

Appendix B

Intersection and Roadway Level of Service

Table of Contents

APPENDIX B: INTERSECTION AND ROADWAY LEVEL OF SERVICE1
 WHAT ARE THE EXISTING TRAFFIC VOLUMES ON SR 167? 1
 WHAT IS THE EXISTING LEVEL OF SERVICE ON SR 167? 1

List of Exhibits

EXHIBIT B-1: SR 167 EXISTING CONDITIONS – NORTHBOUND VOLUME AND LEVEL OF SERVICE (2005)3
 EXHIBIT B-2: SR 167 EXISTING CONDITIONS - SOUTHBOUND VOLUME AND LEVEL OF SERVICE (2005)4
 EXHIBIT B-3: SR 167 EXISTING CONDITION AM PEAK HOUR MAINLINE VOLUME (2005).....5
 EXHIBIT B-5: SR 167 EXISTING CONDITION (2005) NORTHBOUND RAMP VOLUME AND LEVEL OF SERVICE6
 EXHIBIT B-6: SR 167 EXISTING CONDITION (2005) SOUTHBOUND RAMP VOLUME AND LEVEL OF SERVICE.....7
 EXHIBIT B-7: SR 167 RAMP TERMINAL AM AND PM PEAK HOUR LEVEL OF SERVICE AND DELAY.....8
 EXHIBIT B-8: SR 167 LOCAL INTERSECTION PM PEAK HOUR LEVEL OF SERVICE AND DELAY9

What are the Existing Traffic Volumes on SR 167?

The existing weekday AM and PM peak hour traffic volumes on SR 167 mainline and ramps were assembled and balanced from WSDOT, city of Renton, Kent and Auburn records and data counts collected by the third party. The northbound and southbound mainline volumes are shown in table 1 and 2. The northbound and southbound ramp volumes are shown in table 3 and 4. Figure 1 shows volumes in the whole freeway corridor.

The traffic demand on SR 167 northbound mainline ranges from 1,530 to 4,240 vehicles per hour in the weekday PM peak hour and from 1,160 to 5,130 vehicles per hour in the weekday AM peak hour. The volume on southbound mainline ranges from 1,210 to 5,070 vehicles per hour in the weekday PM peak hour and from 1,160 to 4,350 vehicles per hour in the weekday AM peak hour. The highest volumes in peak direction occur between 43rd Street SW and SR 18 interchange. In this area, volumes between interchanges are consistently high without significant variance. In the off-peak direction, on the other hand, the highest volume appears between SR 410 and SR 512 interchanges, where there are four lanes per direction in that segment.

The traffic volumes on northbound ramps vary in AM and PM peak hour. For example, in the PM peak hour, northbound Ellingson Road onramp carries only 310 vehicles and SR 512 onramp carries up to 2,710 vehicles; Southbound Ellingson Road off ramp carries 320 vehicles and SR 512 off ramp carries up to 3,300 vehicles.

What is the existing level of service on SR 167?

The methodology used to evaluate the freeway operation is based on freeway Level of Service (LOS), which is defined in Highway Capacity Manual (HCM) 2000. Freeway LOS has six categories, from LOS A through LOS F, which uses density (vehicle per hour per lane) to measure traffic conditions in a freeway segment. Under this method, LOS A represents free flowing traffic and LOS F describes breakdowns in traffic flow. Exhibit B-1 and B-2 present mainline segments LOS during the weekday AM and PM peak hours.

In the peak directions (SB in PM peak hour and NB in AM peak hour), SR 167 is currently operating near or over capacity (LOS E and LOS F) between SR 410 and 43rd Street SW. There are significant delays and severe congestion experienced in the peak directions. In the off-peak directions, the whole freeway corridor except SR 18 interchange operates in free

flowing condition. SR 18 interchange substantially impacts freeway LOS in peak and off-peak directions due to high demand on on/off ramps and a lot of merge/diverge/weaving movements.

HCM 2000 Ramp methodology was used to conduct freeway ramp operational analysis for weekday AM and PM peak hour. Similarly, this ramp LOS methodology is based on ramp density. HCS+ software was used as a tool to expedite analysis process. The ramp LOS results are presented in table 3 and 4.

Most northbound ramps are operating at LOS C or D in the AM peak hour, which means that ramp volumes are under capacity but vehicles slow down to accommodate merging or diverging. For the southbound PM peak hour, ramps north of Ellingson Road operate at LOS C or D. Ramps between Ellingson Road and SR 410 interchange operate at LOS E, because the freeway mainline carries very high volumes and as a consequence, the high volume significantly impacts the on/off ramp LOS. Vast majority of ramps along the corridor are operating at LOS C or better in off-peak directions.

Synchro 6-14 traffic analysis software was used to conduct ramp terminal and local intersection LOS analysis. Table 5 shows ramp terminal LOS and delay in the weekday AM and PM peak hour. Table 6 shows local intersection LOS and delay in the weekday PM peak hour only.

Thirty-one ramp terminals were analyzed. Majority of them are operating at LOS D or better in the AM and PM peak hour, under existing traffic control. Six intersections in the AM peak hour and nine intersections in PM peak hour operate at LOS E or F, most of which are located in the south of 15th Street NW. Ramp terminals at Ellingson Road and 8th Street E are controlled by stop signs on the off-ramps. These stop sign controlled ramp terminals, except the one at northbound ramp and Ellingson Road, consistently operate at LOS E or F in both AM and PM peak hour.

Except for ramp terminals, local intersections in three identified bottleneck areas, “43rd Street SW/180th Street”, “SR 516/Smith Street”, and “SR 18”, were also analyzed for the weekday PM peak hour only. The intersection of 43rd Street SW with E Valley Street and intersection of Smith Street with 4th Ave operate at LOS E. The intersection of Washington Ave with Meeker Street and intersection of W Valley Highway with Peasley Canyon Road operate at LOS F. All other intersections operate at LOS D or better.

Exhibit B-1

SR 167 Existing Conditions: Northbound Volume and Level of Service (2005)

Location Index	Freeway Segment	Number of Lanes	2005 PM Balanced Volume	2005 AM Balanced Volume	2005 PM LOS	2005 AM LOS
1	N Meridian ST. to SR 512 Off	2	2,320	1,610	D	C
2	SR 512 Off to SR 512 On	1	1,530	1,160	D	C
3	SR 512 On to SR 410 Off	3	4,240	4,090	D	C
4	SR 410 Off to SR 410 On	2	1,990	2,900	B	F
5	SR 410 On to 24th ST. E Off	2	2,550	3,910	C	F
6	24th ST. E Off to 24th ST. E On	2	2,250	3,510	C	F
7	24th ST. E On to 8th ST. E Off	2	2,620	3,740	C	F
8	8th ST. E Off to 8th ST. E On	2	2,320	3,490	C	F
9	8th ST. E On to Ellingson Off	2	2,760	3,740	C	F
10	Ellingson Off to Ellingson On	2	2,540	3,300	C	F
11	Ellingson On to 15th ST. SW Off	2	2,850	3,820	C	F
12	15th ST. SW Off to SR 18 Off	2	2,430	3,400	D	F
13	SR 18 Off to SR 18 EB On	2	1,690	2,740	B	F
14	SR18 EB On to SR 18 WB On	2	3,360	3,750	D	F
15	SR 18 WB On to 15th ST. NW Off	2	4,050	4,710	E	F
16	15th ST. NW Off to 15th ST. NW On	2	3,310	4,090	D	F
17	15th ST. NW On to S 277th NW Off	3	4,010	4,720	C	E
18	S 277th NW Off to S 277th ST. On	3	3,430	4,320	C	E
19	S 277th ST. On to SR 516 ST. Off	3	4,040	4,980	C	E
20	SR 516 ST. Off to SR 516 On	3	3,140	4,080	C	D
21	SR 516 On to 84th AVE S Off	3	3,550	4,530	C	D
22	84th AVE S Off to 84th AVE S On	3	3,170	3,980	C	E
23	84th AVE S On to S 212th ST. Off	3	4,000	5,130	C	F
24	S 212th ST. Off to S 212th ST. On	3	3,410	4,380	C	E
25	S 212th ST. On to SW 43rd ST. Off	3	3,990	5,060	C	F
26	SW 43rd ST. Off to SW 43rd ST. On	3	3,230	4,000	C	F
27	SW 43rd ST. On to I 405 EB Off	3	3,970	4,490	D	F

Exhibit B-2

SR 167 Existing Conditions: Southbound Volume and Level of Service (2005)

Location Index	Freeway Segment	Number of Lanes	2005 PM Balanced Volume	2005 AM Balanced Volume	2005 PM LOS	2005 AM LOS
1	I 405 EB Off to I 405 EB On	2	3,090	2,430	E	C
2	I 405 EB On to SW 43rd ST. Off	3	4,410	3,740	E	C
3	SW 43rd ST. Off to SW 43rd ST. On	3	3,770	2,920	C	C
4	SW 43rd ST. On to S 212th ST. Off	3	4,910	3,280	D	C
5	S 212th ST. Off to S 212th On	3	4,210	2,590	E	C
6	S 212th ST. On to 84th AVE S Off	3	4,930	3,180	E	C
7	84th AVE S Off to 84th AVE S On	3	4,100	2,620	E	B
8	84th AVE S On to SR 516 Off	3	4,820	3,030	E	C
9	SR 516 Off to SR 516 On	3	4,240	2,570	F	B
10	SR 516 On to S 277th ST. Off	3	5,070	3,320	F	C
11	S 277th ST. Off to S 277th ST. On	3	4,360	2,840	F	B
12	S 277th ST. On to 15th ST. NW Off	3	4,830	3,180	F	C
13	15th ST. NW Off to 15th ST. NW On	3	3,970	2,600	F	B
14	15th ST. NW On to SR 18 WB Off	3	4,740	3,160	F	C
15	SR 18 WB Off to SR 18 WB On	2	3,600	2,300	F	C
16	SR 18 WB On to SR 18 EB Off	3	4,670	3,230	F	B
17	SR 18 EB Off to 15th ST. SW Off	3	3,990	2,860	F	C
18	15th ST. SW Off to 15th ST. SW On	2	3,380	2,620	F	C
19	15th ST. SW On to Ellingson RD Off	2	3,780	2,870	F	D
20	Ellingson RD Off to Ellingson RD On	2	3,460	2,590	F	C
21	Ellingson RD On to 8th ST. SE Off	2	3,940	2,910	F	D
22	8th ST. SE Off to 8th ST. SE On	2	3,450	2,610	E	C
23	8th ST. SE On to W Valley HWY Off	2	4,050	2,800	E	C
24	W Valley HWY Off to W Valley HWY On	2	3,700	2,500	E	C

Exhibit B-3
SR 167 Existing Condition AM Peak Hour Mainline Volume (2005)

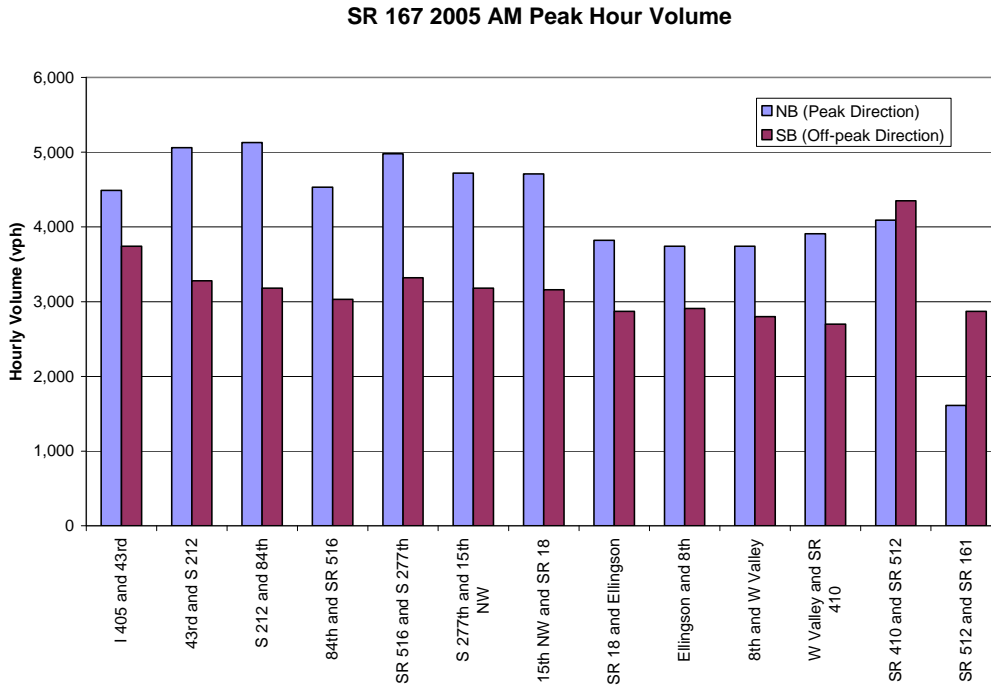


Exhibit B-4
SR 167 Existing Condition PM Peak Hour Mainline Volume (2005)

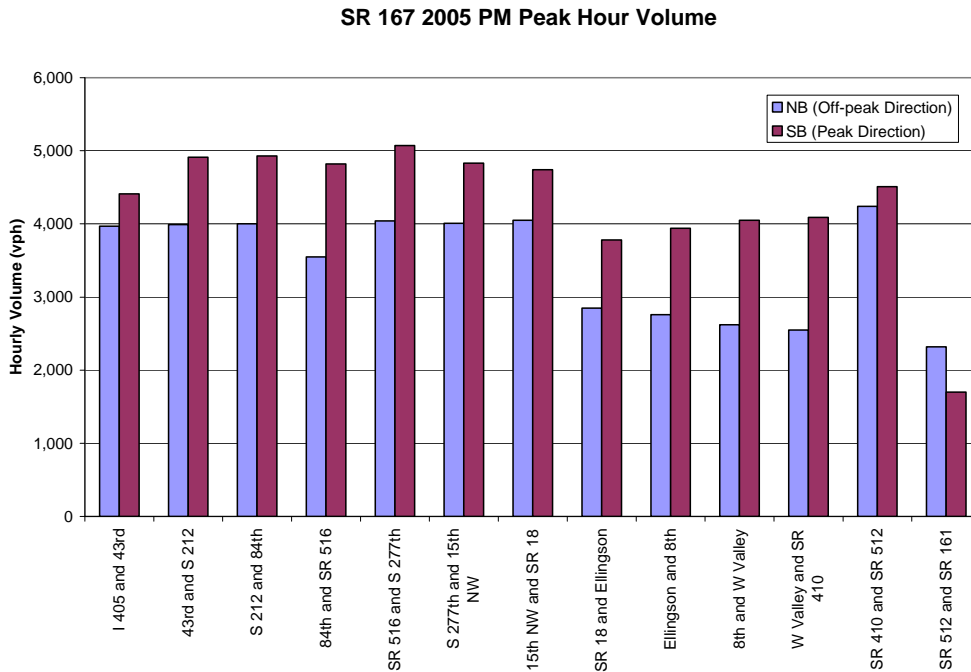


Exhibit B-5
SR 167 Existing Condition (2005) Northbound Ramp Volume and Level of Service

Location Index	Ramp	2005 PM Balanced Volume	2005 AM Balanced Volume	2005 PM LOS	2005 AM LOS
1	SR 512 Off	790	450	C	B
2	SR 512 On	2,710	2,930	B	B
3	SR 410 Off	2,260	1,190	B	A
4	SR 410 On	560	1,010	C	D
5	24th ST. E Off	300	400	C	E
6	24th ST. E On	370	230	C	D
7	8th ST. E Off	300	250	C	E
8	8th ST. E On	440	250	C	D
9	Ellingson ST. Off	220	410	C	D
10	Ellingson ST. On	310	490	C	D
11	15th ST. SW Off	420	420	C	E
12	SR 18 EB Off	740	730	C	D
13	SR 18 EB On	1,670	1,010	B	C
14	SR 18 WB On	690	960	D	F
15	15th ST. NW Off	740	620	E	F
16	15th ST. NW On	700	630	C	C
17	S 277th ST. Off	580	400	C	D
18	S 277th ST. On	610	660	C	D
19	SR 516 / Willis ST. Off	900	900	C	C
20	SR 516 / Willis ST. On	410	450	C	C
21	84th ST. Off	380	550	C	C
22	84th ST. On	830	1,150	C	D
23	S 212th ST. Off	590	750	C	D
24	S 212th ST. On	580	680	C	D
25	S 180th ST. / SW 43rd ST. Off	760	1,060	C	D
26	S 180th ST. / SW 43rd ST. On	740	490	C	C

Exhibit B-6

SR 167 Existing Condition (2005) Southbound Ramp Volume and Level of Service

Location Index	Ramp	2005 PM Balanced Volume	2005 AM Balanced Volume	2005 PM LOS	2005 AM LOS
1	S 180th ST. / SW 43rd ST. Off	640	820	D	C
2	S 180th ST. / SW 43rd ST. On	1,140	360	D	C
3	S 212th ST. Off	700	690	D	B
4	S 212th ST. On	720	590	D	C
5	84th ST. Off	830	560	F	C
6	84th ST. On	720	410	C	B
7	SR 516 / Willis ST. Off	580	460	D	B
8	SR 516 / Willis ST. On	830	750	D	C
9	S 277th ST. Off	710	480	D	C
10	S 277th ST. On	470	340	C	B
11	15th NW Off	860	580	D	B
12	15th NW On	770	560	C	C
13	SR 18 WB Off	1,140	860	B	A
14	SR 18 WB On	1,070	930	E	C
15	SR 18 EB Off	680	370		
16	15th ST. SW Off	610	240	C	B
17	15th ST. SW On	400	210	D	C
18	Ellingson RD Off	320	280	E	C
19	Ellingson RD On	480	320	D	C
20	8th ST. SE Off	490	300	E	C
21	8th ST. SE On	600	190	E	C
22	W Valley HWY Off	350	300	E	C
23	W Valley HWY On	390	200	E	C
24	SR 410 Off	1,310	590	F	B
25	SR 410 On	1,730	2,240	D	D
26	SR 512 Off	3,300	2,300		
27	SR 512 On	490	810	B	D

Exhibit B-7

SR 167 Ramp Terminal AM and PM Peak Hour Level of Service and Delay

Interchange	Ramp Terminal	AM		PM	
		LOS	Delay (sec)	LOS	Delay (sec)
SR 167 at Carr Rd/SW 43rd/SE 180th	SR 167 SB ramp/41St.	D	37	E	55
	SR 167 NB ramp/43rd	C	23	C	25
SR 167 at S 212th St..	SR 167 SB ramp/S 212th St.	A	6	B	18
	SR 167 NB ramp/S 212th St.	C	32	E	79
SR 167 at 84th Ave S/Central Ave N	Sr 167 SB ramp/84th Ave S	B	16	B	17
	SR 167 NB ramp/Central Ave N	A	2	D	39
SR 167 at SR 516/Smith	SR 167 SB Ramp/SR 516	B	17	C	23
	SR 167 NB Ramp/SR 516	C	22	D	39
	Washington/SR 516	C	33	D	41
	74th Ave/SR 516	C	31	C	31
	4th Ave/SR 516	B	17	C	31
SR 167 at S 277th St.	SR 167 SB ramp/S 277th St.	D	36	D	51
	SR 167 NB ramp/S 277th St.	E	76	E	78
SR 167 at 15th St. NW	SR 167 SB ramp/15th St. NW	C	25	D	35
	SR 167 NB Ramp/15th St. NW	C	22	D	44
SR 167 at SR 18	W Valley Hwy/SR 18 WB Ramp	E	66	B	18
	W Valley Hwy/SR 18 EB Ramp	D	36	F	83
	SR 167 SB Ramp/15th St. SW	B	14	B	15
	SR 167 NB Ramp/15th St. SW	C	21	B	15
	C St./SR 18 WB Ramp	B	16	B	18
	C St./SR 18 EB Ramp	C	21	B	20
SR 167 at Ellingson Rd	Sr 167 SB ramp/Ellingson Rd	E	36	F	> 50
	SR 167 NB ramp/Ellingson Rd	C	16	B	13
SR 167 at 8th St. E	SR 167 SB ramp/8th St. E	E	43	F	> 50
	SR 167 NB ramp/8th St. E	F	> 50	F	> 50
SR 167 at 24th St. E/W Valley Hwy E	SR 167 NB ramp/24th St. E	B	12	B	11
	SR 167 SB ramp/W Valley Hwy E	B	18	B	19
SR 167 at SR 410-SR 512	E Main/SR 410 SB Ramp	C	25	B	19
	E Main/SR 410 NB Ramp	F	> 80	E	63
SR 167 at SR 161	SR 167 SB/SR 161	B	13	B	16
	SR 167 NB/SR 161	B	18	F	> 80

Exhibit B-8

SR 167 Local Intersection PM Peak Hour Level of Service and Delay

Bottleneck	Intersection	LOS	Delay (sec)
43rd St. / 180th St.	SW 41st ST. / 84th Ave S	B	19
	84th Ave S / SW 43rd St.	C	29
	SW 43rd St. / E Valley St.	E	78
	SW 43rd St. / Talbot Road S	D	39
SR 516 / Smith St. DAR	Washington Ave / Meeker St.	F	> 80
	Smith ST. / 4th Ave	E	73
	4th Ave / Meeker St.	B	10
	4th Ave / Gowe St.	A	8
SR 18	W Valley Hwy / 15th St. SW	C	27
	15th St. SW / O ST.	C	29
	C St. SW / W Main ST.	C	22
	W Main St. / W Valley Hwy	C	23
	W Valley Hwy / Peasley Canyon	F	> 80