APPENDIX F

RAMP METER ANALYSIS WORKSHEETS

TABLE 7–14
EXISTING AND YEAR 2015 RAMP METER ANALYSIS (FIXED RATE METHOD)

Ramp Meter Location	Model Run: Scenario	Ramp Meter Analysis							
		Total SOV Peak Hour Volume [a] (veh/h)		Peak Hour Ramp Meter Rate [b] (veh/h)		Excess Demand (veh/h) [c]		Queue	
		AM	PM	AM	PM	AM	PM	AM	PM
Carmel Mountain Road to I-5 NB Bypass (2 S0V + 1 HOV)	*Existing*	NM	540	NM	398	NM	142	-	**3550**
	A: No Build	567	738	670	910	-	-	-	-
	B: Auxiliary Lane Alternative	567	738	670	910	-	-	-	-
	C: Direct Connectors Alternative	567	738	670	910	-	-	-	-
	D: Hybrid Alternative	567	738	670	910	-	-	-	-
	D1: Hybrid with flyover Alternative	567	738	670	910	-	-	-	-
Carmel Mountain Road to I-5 SB Bypass (2 S0V + 1 HOV)	*Existing*	NM	NM	NM	NM	-	-	-	-
	A: No Build	855	765	1045	830	-	-	-	-
	B: Auxiliary Lane Alternative	855	765	1045	830	-	-	-	-
	C: Direct Connectors Alternative	855	765	1045	830	-	-	-	-
	D: Hybrid Alternative	855	765	1045	830	-	-	-	-
	D1: Hybrid with flyover Alternative	855	765	1045	830	-	-	-	-
Carmel Valley Road to I-5 NB (1 S0V + 1 HOV)	*Existing*	NM	612	NM	677	-	0	-	0
	A: No Build	1083	907	340	470	743	437	**18,570**	**10,930**
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	1083	907	680	940	403	-	**5320**	-
	B2: No EB slip off-ramp [e], no WB barrier	1083	907	680	940	403	-	**5320**	-
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	333	441	340	470	11	-	-	-
	C2: No EB slip off-ramp, no WB barrier [f]	333	441	340	470	11	-	-	-
	C5: No EB slip off-ramp, with WB C-D system [f]	333	441	340	470	11	-	-	-
	D: Hybrid Alternative	333	441	340	470	11	-	-	-
	D1: Hybrid with flyover Alternative	333	441	340	470	11	-	-	-
Carmel Valley Road to I-5 SB (2 S0V)	*Existing*	840	NM	710	NM	130	-	**3250**	-
	A: No Build	950	940	1300	1000	-	-	-	-
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	950	940	1300	1000	-	-	-	-
	B2: No EB slip off-ramp, no WB barrier	950	940	1300	1000	-	-	-	-
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	950	940	1300	1000	-	-	-	-
	C2: No EB slip off-ramp, no WB barrier	950	940	1300	1000	-	-	-	-
	C5: No EB slip off-ramp, with WB C-D system	1250	1245	1300	1000	-	15	-	**6125**
	D: Hybrid Alternative	1250	1245	1300	1000	-	15	-	**6125**
	D1: Hybrid with flyover Alternative	1250	1245	1300	1000	-	15	-	**6125**
Del Mar Heights Road to I-5 NB (2 S0V + 1 HOV)	*Existing*	NM	1125	NM	593	-	532	-	**13,300**
	A: No Build	1297	1350	1225	1290	72	60	**1800**	**1500**
	B: Auxiliary Lane Alternative	1297	1350	1225	1290	72	60	**1800**	**1500**
	C: Direct Connectors Alternative	1008	1170	1225	1290	-	-	-	-

TABLE 7–14
EXISTING AND YEAR 2015 RAMP METER ANALYSIS (FIXED RATE METHOD)

Ramp Meter Location	Model Run: Scenario	Ramp Meter Analysis							
		Total SOV Peak Hour Volume [a] (veh/h)		Peak Hour Ramp Meter Rate [b] (veh/h)		Excess Demand (veh/h) [c]		Queue	
		AM	PM	AM	PM	AM	PM	AM	PM
	D: Hybrid Alternative	1008	1170	1225	1290	-	-	-	-
	D1: Hybrid with flyover Alternative	1008	1170	1225	1290	-	-	-	-
WB Del Mar Heights Road (loop ramp) to I-5 SB (2 SOV + 1 HOV)	*Existing*	810	540	368	368	442	172	**11,050**	**4300**
	A: No Build	945	630	740	550	45	35	**5125**	**2000**
	B: Auxiliary Lane Alternative	945	630	740	550	45	35	**5125**	**2000**
	C: Direct Connectors Alternative	945	630	740	550	45	35	**5125**	**2000**
	D: Hybrid Alternative	945	630	740	550	45	35	**5125**	**2000**
	D1: Hybrid with flyover Alternative	945	630	740	550	45	35	**5125**	**2000**
EB Del Mar Heights Road (direct ramp) to I-5 SB (2 SOV + 1 HOV)	*Existing*	495	495	492	492	3	3	75	75
	A: No Build	540	513	1175	750	-	-	-	-
	B: Auxiliary Lane Alternative	540	513	1175	750	-	-	-	-
	C: Direct Connectors Alternative	540	513	1175	750	-	-	-	-
	D: Hybrid Alternative	540	513	1175	750	-	-	-	-
	D1: Hybrid with flyover Alternative	540	513	1175	750	-	-	-	-
WB Via de la Valle (direct ramp) to I-5 NB (1 SOV + 1 HOV)	*Existing*	NM	360	NM	343	-	17	-	425
	A: No Build	365	470	460	480	-	-	-	-
	B: Auxiliary Lane Alternative	365	470	460	480	-	-	-	-
	C: Direct Connectors Alternative	333	450	460	480	-	-	-	-
	D: Hybrid Alternative	333	450	460	480	-	-	-	-
	D1: Hybrid with flyover Alternative	333	450	460	480	-	-	-	-
EB Via de la Valle (loop ramp) to I-5 NB (1 SOV + 1 HOV)	*Existing*	NM	540	NM	318	-	222	-	**5550**
	A: No Build	351	585	430	670	-	-	-	-
	B: Auxiliary Lane Alternative	351	585	430	670	-	-	-	-
	C: Direct Connectors Alternative	351	585	430	670	-	-	-	-
	D: Hybrid Alternative	351	585	430	670	-	-	-	-
	D1: Hybrid with flyover Alternative	351	585	430	670	-	-	-	-
WB Via de la Valle (loop ramp) to I-5 SB (1 SOV + 1 HOV)	*Existing*	603	468	343	343	260	125	**5650**	**2275**
	A: No Build	666	621	750	700	-	-	-	-
	B: Auxiliary Lane Alternative	666	621	750	700	-	-	-	-
	C: Direct Connectors Alternative	666	621	750	700	-	-	-	-
	D: Hybrid Alternative	666	621	750	700	-	-	-	-
	D1: Hybrid with flyover Alternative	666	621	750	700	-	-	-	-
EB Via de la Valle (direct ramp) to I-5 SB (2 SOV + 1 HOV)	*Existing*	819	684	593	593	226	91	**5650**	**2275**
	A: No Build	864	729	930	770	-	-	-	-
	B: Auxiliary Lane Alternative	864	729	930	770	-	-	-	-
	C: Direct Connectors Alternative	864	729	930	770	-	-	-	-
	D: Hybrid Alternative	864	729	930	770	-	-	-	-
	D1: Hybrid with flyover Alternative	864	729	930	770	-	-	-	-
Carmel Valley Road to SR-56 WB (2 SOV + 1 HOV)	*Existing*	734	NM	343	NM	391	-	**9785**	-
	A: No Build	733	430	686	686	47	-	**1165**	-
	B: Auxiliary Lane Alternative	733	430	686	686	47	-	**1165**	-
	C: Direct Connectors Alternative	765	450	686	686	79	-	**1975**	-

TABLE 7–14
EXISTING AND YEAR 2015 RAMP METER ANALYSIS (FIXED RATE METHOD)

Ramp Meter Location	Model Run: Scenario	Ramp Meter Analysis							
		Total SOV Peak Hour Volume [a] (veh/h)		Peak Hour Ramp Meter Rate [b] (veh/h)		Excess Demand (veh/h) [c]		Queue	
		AM	PM	AM	PM	AM	PM	AM	PM
	D: Hybrid Alternative	765	450	686	686	79	-	**1975**	-
	D1: Hybrid with flyover Alternative	765	450	686	686	79	-	**1975**	-
WB SR 56 to NB I-5 Freeway Connector (2 SOV)	*Existing*	*DNE*	*DNE*	*DNE*	*DNE*	-	-	-	-
	A: No Build	*DNE*	*DNE*	*DNE*	*DNE*	-	-	-	-
	B: Auxiliary Lane Alternative	*DNE*	*DNE*	*DNE*	*DNE*	-	-	-	-
	C: Direct Connectors Alternative [h]	750	475	660	420	90	55	2250	1375
	C2: No EB slip off-ramp, no WB barrier	750	475	660	420	90	55	2250	1375
	C5: No EB slip off-ramp, with WB C-D system	750	475	660	420	90	55	2250	1375
	D: Hybrid Alternative	750	475	660	420	90	55	2250	1375
	D1: Hybrid with flyover Alternative	750	475	660	420	90	55	2250	1375
WB SR 56 to SB I-5 Freeway Connector (2 SOV)	*Existing*	*DNE*	*DNE*	*DNE*	*DNE*	-	-	-	-
	A: No Build [i]	1925	900	1750	900	175	-	4375	-
	B: Auxiliary Lane Alternative	1925	900	1750	900	175	-	4375	-
	B2: No EB slip off-ramp, no WB barrier	1925	900	1750	900	175	-	4375	-
	C: Direct Connectors Alternative	1925	900	1750	900	175	-	4375	-
	C2: No EB slip off-ramp, no WB barrier	1925	900	1750	900	175	-	4375	-
	C5: No EB slip off-ramp, with WB C-D system	1775	748	1750	900	25	-	625	-
	D: Hybrid Alternative	1775	748	1750	900	25	-	625	-
	D1: Hybrid with flyover Alternative	1775	748	1750	900	25	-	625	-

Footnotes:

a. Peak hour ramp volumes obtained from *2015 Traffic Volumes Report*. SOV peak hour volumes calculated to be 90% of the total on ramp volume (10% accounted for HOV).
b. Peak hour ramp meter rate derived by Caltrans Ramp Metering Branch for the I-5 North Coast Project.
c. Excess demand = SOV Peak hour volume - ramp meter rate.
d. Delay (min) = (Excess demand / Meter rate) * 60. Queue = Excess demand * 25'.
e. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated.
f. This alternative is analyzed with a Collector-Distributor system between Carmel Creek Road and El Camino Real on WB SR-56.
g. Del Mar Heights Road on-ramp to I-5 SB merges with I-5 SB Bypass in the Year 2015 Direct Connector (Run C) scenario.

General Notes:
Bold typeface indicates delays 15 minutes or more.
Ramp Meter Methodology based on SANTEC/ ITE Guidelines.
The lanes shown in the table refer to the Year 2015 Direct Connector (Run C) scenario.
NM – Not metered.
DNE – Does not exist.

TABLE 7–15
EXISTING AND YEAR 2015 RAMP METER ANALYSIS (MAXIMUM 15 MINUTE DELAY METHOD)

Ramp Meter Location	Model Run: Scenario	Ramp Meter Analysis							
		Total SOV Peak Hour Volume [a] (veh/h)		Peak Hour Ramp Meter Rate [b] (veh/h)		Excess Demand (veh/h) [c]		Queue (min) [d]	
		AM	PM	AM	PM	AM	PM	AM	PM
Carmel Mountain Road to I-5 NB Bypass (2 S0V + 1 HOV)	*Existing*	NM	540	NM	398	-	142	-	**3550**
	A: No Build	567	738	670	910	-	-	-	-
	B: Auxiliary Lane Alternative	567	738	670	910	-	-	-	-
	C: Direct Connectors Alternative	567	738	670	910	-	-	-	-
	D: Hybrid Alternative	567	738	670	910	-	-	-	-
	D1: Hybrid with flyover Alternative	567	738	670	910	-	-	-	-
Carmel Mountain Road to I-5 SB Bypass (2 S0V + 1 HOV)	*Existing*	NM	NM	NM	NM	-	-	-	-
	A: No Build	855	765	1045	830	-	-	-	-
	B: Auxiliary Lane Alternative	855	765	1045	830	-	-	-	-
	C: Direct Connectors Alternative	855	765	1045	830	-	-	-	-
	D: Hybrid Alternative	855	765	1045	830	-	-	-	-
	D1: Hybrid with flyover Alternative	855	765	1045	830	-	-	-	-
Carmel Valley Road to I-5 NB (1 S0V + 1 HOV)	*Existing*	NM	612	NM	677	-	0	-	0
	A: No Build	1083	907	*870* [e]	*730*	743	437	**5320**	**4430**
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	1083	907	*870*	940	403	-	**5320**	-
	B2: No EB slip off-ramp [f]*, no WB barrier*	1083	907	*870*	940	403	-	**5320**	-
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	333	441	340	470	11	-	-	-
	C2: No EB slip off-ramp, no WB barrier	333	441	340	470	11	-	-	-
	C5: No EB slip off-ramp, with WB C-D system [g]	333	441	340	470	11	-	-	-
	D: Hybrid Alternative	333	441	340	470	11	-	-	-
	D1: Hybrid with flyover Alternative	333	441	340	470	11	-	-	-
Carmel Valley Road to I-5 SB (2 S0V)	*Existing*	840	NM	710	NM	130	-	3250	-
	A: No Build	950	940	1300	1000	-	-	-	-
	B: Auxiliary Lane, With EB slip off-ramp, no WB barrier	950	940	1300	1000	-	-	-	-
	B2: No EB slip off-ramp, no WB barrier	950	940	1300	1000	-	-	-	-
	C: Direct Connectors, With EB slip off-ramp, no WB barrier	950	940	1300	1000	-	-	-	-
	C2: No EB slip off-ramp, no WB barrier	950	940	1300	1000	-	-	-	-
	C5: No EB slip off-ramp, with WB C-D system	1250	1245	1300	1000	-	15	-	**6125**
	D: Hybrid Alternative	1250	1245	1300	1000	-	15	-	**6125**
	D1: Hybrid with flyover Alternative	1250	1245	1300	1000	-	15	-	**6125**
Del Mar Heights Road to I-5 NB (2 S0V + 1 HOV)	*Existing*	NM	1125	NM	593	-	532	-	**13,300**
	A: No Build	1297	1350	1225	1290	72	60	1800	1500
	B: Auxiliary Lane Alternative	1297	1350	1225	1290	72	60	1800	1500
	C: Direct Connectors Alternative	1008	1170	1225	1290	-	-	-	-
	D: Hybrid Alternative	1008	1170	1225	1290	-	-	-	-

TABLE 7–15
EXISTING AND YEAR 2015 RAMP METER ANALYSIS (MAXIMUM 15 MINUTE DELAY METHOD)

Ramp Meter Location	Model Run: Scenario	Ramp Meter Analysis							
		Total SOV Peak Hour Volume [a] (veh/h)		Peak Hour Ramp Meter Rate [b] (veh/h)		Excess Demand (veh/h) [c]		Queue (min) [d]	
		AM	PM	AM	PM	AM	PM	AM	PM
	D1: Hybrid with flyover Alternative	1008	1170	1225	1290	-	-	-	-
WB Del Mar Heights Road (loop ramp) to I-5 SB (2 S0V + 1 HOV)	*Existing*	810	540	368	368	442	172	**11,050**	**4300**
	A: No Build	945	630	740	550	45	35	1130	1380
	B: Auxiliary Lane Alternative	945	630	740	550	45	35	1130	1380
	C: Direct Connectors Alternative	945	630	740	550	45	35	1130	1380
	D: Hybrid Alternative	945	630	740	550	45	35	1130	1380
	D1: Hybrid with flyover Alternative	945	630	740	550	45	35	1130	1380
EB Del Mar Heights Road (direct ramp) to I-5 SB (2 S0V + 1 HOV)	*Existing*	495	495	492	492	3	3	75	75
	A: No Build	540	513	1175	750	-	-	-	-
	B: Auxiliary Lane Alternative	540	513	1175	750	-	-	-	-
	C: Direct Connectors Alternative	540	513	1175	750	-	-	-	-
	D: Hybrid Alternative	540	513	1175	750	-	-	-	-
	D1: Hybrid with flyover Alternative	540	513	1175	750	-	-	-	-
WB Via de la Valle (direct ramp) to I-5 NB (1 S0V + 1 HOV)	*Existing*	NM	360	NM	343	-	3	-	425
	A: No Build	365	470	460	480	-	-	-	-
	B: Auxiliary Lane Alternative	365	470	460	480	-	-	-	-
	C: Direct Connectors Alternative	333	450	460	480	-	-	-	-
	D: Hybrid Alternative	333	450	460	480	-	-	-	-
	D1: Hybrid with flyover Alternative	333	450	460	480	-	-	-	-
EB Via de la Valle (loop ramp) to I-5 NB (1 S0V + 1 HOV)	*Existing*	NM	540	NM	318	-	222	-	**5550**
	A: No Build	351	585	430	670	-	-	-	-
	B: Auxiliary Lane Alternative	351	585	430	670	-	-	-	-
	C: Direct Connectors Alternative	351	585	430	670	-	-	-	-
	D: Hybrid Alternative	351	585	430	670	-	-	-	-
	D1: Hybrid with flyover Alternative	351	585	430	670	-	-	-	-

TABLE 7–15
EXISTING AND YEAR 2015 RAMP METER ANALYSIS (MAXIMUM 15 MINUTE DELAY METHOD)

Ramp Meter Location	Model Run: Scenario	Ramp Meter Analysis							
		Total SOV Peak Hour Volume [a] (veh/h)		Peak Hour Ramp Meter Rate [b] (veh/h)		Excess Demand (veh/h) [c]		Queue (min) [d]	
		AM	PM	AM	PM	AM	PM	AM	PM
WB Via de la Valle (loop ramp) to I-5 SB (1 S0V + 1 HOV)	*Existing*	603	468	343	343	260	125	**6500**	**3125**
	A: No Build	666	621	750	700	-	-	-	-
	B: Auxiliary Lane Alternative	666	621	750	700	-	-	-	-
	C: Direct Connectors Alternative	666	621	750	700	-	-	-	-
	D: Hybrid Alternative	666	621	750	700	-	-	-	-
	D1: Hybrid with flyover Alternative	666	621	750	700	-	-	-	-
EB Via de la Valle (direct ramp) to I-5 SB (2 S0V + 1 HOV)	*Existing*	819	684	593	593	226	91	**5650**	2275
	A: No Build	864	729	930	770	-	-	-	-
	B: Auxiliary Lane Alternative	864	729	930	770	-	-	-	-
	C: Direct Connectors Alternative	864	729	930	770	-	-	-	-
	D: Hybrid Alternative	864	729	930	770	-	-	-	-
	D1: Hybrid with flyover Alternative	864	729	930	770	-	-	-	-
Carmel Valley Road to SR-56 WB (2 S0V + 1 HOV)	*Existing*	734	NM	343	NM	391	-	**9785**	-
	A: No Build	733	430	686	686	47	-	1170	-
	B: Auxiliary Lane Alternative	733	430	686	686	47	-	1170	-
	C: Direct Connectors Alternative	765	450	686	686	79	-	1975	-
	D: Hybrid Alternative	765	450	686	686	79	-	1975	-
	D1: Hybrid with flyover Alternative	765	450	686	686	79	-	1975	-
WB SR 56 to NB I-5 Freeway Connector (2 S0V)	*Existing*	*DNE*	*DNE*	*DNE*	*DNE*	-	-	-	-
	A: No Build	*DNE*	*DNE*	*DNE*	*DNE*	-	-	-	-
	B: Auxiliary Lane Alternative	*DNE*	*DNE*	*DNE*	*DNE*	-	-	-	-
	C: Direct Connectors Alternative [h]	750	475	660	420	90	55	2250	1375
	C2: No EB slip off-ramp, no WB barrier	750	475	660	420	90	55	2250	1375
	C5: No EB slip off-ramp, with WB C-D system	750	475	660	420	90	55	2250	1375
	D: Hybrid Alternative	750	475	660	420	90	55	2250	1375
	D1: Hybrid with flyover Alternative	750	475	660	420	90	55	2250	1375

TABLE 7–15
EXISTING AND YEAR 2015 RAMP METER ANALYSIS (MAXIMUM 15 MINUTE DELAY METHOD)

Ramp Meter Location	Model Run: Scenario	Ramp Meter Analysis							
		Total SOV Peak Hour Volume [a] (veh/h)		Peak Hour Ramp Meter Rate [b] (veh/h)		Excess Demand (veh/h) [c]		Queue (min) [d]	
		AM	PM	AM	PM	AM	PM	AM	PM
WB SR 56 to SB I-5 Freeway Connector (2 S0V)	*Existing*	*DNE*	*DNE*	*DNE*	*DNE*	-	-	-	-
	A: No Build [i]	1925	900	1750	900	175	-	4375	-
	B: Auxiliary Lane Alternative	1925	900	1750	900	175	-	4375	-
	B2: No EB slip off-ramp, no WB barrier	1925	900	1750	900	175	-	4375	-
	C: Direct Connectors Alternative	1925	900	1750	900	175	-	4375	-
	C2: No EB slip off-ramp, no WB barrier	1925	900	1750	900	175	-	4375	-
	C5: No EB slip off-ramp, with WB C-D system	1775	748	1750	900	25	-	625	-
	D: Hybrid Alternative	1775	748	1750	900	25	-	625	-
	D1: Hybrid with flyover Alternative	1775	748	1750	900	25	-	625	-

Footnotes:

a. Peak hour ramp volumes obtained from 2015 Traffic Volumes Report. SOV peak hour volumes calculated to be 90% of the total on ramp volume (10% accounted for HOV).

b. Peak hour ramp meter rate derived by Caltrans Ramp Metering Branch for the I-5 North Coast Project.

c. Excess demand = SOV Peak hour volume - ramp meter rate.

d. Delay (min) = (Excess demand / Meter rate) * 60. Delay more than 15 minutes is equal to 15 minutes as any demand exceeding 15-minutes will seek an alternative route or will choose to use the ramp during a less busy time period. In the existing scenario, ramp meter experiencing delays more than 15 minutes have been bolded. Ramp meter rates for 15-minute maximum delay have been derived for the future scenarios only. Queue = Excess demand * 25'.

e. The flow rates have been derived based on a maximum delay of 15 minutes at the ramp.

f. This scenario assumes that the EB slip off-ramp to Carmel Creek Road from the I-5 NB connector is eliminated.

General Notes:

Bold typeface indicates 15 minute delays.

The lanes shown in the table refer to the Year 2015 Direct Connector (Run C) scenario.

NM – Not metered.

DNE – Does not exist.

TABLE 8–14
YEAR 2030 RAMP METER ANALYSIS (FIXED RATE METHOD)

Ramp Meter Location	Model Run: Scenario	Ramp Meter Analysis							
		Total SOV Peak Hour Volume [a] (veh/h)		Peak Hour Ramp Meter Rate [b] (veh/h)		Delay (min) [c]		Queue Length [d]	
		AM	PM	AM	PM	AM	PM	AM	PM
Carmel Mountain Road to I-5 NB Bypass (2 S0V + 1 HOV)	*Existing*	NM	540	NM	398	-	**21**	-	**3550**
	E: No Build	648	864	670	910	-	-	-	-
	F: Auxiliary Lane Alternative	648	864	670	910	-	-	-	-
	G: Direct Connectors Alternative	648	864	670	910	-	-	-	-
	H: Hybrid	648	864	670	910	-	-	-	-
	H1: Hybrid with flyover	648	864	670	910	-	-	-	-
Carmel Mountain Road to I-5 SB Bypass (2 S0V + 1 HOV)	*Existing*	NM	NM	NM	NM	-	-	-	-
	E: No Build	1008	792	1045	830	-	-	-	-
	F: Auxiliary Lane Alternative	1008	792	1045	830	-	-	-	-
	G: Direct Connectors Alternative	1008	792	1045	830	-	-	-	-
	H: Hybrid	1008	792	1045	830	-	-	-	-
	H1: Hybrid with flyover	1008	792	1045	830	-	-	-	-
Carmel Valley Road to I-5 NB (1 S0V + 1 HOV)	*Existing*	NM	612	NM	677	-	0	-	0
	E: No Build	1213	1040	340	470	**154**	**73**	**21,830**	**14,260**
	F: Auxiliary Lane Alternative	1213	1040	340	470	**154**	**73**	**21,830**	**14,260**
	G: Direct Connectors Alternative	351	468	340	470	2	-	275	-
	G: Without EB slip off-ramp	351	468	340	470	2	-	275	-
	G: With WB Barrier	704	906	340	470	**64**	**56**	**9095**	**10,900**
	G: Without EB slip off-ramp and with WB Barrier	704	906	340	470	**64**	**56**	**9095**	**10,900**
	H: Hybrid	351	468	340	470	2	-	275	-
	H1: Hybrid with flyover	351	468	340	470	2	-	275	-
Carmel Valley Road to I-5 SB (2 SOV)	*Existing*	840	NM	710	NM	11	-	3250	-
	E: No Build	1080	1050	1300	1000	-	3	-	1250
	F: Auxiliary Lane Alternative	1080	1050	1300	1000	-	3	-	1250
	G: Direct Connectors Alternative	1080	1050	1300	1000	-	3	-	1250
	G: Without EB slip off-ramp	1080	1050	1300	1000	-	3	-	1250
	G: With WB Barrier	1457	1449	1300	1000	7	27	3925	**11,225**
	G: Without EB slip off-ramp and with WB Barrier	1457	1449	1300	1000	7	27	3925	**11,225**
	H: Hybrid	1457	1449	1300	1000	7	27	3925	**11,225**
	H1: Hybrid with flyover	1457	1449	1300	1000	7	27	3925	**11,225**
Del Mar Heights Road to I-5 NB (2 S0V + 1 HOV)	*Existing*	NM	1125	NM	593	-	**54**	-	**13,300**
	E: No Build	1504	1473	1225	1290	14	9	**6975**	**4585**
	F: Auxiliary Lane Alternative	1504	1473	1225	1290	14	9	**6975**	**4585**
	G: Direct Connectors Alternative	1170	1251	1225	1290	-	-	-	-
	H: Hybrid	1170	1251	1225	1290	-	-	-	-
	H1: Hybrid with flyover	1170	1251	1225	1290	-	-	-	-
WB Del Mar Heights Road (loop ramp) to I-5 SB (2 S0V + 1 HOV)	*Existing*	810	540	368	368	**72**	**28**	**11,050**	**4300**
	E: No Build	1125	720	740	550	**31**	**19**	**9625**	**4250**
	F: Auxiliary Lane Alternative	1125	720	740	550	**31**	**19**	**9625**	**4250**
	G: Direct Connectors Alternative [e]	1125	720	740	550	**31**	**19**	**9625**	**4250**

TABLE 8–14
YEAR 2030 RAMP METER ANALYSIS (FIXED RATE METHOD)

Ramp Meter Location	Model Run: Scenario	Ramp Meter Analysis							
		Total SOV Peak Hour Volume [a] (veh/h)		Peak Hour Ramp Meter Rate [b] (veh/h)		Delay (min) [c]		Queue Length [d]	
		AM	PM	AM	PM	AM	PM	AM	PM
	H: Hybrid	1125	720	740	550	**31**	**19**	**9625**	**4250**
	H1: Hybrid with flyover	1125	720	740	550	**31**	**19**	**9625**	**4250**
EB Del Mar Heights Road (direct ramp) to I-5 SB (2 S0V + 1 HOV)	*Existing*	495	495	492	492	3	3	75	75
	E: No Build	711	540	1175	750	-	-	-	-
	F: Auxiliary Lane Alternative	711	540	1175	750	-	-	-	-
	G: Direct Connectors Alternative [e]	711	540	1175	750	-	-	-	-
	H: Hybrid	711	540	1175	750	-	-	-	-
	H1: Hybrid with flyover	711	540	1175	750	-	-	-	-
WB Via de la Valle (direct ramp) to I-5 NB (1 S0V + 1 HOV)	*Existing*	NM	360	NM	343	-	3	-	425
	E: No Build	451	501	460	480	-	21	-	**525**
	F: Auxiliary Lane Alternative	451	501	460	480	-	21	-	**525**
	G: Direct Connectors Alternative	414	477	460	480	-	-	-	-
	H: Hybrid	414	477	460	480	-	-	-	-
	H1: Hybrid with flyover	414	477	460	480	-	-	-	-
EB Via de la Valle (loop ramp) to I-5 NB (1 S0V + 1 HOV)	*Existing*	NM	540	NM	318	-	**42**	-	**5550**
	E: No Build	387	648	430	670	-	-	-	-
	F: Auxiliary Lane Alternative	387	648	430	670	-	-	-	-
	G: Direct Connectors Alternative	387	648	430	670	-	-	-	-
	H: Hybrid	387	648	430	670	-	-	-	-
	H1: Hybrid with flyover	387	648	430	670	-	-	-	-
WB Via de la Valle (loop ramp) to I-5 SB (1 S0V + 1 HOV)	*Existing*	603	468	343	343	**45**	**22**	**6500**	**3125**
	E: No Build	720	675	750	700	-	-	-	-
	F: Auxiliary Lane Alternative	720	675	750	700	-	-	-	-
	G: Direct Connectors Alternative	720	675	750	700	-	-	-	-
	H: Hybrid	720	675	750	700	-	-	-	-
	H1: Hybrid with flyover	720	675	750	700	-	-	-	-
EB Via de la Valle (direct ramp) to I-5 SB (2 S0V + 1 HOV)	*Existing*	819	684	593	593	**23**	9	**5650**	2275
	E: No Build	882	738	930	770	-	-	-	-
	F: Auxiliary Lane Alternative	882	738	930	770	-	-	-	-
	G: Direct Connectors Alternative	882	738	930	770	-	-	-	-
	H: Hybrid	882	738	930	770	-	-	-	-
	H1: Hybrid with flyover	882	738	930	770	-	-	-	-

TABLE 8–14
YEAR 2030 RAMP METER ANALYSIS (FIXED RATE METHOD)

Ramp Meter Location	Model Run: Scenario	Ramp Meter Analysis							
		Total SOV Peak Hour Volume [a] (veh/h)		Peak Hour Ramp Meter Rate [b] (veh/h)		Delay (min) [c]		Queue Length [d]	
		AM	PM	AM	PM	AM	PM	AM	PM
Carmel Valley Road to SR-56 WB (2 S0V + 1 HOV)	*Existing*	734	NM	343	NM	**68**	-	**9785**	-
	E: No Build	755	534	686	686	69	-	**1725**	-
	F: Auxiliary Lane Alternative	755	534	686	686	69	-	**1725**	-
	G: Direct Connectors Alternative	792	558	686	686	106	-	**2650**	-
	H: Hybrid	792	558	686	686	106	-	**2650**	-
	H1: Hybrid with flyover	792	558	686	686	106	-	**2650**	-
WB SR 56 to NB I-5 Freeway Connector (2 S0V)	*Existing*	*DNE*	*DNE*	*DNE*	*DNE*	-	-	-	-
	E: No Build	*DNE*	*DNE*	*DNE*	*DNE*	-	-	-	-
	F: Auxiliary Lane Alternative	*DNE*	*DNE*	*DNE*	*DNE*	-	-	-	-
	G: Direct Connectors Alternative [i]	865	575	760	510	8	8	2625	1625
	G2: No EB slip off-ramp, no WB barrier	865	575	760	510	8	8	2625	1625
	G3: With EB slip off-ramp, with WB barrier	669	332	760	510	0	0	-	-
	G4: No EB slip off-ramp, with WB barrier	669	332	760	510	0	0	-	-
	G5: No EB slip off-ramp, with WB C-D system	865	575	760	510	8	8	2625	1625
	H: Hybrid Alternative [i]	865	575	760	510	8	8	2625	1625
	H1: Hybrid with flyover Alternative	865	575	760	510	8	8	2625	1625

TABLE 8–14
YEAR 2030 RAMP METER ANALYSIS (FIXED RATE METHOD)

Ramp Meter Location	Model Run: Scenario	Ramp Meter Analysis							
		Total SOV Peak Hour Volume [a] (veh/h)		Peak Hour Ramp Meter Rate [b] (veh/h)		Delay (min) [c]		Queue Length [d]	
		AM	PM	AM	PM	AM	PM	AM	PM
WB SR 56 to SB I-5 Freeway Connector (2 SOV)	*Existing*	*DNE*	*DNE*	*DNE*	*DNE*	-	-		
	E: No Build	1998	1000	1750[j]	900[j]	9	7	6225	2500
	F: Auxiliary Lane Alternative	1998	1000	1750	900	9	7	6225	2500
	F2: No EB slip off-ramp, no WB barrier	1998	1000	1750	900	9	7	6225	2500
	F3: With EB slip off-ramp, with WB barrier	1811	801	1750	900	2	0	1525	-
	F4: No EB slip off-ramp, with WB barrier	1811	801	1750	900	2	0	1525	-
	G: Direct Connectors Alternative	1998	1000	1750	900	9	7	6225	2500
	G2: No EB slip off-ramp, no WB barrier	1998	1000	1750	900	9	7	6225	2500
	G3: With EB slip off-ramp, with WB barrier	1811	801	1750	900	2	0	1525	-
	G4: No EB slip off-ramp, with WB barrier	1811	801	1750	900	2	0	1525	-
	G5: No EB slip off-ramp, with WB C-D system	1811	801	1750	900	2	0	1525	-
	H: Hybrid Alternative	1811	801	1750	900	2	0	1525	-
	H1: Hybrid with flyover Alternative	1811	801	1750	900	2	0	1525	-

Footnotes:

a. Peak hour ramp volumes obtained from 2030 Full Build Run G analysis. SOV peak hour volumes calculated to be 90% of the total on ramp volume (10% accounted for HOV).
b. Peak hour ramp meter rate derived by Caltrans Ramp Metering Branch for the I-5 North Coast Project.
c. Delay (min) = (Excess demand / Meter rate) * 60.
d. Queue calculated as Excess demand * 25' (assumed car length for conservative analysis).
e. Del Mar Heights Road on-ramp to I-5 SB merges with I-5 SB Bypass in the Year 2030 Build (Run G) scenario.

General Notes:

Bold typeface indicates delays 15 minutes or more.
Ramp Meter Methodology based on SANTEC/ ITE Guidelines.
The lanes shown in the table refer to the Year 2030 Build (Run G) scenario.
NM – Not metered.
DNE – Does not exist.

TABLE 8–15
YEAR 2030 RAMP METER ANALYSIS (MAXIMUM 15 MINUTE DELAY METHOD)

Ramp Meter Location	Model Run: Scenario	Ramp Meter Analysis							
		Total SOV Peak Hour Volume [a] (veh/h)		Peak Hour Ramp Meter Rate [b] (veh/h)		Delay (min) [c]		Queue Length [d]	
		AM	PM	AM	PM	AM	PM	AM	PM
Carmel Mountain Road to I-5 NB (2 S0V + 1 HOV)	*Existing*	NM	540	NM	398	-	**21**	-	**3550**
	E: No Build	648	864	670	910	-	-	-	-
	F: Auxiliary Lane Alternative	648	864	670	910	-	-	-	-
	G: Direct Connectors Alternative	648	864	670	910	-	-	-	-
	H: Hybrid Alternative	648	864	670	910	-	-	-	-
	H1: Hybrid with flyover Alternative	648	864	670	910	-	-	-	-
Carmel Mountain Road to I-5 SB (2 S0V + 1 HOV)	*Existing*	NM	NM	NM	NM	-	-	-	-
	E: No Build	1008	792	1045	830	-	-	-	-
	F: Auxiliary Lane Alternative	1008	792	1045	830	-	-	-	-
	G: Direct Connectors Alternative	1008	792	1045	830	-	-	-	-
	H: Hybrid Alternative	1008	792	1045	830	-	-	-	-
	H1: Hybrid with flyover Alternative	1008	792	1045	830	-	-	-	-
Carmel Valley Road to I-5 NB (1 S0V + 1 HOV)	*Existing*	NM	612	NM	677	-	0	-	0
	E: No Build	1213	1040	*970*[e]	*830*[e]	**15**	**15**	**6080**	**5260**
	F: Auxiliary Lane Alternative	1213	1040	*970*[e]	*830*[e]	**15**	**15**	**6080**	**5260**
	G: Direct Connectors Alternative	351	468	340	470	2	-	275	-
	G: Without EB slip off-ramp	351	468	340	470	2	-	275	-
	G: With WB Barrier	704	906	*560*[e]	*725*[e]	**15**	**15**	**3595**	**4535**
	G: Without EB slip off-ramp and with WB Barrier	704	906	*560*	*725*	**15**	**15**	**3595**	**4535**
	H: Hybrid Alternative	351	468	340	470	2	-	275	-
	H1: Hybrid with flyover Alternative	351	468	340	470	2	-	275	-
Carmel Valley Road to I-5 SB (2 S0V)	*Existing*	840	NM	710	NM	11	-	3250	-
	E: No Build	1080	1050	1300	1000	-	3	-	-
	F: Auxiliary Lane Alternative	1080	1050	1300	1000	-	3	-	-
	G: Direct Connectors Alternative	1080	1050	1300	1000	-	3	-	-
	G: Without EB slip off-ramp	1080	1050	1300	1000	-	3	-	-
	G: With WB Barrier	1457	1449	1300	*1160*[e]	7	**15**	3925	**7225**
	G: Without EB slip off-ramp and with WB Barrier	1457	1449	1300	*1160*[e]	7	**15**	3925	**7225**
	H: Hybrid Alternative	1457	1449	1300	*1160*[e]	7	**15**	3925	**7225**
	H1: Hybrid with flyover Alternative	1457	1449	1300	*1160*[e]	7	**15**	3925	**7225**
Del Mar Heights Road to I-5 NB (2 S0V + 1 HOV)	*Existing*	NM	1125	NM	593	-	**54**	-	**13,300**
	E: No Build	1504	1473	1225	1290	14	9	**6975**	**4585**
	F: Auxiliary Lane Alternative	1504	1473	1225	1290	14	9	**6975**	**4585**
	G: Direct Connectors Alternative	1170	1251	1225	1290	-	-	-	-
	H: Hybrid Alternative	1170	1251	1225	1290	-	-	-	-
	H1: Hybrid with flyover Alternative	1170	1251	1225	1290	-	-	-	-
WB Del Mar Heights Road (loop ramp) to I-5 SB (2 S0V + 1 HOV)	*Existing*	810	540	368	368	**72**	**28**	**11,050**	**4300**
	E: No Build	1125	720	*900*[e]	*575*[e]	**15**	**15**	**5625**	**3625**
	F: Auxiliary Lane Alternative	1125	720	*900*[e]	*575*[e]	**15**	**15**	**5625**	**3625**
	G: Direct Connectors Alternative	1125	720	*900*	*575*	**15**	**15**	**5625**	**3625**

TABLE 8–15
YEAR 2030 RAMP METER ANALYSIS (MAXIMUM 15 MINUTE DELAY METHOD)

Ramp Meter Location	Model Run: Scenario	Ramp Meter Analysis							
		Total SOV Peak Hour Volume [a] (veh/h)		Peak Hour Ramp Meter Rate [b] (veh/h)		Delay (min) [c]		Queue Length [d]	
		AM	PM	AM	PM	AM	PM	AM	PM
	H: Hybrid Alternative	1125	720	*900*	*575*	**15**	**15**	**5625**	**3625**
	H1: Hybrid with flyover Alternative	1125	720	*900*	*575*	**15**	**15**	**5625**	**3625**
EB Del Mar Heights Road (direct ramp) to I-5 SB (2 S0V + 1 HOV)	*Existing*	495	495	492	492	3	3	75	75
	E: No Build	711	540	1175	750	-	-	-	-
	F: Auxiliary Lane Alternative	711	540	1175	750	-	-	-	-
	G: Direct Connectors Alternative	711	540	1175	750	-	-	-	-
	H: Hybrid Alternative	711	540	1175	750	-	-	-	-
	H1: Hybrid with flyover Alternative	711	540	1175	750	-	-	-	-
WB Via de la Valle (direct ramp) to I-5 NB (1 S0V + 1 HOV)	*Existing*	NM	360	NM	343	-	3	-	425
	E: No Build	451	501	460	480	-	3	-	**525**
	F: Auxiliary Lane Alternative	451	501	460	480	-	3	-	**525**
	G: Direct Connectors Alternative	414	477	460	480	-	-	-	-
	H: Hybrid Alternative	414	477	460	480	-	-	-	-
	H1: Hybrid with flyover Alternative	414	477	460	480	-	-	-	-
EB Via de la Valle (loop ramp) to I-5 NB (1 S0V + 1 HOV)	*Existing*	NM	540	NM	318	-	**42**	-	**5550**
	E: No Build	387	648	430	670	-	-	-	-
	F: Auxiliary Lane Alternative	387	648	430	670	-	-	-	-
	G: Direct Connectors Alternative	387	648	430	670	-	-	-	-
	H: Hybrid Alternative	387	648	430	670	-	-	-	-
	H1: Hybrid with flyover Alternative	387	648	430	670	-	-	-	-
WB Via de la Valle (loop ramp) to I-5 SB (1 S0V + 1 HOV)	*Existing*	603	468	343	343	**45**	**22**	**6500**	**3125**
	E: No Build	720	675	750	700	-	-	-	-
	F: Auxiliary Lane Alternative	720	675	750	700	-	-	-	-
	G: Direct Connectors Alternative	720	675	750	700	-	-	-	-
	H: Hybrid Alternative	720	675	750	700	-	-	-	-
	H1: Hybrid with flyover Alternative	720	675	750	700	-	-	-	-
EB Via de la Valle (direct ramp) to I-5 SB (2 S0V + 1 HOV)	*Existing*	819	684	593	593	**23**	9	**5650**	2275
	E: No Build	882	738	930	770	-	-	-	-
	F: Auxiliary Lane Alternative	882	738	930	770	-	-	-	-
	G: Direct Connectors Alternative	882	738	930	770	-	-	-	-
	H: Hybrid Alternative	882	738	930	770	-	-	-	-
	H1: Hybrid with flyover Alternative	882	738	930	770	-	-	-	-
Carmel Valley Road to SR-56 WB (2 S0V + 1 HOV)	*Existing*	734	NM	343	NM	**68**	-	**9785**	-
	E: No Build	755	534	686	686	6	-	**1725**	-
	F: Auxiliary Lane Alternative	755	534	686	686	6	-	**1725**	-
	G: Direct Connectors Alternative	792	558	686	686	9	-	**2650**	-
	H: Hybrid Alternative	792	558	686	686	9	-	**2650**	-
	H1: Hybrid with flyover Alternative	792	558	686	686	9	-	**2650**	-
WB SR 56 to NB I-5 Freeway Connector (2 S0V)	*Existing*	*DNE*	*DNE*	*DNE*	*DNE*	-	-	-	-
	E: No Build	*DNE*	*DNE*	*DNE*	*DNE*	-	-	-	-
	F: Auxiliary Lane Alternative	*DNE*	*DNE*	*DNE*	*DNE*	-	-	-	-
	G: Direct Connectors Alternative	865	575	760[j]	510[j]	8	8	2625	1625

TABLE 8–15
YEAR 2030 RAMP METER ANALYSIS (MAXIMUM 15 MINUTE DELAY METHOD)

Ramp Meter Location	Model Run: Scenario	Ramp Meter Analysis							
		Total SOV Peak Hour Volume [a] (veh/h)		Peak Hour Ramp Meter Rate [b] (veh/h)		Delay (min) [c]		Queue Length [d]	
		AM	PM	AM	PM	AM	PM	AM	PM
	G2: No EB slip off-ramp, no WB barrier	865	575	760	510	8	8	2625	1625
	G3: With EB slip off-ramp, with WB barrier	669	332	760	510	0	0	-	-
	G4: No EB slip off-ramp, with WB barrier	669	332	760	510	0	0	-	-
	G5: No EB slip off-ramp, with WB C-D system	865	575	760	510	8	8	2625	1625
	H: Hybrid Alternative	865	575	760	510	8	8	2625	1625
	H1: Hybrid with flyover Alternative	865	575	760	510	8	8	2625	1625
WB SR 56 to SB I-5 Freeway Connector (2 S0V)	*Existing*	*DNE*	*DNE*	*DNE*	*DNE*	-	-		
	E: No Build	1998	1000	1750 [k]	900 [k]	9	7	6225	2500
	F: Auxiliary Lane Alternative	1998	1000	1750	900	9	7	6225	2500
	F2: No EB slip off-ramp, no WB barrier	1998	1000	1750	900	9	7	6225	2500
	F3: With EB slip off-ramp, with WB barrier	1811	801	1750	900	2	0	1525	-
	F4: No EB slip off-ramp, with WB barrier	1811	801	1750	900	2	0	1525	-
	G: Direct Connectors Alternative	1998	1000	1750	900	9	7	6225	2500
	G2: No EB slip off-ramp, no WB barrier	1998	1000	1750	900	9	7	6225	2500
	G3: With EB slip off-ramp, with WB barrier	1811	801	1750	900	2	0	1525	-
	G4: No EB slip off-ramp, with WB barrier	1811	801	1750	900	2	0	1525	-
	G5: No EB slip off-ramp, with WB C-D system	1811	801	1750	900	2	0	1525	-
	H: Hybrid Alternative	1811	801	1750	900	2	0	1525	-
	H1: Hybrid with flyover Alternative	1811	801	1750	900	2	0	1525	-

Footnotes:

a. Peak hour ramp volumes obtained from 2030 Full Build Run G analysis. SOV peak hour volumes calculated to be 90% of the total on ramp volume (10% accounted for HOV).

b. Peak hour ramp meter rate derived by Caltrans Ramp Metering Branch for the I-5 North Coast Project.

c. Delay (min) = (Excess demand / Meter rate) * 60.

d. Queue calculated as Excess demand * 25' (assumed car length for conservative analysis). The ramp meter rate for the 15-minute maximum delay method can be adjusted only for future scenarios and not for existing.

e. Del Mar Heights Road on-ramp to I-5 SB merges with I-5 SB Bypass in the Year 2030 Build (Run G) scenario.

General Notes:

Bold typeface indicates delays 15 minutes or more.
Ramp Meter Methodology based on SANTEC/ ITE Guidelines.
The lanes shown in the table refer to the Year 2030 Build (Run G) scenario.
NM – Not metered. DNE – Does not exist.