yellow and white pavement markings to better delineate the travel lanes.

- Placed reflective raised pavement markers to better delineate the travel lanes, especially at night.
- Provided temporary illuminated barricades along the curb on the outside of the curve.

The potential improvements listed below have been identified to provide better guidance for drivers approaching the curve.



- Provide “line extensions through the intersection” along the 250-foot centerline to better define the through movement along South End Road. The *Manual on Uniform Traffic Control Devices (MUTCD)* Section 3B.03 (Extensions Through Intersection) provides guidance for the installation of these pavement markings. *MUTCD Figure 3B-13 is provided in Attachment “B”.*
- Consider centerline rumble strips and/or raised reflective pavement markers starting and ending in the vicinity of the existing advance CURVE AHEAD warning signs. This treatment may raise noise concerns from property owners close to South End Road though.
- Consider providing a wider striped median to provide separation between opposing lanes. There is flexibility within the existing pavement, but this will result in prohibiting on-street parking for some distance along South End Road.
- Provide chevron signs (W1-8L and W1-8R) for both south- and northbound approaches. Chevron signs or a one lane direction large arrow sign (W1-6L and W1-6R) are recommended treatments per Table 2C-5 in the 2009 MUTCD for curves 10 mph below the posted speed. Special attention should be given to the placement of these signs in relation with the existing sidewalk to assure American Disability Act (ADA) regulations for accessibility.
  - o In addition, on-street parking should be prohibited in front of these signs to be visible at all times by installing 12”x18” NO PARKING ANY TIME (R7-1L and R7-1R) signs to maintain clear sight lines to chevron signs.
- Consider removing and replacing the existing CURVE AHEAD signs with 48”x48” CURVE AHEAD (W1-2) warning signs with 30”x30” 25-MPH (W13-1P) advisory plaques.
- Provide roadway lighting along southbound approach to provide lighting uniformity at and approaching the curve.

Figure 2 illustrates the proposed improvements. These improvements would typically address the safety concerns at this curve. In addition, the following treatments were also considered, but the feasibility of these treatments appears inappropriate due to the project location and the expenditure relative to the potential benefit.

- Intelligent Transportation System (ITS) treatment
  - o Another consideration could be to provide an ITS treatment by installing a flashing beacon that is actuated by approaching vehicles traveling faster than the posted speed of 35 mph. The location of such an installation would be determined by providing sufficient reaction and perception time for motorists to decelerate into the 25-mph curve. Such a treatment is a supplemental device (MUTCD Section 4L.03) to the proposed improvements listed above. Since this curve is located in a residential area along a 35-mph facility, the previous mentioned treatments should provide sufficient warning for the 25-mph curve.
- Narrower Travel Lanes
  - o The *National Cooperative Highway Research Program (NCHRP) Report 613* (Guidelines for Selection of Speed Reduction Treatments at High-Speed Intersections) addresses the effect of narrower lane widths on speeds in Section 4.11. The road pavement section (curb-to-curb) dimension has to be decreased to see an effect on speed. However, a narrower cross section would have an impact on cyclists, as well as vehicles over-tracking (especially trucks) into the opposing lane and/or bike lane around the 250-foot curve.
- Roadside Treatment: Guardrail
  - o The *American Association of State Highway and Transportation Officials (AASHTO) Roadside Design Guide* provides current information and operating practices related to roadside safety. A roadside barrier is typically provided if there is insufficient recovery area and/or to protect drivers from obstructions within clear zones. The “recovery area” for vehicles or “clear zone” is immediately adjacent to and parallel with the roadway and is kept free of hazards by removing objects considered to be an impact danger to errant motorists.
  - o The challenge the project area provides is the location of the Gentry Way intersection. The installation of a barrier will result in end treatments in line with oncoming traffic, because a continuous treatment along the entire curve is impossible due to the intersection. In addition at the curb-returns, gaps in the barrier need to be provided for pedestrians to cross the intersection. These end treatments will need to be designed for crash absorption. Further, roadside barriers are tested for specific ranges of impact angles (less than 20 degrees). With the presence of the Gentry Way intersection in the curve, the potential impact angles will likely exceed the tested range. Therefore, no roadside treatment is suggested at this location.

## ***Recommended Improvements***

- Develop a wider striped median to provide separation between opposing lanes.
- Provide “line extensions through the intersection” along the curve to better define the through movement along South End Road.
- Install centerline raised reflective pavement markers starting and ending in the vicinity of the existing advance CURVE AHEAD warning signs.
- Provide chevron signs (W1-8L and W1-8R) for both south- and northbound approaches.
- Install no parking signs (R7-1L and R7-1R) to main clear sight lines to chevron signs.
- Provide roadway lighting along southbound approach (north of the curve) to provide lighting uniformity at and approaching the curve.



LAWTON RD

WARNER PARROTT RD

GLACIER CT

PROJECT AREA

S GENTRY WAY

SOUTH END RD

LAFAYETTE  
AVE

S PARTLOW RD

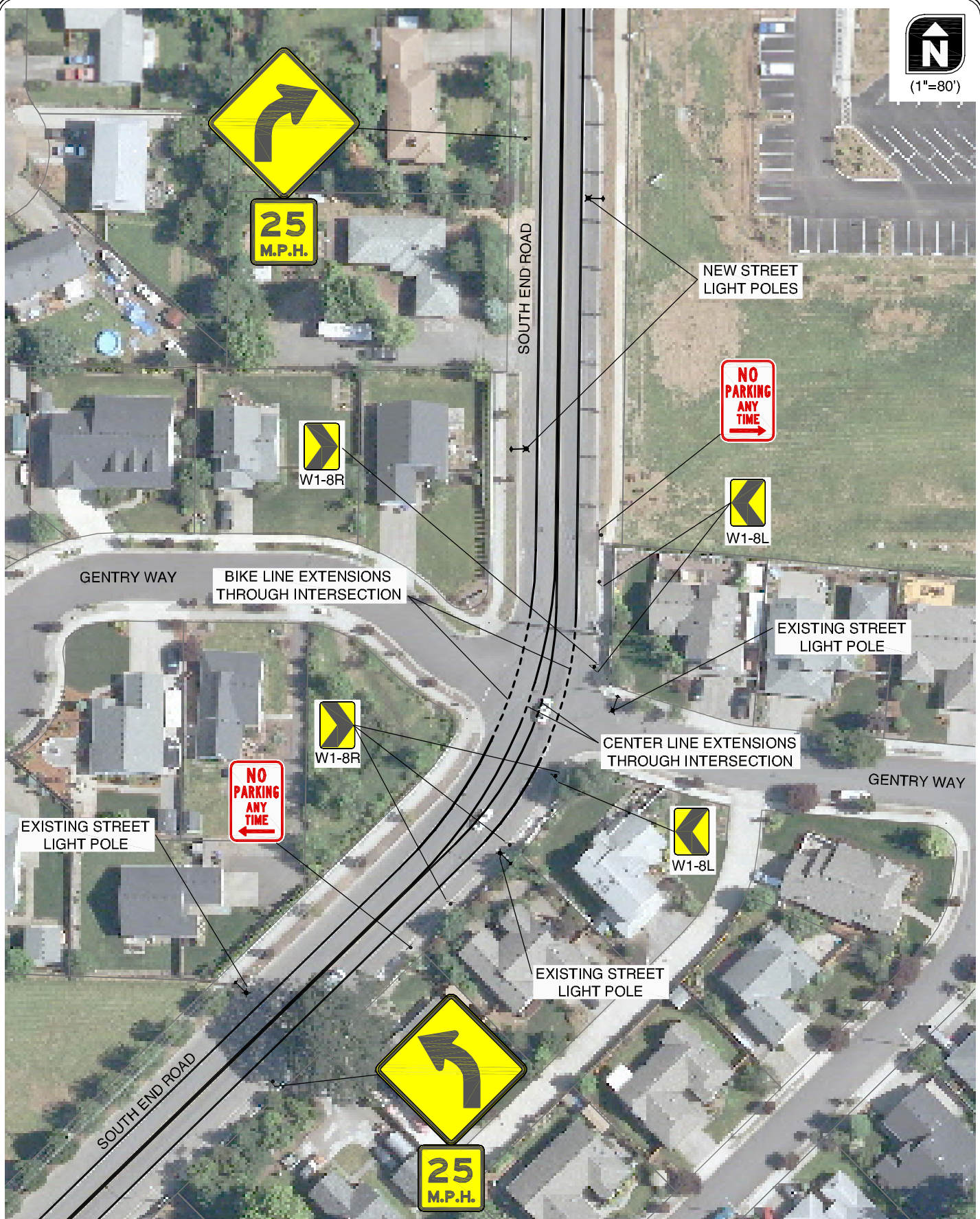
PROJECT VICINITY MAP  
OREGON CITY, OREGON

FIGURE  
**1**

H:\profile\10323 - Oregon City Flex. Serv. Contract\Work-Order-3\dwgs\Design\10323\_FD01.dwg Dec 01, 2010 - 1:58pm - jhenriksen Layout Tab: Fig-01



H:\profile\10323 - Oregon City Flex. Serv. Contract\Work-Order-3\dwgs\Design\10323\_F002.dwg Dec 13, 2010 - 11:50am - jhenriksen Layout Tab: Fig-02



PROPOSED IMPROVEMENTS  
OREGON CITY, OREGON

Attachment "A":  
Speed Data



# Quality Counts

City of Oregon City 2008  
Speed Traffic Survey

16285 SW 85th Ave  
Tigard, OR 97224  
503-620-4242

Site Code: 10389149  
Station ID: Location 148  
South End Rd South of Warner Parrott Rd

Latitude: 0' 0.000 Undefined

SB

| Start Time | 1<br>15 | 16<br>20 | 21<br>25 | 26<br>30 | 31<br>35 | 36<br>40 | 41<br>45 | 46<br>50 | 51<br>55 | 56<br>60 | 61<br>65 | 66<br>70 | 71<br>75 | 76<br>999 | Total |
|------------|---------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|-------|
| 10/28/08   |         |          |          |          |          |          |          |          |          |          |          |          |          |           |       |
| 8          | 0       | 1        | 2        | 19       | 11       | 2        | 1        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 36    |
| 01:00      | 0       | 1        | 1        | 5        | 6        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 13    |
| 02:00      | 0       | 1        | 2        | 1        | 5        | 1        | 0        | 0        | 1        | 0        | 0        | 0        | 0        | 0         | 11    |
| 03:00      | 1       | 0        | 1        | 3        | 2        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 7     |
| 04:00      | 2       | 1        | 2        | 5        | 6        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 16    |
| 05:00      | 1       | 1        | 2        | 16       | 12       | 2        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 34    |
| 06:00      | 7       | 2        | 4        | 26       | 28       | 2        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 69    |
| 07:00      | 12      | 0        | 16       | 56       | 41       | 11       | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 136   |
| 08:00      | 3       | 1        | 22       | 59       | 49       | 6        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 140   |
| 09:00      | 9       | 3        | 9        | 59       | 30       | 4        | 1        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 115   |
| 10:00      | 6       | 3        | 14       | 58       | 54       | 5        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 140   |
| 11:00      | 3       | 5        | 14       | 80       | 55       | 10       | 1        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 168   |
| 12 PM      | 3       | 2        | 18       | 86       | 66       | 9        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 184   |
| 13:00      | 16      | 2        | 16       | 87       | 67       | 11       | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 199   |
| 14:00      | 11      | 8        | 35       | 110      | 80       | 8        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 252   |
| 15:00      | 13      | 5        | 21       | 144      | 133      | 15       | 1        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 332   |
| 16:00      | 17      | 7        | 21       | 170      | 180      | 19       | 2        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 416   |
| 17:00      | 24      | 13       | 27       | 161      | 218      | 33       | 2        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 478   |
| 18:00      | 9       | 5        | 12       | 164      | 164      | 17       | 1        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 372   |
| 19:00      | 6       | 8        | 15       | 122      | 99       | 12       | 2        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 264   |
| 20:00      | 1       | 3        | 8        | 74       | 74       | 10       | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 170   |
| 21:00      | 4       | 3        | 5        | 43       | 61       | 8        | 1        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 125   |
| 22:00      | 0       | 1        | 5        | 25       | 28       | 9        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 68    |
| 23:00      | 0       | 0        | 2        | 17       | 24       | 2        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 45    |
| Total      | 148     | 76       | 274      | 1590     | 1493     | 196      | 12       | 0        | 1        | 0        | 0        | 0        | 0        | 0         | 3790  |

Daily

15th Percentile : 26 MPH  
50th Percentile : 30 MPH  
85th Percentile : 34 MPH  
95th Percentile : 36 MPH

Mean Speed(Average) : 29 MPH  
10 MPH Pace Speed : 26-35 MPH  
Number in Pace : 3083  
Percent in Pace : 81.3%  
Number of Vehicles > 35 MPH : 209  
Percent of Vehicles > 35 MPH : 5.5%

Grand  
Total

148 76 274 1590 1493 196 12 0 1 0 0 0 0 0 0 3790

Overall

15th Percentile : 26 MPH  
50th Percentile : 30 MPH  
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City of Oregon City 2008  
Speed Traffic Survey

## Quality Counts

16285 SW 85th Ave  
Tigard, OR 97224  
503-620-4242

Site Code: 10389149  
Station ID: Location 148  
South End Rd South of Warner Parrott Rd

Latitude: 0' 0.000 Undefined

NB

| Start Time | 1<br>15 | 16<br>20 | 21<br>25 | 26<br>30 | 31<br>35 | 36<br>40 | 41<br>45 | 46<br>50 | 51<br>55 | 56<br>60 | 61<br>65 | 66<br>70 | 71<br>75 | 76<br>999 | Total |
|------------|---------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|-------|
| 10/28/08   |         |          |          |          |          |          |          |          |          |          |          |          |          |           |       |
| 8          | 0       | 0        | 1        | 2        | 5        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 8     |
| 01:00      | 0       | 0        | 0        | 2        | 6        | 1        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 9     |
| 02:00      | 0       | 0        | 0        | 5        | 5        | 1        | 1        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 12    |
| 03:00      | 1       | 0        | 0        | 5        | 9        | 1        | 1        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 17    |
| 04:00      | 1       | 1        | 1        | 18       | 29       | 4        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 54    |
| 05:00      | 3       | 2        | 8        | 78       | 79       | 13       | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 183   |
| 06:00      | 12      | 17       | 73       | 174      | 102      | 4        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 382   |
| 07:00      | 45      | 52       | 125      | 175      | 39       | 4        | 1        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 441   |
| 08:00      | 6       | 6        | 43       | 171      | 80       | 5        | 1        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 312   |
| 09:00      | 3       | 6        | 19       | 110      | 80       | 8        | 1        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 227   |
| 10:00      | 7       | 6        | 26       | 103      | 61       | 9        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 212   |
| 11:00      | 8       | 8        | 17       | 103      | 66       | 4        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 206   |
| 12 PM      | 5       | 2        | 21       | 93       | 72       | 11       | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 204   |
| 13:00      | 8       | 1        | 21       | 77       | 53       | 9        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 169   |
| 14:00      | 26      | 15       | 36       | 100      | 50       | 5        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 232   |
| 15:00      | 16      | 7        | 26       | 101      | 69       | 11       | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 230   |
| 16:00      | 11      | 9        | 36       | 108      | 69       | 10       | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 243   |
| 17:00      | 24      | 7        | 30       | 118      | 86       | 9        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 274   |
| 18:00      | 12      | 4        | 14       | 120      | 81       | 3        | 1        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 235   |
| 19:00      | 8       | 5        | 10       | 60       | 42       | 7        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 132   |
| 20:00      | 2       | 4        | 6        | 40       | 34       | 6        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 92    |
| 21:00      | 2       | 0        | 8        | 42       | 32       | 5        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 89    |
| 22:00      | 0       | 0        | 3        | 13       | 15       | 1        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 32    |
| 23:00      | 0       | 2        | 0        | 3        | 7        | 1        | 1        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 14    |
| Total      | 200     | 154      | 524      | 1821     | 1171     | 132      | 7        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 4009  |

Daily

15th Percentile : 23 MPH  
 50th Percentile : 29 MPH  
 85th Percentile : 34 MPH  
 95th Percentile : 35 MPH

Mean Speed(Average) : 28 MPH  
 10 MPH Pace Speed : 26-35 MPH  
 Number in Pace : 2992  
 Percent in Pace : 74.6%  
 Number of Vehicles > 35 MPH : 139  
 Percent of Vehicles > 35 MPH : 3.5%

|             |     |     |     |      |      |     |   |   |   |   |   |   |   |   |      |
|-------------|-----|-----|-----|------|------|-----|---|---|---|---|---|---|---|---|------|
| Grand Total | 200 | 154 | 524 | 1821 | 1171 | 132 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4009 |
|-------------|-----|-----|-----|------|------|-----|---|---|---|---|---|---|---|---|------|

Overall

15th Percentile : 23 MPH  
 50th Percentile : 29 MPH  
 85th Percentile : 34 MPH  
 95th Percentile : 35 MPH

Mean Speed(Average) : 28 MPH  
 10 MPH Pace Speed : 26-35 MPH  
 Number in Pace : 2992  
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# Quality Counts

City of Oregon City 2008  
Speed Traffic Survey

16285 SW 85th Ave  
Tigard, OR 97224  
503-620-4242

Site Code: 10389150  
Station ID: Location 149  
South End Rd NE of Partlow Rd

Latitude: 0' 0.000 Undefined

NB

| Start    | 1  | 16 | 21 | 26  | 31   | 36   | 41  | 46 | 51 | 56 | 61 | 66 | 71 | 76  |       |
|----------|----|----|----|-----|------|------|-----|----|----|----|----|----|----|-----|-------|
| Time     | 15 | 20 | 25 | 30  | 35   | 40   | 45  | 50 | 55 | 60 | 65 | 70 | 75 | 999 | Total |
| 10/21/08 | 0  | 0  | 0  | 1   | 1    | 5    | 2   | 1  | 0  | 0  | 0  | 0  | 0  | 0   | 10    |
| 01:00    | 0  | 0  | 0  | 0   | 3    | 2    | 2   | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 7     |
| 02:00    | 0  | 0  | 0  | 2   | 3    | 3    | 2   | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 10    |
| 03:00    | 0  | 0  | 0  | 1   | 7    | 7    | 2   | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 17    |
| 04:00    | 0  | 0  | 2  | 8   | 15   | 13   | 10  | 1  | 0  | 0  | 0  | 0  | 0  | 0   | 49    |
| 05:00    | 0  | 0  | 0  | 17  | 50   | 65   | 18  | 2  | 0  | 0  | 0  | 0  | 0  | 0   | 152   |
| 06:00    | 5  | 0  | 1  | 37  | 132  | 140  | 35  | 3  | 0  | 0  | 0  | 0  | 0  | 0   | 353   |
| 07:00    | 14 | 8  | 1  | 46  | 214  | 108  | 12  | 2  | 0  | 0  | 0  | 0  | 0  | 0   | 405   |
| 08:00    | 5  | 0  | 7  | 76  | 158  | 82   | 8   | 1  | 0  | 0  | 0  | 0  | 0  | 0   | 337   |
| 09:00    | 3  | 1  | 7  | 27  | 89   | 52   | 21  | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 200   |
| 10:00    | 3  | 1  | 3  | 33  | 70   | 56   | 14  | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 180   |
| 11:00    | 7  | 0  | 3  | 36  | 86   | 71   | 23  | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 226   |
| 12 PM    | 0  | 0  | 1  | 15  | 82   | 82   | 19  | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 199   |
| 13:00    | 3  | 0  | 3  | 16  | 70   | 66   | 19  | 2  | 1  | 0  | 0  | 0  | 0  | 0   | 180   |
| 14:00    | 6  | 2  | 8  | 26  | 93   | 64   | 11  | 1  | 0  | 0  | 0  | 0  | 0  | 0   | 211   |
| 15:00    | 6  | 0  | 5  | 25  | 103  | 70   | 11  | 1  | 1  | 0  | 0  | 0  | 0  | 0   | 222   |
| 16:00    | 6  | 0  | 0  | 16  | 84   | 104  | 22  | 0  | 1  | 0  | 0  | 0  | 0  | 0   | 233   |
| 17:00    | 5  | 0  | 5  | 18  | 98   | 100  | 27  | 2  | 0  | 0  | 0  | 0  | 0  | 0   | 255   |
| 18:00    | 8  | 0  | 4  | 27  | 95   | 80   | 14  | 1  | 0  | 0  | 0  | 0  | 0  | 0   | 229   |
| 19:00    | 2  | 0  | 3  | 17  | 55   | 51   | 9   | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 137   |
| 20:00    | 1  | 0  | 0  | 11  | 27   | 26   | 15  | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 80    |
| 21:00    | 0  | 0  | 0  | 6   | 41   | 31   | 4   | 0  | 1  | 0  | 0  | 0  | 0  | 0   | 83    |
| 22:00    | 0  | 0  | 1  | 3   | 6    | 17   | 4   | 1  | 0  | 0  | 0  | 0  | 0  | 0   | 32    |
| 23:00    | 0  | 0  | 0  | 2   | 4    | 5    | 1   | 0  | 1  | 0  | 0  | 0  | 0  | 0   | 13    |
| Total    | 74 | 12 | 54 | 466 | 1586 | 1300 | 305 | 18 | 5  | 0  | 0  | 0  | 0  | 0   | 3820  |

Daily

15th Percentile : 30 MPH  
50th Percentile : 35 MPH  
85th Percentile : 40 MPH  
95th Percentile : 43 MPH

Mean Speed(Average) : 34 MPH  
10 MPH Pace Speed : 31-40 MPH

Number in Pace : 2886  
Percent in Pace : 75.5%  
Number of Vehicles > 40 MPH : 328  
Percent of Vehicles > 40 MPH : 8.6%

Grand

Total 74 12 54 466 1586 1300 305 18 5 0 0 0 0 0 3820

Overall

15th Percentile : 30 MPH  
50th Percentile : 35 MPH  
85th Percentile : 40 MPH  
95th Percentile : 43 MPH

Mean Speed(Average) : 34 MPH  
10 MPH Pace Speed : 31-40 MPH

Number in Pace : 2886  
Percent in Pace : 75.5%  
Number of Vehicles > 40 MPH : 328  
Percent of Vehicles > 40 MPH : 8.6%

# Quality Counts

16285 SW 85th Ave  
Tigard, OR 97224  
503-620-4242

Page 2

City of Oregon City 2008  
Speed Traffic Survey

Site Code: 10389150  
Station ID: Location 149  
South End Rd NE of Partlow Rd

Latitude: 0° 0.000 Undefined

SB

| Start Time | 1<br>15 | 16<br>20 | 21<br>25 | 26<br>30 | 31<br>35 | 36<br>40 | 41<br>45 | 46<br>50 | 51<br>55 | 56<br>60 | 61<br>65 | 66<br>70 | 71<br>75 | 76<br>999 | Total |
|------------|---------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|-------|
| 10/21/08   |         |          |          |          |          |          |          |          |          |          |          |          |          |           |       |
| 8          | 0       | 0        | 0        | 1        | 5        | 7        | 4        | 1        | 1        | 0        | 0        | 0        | 0        | 0         | 19    |
| 01:00      | 0       | 0        | 0        | 0        | 3        | 3        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 6     |
| 02:00      | 0       | 0        | 1        | 0        | 1        | 3        | 1        | 0        | 0        | 1        | 0        | 1        | 0        | 0         | 8     |
| 03:00      | 0       | 0        | 0        | 0        | 4        | 2        | 0        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 6     |
| 04:00      | 0       | 0        | 0        | 0        | 6        | 1        | 2        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 9     |
| 05:00      | 0       | 0        | 0        | 3        | 13       | 8        | 5        | 0        | 1        | 0        | 0        | 0        | 0        | 0         | 30    |
| 06:00      | 3       | 1        | 2        | 5        | 17       | 21       | 8        | 1        | 0        | 0        | 0        | 0        | 0        | 0         | 58    |
| 07:00      | 10      | 2        | 4        | 7        | 77       | 47       | 14       | 2        | 1        | 0        | 0        | 0        | 0        | 0         | 164   |
| 08:00      | 6       | 0        | 2        | 18       | 54       | 40       | 7        | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 127   |
| 09:00      | 4       | 0        | 3        | 18       | 46       | 35       | 15       | 1        | 0        | 0        | 0        | 0        | 0        | 0         | 122   |
| 10:00      | 2       | 1        | 2        | 18       | 41       | 35       | 11       | 2        | 0        | 0        | 0        | 0        | 0        | 0         | 112   |
| 11:00      | 3       | 0        | 5        | 14       | 56       | 65       | 8        | 3        | 0        | 0        | 0        | 0        | 0        | 0         | 154   |
| 12 PM      | 6       | 0        | 2        | 18       | 43       | 80       | 22       | 1        | 0        | 0        | 0        | 0        | 0        | 0         | 172   |
| 13:00      | 1       | 0        | 1        | 8        | 73       | 83       | 24       | 0        | 0        | 0        | 0        | 0        | 0        | 0         | 190   |
| 14:00      | 5       | 0        | 2        | 15       | 86       | 106      | 29       | 2        | 0        | 0        | 0        | 0        | 0        | 0         | 245   |
| 15:00      | 11      | 3        | 4        | 25       | 104      | 130      | 26       | 4        | 1        | 0        | 0        | 0        | 0        | 0         | 308   |
| 16:00      | 9       | 0        | 0        | 26       | 79       | 155      | 58       | 2        | 0        | 0        | 0        | 0        | 0        | 0         | 329   |
| 17:00      | 16      | 0        | 0        | 15       | 140      | 229      | 64       | 4        | 2        | 0        | 0        | 0        | 0        | 0         | 470   |
| 18:00      | 9       | 0        | 0        | 31       | 135      | 145      | 26       | 3        | 0        | 0        | 0        | 0        | 0        | 0         | 349   |
| 19:00      | 5       | 0        | 4        | 29       | 97       | 101      | 14       | 1        | 0        | 0        | 0        | 0        | 0        | 0         | 251   |
| 20:00      | 4       | 0        | 2        | 14       | 59       | 72       | 17       | 1        | 0        | 0        | 0        | 0        | 0        | 0         | 169   |
| 21:00      | 0       | 0        | 2        | 15       | 54       | 48       | 11       | 3        | 0        | 0        | 0        | 0        | 0        | 0         | 133   |
| 22:00      | 0       | 0        | 0        | 4        | 24       | 32       | 9        | 1        | 0        | 0        | 0        | 0        | 0        | 0         | 70    |
| 23:00      | 0       | 0        | 0        | 2        | 12       | 19       | 1        | 0        | 0        | 0        | 1        | 0        | 0        | 0         | 35    |
| Total      | 94      | 7        | 36       | 286      | 1229     | 1467     | 376      | 32       | 6        | 1        | 1        | 1        | 0        | 0         | 3536  |

Daily

15th Percentile : 31 MPH  
50th Percentile : 36 MPH  
85th Percentile : 40 MPH  
95th Percentile : 44 MPH

Mean Speed(Average) : 35 MPH  
10 MPH Pace Speed : 31-40 MPH  
Number in Pace : 2696  
Percent in Pace : 76.2%  
Number of Vehicles > 40 MPH : 417  
Percent of Vehicles > 40 MPH : 11.8%

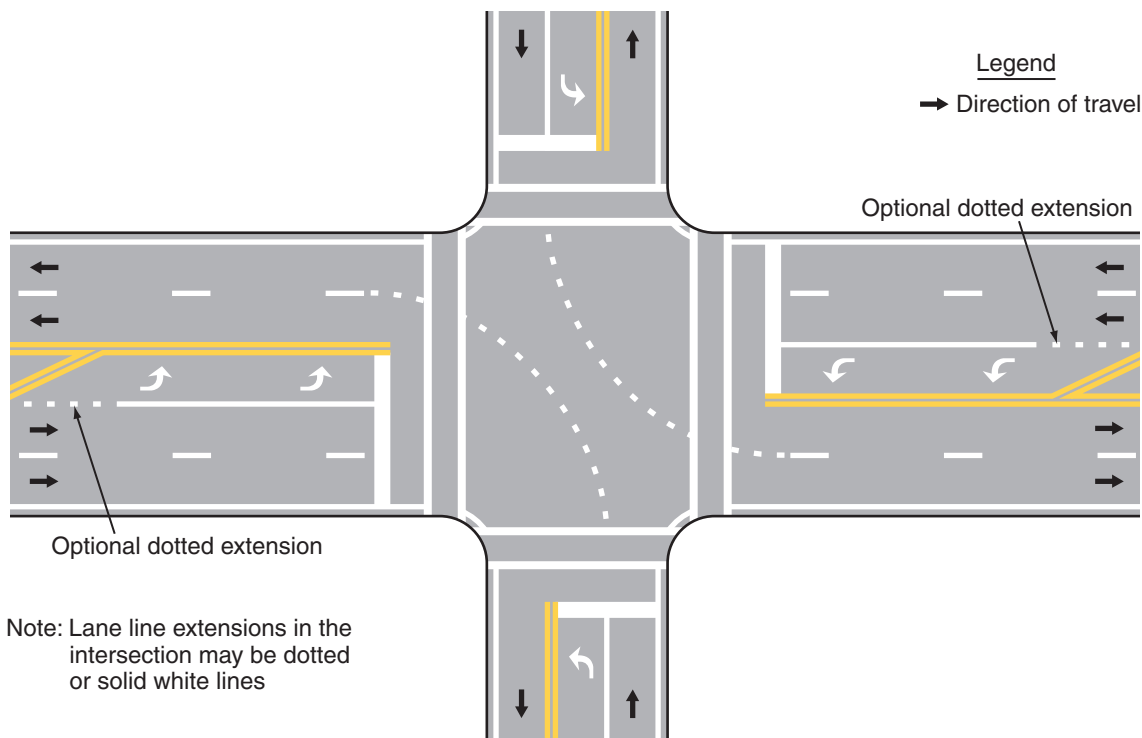
|             |    |   |    |     |      |      |     |    |   |   |   |   |   |   |      |
|-------------|----|---|----|-----|------|------|-----|----|---|---|---|---|---|---|------|
| Grand Total | 94 | 7 | 36 | 286 | 1229 | 1467 | 376 | 32 | 6 | 1 | 1 | 1 | 0 | 0 | 3536 |
|-------------|----|---|----|-----|------|------|-----|----|---|---|---|---|---|---|------|

Overall

15th Percentile : 31 MPH  
50th Percentile : 36 MPH  
85th Percentile : 40 MPH  
95th Percentile : 44 MPH

Mean Speed(Average) : 35 MPH  
10 MPH Pace Speed : 31-40 MPH  
Number in Pace : 2696  
Percent in Pace : 76.2%  
Number of Vehicles > 40 MPH : 417  
Percent of Vehicles > 40 MPH : 11.8%

Attachment "B":  
MUTCD Figure 3B-13

**Figure 3B-13. Examples of Line Extensions through Intersections (Sheet 2 of 2)****C - Typical dotted line markings to extend lane line markings into the intersection****D - Typical dotted line markings to extend center line and lane line markings into the intersection**