



January 29, 2019

Bill Bullock, PE, City Engineer
City of Maple Valley
22017 SE Wax Road, Suite 200
Maple Valley, Washington 98038

Via email: Bill.Bullock@maplevalleywa.gov

Regarding: Witte Road and SE 256th Street Intersection – Traffic Impacts of 220th Avenue SE Closure
Witte Road Improvements Phase 2
Maple Valley, Washington
PBS Project 45006.006, Phase 0300

Dear Mr. Bullock:

This report was prepared to address concerns with the possible traffic impact at the Witte Road SE and SE 256th Street intersection due to the closure of 220th Avenue SE at Witte Road SE. The closure of 220th Avenue SE is proposed as part of the Witte Road Improvements Phase 2 project. The primary concern was to address the possible need for a left turn lane on Witte Road SE at SE 256th Street due to the traffic diversion from the Witte Road SE and 220th Avenue SE intersection closure. See the Figure 1 for the vicinity map and Figure 2 for the Witte Road Improvements Phase 2 plan view.

Existing Conditions

Traffic volumes were collected at both the Witte Road intersections at 256th Street SE and 220th Avenue SE in January 2019 in the PM peak hour on a typical weekday. The October 2018 24-hour hose count on 220 Avenue SE showed the AM peak hour was significantly lower in volume. Thus, only the PM peak hour was included in this evaluation. See the Figure 3 for the existing turning movement counts and Appendix A for turning movement count data.

The collision history of both intersections were requested from the Washington State Department of Transportation (WSDOT) for the years 2013–2018. The intersections had a few collisions (four in approximately seven years); none with serious or fatal injuries. The collision data is included in Appendix B.

The current Witte Road SE and SE 256th Street intersection alignment has limited sight distance. The proposed project will improve sight distance by aligning the intersection at 90 degrees and adding sidewalk.

Future Traffic Conditions

The existing traffic counts were extrapolated by a growth rate to evaluate the future traffic conditions. The following PM peak hour scenarios were evaluated:

- 2019 under the existing roadway conditions
- 2019 with 220th Avenue closure at Witte Road per the Witte Road Improvements Phase 2
- 2028 with 220th Avenue closure at Witte Road per the Witte Road Improvements Phase 2
- 2033 with 220th Avenue closure at Witte Road per the Witte Road Improvements Phase 2
- 2038 with 220th Avenue closure at Witte Road per the Witte Road Improvements Phase 2

The turning movement volumes on 220th Avenue SE were added to the SE 256th Street intersection with Witte Road SE to address the closure of 220th Avenue SE. To evaluate the future conditions, an annual grow rate was applied for the 10, 15, and 20 forecast years. See Figure 3 for traffic counts.

The growth rate is based on an assumed a 2 percent annual growth rate on Witte Road and 1 percent annual growth rate on SE 256th Street based on our phone conversation. We later received a transportation model output from the Puget Sound Regional Council (PSRC) that showed a 1 percent growth rate for 10-year forecast on Witte Road and 0.6 percent growth rate on SE 256th Street. For the 15- and 20-year forecast, PSRC showed a 0.7 percent growth rate on Witte Road and 0.6 percent on SE 256th Street. The model does not include SE 256th Street or 220th Avenue SE but the centroid connectors showed a 0.6 percent growth rate as a good proxy for these local roadways. Thus, the assumed growth rates are conservative for this evaluation.

Level of Service Evaluation

The level of service (LOS) was calculated for the Witte Road SE and SE 256th Street intersections under scenarios listed above with Synchro 9 software, using Highway Capacity 2010 analysis methodology. The analysis includes calculation of the 95th percentile queue length in vehicles on the minor movements, SE 256th Street, and northbound left turn on Witte Road. The analysis assumes no change to the existing traffic control of a stop sign on SE 256th Street and none on Witte Road. A one lane approach is assumed on each approach. Table 1 summarizes the evaluation and the Sychro report for each scenario is included Appendix C.

Scenario	Intersection LOS	256th St delay (seconds)	256th St queue (vehicles)	Witte Rd left turn delay (seconds)	Witte Rd left turn queue (vehicles)
2019 Existing	C	15.9	0.3	9.6	0.1
2019	C	19.7	0.5	9.8	0.1
2028	D	27	0.8	10.7	0.2
2033	D	33.2	1.1	11.3	0.2
2038	E	44.8	1.6	12.1	0.2

The LOS of the intersection in 2038 is due to the delay on SE 256th Street. This is based on a conservative growth forecast. We ran the LOS with the growth provided from the PSRC (0.7 percent on Witte Road and 0.6 percent on SE 256th Street for the 20 year scenario) and the 2038 LOS is estimated at C with 24.6 seconds of delay on SE 256th Street. If the growth rate was close to the assume high rate of 2 percent on Witte Road and 1 percent on SE 256th Street, a right turn lane SE 256th Street will reduce the delay on SE 256th Street (36 second on the approach).

Left Turn Lane Evaluation

The need for a left turn lane from northbound Witte Road SE on to SE 256th Street was evaluated using the WSDOT Design Manual process in Section 1310.03(2)(a). The evaluation is a function of the posted speed limit. Exhibit 1310-7a, Left-Turn Storage Guidelines: Two-Lane, Unsignalized has a curve for various speed limits with 40 miles per hour the lowest speed limit on the figure. Witte Road is posted at 35 miles per hour but 40 was used as a conservative approximation. PBS graphed the existing 2019 results in “further analysis recommended” for the need of a left turn storage. Graphing of forecast volumes resulted in the further analysis recommendation. See the graphed results in Appendix C.

LOS analysis did not support the need for a left turn lane as the delay and queueing in the 20 year forecast with a conservative growth rated did not merit the expense of a left turn lane on Witte Road SE. The collision history did not support the need for a left turn lane based on the lack of collisions susceptible to correction with a left turn lane. Sight distance was checked to verify adequate decision sight distance (345 feet for a single unit truck) is available to make a left turn from Witte Road on to SE 256th Avenue. An approaching vehicle from the south will need to deaccelerate from 35 mph to approximately 15 mph to make the left turn. After further analysis, a left turn lane is not recommended.

Findings and Recommendations

The existing traffic conditions meet WSDOT criteria for further analysis for a left turn lane on Witte Road SE at SE 256th Street. After further evaluation of LOS, collision history, decision sight distance, and the speed reduction to make a left turn, we find a left turn lane is not needed.

We recommend proceeding the Phase 2 project without a left turn lane on Witte Road at SE 256th Street. In future phases the traffic volume on Witte Road should be monitored to verify the modest growth rate as forecasted by the PSRC model. If traffic grows faster than 2 percent annually, the turning movement volumes should be collected, the LOS calculated, and a right turn on SE 256th Avenue should be considered.

Please feel free to contact me at 360.567.217 or john.manix@pbsusa.com with any questions or comments.

Sincerely,

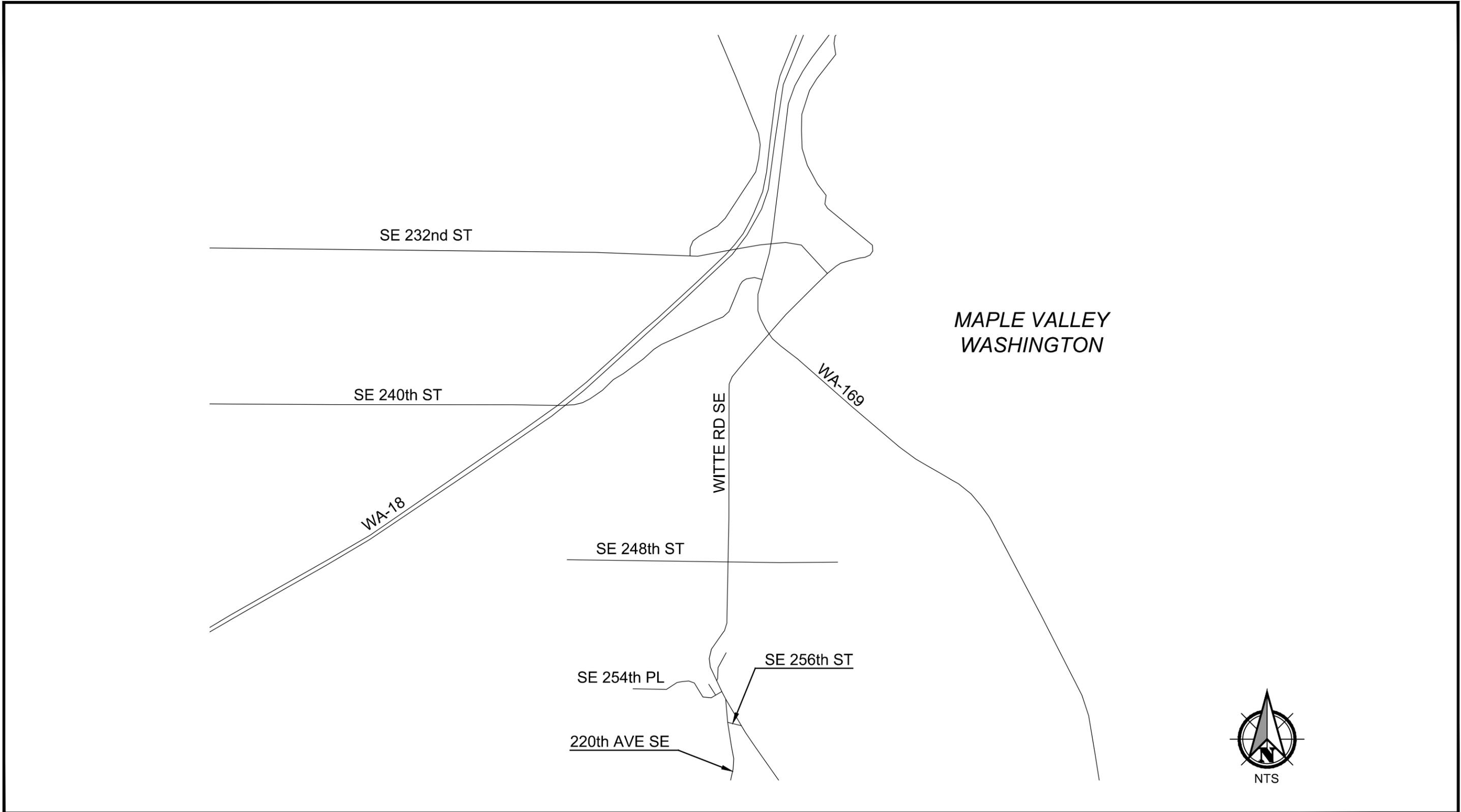
John Manix, PE
Senior Traffic Engineer

- Attachments: Figures
Appendix A. 2019 Traffic Count Data
Appendix B. 2013–2018 Collision Data
Appendix C. LOS Analysis Reports
Appendix D. WSDOT Design Manual



JAM:DE:mo

Figures



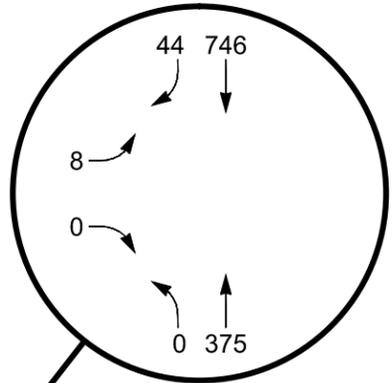
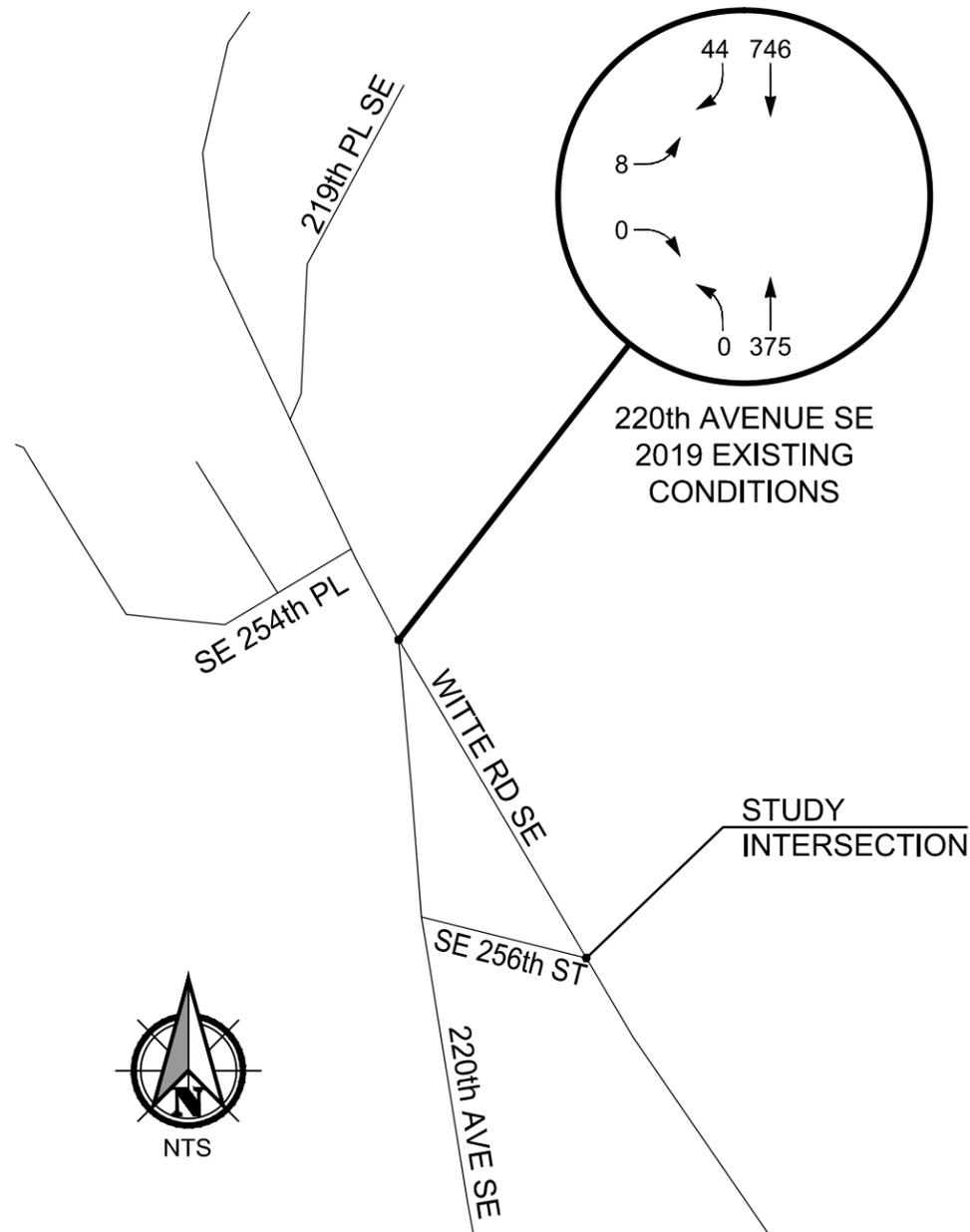
Vicinity Map
Witte Road Improvements Phase 2 - SE 256th Street Evaluation

JAN 2019
FIGURE
1

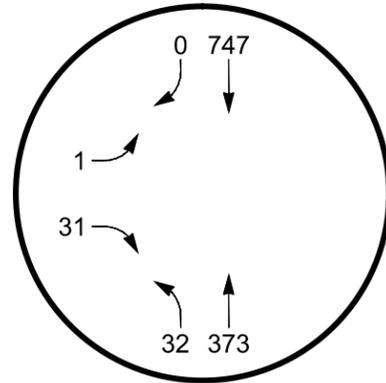


Plan View
Witte Road Improvements Phase 2 - SE 256th Street Evaluation

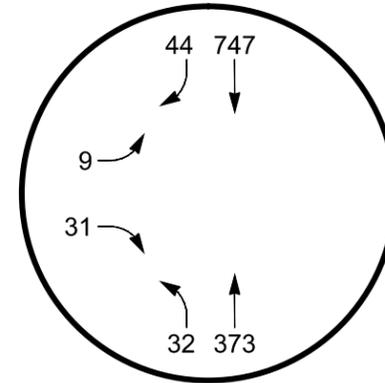
JAN 2019
 FIGURE
2



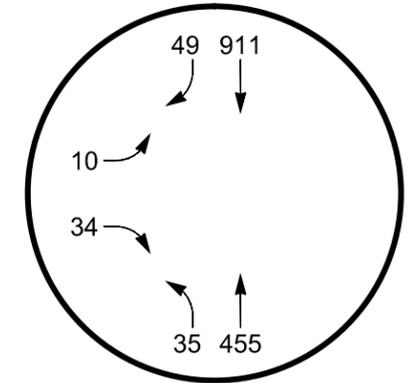
220th AVENUE SE
2019 EXISTING
CONDITIONS



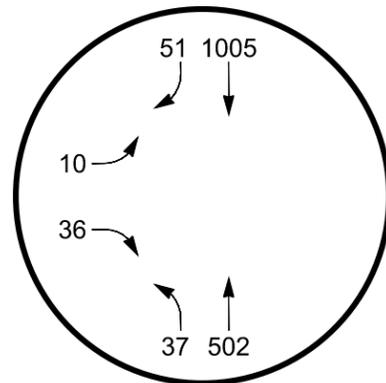
2019 EXISTING
CONDITIONS



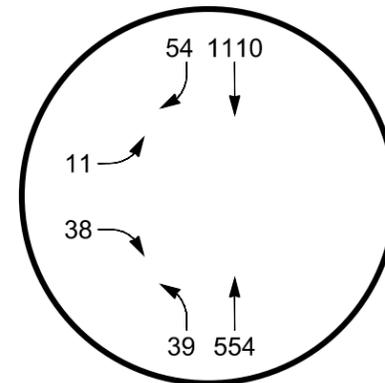
2019 WITH
220th AVENUE CLOSURE



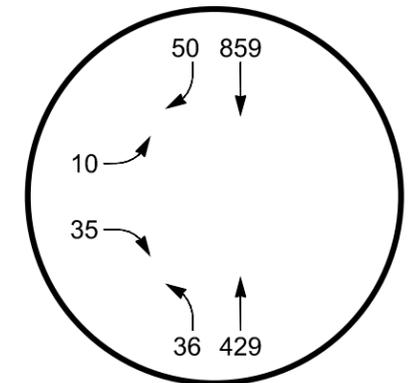
* 2028 WITH
220th AVENUE CLOSURE



* 2033 WITH
220th AVENUE CLOSURE



* 2038 WITH
220th AVENUE CLOSURE



2038 WITH
220th AVENUE CLOSURE
AND PSRC GROWTH RATE

* WITH 2% ANNUAL GROWTH RATE ON WITTE ROAD SE
AND 1% GROWTH RATE ON SE 256TH ST



Traffic Volumes
Witte Road Improvements Phase 2 - SE 256th Street Evaluation

JAN 2019

FIGURE

3

Appendix A

2019 Traffic Count Data



(303) 216-2439
www.alltrafficdata.net

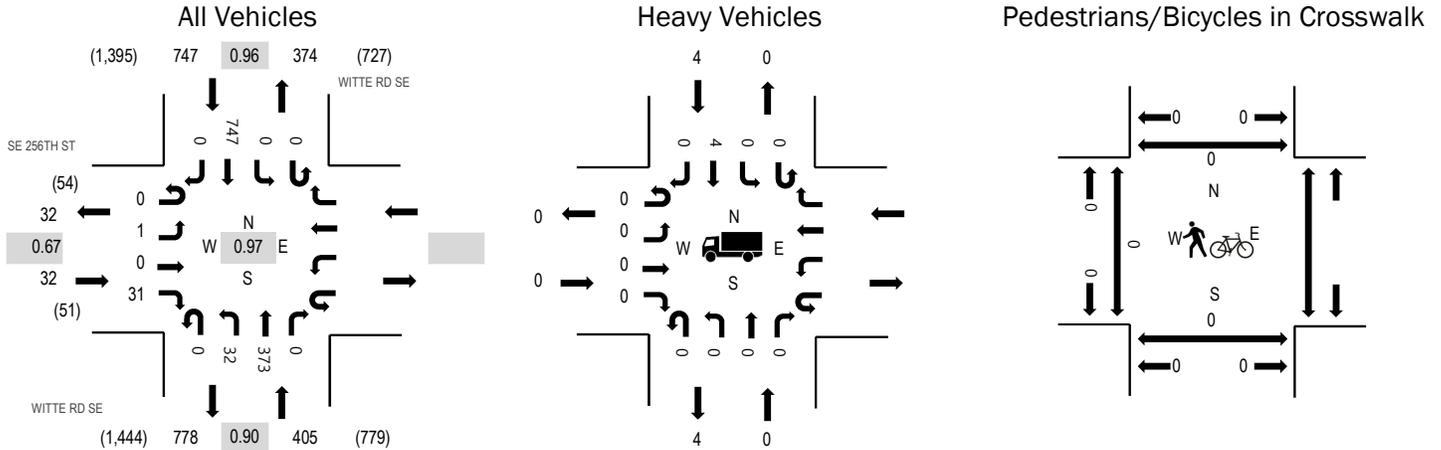
Location: 1 WITTE RD SE & SE 256TH ST PM

Date: Thursday, January 17, 2019

Peak Hour: 04:45 PM - 05:45 PM

Peak 15-Minutes: 04:45 PM - 05:00 PM

Peak Hour



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	0.0%	0.67
WB		
NB	0.0%	0.90
SB	0.5%	0.96
All	0.3%	0.97

Traffic Counts - All Vehicles

Interval Start Time	SE 256TH ST Eastbound				Westbound				WITTE RD SE Northbound				WITTE RD SE Southbound				Total	Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right		
4:00 PM	0	0	0	4					0	4	72	0	0	0	158	0	238	1,079
4:15 PM	0	0	0	4					0	10	95	0	0	0	175	0	284	1,145
4:30 PM	0	0	0	6					0	3	82	0	0	0	161	0	252	1,146
4:45 PM	0	0	0	5					0	10	103	0	0	0	187	0	305	1,184
5:00 PM	0	0	0	5					0	10	94	0	0	0	195	0	304	1,146
5:15 PM	0	0	0	10					0	5	91	0	0	0	179	0	285	
5:30 PM	0	1	0	11					0	7	85	0	0	0	186	0	290	
5:45 PM	0	1	0	4					0	5	103	0	0	0	154	0	267	
Count Total	0	2	0	49					0	54	725	0	0	0	1,395	0	2,225	
Peak Hour	0	1	0	31					0	32	373	0	0	0	747	0	1,184	

Traffic Counts - Heavy Vehicles and Pedestrians/Bicycles in Crosswalk

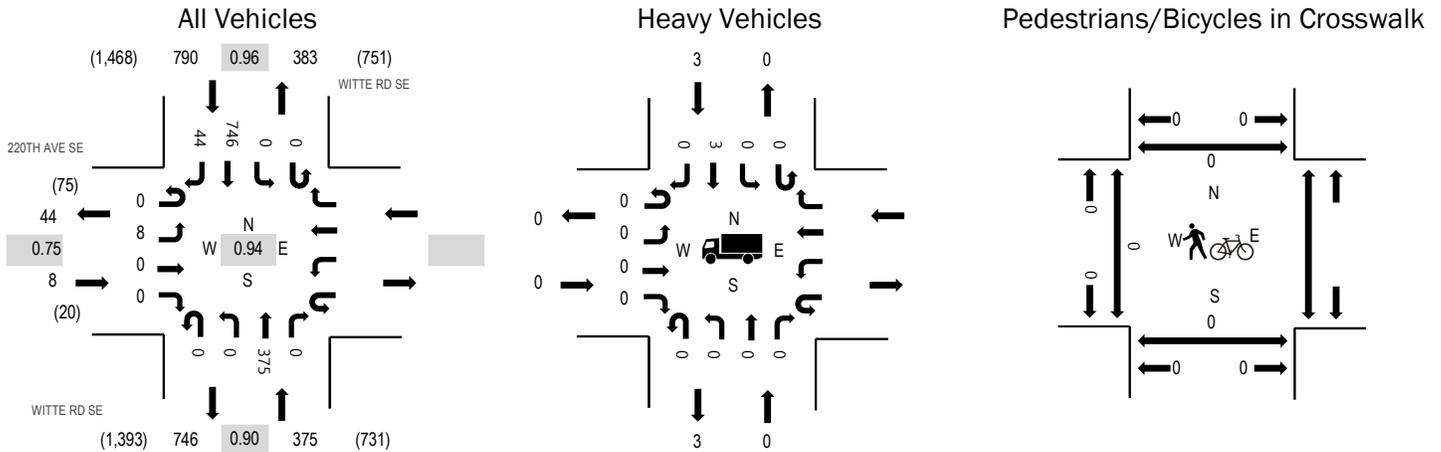
Interval Start Time	Heavy Vehicles					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
4:00 PM	0	7		1	8	4:00 PM	0	0		0	0
4:15 PM	1	1		0	2	4:15 PM	0	0		0	0
4:30 PM	0	1		0	1	4:30 PM	0	0		0	0
4:45 PM	0	0		2	2	4:45 PM	0	0		0	0
5:00 PM	0	0		1	1	5:00 PM	0	0		0	0
5:15 PM	0	0		0	0	5:15 PM	0	0		0	0
5:30 PM	0	0		1	1	5:30 PM	0	0		0	0
5:45 PM	0	0		0	0	5:45 PM	0	0		0	0
Count Total	1	9		5	15	Count Total	0	0		0	0
Peak Hour	0	0		4	4	Peak Hour	0	0		0	0



(303) 216-2439
www.alltrafficdata.net

Location: 2 WITTE RD SE & 220TH AVE SE PM
Date: Thursday, January 17, 2019
Peak Hour: 04:45 PM - 05:45 PM
Peak 15-Minutes: 04:45 PM - 05:00 PM

Peak Hour



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	0.0%	0.75
WB		
NB	0.0%	0.90
SB	0.4%	0.96
All	0.3%	0.94

Traffic Counts - All Vehicles

Interval Start Time	220TH AVE SE Eastbound				Westbound				WITTE RD SE Northbound				WITTE RD SE Southbound				Total	Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right		
4:00 PM	0	4	0	0					0	0	75	0	0	0	157	8	244	1,089
4:15 PM	0	3	0	0					0	0	93	0	0	0	174	7	277	1,138
4:30 PM	0	2	0	0					0	0	84	0	0	0	161	9	256	1,146
4:45 PM	0	3	0	0					0	0	103	0	0	0	190	16	312	1,173
5:00 PM	0	1	0	0					0	0	94	0	0	0	192	6	293	1,130
5:15 PM	0	4	0	0					0	0	89	0	0	0	181	11	285	
5:30 PM	0	0	0	0					0	0	89	0	0	0	183	11	283	
5:45 PM	0	3	0	0					0	0	104	0	0	0	155	7	269	
Count Total	0	20	0	0					0	0	731	0	0	0	1,393	75	2,219	
Peak Hour	0	8	0	0					0	0	375	0	0	0	746	44	1,173	

Traffic Counts - Heavy Vehicles and Pedestrians/Bicycles in Crosswalk

Interval Start Time	Heavy Vehicles					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
4:00 PM	0	7		1	8	4:00 PM	0	0		0	0
4:15 PM	0	1		0	1	4:15 PM	0	0		0	0
4:30 PM	0	1		0	1	4:30 PM	0	0		0	0
4:45 PM	0	0		2	2	4:45 PM	0	0		0	0
5:00 PM	0	0		0	0	5:00 PM	0	0		0	0
5:15 PM	0	0		0	0	5:15 PM	0	0		0	0
5:30 PM	0	0		1	1	5:30 PM	0	0		0	0
5:45 PM	0	0		0	0	5:45 PM	0	0		0	0
Count Total	0	9		4	13	Count Total	0	0		0	0
Peak Hour	0	0		3	3	Peak Hour	0	0		0	0

Daily Speed

mph	Combined Channels														Avg.
	Total	0 - < 15	15 - < 20	20 - < 25	25 - < 30	30 - < 35	35 - < 40	40 - < 45	45 - < 50	50 - < 55	55 - < 60	60 - < 65	65 - < 70	70 - < 200	
12:00 AM	7	0	0	3	1	2	1	0	0	0	0	0	0	0	28.6
1:00 AM	4	2	0	0	1	0	0	1	0	0	0	0	0	0	23.1
2:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
3:00 AM	5	0	0	0	2	2	0	0	1	0	0	0	0	0	32.9
4:00 AM	10	0	0	0	6	3	1	0	0	0	0	0	0	0	30.1
5:00 AM	35	0	0	1	13	12	4	3	1	1	0	0	0	0	32.3
6:00 AM	38	0	1	4	11	17	5	0	0	0	0	0	0	0	30.3
7:00 AM	73	2	2	11	24	22	8	4	0	0	0	0	0	0	29.1
8:00 AM	92	5	12	28	28	11	4	1	2	1	0	0	0	0	25.8
9:00 AM	93	0	8	27	34	14	3	3	3	1	0	0	0	0	27.6
10:00 AM	70	9	7	20	13	15	3	1	1	0	1	0	0	0	25.4
11:00 AM	81	2	17	26	27	4	3	1	1	0	0	0	0	0	24.6
12:00 PM	74	2	7	34	20	8	2	1	0	0	0	0	0	0	24.8
1:00 PM	80	6	6	26	22	12	4	2	1	1	0	0	0	0	26.0
2:00 PM	123	9	5	28	46	21	9	1	2	2	0	0	0	0	27.2
3:00 PM	133	12	16	40	38	14	8	5	0	0	0	0	0	0	24.9
4:00 PM	133	6	12	30	45	23	7	6	3	1	0	0	0	0	27.3
5:00 PM	151	6	4	35	54	29	12	7	4	0	0	0	0	0	28.2
6:00 PM	139	3	4	24	41	30	21	8	6	2	0	0	0	0	30.8
7:00 PM	84	0	1	17	35	15	5	5	6	0	0	0	0	0	30.2
8:00 PM	54	0	1	11	16	11	3	9	2	1	0	0	0	0	31.4
9:00 PM	41	0	1	8	15	4	5	3	3	1	1	0	0	0	31.9
10:00 PM	21	1	0	5	6	0	6	1	2	0	0	0	0	0	31.1
11:00 PM	13	0	2	2	7	0	1	0	0	1	0	0	0	0	28.0
Total	1554	65	106	380	505	269	115	62	38	12	2	0	0	0	27.8
%		4.2	6.8	24.5	32.5	17.3	7.4	4.0	2.4	0.8	0.1	0.0	0.0	0.0	
Average (Mean)	27.8 mph	Minimum 5.0 mph		Maximum 60.0 mph				Pace Range 21.5 - 31.5 mph				917 vehicles (59.0%)			
Percentile Speeds		<u>10%</u>	<u>15%</u>	<u>50%</u>	<u>85%</u>	<u>90%</u>									
(mph)		19.7	21.0	27.2	34.9	37.8									
Speeds Exceeded		<u>25 mph</u>	<u>35 mph</u>	<u>45 mph</u>	<u>55 mph</u>	<u>65 mph</u>	<u>75 mph</u>								
		64.1% (996)	14.7% (229)	3.3% (51)	0.1% (2)	0% (0)	0% (0)								

Daily Speed

mph	Combined Channels														Avg.
	Total	0 - < 15	15 - < 20	20 - < 25	25 - < 30	30 - < 35	35 - < 40	40 - < 45	45 - < 50	50 - < 55	55 - < 60	60 - < 65	65 - < 70	70 - < 200	
12:00 AM	6	0	0	2	1	2	0	1	0	0	0	0	0	0	29.7
1:00 AM	8	0	3	1	2	0	1	0	1	0	0	0	0	0	26.9
2:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
3:00 AM	4	0	0	0	3	0	0	0	1	0	0	0	0	0	32.9
4:00 AM	12	0	1	1	5	3	2	0	0	0	0	0	0	0	29.3
5:00 AM	36	0	0	7	15	7	5	2	0	0	0	0	0	0	30.1
6:00 AM	41	0	0	7	14	11	6	1	1	1	0	0	0	0	31.0
7:00 AM	90	8	8	13	29	20	10	0	1	0	1	0	0	0	27.3
8:00 AM	95	6	11	26	33	9	8	2	0	0	0	0	0	0	25.6
9:00 AM	63	10	14	22	11	2	3	0	0	0	0	0	0	1	22.1
10:00 AM	60	6	4	15	17	8	9	1	0	0	0	0	0	0	26.0
11:00 AM	85	0	5	29	27	13	6	2	0	2	0	0	0	1	28.2
12:00 PM	87	1	2	34	20	20	7	0	1	2	0	0	0	0	28.2
1:00 PM	83	2	4	19	29	20	4	4	1	0	0	0	0	0	28.4
2:00 PM	106	0	11	27	33	14	14	5	1	0	0	0	0	1	28.8
3:00 PM	138	7	15	41	43	16	12	2	1	1	0	0	0	0	26.1
4:00 PM	143	1	6	25	49	37	14	1	9	0	1	0	0	0	29.9
5:00 PM	147	0	4	24	47	34	22	10	3	0	2	1	0	0	31.2
6:00 PM	112	1	2	19	37	29	15	4	2	2	1	0	0	0	30.7
7:00 PM	97	2	4	16	33	22	4	8	6	1	0	1	0	0	30.5
8:00 PM	66	1	2	9	20	21	5	5	2	1	0	0	0	0	30.7
9:00 PM	42	0	1	6	16	8	4	2	4	1	0	0	0	0	31.4
10:00 PM	10	0	0	4	2	2	1	1	0	0	0	0	0	0	29.6
11:00 PM	14	0	0	4	2	1	5	1	1	0	0	0	0	0	33.0

Total	1545	45	97	351	488	299	157	52	35	11	5	2	0	3	28.7
%		2.9	6.3	22.7	31.6	19.4	10.2	3.4	2.3	0.7	0.3	0.1	0.0	0.2	

Average (Mean) 28.7 mph **Minimum** 5.6 mph **Maximum** 91.0 mph **Pace Range** 22.4 - 32.4 mph 888 vehicles (57.5%)

Percentile Speeds
 (mph) 10% 15% 50% 85% 90%
 20.4 21.8 28.0 35.8 37.7

Speeds Exceeded
25 mph 35 mph 45 mph 55 mph 65 mph 75 mph
 67.8% (1047) 17.1% (264) 3.5% (54) 0.6% (9) 0.2% (3) 0.2% (3)

Daily Speed

mph	Combined Channels														Avg.	
	Total	0 - < 15	15 - < 20	20 - < 25	25 - < 30	30 - < 35	35 - < 40	40 - < 45	45 - < 50	50 - < 55	55 - < 60	60 - < 65	65 - < 70	70 - < 200		
12:00 AM	2	0	0	0	2	0	0	0	0	0	0	0	0	0	27.8	
1:00 AM	7	0	0	2	3	0	0	1	1	0	0	0	0	0	31.5	
2:00 AM	5	0	1	1	1	1	0	0	1	0	0	0	0	0	30.4	
3:00 AM	5	0	0	0	2	2	0	1	0	0	0	0	0	0	31.8	
4:00 AM	11	0	0	1	3	5	2	0	0	0	0	0	0	0	31.1	
5:00 AM	31	0	0	2	12	14	2	1	0	0	0	0	0	0	30.4	
6:00 AM	41	1	0	5	15	17	2	1	0	0	0	0	0	0	29.1	
7:00 AM	72	24	15	19	12	2	0	0	0	0	0	0	0	0	18.6	
8:00 AM	89	21	17	28	16	7	0	0	0	0	0	0	0	0	20.1	
9:00 AM	74	2	14	24	20	5	5	3	0	1	0	0	0	0	25.2	
10:00 AM	64	4	8	32	14	5	1	0	0	0	0	0	0	0	23.1	
11:00 AM	65	2	8	19	25	7	3	1	0	0	0	0	0	0	25.6	
12:00 PM	79	6	19	22	20	10	2	0	0	0	0	0	0	0	24.0	
1:00 PM	86	26	19	19	15	3	3	0	0	1	0	0	0	0	19.7	
2:00 PM	90	26	15	31	9	3	5	1	0	0	0	0	0	0	19.9	
3:00 PM	87	24	19	23	15	4	1	1	0	0	0	0	0	0	19.3	
4:00 PM	164	7	14	42	43	30	14	7	1	5	0	1	0	0	28.1	
5:00 PM	151	2	4	30	49	32	20	7	5	1	1	0	0	0	30.0	
6:00 PM	114	2	4	28	35	22	11	5	5	1	0	1	0	0	29.8	
7:00 PM	80	0	4	20	26	17	6	3	2	1	1	0	0	0	29.3	
8:00 PM	69	0	4	18	20	12	13	1	0	0	1	0	0	0	29.2	
9:00 PM	46	0	1	8	13	10	7	3	3	1	0	0	0	0	31.6	
10:00 PM	13	1	0	3	4	1	2	2	0	0	0	0	0	0	29.4	
11:00 PM	21	2	3	5	5	2	1	0	2	0	0	1	0	0	28.2	
Total	1466	150	169	382	379	211	100	38	20	11	3	3	0	0	25.6	
%		10.2	11.5	26.1	25.9	14.4	6.8	2.6	1.4	0.8	0.2	0.2	0.0	0.0		
Average (Mean)	25.6 mph		Minimum	5.1 mph		Maximum	63.7 mph		Pace Range	21.1 - 31.1 mph					770 vehicles (52.5%)	
Percentile Speeds			<u>10%</u>	<u>15%</u>	<u>50%</u>	<u>85%</u>	<u>90%</u>									
	(mph)		14.6	17.6	25.4	33.3	36.0									
Speeds Exceeded	<u>25 mph</u>	<u>35 mph</u>	<u>45 mph</u>	<u>55 mph</u>	<u>65 mph</u>	<u>75 mph</u>										
	52.0% (762)	11.8% (173)	2.5% (37)	0.4% (6)	0% (0)	0% (0)										

Appendix B

2013–2018 Collision Data

JURISDICTION	COUNTY	CITY	PRIMARY TRAFFICWAY	BLOCK NUMBER	INTERSECTING TRAFFICWAY	REFERENCE POINT NAME	DATE	MOST SEVERE INJURY TYPE
City Street	King	Maple Valley	WITTE RD SE	25500	SE 256 ST		04/11/2018	No Apparent Injury
City Street	King	Maple Valley	WITTE RD SE	25800		SE 256TH ST	05/20/2017	Suspected Minor Injury
City Street	King	Maple Valley	WITTE RD SE	25600		SE 256TH ST	12/09/2015	No Apparent Injury
City Street	King	Maple Valley	WITTE RD SE	25700		SE 256TH ST	05/21/2013	Suspected Minor Injury
City Street	King	Maple Valley	WITTE RD SE	25700		SE 256TH ST	06/27/2013	No Apparent Injury
City Street	King	Maple Valley	WITTE RD SE	25500	220TH AVE SE		01/29/2014	No Apparent Injury
City Street	King	Maple Valley	WITTE RD SE	25800		SE 256TH ST	06/30/2014	No Apparent Injury
City Street	King	Maple Valley	WITTE RD SE	25500	220TH AVE SE		03/09/2016	No Apparent Injury
City Street	King	Maple Valley	WITTE RD SE	0	SE 256TH ST		02/15/2017	Possible Injury

# Injuries	JUNCTION RELATIONSHIP	FIRST COLLISION TYPE / OBJECT STRUCK	VEHICLE 1 ACTION
0	At Intersection and Related	Entering at angle	Making Left Turn
1	Not at Intersection and Not Related	Tree or Stump (stationary)	Going Straight Ahead
0	Not at Intersection and Not Related	Fallen tree hit by vehicle (on the road)	Going Straight Ahead
2	Not at Intersection and Not Related	From same direction - both going straight - both moving - rear-end	Slowing
0	Not at Intersection and Not Related	Roadway Ditch	Going Straight Ahead
0	At Intersection and Related	Entering at angle	Making Left Turn
0	Not at Intersection and Not Related	Mailbox	Going Straight Ahead
0	At Intersection and Related	From same direction - both going straight - one stopped - rear-end	Going Straight Ahead
2	At Intersection and Related	From same direction - both going straight - both moving - rear-end	Going Straight Ahead

VEHICLE 2 ACTION	VEHICLE 1 COMPASS DIRECTION FROM	VEHICLE 1 COMPASS DIRECTION TO	VEHICLE 2 COMPASS DIRECTION FROM	VEHICLE 2 COMPASS DIRECTION TO
Going Straight Ahead	Northwest	North	South	North
	South	North		
	South	North		
Going Straight Ahead	South	North	South	North
	South	North		
Going Straight Ahead	Southwest	North	North	South
	North	South		
Stopped for Traffic	South	North	Vehicle Stopped	Vehicle Stopped
Slowing	North	South	North	South

Appendix C

LOS Analysis Reports

Intersection						
Int Delay, s/veh	0.7					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			T		
Traffic Vol, veh/h	1	31	32	373	747	0
Future Vol, veh/h	1	31	32	373	747	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	34	35	405	812	0

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1287	812	812	0	-	0
Stage 1	812	-	-	-	-	-
Stage 2	475	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	181	379	814	-	-	-
Stage 1	437	-	-	-	-	-
Stage 2	626	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	171	379	814	-	-	-
Mov Cap-2 Maneuver	171	-	-	-	-	-
Stage 1	437	-	-	-	-	-
Stage 2	592	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	15.9	0.8	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	814	-	365	-	-
HCM Lane V/C Ratio	0.043	-	0.095	-	-
HCM Control Delay (s)	9.6	0	15.9	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.1	-	0.3	-	-

Intersection						
Int Delay, s/veh	0.9					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			T		
Traffic Vol, veh/h	9	31	32	373	747	44
Future Vol, veh/h	9	31	32	373	747	44
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	10	34	35	405	812	48

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1311	836	860	0	-	0
Stage 1	836	-	-	-	-	-
Stage 2	475	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	175	367	781	-	-	-
Stage 1	425	-	-	-	-	-
Stage 2	626	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	165	367	781	-	-	-
Mov Cap-2 Maneuver	165	-	-	-	-	-
Stage 1	425	-	-	-	-	-
Stage 2	590	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	19.7	0.8	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	781	-	288	-	-
HCM Lane V/C Ratio	0.045	-	0.151	-	-
HCM Control Delay (s)	9.8	0	19.7	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.1	-	0.5	-	-

Intersection						
Int Delay, s/veh	1.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			T		
Traffic Vol, veh/h	10	34	35	455	911	49
Future Vol, veh/h	10	34	35	455	911	49
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	37	38	495	990	53

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1588	1017	1043	0	-	0
Stage 1	1017	-	-	-	-	-
Stage 2	571	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	119	288	667	-	-	-
Stage 1	349	-	-	-	-	-
Stage 2	565	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	110	288	667	-	-	-
Mov Cap-2 Maneuver	110	-	-	-	-	-
Stage 1	349	-	-	-	-	-
Stage 2	520	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	27	0.8	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	667	-	211	-	-
HCM Lane V/C Ratio	0.057	-	0.227	-	-
HCM Control Delay (s)	10.7	0	27	-	-
HCM Lane LOS	B	A	D	-	-
HCM 95th %tile Q(veh)	0.2	-	0.8	-	-

Intersection						
Int Delay, s/veh	1.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			T		
Traffic Vol, veh/h	10	36	37	502	1005	51
Future Vol, veh/h	10	36	37	502	1005	51
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	39	40	546	1092	55

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1746	1120	1148	0	-	0
Stage 1	1120	-	-	-	-	-
Stage 2	626	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	95	251	609	-	-	-
Stage 1	312	-	-	-	-	-
Stage 2	533	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	86	251	609	-	-	-
Mov Cap-2 Maneuver	86	-	-	-	-	-
Stage 1	312	-	-	-	-	-
Stage 2	483	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	33.2	0.8	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	609	-	177	-	-
HCM Lane V/C Ratio	0.066	-	0.282	-	-
HCM Control Delay (s)	11.3	0	33.2	-	-
HCM Lane LOS	B	A	D	-	-
HCM 95th %tile Q(veh)	0.2	-	1.1	-	-

Intersection						
Int Delay, s/veh	1.5					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			T		
Traffic Vol, veh/h	11	38	39	554	1110	54
Future Vol, veh/h	11	38	39	554	1110	54
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	41	42	602	1207	59

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1923	1236	1265	0	-	0
Stage 1	1236	-	-	-	-	-
Stage 2	687	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	74	215	549	-	-	-
Stage 1	274	-	-	-	-	-
Stage 2	499	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	65	215	549	-	-	-
Mov Cap-2 Maneuver	65	-	-	-	-	-
Stage 1	274	-	-	-	-	-
Stage 2	442	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	44.8	0.8	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	549	-	142	-	-
HCM Lane V/C Ratio	0.077	-	0.375	-	-
HCM Control Delay (s)	12.1	0	44.8	-	-
HCM Lane LOS	B	A	E	-	-
HCM 95th %tile Q(veh)	0.2	-	1.6	-	-

Intersection						
Int Delay, s/veh	1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W			W	W	
Traffic Vol, veh/h	10	35	36	429	859	50
Future Vol, veh/h	10	35	36	429	859	50
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	38	39	466	934	54

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1506	961	988	0	-	0
Stage 1	961	-	-	-	-	-
Stage 2	545	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	133	311	699	-	-	-
Stage 1	371	-	-	-	-	-
Stage 2	581	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	123	311	699	-	-	-
Mov Cap-2 Maneuver	123	-	-	-	-	-
Stage 1	371	-	-	-	-	-
Stage 2	537	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	24.6	0.8	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	699	-	232	-	-
HCM Lane V/C Ratio	0.056	-	0.211	-	-
HCM Control Delay (s)	10.5	0	24.6	-	-
HCM Lane LOS	B	A	C	-	-
HCM 95th %tile Q(veh)	0.2	-	0.8	-	-

Appendix D

WSDOT Design Manual

1310.03(2) *Left-Turn Lanes and Turn Radii*

Left-turn lanes provide storage, separate from the through lanes, for left-turning vehicles waiting for a signal to change or for a gap in opposing traffic. (See [1310.03\(4\)](#) for a discussion on speed change lanes.)

Design left-turn channelization to provide sufficient operational flexibility to function under peak loads and adverse conditions.

1310.03(2)(a) *One-Way Left-Turn Lanes*

One-way left-turn lanes are separate storage lanes for vehicles turning left from one roadway onto another. One-way left-turn lanes may be an economical way to lessen delays and crash potential involving left-turning vehicles. In addition, they can allow deceleration clear of the through traffic lanes. Provide a minimum storage length of 100 feet for one-way left-turn lanes. When evaluating left-turn lanes, include impacts to all intersection movements and users.

At signalized intersections, use a traffic signal analysis to determine whether a left-turn lane is needed and the storage length. If the length determined is less than the 100-foot minimum, make it 100 feet (see [Chapter 1330](#)).

At unsignalized intersections, use the following as a guide to determine whether or not to provide one-way left-turn lanes:

- A traffic analysis indicates congestion reduction with a left-turn lane. On two-lane highways, use [Exhibit 1310-7a](#), based on total traffic volume (DHV) for both directions and percent left-turn traffic, to determine whether further investigation is needed. On four-lane highways, use [Exhibit 1310-7b](#) to determine whether a left-turn lane is recommended.
- A study indicates crash reduction with a left-turn lane.
- Restrictive geometrics require left-turning vehicles to slow greatly below the speed of the through traffic.
- There is less than decision sight distance for traffic approaching a vehicle stopped at the intersection to make a left turn.

A traffic analysis based on the *Highway Capacity Manual* (HCM) may also be used to determine whether left-turn lanes are needed to maintain the desired level of service.

Exhibit 1310-7a Left-Turn Storage Guidelines: Two-Lane, Unsignalized

