

Attachment C

HCM Merge, Diverge, and Weaving Analysis Worksheets

HCS7 Freeway Merge Text Report

FREEWAY MERGE ANALYSIS

File Name: Merge_SR57N_OnRamp_EB_Katella_AM.xuf
 Analyst: Mladen Popovic
 Agency: Dudek
 Jurisdiction: Caltrans
 Date: 8/14/2018
 Analysis Year: 2018
 Time Period Analyzed: 2035 AM Peak Hour
 Project Description: SR-57 N, Katella Avenue on-ramp (EB Katella Ave), Ball Road
 Basin EIR
 Units: U.S. Customary

LOS and Performance Measures

Density in On-Ramp (Merge) Influence Area, DR	27.1	pc/mi/ln
Level of Service, LOS	C	
Average Flow in Outer Lanes, vOA	3748	pc/mi/ln
Average Speed in Ramp Influence Area, SR	60.4	mi/h
Average Speed in Outer Lanes of Freeway, SO	67.5	mi/h
Average Speed for On-Ramp (Merge) Junction, S	64.0	mi/h
Density Across All Lanes, D	29.7	pc/mi/ln

Step 1: Specify Inputs and Convert Demand Volumes to Demand Flow Rates

Freeway Data			
Number of Freeway Lanes	5		ln
Freeway Free-Flow Speed, FFS	72.4		mi/h
Segment Length	1500		ft
Multilane Highway or C-D Roadway?	Freeway		
Demand Volume, V	8058		veh/h
Peak Hour Factor, PHF	0.94		
Ramp Data			
Number of Ramp Lanes	1		ln
Ramp Free-Flow Speed, SFR	25.0		mi/h
Ramp Side	Right		
Length of First Acceleration Lane, LA or LA1	575		ft
Length of Second Acceleration Lane, LA2	-		ft
Junction Components			
	Freeway	Ramp	
Demand Volume, V	8058	707	veh/h
Peak Hour Factor, PHF	0.94	0.94	
Percent Total Trucks	2.00	2.00	%
Percent SUTs	-	-	%
Percent TTs	-	-	%
Prop.Total Trucks, PT	0.0200	0.0200	
Heavy Vehicle PCE, ET	2.000	2.000	
Heavy Vehicle Adj., fHV	0.980	0.980	
Terrain Type	Level	Level	
Percent Grade	-	-	%
Grade Length	-	-	mi
Demand Adj.Factor, DAF	1.000	1.000	
Demand Flow Rate, v	8747	767	pc/h

Step 2: Estimate the Approaching Flow Rate in Lanes 1 and 2

Estimating Flow in Lanes 1 and 2 for On-Ramps			
Adjacent Upstream Off-Ramp Equilibrium Distance, LEQ	-		ft
Adjacent Downstream Off-Ramp Equilibrium Distance, LEQ	-		ft
Prop. Freeway Veh. in Lanes 1 and 2, PFM	0.122		
Flow Rate in Lanes 1 and 2, v12	2499		pc/h

Step 3: Estimate Capacity of Ramp-Freeway Junction and Compare Flow Rates

Capacity Checks

	Actual	Maximum	Violation?
vFO	9514	12000	No
vR	767	1900	No
vR12	3266	4600	No
	Freeway	Ramp	
Unadjusted Capacity, cmd	12000	1900	pc/h
Driver Population	All Familiar	All Familiar	
Driver Population CAF	1.000	1.000	
Weather Type	Non-Severe Weather	Non-Severe Weather	
Weather Type CAF	1.000	1.000	
Incident Type	No Incident	-	
Final Capacity Adj. Factor, CAF	1.000	1.000	
Adjusted Capacity, cmda	12000	1900	pc/h

Step 4: Estimate Density in Ramp Influence Area and Determine LOS

Demand Flow Rate on Ramp, vR	767	pc/h
Demand Flow Rate in Lanes 1 and 2, v12	2499	pc/h
Length of Acceleration Lane, LA	575	ft
Density in On-Ramp Influence Area, DR	27.1	pc/mi/ln
Density in On-Ramp Influence Area, DR	26.6	veh/mi/ln
Level of Service, LOS	C	

Step 5: Estimate Speeds in the Vicinity of Ramp-Freeway Junctions

Freeway Free-Flow Speed, FFS	72.4	mi/h
Ramp Free-Flow Speed, SFR	25.0	mi/h
Length of Acceleration Lane, LA	575	ft
Driver Population	All Familiar	
Driver Population SAF	1.000	
Weather Type	Non-Severe Weather	
Weather Type SAF	1.000	
Final Speed Adjustment Factor, SAF	1.000	
Demand Flow Rate on Freeway, vF4eff	6247	pc/h
Demand Flow Rate in Lanes 1 and 2, v12	2499	pc/h
Total Demand Flow Entering On-Ramp Infl. Area, vR12	3266	pc/h
Number of Outer Lanes on Freeway, NO	2	ln
Speed Index for On-Ramp, MS	0.394	
Average Speed in Ramp Influence Area, SR	60.4	mi/h
Average Flow in Outer Lanes, vOA	1874	pc/h/ln
Average Speed in Outer Lanes of Freeway, SO	67.5	mi/h
Average Speed for On-Ramp Junction, S	64.0	mi/h
Density Across All Lanes, D	29.7	pc/mi/ln

HCS7 Freeway Weaving Segments Text Report

FREEWAY WEAIVING SEGMENT ANALYSIS

File Name: Weave_SR57N_KatellaOn_Balloff_AM.xuf
 Analyst: Mladen Popovic
 Agency: Mladen Popovic
 Jurisdiction: Caltrans
 Date: 8/15/2018
 Analysis Year: 2018
 Time Period Analyzed: 2035 AM Peak Hour
 Project Description: SR-57 N, Katella Ave on-ramp to Ball Rd off-ramp, Ball Road
 Basin EIR
 Units: U.S. Customary

LOS and Performance Measures

Demand Flow Rate, v	9510	pc/h
Capacity, cW	10177	pc/h
Volume-to-Capacity Ratio, v/c	0.83	
Average Speed, S	56.1	mi/h
Density, D	33.9	pc/mi/ln
Level of Service, LOS	D	

Step 1: Input Data

Segment Type	Freeway	
Number of Lanes, N	5	ln
Free-Flow Speed, FFS	72.7	mi/h
Weaving Configuration	One-Sided	
Number of Maneuver Lanes, NWL	2	ln
Short Length, LS	2130	ft
Interchange Density, ID	1.33	int/mi
Terrain Type	Level	
Percent Grade	-	%
Grade Length	-	mi
On-Ramp Terrain Type	Level	
Percent Grade	-	%
Grade Length	-	mi
Off-Ramp Terrain Type	Level	
Percent Grade	-	%
Grade Length	-	mi
Minimum Ramp-to-Freeway Lane Changes, LCRF	1	lc/pc
Minimum Freeway-to-Ramp Lane Changes, LCFR	1	lc/pc
Minimum Ramp-to-Ramp Lane Changes, LCRR	0	lc/pc
Freeway-to-Freeway Demand, VFF	7094	veh/h
Ramp-to-Freeway Demand, VRF	133	veh/h
Freeway-to-Ramp Demand, VFR	715	veh/h
Ramp-to-Ramp Demand, VRR	13	veh/h
Peak Hour Factor, PHF	0.94	
Percent Total Trucks	12.40	%
Percent Single-Unit Trucks, SUT	-	%
Percent Tractor-Trailers, TT	-	%

Step 2: Adjust Volume

Volume Components

	VFF	VRF	VRR	VFR	
Demand Volume, Vi	7094	133	13	715	veh/h
Peak Hour Factor, PHF	0.94	0.94	0.94	0.94	
Percent Total Trucks	12.40	12.40	12.40	12.40	%
Percent Single-Unit Trucks, SUT	-	-	-	-	%
Percent Tractor-Trailers, TT	-	-	-	-	%
Proportion of Total Trucks, PT	0.1240	0.1240	0.1240	0.1240	
Heavy Vehicle PCE, ET	2.000	2.000	2.000	2.000	
Heavy Vehicle Adjustment Factor, fHV	0.890	0.890	0.890	0.890	

Demand Adjustment Factor, DAF	1.000	1.000	1.000	1.000	
Flow Rate, vi	8480	159	16	855	pc/h
Weaving Flow Rate, vW	1014				pc/h
Non-Weaving Flow Rate, vNW	8496				pc/h
Total Flow Rate, v	9510				pc/h
Volume Ratio, VR	0.107				

Step 3: Determine Configuration Characteristics

Weaving Configuration	One-Sided				
Minimum Ramp-to-Freeway Lane Changes, LCRF	1				lc/pc
Minimum Freeway-to-Ramp Lane Changes, LCFR	1				lc/pc
Minimum Ramp-to-Ramp Lane Changes, LCRR	0				lc/pc
Ramp-to-Freeway Flow Rate, vRF	159				pc/h
Freeway-to-Ramp Flow Rate, vFR	855				pc/h
Ramp-to-Ramp Flow Rate, vRR	16				pc/h
Minimum Weaving Lane-Changing Rate, LCMIN	1014				lc/h

Step 4: Determine Maximum Weaving Length

Volume Ratio, VR	0.107				
Number of Maneuver Lanes, NWL	2				ln
Maximum Weaving Segment Length, LMAX	3608				ft
Short Length, LS	2130				ft

Step 5: Determine Weaving Segment Capacity

Volume Ratio, VR	0.107				
Short Length, LS	2130				ft
Number of Maneuver Lanes, NWL	2				ln
Number of Lanes, N	5				ln
Heavy Vehicle Adjustment Factor, fHV	0.890				
Freeway Segment Capacity, cIFL	2400				pc/h/ln
Density-Based Capacity, cIWL	2287				pc/h/ln
Demand Flow-Based Capacity, cIW	22430				pc/h
Weaving Segment Capacity, cW	10177				veh/h
Unadjusted Capacity of Weaving Area, cW	10177				veh/h
Driver Population	All Familiar				
Driver Population CAF	1.000				
Weather Type	Non-Severe Weather				
Weather Type CAF	1.000				
Incident Type	No Incident				
Incident Type CAF	1.000				
Final Capacity Adjustment Factor, CAF	1.000				
Adjusted Capacity of Weaving Area, cwa	10177				veh/h
Adjusted Capacity of Weaving Area	11436				pc/h
Volume-to-Capacity Ratio, v/c	0.83				

Step 6: Determine Lane-Changing Rates

Minimum Weaving Lane-Changing Rate, LCMIN	1014				lc/h
Short Length, LS	2130				ft
Number of Lanes, N	5				ln
Interchange Density, ID	1.33				int/mi
Non-Weaving Flow Rate, vNW	8496				pc/h
Non-Weaving Vehicle Index, INW	2407				
Weaving Lane-Changing Rate, LCW	1835				lc/h
Non-Weaving Lane-Changing Rate, LCNW	3584				lc/h
Total Lane-Changing Rate, LCALL	5419				lc/h

Step 7: Determine Average Speeds of Weaving and Non-Weaving Vehicles

Free-Flow Speed, FFS	72.7				mi/h
Driver Population	All Familiar				
Driver Population SAF	1.000				
Weather Type	Non-Severe Weather				

Weather Type SAF	1.000	
Final Speed Adjustment Factor, SAF	1.000	
Total Lane-Changing Rate, LCALL	5419	lc/h
Short Length, LS	2130	ft
Weaving Intensity Factor, W	0.472	
Minimum Average Weaving Speed, SMIN	15	mi/h
Maximum Average Weaving Speed, SMAX	72.7	mi/h
Average Weaving Speed, SW	54.2	mi/h
Average Non-Weaving Speed, SNW	56.3	mi/h
Average Speed, S	56.1	mi/h

Step 8: Determine LOS

Demand Flow Rate, v	9510	pc/h
Number of Lanes, N	5	ln
Average Speed, S	56.1	mi/h
Density, D	33.9	pc/mi/ln
Level of Service, LOS	D	

This Freeway Weaving Segment text report was created in HCS™ Freeways Version 7.5 on 8/21/2018 13:22:41

HCS7 Freeway Merge Text Report

FREEWAY MERGE ANALYSIS

File Name: Merge_SR57N_OnRamp_EB_Ball_AM.xuf
 Analyst: Mladen Popovic
 Agency: Dudek
 Jurisdiction: Caltrans
 Date: 8/14/2018
 Analysis Year: 2018
 Time Period Analyzed: 2035 AM Peak Hour
 Project Description: SR-57 N, Ball Road on-ramp (EB Ball Rd), Ball Road Basin
 EIR
 Units: U.S. Customary

LOS and Performance Measures

Density in On-Ramp (Merge) Influence Area, DR	26.2	pc/mi/ln
Level of Service, LOS	C	
Average Flow in Outer Lanes, vOA	4005	pc/mi/ln
Average Speed in Ramp Influence Area, SR	60.9	mi/h
Average Speed in Outer Lanes of Freeway, SO	67.3	mi/h
Average Speed for On-Ramp (Merge) Junction, S	64.3	mi/h
Density Across All Lanes, D	30.1	pc/mi/ln

Step 1: Specify Inputs and Convert Demand Volumes to Demand Flow Rates

Freeway Data			
Number of Freeway Lanes	5		ln
Freeway Free-Flow Speed, FFS	72.7		mi/h
Segment Length	1500		ft
Multilane Highway or C-D Roadway?	Freeway		
Demand Volume, V	7676		veh/h
Peak Hour Factor, PHF	0.94		
Ramp Data			
Number of Ramp Lanes	1		ln
Ramp Free-Flow Speed, SFR	25.0		mi/h
Ramp Side	Right		
Length of First Acceleration Lane, LA or LA1	600		ft
Length of Second Acceleration Lane, LA2	-		ft
Junction Components			
	Freeway	Ramp	
Demand Volume, V	7676	411	veh/h
Peak Hour Factor, PHF	0.94	0.94	
Percent Total Trucks	12.40	12.40	%
Percent SUTs	-	-	%
Percent TTs	-	-	%
Prop.Total Trucks, PT	0.1240	0.1240	
Heavy Vehicle PCE, ET	2.000	2.000	
Heavy Vehicle Adj., fHV	0.890	0.890	
Terrain Type	Level	Level	
Percent Grade	-	-	%
Grade Length	-	-	mi
Demand Adj.Factor, DAF	1.000	1.000	
Demand Flow Rate, v	9175	491	pc/h

Step 2: Estimate the Approaching Flow Rate in Lanes 1 and 2

Estimating Flow in Lanes 1 and 2 for On-Ramps			
Adjacent Upstream Off-Ramp Equilibrium Distance, LEQ	-		ft
Adjacent Downstream Off-Ramp Equilibrium Distance, LEQ	-		ft
Prop. Freeway Veh. in Lanes 1 and 2, PFM	0.156		
Flow Rate in Lanes 1 and 2, v12	2670		pc/h

Step 3: Estimate Capacity of Ramp-Freeway Junction and Compare Flow Rates

Capacity Checks

	Actual	Maximum	Violation?
vFO	9666	12000	No
vR	491	1900	No
vR12	3161	4600	No
	Freeway	Ramp	
Unadjusted Capacity, cmd	12000	1900	pc/h
Driver Population	All Familiar	All Familiar	
Driver Population CAF	1.000	1.000	
Weather Type	Non-Severe Weather	Non-Severe Weather	
Weather Type CAF	1.000	1.000	
Incident Type	No Incident	-	
Final Capacity Adj. Factor, CAF	1.000	1.000	
Adjusted Capacity, cmda	12000	1900	pc/h

Step 4: Estimate Density in Ramp Influence Area and Determine LOS

Demand Flow Rate on Ramp, vR	491	pc/h
Demand Flow Rate in Lanes 1 and 2, v12	2670	pc/h
Length of Acceleration Lane, LA	600	ft
Density in On-Ramp Influence Area, DR	26.2	pc/mi/ln
Density in On-Ramp Influence Area, DR	23.3	veh/mi/ln
Level of Service, LOS	C	

Step 5: Estimate Speeds in the Vicinity of Ramp-Freeway Junctions

Freeway Free-Flow Speed, FFS	72.7	mi/h
Ramp Free-Flow Speed, SFR	25.0	mi/h
Length of Acceleration Lane, LA	600	ft
Driver Population	All Familiar	
Driver Population SAF	1.000	
Weather Type	Non-Severe Weather	
Weather Type SAF	1.000	
Final Speed Adjustment Factor, SAF	1.000	
Demand Flow Rate on Freeway, vF4eff	6675	pc/h
Demand Flow Rate in Lanes 1 and 2, v12	2670	pc/h
Total Demand Flow Entering On-Ramp Infl. Area, vR12	3161	pc/h
Number of Outer Lanes on Freeway, NO	2	ln
Speed Index for On-Ramp, MS	0.383	
Average Speed in Ramp Influence Area, SR	60.9	mi/h
Average Flow in Outer Lanes, vOA	2003	pc/h/ln
Average Speed in Outer Lanes of Freeway, SO	67.3	mi/h
Average Speed for On-Ramp Junction, S	64.3	mi/h
Density Across All Lanes, D	30.1	pc/mi/ln

This Freeway Merge Segment text report was created in HCS™ Freeways Version 7.5 on 8/15/2018 15:54:41

HCS7 Freeway Merge Text Report

FREEWAY MERGE ANALYSIS

File Name: Merge_SR57N_OnRamp_WB_Ball_AM.xuf
 Analyst: Mladen Popovic
 Agency: Dudek
 Jurisdiction: Caltrans
 Date: 8/14/2018
 Analysis Year: 2018
 Time Period Analyzed: 2035 AM Peak Hour
 Project Description: SR-57 N, Ball Road on-ramp (WB Ball Rd), Ball Road Basin
 EIR
 Units: U.S. Customary

LOS and Performance Measures

Density in On-Ramp (Merge) Influence Area, DR	24.8	pc/mi/ln
Level of Service, LOS	C	
Average Flow in Outer Lanes, vOA	3916	pc/mi/ln
Average Speed in Ramp Influence Area, SR	62.8	mi/h
Average Speed in Outer Lanes of Freeway, SO	68.4	mi/h
Average Speed for On-Ramp (Merge) Junction, S	65.8	mi/h
Density Across All Lanes, D	28.6	pc/mi/ln

Step 1: Specify Inputs and Convert Demand Volumes to Demand Flow Rates

Freeway Data			
Number of Freeway Lanes	5		ln
Freeway Free-Flow Speed, FFS	73.6		mi/h
Segment Length	1500		ft
Multilane Highway or C-D Roadway?	Freeway		
Demand Volume, V	8265		veh/h
Peak Hour Factor, PHF	0.94		
Ramp Data			
Number of Ramp Lanes	1		ln
Ramp Free-Flow Speed, SFR	45.0		mi/h
Ramp Side	Right		
Length of First Acceleration Lane, LA or LA1	650		ft
Length of Second Acceleration Lane, LA2	-		ft
Junction Components			
	Freeway	Ramp	
Demand Volume, V	8265	364	veh/h
Peak Hour Factor, PHF	0.94	0.94	
Percent Total Trucks	2.70	2.70	%
Percent SUTs	-	-	%
Percent TTs	-	-	%
Prop.Total Trucks, PT	0.0270	0.0270	
Heavy Vehicle PCE, ET	2.000	2.000	
Heavy Vehicle Adj., fHV	0.974	0.974	
Terrain Type	Level	Level	
Percent Grade	-	-	%
Grade Length	-	-	mi
Demand Adj.Factor, DAF	1.000	1.000	
Demand Flow Rate, v	9027	398	pc/h

Step 2: Estimate the Approaching Flow Rate in Lanes 1 and 2

Estimating Flow in Lanes 1 and 2 for On-Ramps			
Adjacent Upstream Off-Ramp Equilibrium Distance, LEQ	-		ft
Adjacent Downstream Off-Ramp Equilibrium Distance, LEQ	-		ft
Prop. Freeway Veh. in Lanes 1 and 2, PFM	0.168		
Flow Rate in Lanes 1 and 2, v12	2611		pc/h

Step 3: Estimate Capacity of Ramp-Freeway Junction and Compare Flow Rates

Capacity Checks

	Actual	Maximum	Violation?
vFO	9425	12000	No
vR	398	2100	No
vR12	3009	4600	No
	Freeway	Ramp	
Unadjusted Capacity, cmd	12000	2100	pc/h
Driver Population	All Familiar	All Familiar	
Driver Population CAF	1.000	1.000	
Weather Type	Non-Severe Weather	Non-Severe Weather	
Weather Type CAF	1.000	1.000	
Incident Type	No Incident	-	
Final Capacity Adj. Factor, CAF	1.000	1.000	
Adjusted Capacity, cmda	12000	2100	pc/h

 Step 4: Estimate Density in Ramp Influence Area and Determine LOS

Demand Flow Rate on Ramp, vR	398	pc/h
Demand Flow Rate in Lanes 1 and 2, v12	2611	pc/h
Length of Acceleration Lane, LA	650	ft
Density in On-Ramp Influence Area, DR	24.8	pc/mi/ln
Density in On-Ramp Influence Area, DR	24.2	veh/mi/ln
Level of Service, LOS	C	

 Step 5: Estimate Speeds in the Vicinity of Ramp-Freeway Junctions

Freeway Free-Flow Speed, FFS	73.6	mi/h
Ramp Free-Flow Speed, SFR	45.0	mi/h
Length of Acceleration Lane, LA	650	ft
Driver Population	All Familiar	
Driver Population SAF	1.000	
Weather Type	Non-Severe Weather	
Weather Type SAF	1.000	
Final Speed Adjustment Factor, SAF	1.000	
Demand Flow Rate on Freeway, vF4eff	6527	pc/h
Demand Flow Rate in Lanes 1 and 2, v12	2611	pc/h
Total Demand Flow Entering On-Ramp Infl. Area, vR12	3009	pc/h
Number of Outer Lanes on Freeway, NO	2	ln
Speed Index for On-Ramp, MS	0.342	
Average Speed in Ramp Influence Area, SR	62.8	mi/h
Average Flow in Outer Lanes, vOA	1958	pc/h/ln
Average Speed in Outer Lanes of Freeway, SO	68.4	mi/h
Average Speed for On-Ramp Junction, S	65.8	mi/h
Density Across All Lanes, D	28.6	pc/mi/ln

This Freeway Merge Segment text report was created in HCS™ Freeways Version 7.5 on 8/15/2018 15:56:21

 FREEWAY DIVERGE ANALYSIS

File Name: Diverge_SR57N_OffRamp_Lincoln_AM.xuf
 Analyst: Mladen Popovic
 Agency: Dudek
 Jurisdiction: Caltrans
 Date: 8/15/2018
 Analysis Year: 2018
 Time Period Analyzed: 2035 AM Peak Hour
 Project Description: SR-57 N, Lincoln Avenue off-ramp, Ball Road Basin EIR
 Units: U.S. Customary

 LOS and Performance Measures

Density in Off-Ramp (Diverge) Influence Area, DR	32.5	pc/mi/ln
Level of Service, LOS	D	
Average Flow in Outer Lanes, vOA	3785	pc/mi/ln
Average Speed in Ramp Influence Area, SR	62.7	mi/h
Average Speed in Outer Lanes of Freeway, SO	77.3	mi/h
Average Speed for Off-Ramp (Diverge) Junction, S	69.6	mi/h
Density Across All Lanes, D	25.9	pc/mi/ln

 Step 1: Specify Inputs and Convert Demand Volumes to Demand Flow Rates

Freeway Data			
Number of Freeway Lanes	5		ln
Freeway Free-Flow Speed, FFS	73.6		mi/h
Segment Length	1500		ft
Multilane Highway or C-D Roadway?	Freeway		
Demand Volume, V	8265		veh/h
Peak Hour Factor, PHF	0.94		

Ramp Data			
Number of Ramp Lanes	1		ln
Ramp Free-Flow Speed, SFR	45.0		mi/h
Ramp Side	Right		
Length of First Deceleration Lane, LD or LD1	150		ft
Length of Second Deceleration Lane, LD2	-		ft

Junction Components	Freeway	Ramp	
Demand Volume, V	8265	469	veh/h
Peak Hour Factor, PHF	0.94	0.94	
Percent Total Trucks	2.70	2.70	%
Percent SUTs	-	-	%
Percent TTs	-	-	%
Prop.Total Trucks, PT	0.0270	0.0270	
Heavy Vehicle PCE, ET	2.000	2.000	
Heavy Vehicle Adj., fHV	0.974	0.974	
Terrain Type	Level	Level	
Percent Grade	-	-	%
Grade Length	-	-	mi
Demand Adj.Factor, DAF	1.000	1.000	
Demand Flow Rate, v	9027	512	pc/h

 Step 2: Estimate the Approaching Flow Rate in Lanes 1 and 2

Estimating Flow in Lanes 1 and 2 for Off-Ramps			
Adjacent Upstream On-Ramp Equilibrium Distance, LEQ	-		ft
Adjacent Downstream Off-Ramp Equilibrium Distance, LEQ	-		ft
Prop. Freeway Veh. in Lanes 1 and 2, PFD	0.436		
Flow Rate in Lanes 1 and 2, v12	3437		pc/h

 Step 3: Estimate Capacity of Ramp-Freeway Junction and Compare Flow Rates

Capacity Checks

	Actual	Maximum	Violation?
vF	9027	12000	No
vR	512	2100	No
v12	3437	4400	No
	Freeway	Ramp	
Unadjusted Capacity, cmd	12000	2100	pc/h
Driver Population	All Familiar	All Familiar	
Driver Population CAF	1.000	1.000	
Weather Type	Non-Severe Weather	Non-Severe Weather	
Weather Type CAF	1.000	1.000	
Incident Type	No Incident	-	
Final Capacity Adj. Factor, CAF	1.000	1.000	
Adjusted Capacity, cmda	12000	2100	pc/h

Step 4: Estimate Density in Ramp Influence Area and Determine LOS

Demand Flow Rate in Lanes 1 and 2, v12	3437	pc/h
Length of Deceleration Lane, LA	150	ft
Density in Off-Ramp Influence Area, DR	32.5	pc/mi/ln
Density in Off-Ramp Influence Area, DR	31.7	veh/mi/ln
Level of Service, LOS	D	

Step 5: Estimate Speeds in the Vicinity of Ramp-Freeway Junctions

Freeway Free-Flow Speed, FFS	73.6	mi/h
Ramp Free-Flow Speed, SFR	45.0	mi/h
Driver Population	All Familiar	
Driver Population SAF	1.000	
Weather Type	Non-Severe Weather	
Weather Type SAF	1.000	
Final Speed Adjustment Factor, SAF	1.000	
Demand Flow Rate on Freeway, vF4eff	7222	pc/h
Demand Flow Rate in Lanes 1 and 2, v12	3437	pc/h
Number of Outer Lanes on Freeway, NO	2	ln
Speed Index for Off-Ramp, DS	0.344	
Average Speed in Ramp Influence Area, SR	62.7	mi/h
Average Flow in Outer Lanes, vOA	1892	pc/h/ln
Average Speed in Outer Lanes of Freeway, SO	77.3	mi/h
Average Speed for Off-Ramp Junction, S	69.6	mi/h
Density Across All Lanes, D	25.9	pc/mi/ln

This Freeway Diverge Segment text report was created in HCS™ Freeways Version 7.5 on 8/15/2018 15:58:28

HCS7 Freeway Weaving Segments Text Report

FREEWAY WEAIVING SEGMENT ANALYSIS

File Name: Weave_SR57S_LincolnOn_Balloff_AM.xuf
 Analyst: Mladen Popovic
 Agency: Mladen Popovic
 Jurisdiction: Caltrans
 Date: 8/15/2018
 Analysis Year: 2018
 Time Period Analyzed: 2035 AM Peak Hour
 Project Description: SR-57 S, Lincoln Ave on-ramp to Ball Rd off-ramp, Ball Road
 Basin EIR
 Units: U.S. Customary

LOS and Performance Measures

Demand Flow Rate, v	16042	pc/h
Capacity, cW	9131	pc/h
Volume-to-Capacity Ratio, v/c	1.71	
Average Speed, S	-	mi/h
Density, D	-	pc/mi/ln
Level of Service, LOS	F	

Step 1: Input Data

Segment Type	Freeway	
Number of Lanes, N	4	ln
Free-Flow Speed, FFS	65.3	mi/h
Weaving Configuration	One-Sided	
Number of Maneuver Lanes, NWL	2	ln
Short Length, LS	3575	ft
Interchange Density, ID	1.33	int/mi
Terrain Type	Level	
Percent Grade	-	%
Grade Length	-	mi
On-Ramp Terrain Type	Level	
Percent Grade	-	%
Grade Length	-	mi
Off-Ramp Terrain Type	Level	
Percent Grade	-	%
Grade Length	-	mi
Minimum Ramp-to-Freeway Lane Changes, LCRF	1	lc/pc
Minimum Freeway-to-Ramp Lane Changes, LCFR	1	lc/pc
Minimum Ramp-to-Ramp Lane Changes, LCRR	0	lc/pc
Freeway-to-Freeway Demand, VFF	13067	veh/h
Ramp-to-Freeway Demand, VRF	277	veh/h
Freeway-to-Ramp Demand, VFR	1271	veh/h
Ramp-to-Ramp Demand, VRR	27	veh/h
Peak Hour Factor, PHF	0.94	
Percent Total Trucks	3.00	%
Percent Single-Unit Trucks, SUT	-	%
Percent Tractor-Trailers, TT	-	%

Step 2: Adjust Volume

Volume Components

	VFF	VRF	VRR	VFR	
Demand Volume, Vi	13067	277	27	1271	veh/h
Peak Hour Factor, PHF	0.94	0.94	0.94	0.94	
Percent Total Trucks	3.00	3.00	3.00	3.00	%
Percent Single-Unit Trucks, SUT	-	-	-	-	%
Percent Tractor-Trailers, TT	-	-	-	-	%
Proportion of Total Trucks, PT	0.0300	0.0300	0.0300	0.0300	
Heavy Vehicle PCE, ET	2.000	2.000	2.000	2.000	
Heavy Vehicle Adjustment Factor, fHV	0.971	0.971	0.971	0.971	

Demand Adjustment Factor, DAF	1.000	1.000	1.000	1.000	
Flow Rate, vi	14316	303	30	1393	pc/h
Weaving Flow Rate, vW	1696				pc/h
Non-Weaving Flow Rate, vNW	14346				pc/h
Total Flow Rate, v	16042				pc/h
Volume Ratio, VR	0.106				

Step 3: Determine Configuration Characteristics

Weaving Configuration	One-Sided				
Minimum Ramp-to-Freeway Lane Changes, LCRF	1				lc/pc
Minimum Freeway-to-Ramp Lane Changes, LCFR	1				lc/pc
Minimum Ramp-to-Ramp Lane Changes, LCRR	0				lc/pc
Ramp-to-Freeway Flow Rate, vRF	303				pc/h
Freeway-to-Ramp Flow Rate, vFR	1393				pc/h
Ramp-to-Ramp Flow Rate, vRR	30				pc/h
Minimum Weaving Lane-Changing Rate, LCMIN	1696				lc/h

Step 4: Determine Maximum Weaving Length

Volume Ratio, VR	0.106				
Number of Maneuver Lanes, NWL	2				ln
Maximum Weaving Segment Length, LMAX	3598				ft
Short Length, LS	3575				ft

Step 5: Determine Weaving Segment Capacity

Volume Ratio, VR	0.106				
Short Length, LS	3575				ft
Number of Maneuver Lanes, NWL	2				ln
Number of Lanes, N	4				ln
Heavy Vehicle Adjustment Factor, fHV	0.971				
Freeway Segment Capacity, cIFL	2353				pc/h/ln
Density-Based Capacity, cIWL	2351				pc/h/ln
Demand Flow-Based Capacity, cIW	22642				pc/h
Weaving Segment Capacity, cW	9131				veh/h
Unadjusted Capacity of Weaving Area, cW	9131				veh/h
Driver Population	All Familiar				
Driver Population CAF	1.000				
Weather Type	Non-Severe Weather				
Weather Type CAF	1.000				
Incident Type	No Incident				
Incident Type CAF	1.000				
Final Capacity Adjustment Factor, CAF	1.000				
Adjusted Capacity of Weaving Area, cwa	9131				veh/h
Adjusted Capacity of Weaving Area	9404				pc/h
Volume-to-Capacity Ratio, v/c	1.71				

Step 6: Determine Lane-Changing Rates

Minimum Weaving Lane-Changing Rate, LCMIN	1696				lc/h
Short Length, LS	3575				ft
Number of Lanes, N	4				ln
Interchange Density, ID	1.33				int/mi
Non-Weaving Flow Rate, vNW	14346				pc/h
Non-Weaving Vehicle Index, INW	-				
Weaving Lane-Changing Rate, LCW	-				lc/h
Non-Weaving Lane-Changing Rate, LCNW	-				lc/h
Total Lane-Changing Rate, LCALL	-				lc/h

Step 7: Determine Average Speeds of Weaving and Non-Weaving Vehicles

Free-Flow Speed, FFS	65.3				mi/h
Driver Population	All Familiar				
Driver Population SAF	1.000				
Weather Type	Non-Severe Weather				

Weather Type SAF	1.000	
Final Speed Adjustment Factor, SAF	1.000	
Total Lane-Changing Rate, LCALL	-	lc/h
Short Length, LS	3575	ft
Weaving Intensity Factor, W	-	
Minimum Average Weaving Speed, SMIN	15	mi/h
Maximum Average Weaving Speed, SMAX	65.3	mi/h
Average Weaving Speed, SW	-	mi/h
Average Non-Weaving Speed, SNW	-	mi/h
Average Speed, S	-	mi/h

Step 8: Determine LOS

Demand Flow Rate, v	16042	pc/h
Number of Lanes, N	4	ln
Average Speed, S	-	mi/h
Density, D	-	pc/mi/ln
Level of Service, LOS	F	

This Freeway Weaving Segment text report was created in HCS™ Freeways Version 7.5 on 8/16/2018 09:26:37

HCS7 Freeway Merge Text Report

FREEWAY MERGE ANALYSIS

File Name: Merge_SR57S_OnRamp_WB_Ball_AM.xuf
 Analyst: Mladen Popovic
 Agency: Dudek
 Jurisdiction: Caltrans
 Date: 8/14/2018
 Analysis Year: 2018
 Time Period Analyzed: 2035 AM Peak Hour
 Project Description: SR-57 S, Ball Road on-ramp (WB Ball Rd), Ball Road Basin
 EIR
 Units: U.S. Customary

LOS and Performance Measures

Density in On-Ramp (Merge) Influence Area, DR	81.6	pc/mi/ln
Level of Service, LOS	F	
Average Flow in Outer Lanes, vOA	5400	pc/mi/ln
Average Speed in Ramp Influence Area, SR	0.0	mi/h
Average Speed in Outer Lanes of Freeway, SO	56.4	mi/h
Average Speed for On-Ramp (Merge) Junction, S	-	mi/h
Density Across All Lanes, D	-	pc/mi/ln

Step 1: Specify Inputs and Convert Demand Volumes to Demand Flow Rates

Freeway Data			
Number of Freeway Lanes	4		ln
Freeway Free-Flow Speed, FFS	65.3		mi/h
Segment Length	1500		ft
Multilane Highway or C-D Roadway?	Freeway		
Demand Volume, V	14061		veh/h
Peak Hour Factor, PHF	0.94		
Ramp Data			
Number of Ramp Lanes	1		ln
Ramp Free-Flow Speed, SFR	25.0		mi/h
Ramp Side	Right		
Length of First Acceleration Lane, LA or LA1	575		ft
Length of Second Acceleration Lane, LA2	-		ft
Junction Components			
	Freeway	Ramp	
Demand Volume, V	14061	205	veh/h
Peak Hour Factor, PHF	0.94	0.94	
Percent Total Trucks	3.00	3.00	%
Percent SUTs	-	-	%
Percent TTs	-	-	%
Prop.Total Trucks, PT	0.0300	0.0300	
Heavy Vehicle PCE, ET	2.000	2.000	
Heavy Vehicle Adj., fHV	0.971	0.971	
Terrain Type	Level	Level	
Percent Grade	-	-	%
Grade Length	-	-	mi
Demand Adj.Factor, DAF	1.000	1.000	
Demand Flow Rate, v	15405	225	pc/h

Step 2: Estimate the Approaching Flow Rate in Lanes 1 and 2

Estimating Flow in Lanes 1 and 2 for On-Ramps		
Adjacent Upstream Off-Ramp Equilibrium Distance, LEQ	-	ft
Adjacent Downstream Off-Ramp Equilibrium Distance, LEQ	-	ft
Prop. Freeway Veh. in Lanes 1 and 2, PFM	0.190	
Flow Rate in Lanes 1 and 2, v12	10005	pc/h

Step 3: Estimate Capacity of Ramp-Freeway Junction and Compare Flow Rates

Capacity Checks

	Actual	Maximum	Violation?
vFO	15630	9400	Yes
vR	225	1900	No
vR12	10230	4600	Yes
	Freeway	Ramp	
Unadjusted Capacity, cmd	9400	1900	pc/h
Driver Population	All Familiar	All Familiar	
Driver Population CAF	1.000	1.000	
Weather Type	Non-Severe Weather	Non-Severe Weather	
Weather Type CAF	1.000	1.000	
Incident Type	No Incident	-	
Final Capacity Adj. Factor, CAF	1.000	1.000	
Adjusted Capacity, cmda	9400	1900	pc/h

Step 4: Estimate Density in Ramp Influence Area and Determine LOS

Demand Flow Rate on Ramp, vR	225	pc/h
Demand Flow Rate in Lanes 1 and 2, v12	10005	pc/h
Length of Acceleration Lane, LA	575	ft
Density in On-Ramp Influence Area, DR	81.6	pc/mi/ln
Density in On-Ramp Influence Area, DR	-	veh/mi/ln
Level of Service, LOS	F	

Step 5: Estimate Speeds in the Vicinity of Ramp-Freeway Junctions

Freeway Free-Flow Speed, FFS	65.3	mi/h
Ramp Free-Flow Speed, SFR	25.0	mi/h
Length of Acceleration Lane, LA	575	ft
Driver Population	All Familiar	
Driver Population SAF	1.000	
Weather Type	Non-Severe Weather	
Weather Type SAF	1.000	
Final Speed Adjustment Factor, SAF	1.000	
Demand Flow Rate on Freeway, vF	15405	pc/h
Demand Flow Rate in Lanes 1 and 2, v12	10005	pc/h
Total Demand Flow Entering On-Ramp Infl. Area, vR12	10230	pc/h
Number of Outer Lanes on Freeway, NO	2	ln
Speed Index for On-Ramp, MS	-	
Average Speed in Ramp Influence Area, SR	0.0	mi/h
Average Flow in Outer Lanes, vOA	2700	pc/h/ln
Average Speed in Outer Lanes of Freeway, SO	56.4	mi/h
Average Speed for On-Ramp Junction, S	-	mi/h
Density Across All Lanes, D	-	pc/mi/ln

HCS7 Freeway Weaving Segments Text Report

FREEWAY WEAIVING SEGMENT ANALYSIS

File Name: Weave_SR57S_KatellaOn_Balloff_AM.xuf
 Analyst: Mladen Popovic
 Agency: Mladen Popovic
 Jurisdiction: Caltrans
 Date: 8/15/2018
 Analysis Year: 2018
 Time Period Analyzed: 2035 AM Peak Hour
 Project Description: SR-57 S, Ball Rd On-Ramp to Katella Ave Off-Ramp, Ball Road
 Basin EIR
 Units: U.S. Customary

LOS and Performance Measures

Demand Flow Rate, v	16127	pc/h
Capacity, cW	9130	pc/h
Volume-to-Capacity Ratio, v/c	1.73	
Average Speed, S	-	mi/h
Density, D	-	pc/mi/ln
Level of Service, LOS	F	

Step 1: Input Data

Segment Type	Freeway	
Number of Lanes, N	4	ln
Free-Flow Speed, FFS	72.0	mi/h
Weaving Configuration	One-Sided	
Number of Maneuver Lanes, NWL	2	ln
Short Length, LS	2490	ft
Interchange Density, ID	1.33	int/mi
Terrain Type	Level	
Percent Grade	-	%
Grade Length	-	mi
On-Ramp Terrain Type	Level	
Percent Grade	-	%
Grade Length	-	mi
Off-Ramp Terrain Type	Level	
Percent Grade	-	%
Grade Length	-	mi
Minimum Ramp-to-Freeway Lane Changes, LCRF	1	lc/pc
Minimum Freeway-to-Ramp Lane Changes, LCFR	1	lc/pc
Minimum Ramp-to-Ramp Lane Changes, LCRR	0	lc/pc
Freeway-to-Freeway Demand, VFF	13503	veh/h
Ramp-to-Freeway Demand, VRF	613	veh/h
Freeway-to-Ramp Demand, VFR	680	veh/h
Ramp-to-Ramp Demand, VRR	61	veh/h
Peak Hour Factor, PHF	0.94	
Percent Total Trucks	2.00	%
Percent Single-Unit Trucks, SUT	-	%
Percent Tractor-Trailers, TT	-	%

Step 2: Adjust Volume

Volume Components

	VFF	VRF	VRR	VFR	
Demand Volume, Vi	13503	613	61	680	veh/h
Peak Hour Factor, PHF	0.94	0.94	0.94	0.94	
Percent Total Trucks	2.00	2.00	2.00	2.00	%
Percent Single-Unit Trucks, SUT	-	-	-	-	%
Percent Tractor-Trailers, TT	-	-	-	-	%
Proportion of Total Trucks, PT	0.0200	0.0200	0.0200	0.0200	
Heavy Vehicle PCE, ET	2.000	2.000	2.000	2.000	
Heavy Vehicle Adjustment Factor, fHV	0.980	0.980	0.980	0.980	

Demand Adjustment Factor, DAF	1.000	1.000	1.000	1.000	
Flow Rate, vi	14658	665	66	738	pc/h
Weaving Flow Rate, vW	1403				pc/h
Non-Weaving Flow Rate, vNW	14724				pc/h
Total Flow Rate, v	16127				pc/h
Volume Ratio, VR	0.087				

Step 3: Determine Configuration Characteristics

Weaving Configuration	One-Sided				
Minimum Ramp-to-Freeway Lane Changes, LCRF	1				lc/pc
Minimum Freeway-to-Ramp Lane Changes, LCFR	1				lc/pc
Minimum Ramp-to-Ramp Lane Changes, LCRR	0				lc/pc
Ramp-to-Freeway Flow Rate, vRF	665				pc/h
Freeway-to-Ramp Flow Rate, vFR	738				pc/h
Ramp-to-Ramp Flow Rate, vRR	66				pc/h
Minimum Weaving Lane-Changing Rate, LCMIN	1014				lc/h

Step 4: Determine Maximum Weaving Length

Volume Ratio, VR	0.087				
Number of Maneuver Lanes, NWL	2				ln
Maximum Weaving Segment Length, LMAX	3414				ft
Short Length, LS	2490				ft

Step 5: Determine Weaving Segment Capacity

Volume Ratio, VR	0.087				
Short Length, LS	2490				ft
Number of Maneuver Lanes, NWL	2				ln
Number of Lanes, N	4				ln
Heavy Vehicle Adjustment Factor, fHV	0.980				
Freeway Segment Capacity, cIFL	2400				pc/h/ln
Density-Based Capacity, cIWL	2329				pc/h/ln
Demand Flow-Based Capacity, cIW	27586				pc/h
Weaving Segment Capacity, cW	9130				veh/h
Unadjusted Capacity of Weaving Area, cW	9130				veh/h
Driver Population	All Familiar				
Driver Population CAF	1.000				
Weather Type	Non-Severe Weather				
Weather Type CAF	1.000				
Incident Type	No Incident				
Incident Type CAF	1.000				
Final Capacity Adjustment Factor, CAF	1.000				
Adjusted Capacity of Weaving Area, cwa	9130				veh/h
Adjusted Capacity of Weaving Area	9316				pc/h
Volume-to-Capacity Ratio, v/c	1.73				

Step 6: Determine Lane-Changing Rates

Minimum Weaving Lane-Changing Rate, LCMIN	1014				lc/h
Short Length, LS	2490				ft
Number of Lanes, N	4				ln
Interchange Density, ID	1.33				int/mi
Non-Weaving Flow Rate, vNW	14724				pc/h
Non-Weaving Vehicle Index, INW	-				
Weaving Lane-Changing Rate, LCW	-				lc/h
Non-Weaving Lane-Changing Rate, LCNW	-				lc/h
Total Lane-Changing Rate, LCALL	-				lc/h

Step 7: Determine Average Speeds of Weaving and Non-Weaving Vehicles

Free-Flow Speed, FFS	72.0				mi/h
Driver Population	All Familiar				
Driver Population SAF	1.000				
Weather Type	Non-Severe Weather				

Weather Type SAF	1.000	
Final Speed Adjustment Factor, SAF	1.000	
Total Lane-Changing Rate, LCALL	-	lc/h
Short Length, LS	2490	ft
Weaving Intensity Factor, W	-	
Minimum Average Weaving Speed, SMIN	15	mi/h
Maximum Average Weaving Speed, SMAX	72.0	mi/h
Average Weaving Speed, SW	-	mi/h
Average Non-Weaving Speed, SNW	-	mi/h
Average Speed, S	-	mi/h

Step 8: Determine LOS

Demand Flow Rate, v	16127	pc/h
Number of Lanes, N	4	ln
Average Speed, S	-	mi/h
Density, D	-	pc/mi/ln
Level of Service, LOS	F	

This Freeway Weaving Segment text report was created in HCS™ Freeways Version 7.5 on 8/21/2018 13:33:11

HCS7 Freeway Merge Text Report

FREEWAY MERGE ANALYSIS

File Name: Merge_SR57N_OnRamp_EB_Katella_PM.xuf
 Analyst: Mladen Popovic
 Agency: Dudek
 Jurisdiction: Caltrans
 Date: 8/14/2018
 Analysis Year: 2018
 Time Period Analyzed: 2035 PM Peak Hour
 Project Description: SR-57 N, Katella Avenue on-ramp (EB Katella Ave), Ball Road
 Basin EIR
 Units: U.S. Customary

LOS and Performance Measures

Density in On-Ramp (Merge) Influence Area, DR	28.0	pc/mi/ln
Level of Service, LOS	C	
Average Flow in Outer Lanes, vOA	3748	pc/mi/ln
Average Speed in Ramp Influence Area, SR	60.0	mi/h
Average Speed in Outer Lanes of Freeway, SO	67.5	mi/h
Average Speed for On-Ramp (Merge) Junction, S	63.7	mi/h
Density Across All Lanes, D	30.3	pc/mi/ln

Step 1: Specify Inputs and Convert Demand Volumes to Demand Flow Rates

Freeway Data			
Number of Freeway Lanes	5		ln
Freeway Free-Flow Speed, FFS	72.4		mi/h
Segment Length	1500		ft
Multilane Highway or C-D Roadway?	Freeway		
Demand Volume, V	8058		veh/h
Peak Hour Factor, PHF	0.94		
Ramp Data			
Number of Ramp Lanes	1		ln
Ramp Free-Flow Speed, SFR	25.0		mi/h
Ramp Side	Right		
Length of First Acceleration Lane, LA or LA1	575		ft
Length of Second Acceleration Lane, LA2	-		ft
Junction Components			
	Freeway	Ramp	
Demand Volume, V	8058	824	veh/h
Peak Hour Factor, PHF	0.94	0.94	
Percent Total Trucks	2.00	2.00	%
Percent SUTs	-	-	%
Percent TTs	-	-	%
Prop.Total Trucks, PT	0.0200	0.0200	
Heavy Vehicle PCE, ET	2.000	2.000	
Heavy Vehicle Adj., fHV	0.980	0.980	
Terrain Type	Level	Level	
Percent Grade	-	-	%
Grade Length	-	-	mi
Demand Adj.Factor, DAF	1.000	1.000	
Demand Flow Rate, v	8747	894	pc/h

Step 2: Estimate the Approaching Flow Rate in Lanes 1 and 2

Estimating Flow in Lanes 1 and 2 for On-Ramps			
Adjacent Upstream Off-Ramp Equilibrium Distance, LEQ	-		ft
Adjacent Downstream Off-Ramp Equilibrium Distance, LEQ	-		ft
Prop. Freeway Veh. in Lanes 1 and 2, PFM	0.106		
Flow Rate in Lanes 1 and 2, v12	2499		pc/h

Step 3: Estimate Capacity of Ramp-Freeway Junction and Compare Flow Rates

Capacity Checks

	Actual	Maximum	Violation?
vFO	9641	12000	No
vR	894	1900	No
vR12	3393	4600	No
	Freeway	Ramp	
Unadjusted Capacity, cmd	12000	1900	pc/h
Driver Population	All Familiar	All Familiar	
Driver Population CAF	1.000	1.000	
Weather Type	Non-Severe Weather	Non-Severe Weather	
Weather Type CAF	1.000	1.000	
Incident Type	No Incident	-	
Final Capacity Adj. Factor, CAF	1.000	1.000	
Adjusted Capacity, cmda	12000	1900	pc/h

Step 4: Estimate Density in Ramp Influence Area and Determine LOS

Demand Flow Rate on Ramp, vR	894	pc/h
Demand Flow Rate in Lanes 1 and 2, v12	2499	pc/h
Length of Acceleration Lane, LA	575	ft
Density in On-Ramp Influence Area, DR	28.0	pc/mi/ln
Density in On-Ramp Influence Area, DR	27.4	veh/mi/ln
Level of Service, LOS	C	

Step 5: Estimate Speeds in the Vicinity of Ramp-Freeway Junctions

Freeway Free-Flow Speed, FFS	72.4	mi/h
Ramp Free-Flow Speed, SFR	25.0	mi/h
Length of Acceleration Lane, LA	575	ft
Driver Population	All Familiar	
Driver Population SAF	1.000	
Weather Type	Non-Severe Weather	
Weather Type SAF	1.000	
Final Speed Adjustment Factor, SAF	1.000	
Demand Flow Rate on Freeway, vF4eff	6247	pc/h
Demand Flow Rate in Lanes 1 and 2, v12	2499	pc/h
Total Demand Flow Entering On-Ramp Infl. Area, vR12	3393	pc/h
Number of Outer Lanes on Freeway, NO	2	ln
Speed Index for On-Ramp, MS	0.408	
Average Speed in Ramp Influence Area, SR	60.0	mi/h
Average Flow in Outer Lanes, vOA	1874	pc/h/ln
Average Speed in Outer Lanes of Freeway, SO	67.5	mi/h
Average Speed for On-Ramp Junction, S	63.7	mi/h
Density Across All Lanes, D	30.3	pc/mi/ln

This Freeway Merge Segment text report was created in HCS™ Freeways Version 7.5 on 8/15/2018 15:45:17

HCS7 Freeway Weaving Segments Text Report

FREEWAY WEAVING SEGMENT ANALYSIS

File Name: Weave_SR57N_KatellaOn_Balloff_PM.xuf
 Analyst: Mladen Popovic
 Agency: Mladen Popovic
 Jurisdiction: Caltrans
 Date: 8/15/2018
 Analysis Year: 2018
 Time Period Analyzed: 2035 PM Peak Hour
 Project Description: SR-57 N, Katella Ave on-ramp to Ball Rd off-ramp, Ball Road
 Basin EIR
 Units: U.S. Customary

LOS and Performance Measures

Demand Flow Rate, v	15068	pc/h
Capacity, cW	10434	pc/h
Volume-to-Capacity Ratio, v/c	1.33	
Average Speed, S	-	mi/h
Density, D	-	pc/mi/ln
Level of Service, LOS	F	

Step 1: Input Data

Segment Type	Freeway	
Number of Lanes, N	5	ln
Free-Flow Speed, FFS	69.1	mi/h
Weaving Configuration	One-Sided	
Number of Maneuver Lanes, NWL	2	ln
Short Length, LS	2130	ft
Interchange Density, ID	1.33	int/mi
Terrain Type	Level	
Percent Grade	-	%
Grade Length	-	mi
On-Ramp Terrain Type	Level	
Percent Grade	-	%
Grade Length	-	mi
Off-Ramp Terrain Type	Level	
Percent Grade	-	%
Grade Length	-	mi
Minimum Ramp-to-Freeway Lane Changes, LCRF	1	lc/pc
Minimum Freeway-to-Ramp Lane Changes, LCFR	1	lc/pc
Minimum Ramp-to-Ramp Lane Changes, LCRR	0	lc/pc
Freeway-to-Freeway Demand, VFF	11256	veh/h
Ramp-to-Freeway Demand, VRF	621	veh/h
Freeway-to-Ramp Demand, VFR	1119	veh/h
Ramp-to-Ramp Demand, VRR	62	veh/h
Peak Hour Factor, PHF	0.94	
Percent Total Trucks	8.10	%
Percent Single-Unit Trucks, SUT	-	%
Percent Tractor-Trailers, TT	-	%

Step 2: Adjust Volume

Volume Components

	VFF	VRF	VRR	VFR	
Demand Volume, Vi	11256	621	62	1119	veh/h
Peak Hour Factor, PHF	0.94	0.94	0.94	0.94	
Percent Total Trucks	8.10	8.10	8.10	12.40	%
Percent Single-Unit Trucks, SUT	-	-	-	-	%
Percent Tractor-Trailers, TT	-	-	-	-	%
Proportion of Total Trucks, PT	0.0810	0.0810	0.0810	0.1240	
Heavy Vehicle PCE, ET	2.000	2.000	2.000	2.000	
Heavy Vehicle Adjustment Factor, fHV	0.925	0.925	0.925	0.890	

Demand Adjustment Factor, DAF	1.000	1.000	1.000	1.000	
Flow Rate, vi	12945	714	71	1338	pc/h
Weaving Flow Rate, vW	2052				pc/h
Non-Weaving Flow Rate, vNW	13016				pc/h
Total Flow Rate, v	15068				pc/h
Volume Ratio, VR	0.136				

Step 3: Determine Configuration Characteristics

Weaving Configuration	One-Sided			
Minimum Ramp-to-Freeway Lane Changes, LCRF	1			1c/pc
Minimum Freeway-to-Ramp Lane Changes, LCFR	1			1c/pc
Minimum Ramp-to-Ramp Lane Changes, LCRR	0			1c/pc
Ramp-to-Freeway Flow Rate, vRF	714			pc/h
Freeway-to-Ramp Flow Rate, vFR	1338			pc/h
Ramp-to-Ramp Flow Rate, vRR	71			pc/h
Minimum Weaving Lane-Changing Rate, LCMIN	0			1c/h

Step 4: Determine Maximum Weaving Length

Volume Ratio, VR	0.136			
Number of Maneuver Lanes, NWL	2			1n
Maximum Weaving Segment Length, LMAX	3892			ft
Short Length, LS	2130			ft

Step 5: Determine Weaving Segment Capacity

Volume Ratio, VR	0.136			
Short Length, LS	2130			ft
Number of Maneuver Lanes, NWL	2			1n
Number of Lanes, N	5			1n
Heavy Vehicle Adjustment Factor, fHV	0.925			
Freeway Segment Capacity, cIFL	2391			pc/h/1n
Density-Based Capacity, cIWL	2256			pc/h/1n
Demand Flow-Based Capacity, cIW	17647			pc/h
Weaving Segment Capacity, cW	10434			veh/h
Unadjusted Capacity of Weaving Area, cW	10434			veh/h
Driver Population	All Familiar			
Driver Population CAF	1.000			
Weather Type	Non-Severe Weather			
Weather Type CAF	1.000			
Incident Type	No Incident			
Incident Type CAF	1.000			
Final Capacity Adjustment Factor, CAF	1.000			
Adjusted Capacity of Weaving Area, cwa	10434			veh/h
Adjusted Capacity of Weaving Area	11318			pc/h
Volume-to-Capacity Ratio, v/c	1.33			

Step 6: Determine Lane-Changing Rates

Minimum Weaving Lane-Changing Rate, LCMIN	0			1c/h
Short Length, LS	2130			ft
Number of Lanes, N	5			1n
Interchange Density, ID	1.33			int/mi
Non-Weaving Flow Rate, vNW	13016			pc/h
Non-Weaving Vehicle Index, INW	-			
Weaving Lane-Changing Rate, LCW	-			1c/h
Non-Weaving Lane-Changing Rate, LCNW	-			1c/h
Total Lane-Changing Rate, LCALL	-			1c/h

Step 7: Determine Average Speeds of Weaving and Non-Weaving Vehicles

Free-Flow Speed, FFS	69.1			mi/h
Driver Population	All Familiar			
Driver Population SAF	1.000			
Weather Type	Non-Severe Weather			

Weather Type SAF	1.000	
Final Speed Adjustment Factor, SAF	1.000	
Total Lane-Changing Rate, LCALL	-	lc/h
Short Length, LS	2130	ft
Weaving Intensity Factor, W	-	
Minimum Average Weaving Speed, SMIN	15	mi/h
Maximum Average Weaving Speed, SMAX	69.1	mi/h
Average Weaving Speed, SW	-	mi/h
Average Non-Weaving Speed, SNW	-	mi/h
Average Speed, S	-	mi/h

Step 8: Determine LOS

Demand Flow Rate, v	15068	pc/h
Number of Lanes, N	5	ln
Average Speed, S	-	mi/h
Density, D	-	pc/mi/ln
Level of Service, LOS	F	

This Freeway Weaving Segment text report was created in HCS™ Freeways Version 7.5 on 8/21/2018 13:24:37

HCS7 Freeway Merge Text Report

FREEWAY MERGE ANALYSIS

File Name: Merge_SR57N_OnRamp_EB_Ball_PM.xuf
 Analyst: Mladen Popovic
 Agency: Dudek
 Jurisdiction: Caltrans
 Date: 8/14/2018
 Analysis Year: 2018
 Time Period Analyzed: 2035 PM Peak Hour
 Project Description: SR-57 N, Ball Road on-ramp (EB Ball Rd), Ball Road Basin
 EIR
 Units: U.S. Customary

LOS and Performance Measures

Density in On-Ramp (Merge) Influence Area, DR	51.1	pc/mi/ln
Level of Service, LOS	F	
Average Flow in Outer Lanes, vOA	5400	pc/mi/ln
Average Speed in Ramp Influence Area, SR	0.0	mi/h
Average Speed in Outer Lanes of Freeway, SO	60.2	mi/h
Average Speed for On-Ramp (Merge) Junction, S	-	mi/h
Density Across All Lanes, D	-	pc/mi/ln

Step 1: Specify Inputs and Convert Demand Volumes to Demand Flow Rates

Freeway Data			
Number of Freeway Lanes	5		ln
Freeway Free-Flow Speed, FFS	69.1		mi/h
Segment Length	1500		ft
Multilane Highway or C-D Roadway?	Freeway		
Demand Volume, V	11754		veh/h
Peak Hour Factor, PHF	0.94		
Ramp Data			
Number of Ramp Lanes	1		ln
Ramp Free-Flow Speed, SFR	25.0		mi/h
Ramp Side	Right		
Length of First Acceleration Lane, LA or LA1	600		ft
Length of Second Acceleration Lane, LA2	-		ft
Junction Components			
	Freeway	Ramp	
Demand Volume, V	11754	647	veh/h
Peak Hour Factor, PHF	0.94	0.94	
Percent Total Trucks	8.10	8.10	%
Percent SUTs	-	-	%
Percent TTs	-	-	%
Prop.Total Trucks, PT	0.0810	0.0810	
Heavy Vehicle PCE, ET	2.000	2.000	
Heavy Vehicle Adj., fHV	0.925	0.925	
Terrain Type	Level	Level	
Percent Grade	-	-	%
Grade Length	-	-	mi
Demand Adj.Factor, DAF	1.000	1.000	
Demand Flow Rate, v	13518	744	pc/h

Step 2: Estimate the Approaching Flow Rate in Lanes 1 and 2

Estimating Flow in Lanes 1 and 2 for On-Ramps			
Adjacent Upstream Off-Ramp Equilibrium Distance, LEQ	-		ft
Adjacent Downstream Off-Ramp Equilibrium Distance, LEQ	-		ft
Prop. Freeway Veh. in Lanes 1 and 2, PFM	0.125		
Flow Rate in Lanes 1 and 2, v12	5618		pc/h

Step 3: Estimate Capacity of Ramp-Freeway Junction and Compare Flow Rates

Capacity Checks

	Actual	Maximum	Violation?
vFO	14262	11750	Yes
vR	744	1900	No
vR12	6362	4600	Yes
	Freeway	Ramp	
Unadjusted Capacity, cmd	11750	1900	pc/h
Driver Population	All Familiar	All Familiar	
Driver Population CAF	1.000	1.000	
Weather Type	Non-Severe Weather	Non-Severe Weather	
Weather Type CAF	1.000	1.000	
Incident Type	No Incident	-	
Final Capacity Adj. Factor, CAF	1.000	1.000	
Adjusted Capacity, cmda	11750	1900	pc/h

Step 4: Estimate Density in Ramp Influence Area and Determine LOS

Demand Flow Rate on Ramp, vR	744	pc/h
Demand Flow Rate in Lanes 1 and 2, v12	5618	pc/h
Length of Acceleration Lane, LA	600	ft
Density in On-Ramp Influence Area, DR	51.1	pc/mi/ln
Density in On-Ramp Influence Area, DR	-	veh/mi/ln
Level of Service, LOS	F	

Step 5: Estimate Speeds in the Vicinity of Ramp-Freeway Junctions

Freeway Free-Flow Speed, FFS	69.1	mi/h
Ramp Free-Flow Speed, SFR	25.0	mi/h
Length of Acceleration Lane, LA	600	ft
Driver Population	All Familiar	
Driver Population SAF	1.000	
Weather Type	Non-Severe Weather	
Weather Type SAF	1.000	
Final Speed Adjustment Factor, SAF	1.000	
Demand Flow Rate on Freeway, vF4eff	11018	pc/h
Demand Flow Rate in Lanes 1 and 2, v12	5618	pc/h
Total Demand Flow Entering On-Ramp Infl. Area, vR12	6362	pc/h
Number of Outer Lanes on Freeway, NO	2	ln
Speed Index for On-Ramp, MS	-	
Average Speed in Ramp Influence Area, SR	0.0	mi/h
Average Flow in Outer Lanes, vOA	2700	pc/h/ln
Average Speed in Outer Lanes of Freeway, SO	60.2	mi/h
Average Speed for On-Ramp Junction, S	-	mi/h
Density Across All Lanes, D	-	pc/mi/ln

This Freeway Merge Segment text report was created in HCS™ Freeways Version 7.5 on 8/15/2018 15:55:25

HCS7 Freeway Merge Text Report

FREEWAY MERGE ANALYSIS

File Name: Merge_SR57N_OnRamp_WB_Ball_PM.xuf
 Analyst: Mladen Popovic
 Agency: Dudek
 Jurisdiction: Caltrans
 Date: 8/14/2018
 Analysis Year: 2018
 Time Period Analyzed: 2035 PM Peak Hour
 Project Description: SR-57 N, Ball Road on-ramp (WB Ball Rd), Ball Road Basin
 EIR
 Units: U.S. Customary

LOS and Performance Measures

Density in On-Ramp (Merge) Influence Area, DR	54.5	pc/mi/ln
Level of Service, LOS	F	
Average Flow in Outer Lanes, vOA	5400	pc/mi/ln
Average Speed in Ramp Influence Area, SR	0.0	mi/h
Average Speed in Outer Lanes of Freeway, SO	58.7	mi/h
Average Speed for On-Ramp (Merge) Junction, S	-	mi/h
Density Across All Lanes, D	-	pc/mi/ln

Step 1: Specify Inputs and Convert Demand Volumes to Demand Flow Rates

Freeway Data			
Number of Freeway Lanes	5		ln
Freeway Free-Flow Speed, FFS	67.6		mi/h
Segment Length	1500		ft
Multilane Highway or C-D Roadway?	Freeway		
Demand Volume, V	12811		veh/h
Peak Hour Factor, PHF	0.94		
Ramp Data			
Number of Ramp Lanes	1		ln
Ramp Free-Flow Speed, SFR	45.0		mi/h
Ramp Side	Right		
Length of First Acceleration Lane, LA or LA1	650		ft
Length of Second Acceleration Lane, LA2	-		ft
Junction Components			
	Freeway	Ramp	
Demand Volume, V	12811	850	veh/h
Peak Hour Factor, PHF	0.94	0.94	
Percent Total Trucks	1.50	1.50	%
Percent SUTs	-	-	%
Percent TTs	-	-	%
Prop.Total Trucks, PT	0.0150	0.0150	
Heavy Vehicle PCE, ET	2.000	2.000	
Heavy Vehicle Adj., fHV	0.985	0.985	
Terrain Type	Level	Level	
Percent Grade	-	-	%
Grade Length	-	-	mi
Demand Adj.Factor, DAF	1.000	1.000	
Demand Flow Rate, v	13836	918	pc/h

Step 2: Estimate the Approaching Flow Rate in Lanes 1 and 2

Estimating Flow in Lanes 1 and 2 for On-Ramps			
Adjacent Upstream Off-Ramp Equilibrium Distance, LEQ	-		ft
Adjacent Downstream Off-Ramp Equilibrium Distance, LEQ	-		ft
Prop. Freeway Veh. in Lanes 1 and 2, PFM	0.103		
Flow Rate in Lanes 1 and 2, v12	5936		pc/h

Step 3: Estimate Capacity of Ramp-Freeway Junction and Compare Flow Rates

Capacity Checks

	Actual	Maximum	Violation?
vFO	14754	11750	Yes
vR	918	2100	No
vR12	6854	4600	Yes
	Freeway	Ramp	
Unadjusted Capacity, cmd	11750	2100	pc/h
Driver Population	All Familiar	All Familiar	
Driver Population CAF	1.000	1.000	
Weather Type	Non-Severe Weather	Non-Severe Weather	
Weather Type CAF	1.000	1.000	
Incident Type	No Incident	-	
Final Capacity Adj. Factor, CAF	1.000	1.000	
Adjusted Capacity, cmda	11750	2100	pc/h

Step 4: Estimate Density in Ramp Influence Area and Determine LOS

Demand Flow Rate on Ramp, vR	918	pc/h
Demand Flow Rate in Lanes 1 and 2, v12	5936	pc/h
Length of Acceleration Lane, LA	650	ft
Density in On-Ramp Influence Area, DR	54.5	pc/mi/ln
Density in On-Ramp Influence Area, DR	-	veh/mi/ln
Level of Service, LOS	F	

Step 5: Estimate Speeds in the Vicinity of Ramp-Freeway Junctions

Freeway Free-Flow Speed, FFS	67.6	mi/h
Ramp Free-Flow Speed, SFR	45.0	mi/h
Length of Acceleration Lane, LA	650	ft
Driver Population	All Familiar	
Driver Population SAF	1.000	
Weather Type	Non-Severe Weather	
Weather Type SAF	1.000	
Final Speed Adjustment Factor, SAF	1.000	
Demand Flow Rate on Freeway, vF4eff	11336	pc/h
Demand Flow Rate in Lanes 1 and 2, v12	5936	pc/h
Total Demand Flow Entering On-Ramp Infl. Area, vR12	6854	pc/h
Number of Outer Lanes on Freeway, NO	2	ln
Speed Index for On-Ramp, MS	-	
Average Speed in Ramp Influence Area, SR	0.0	mi/h
Average Flow in Outer Lanes, vOA	2700	pc/h/ln
Average Speed in Outer Lanes of Freeway, SO	58.7	mi/h
Average Speed for On-Ramp Junction, S	-	mi/h
Density Across All Lanes, D	-	pc/mi/ln

This Freeway Merge Segment text report was created in HCS™ Freeways Version 7.5 on 8/15/2018 15:57:33

 FREEWAY DIVERGE ANALYSIS

File Name: Diverge_SR57N_OffRamp_Lincoln_PM.xuf
 Analyst: Mladen Popovic
 Agency: Dudek
 Jurisdiction: Caltrans
 Date: 8/15/2018
 Analysis Year: 2018
 Time Period Analyzed: 2035 PM Peak Hour
 Project Description: SR-57 N, Lincoln Avenue off-ramp, Ball Road Basin EIR
 Units: U.S. Customary

 LOS and Performance Measures

Density in Off-Ramp (Diverge) Influence Area, DR	51.7	pc/mi/ln
Level of Service, LOS	F	
Average Flow in Outer Lanes, vOA	5400	pc/mi/ln
Average Speed in Ramp Influence Area, SR	57.2	mi/h
Average Speed in Outer Lanes of Freeway, SO	67.5	mi/h
Average Speed for Off-Ramp (Diverge) Junction, S	-	mi/h
Density Across All Lanes, D	-	pc/mi/ln

 Step 1: Specify Inputs and Convert Demand Volumes to Demand Flow Rates

Freeway Data			
Number of Freeway Lanes	5		ln
Freeway Free-Flow Speed, FFS	67.6		mi/h
Segment Length	1500		ft
Multilane Highway or C-D Roadway?	Freeway		
Demand Volume, V	12811		veh/h
Peak Hour Factor, PHF	0.94		

Ramp Data			
Number of Ramp Lanes	1		ln
Ramp Free-Flow Speed, SFR	45.0		mi/h
Ramp Side	Right		
Length of First Deceleration Lane, LD or LD1	150		ft
Length of Second Deceleration Lane, LD2	-		ft

Junction Components	Freeway	Ramp	
Demand Volume, V	12811	1128	veh/h
Peak Hour Factor, PHF	0.94	0.94	
Percent Total Trucks	1.50	1.50	%
Percent SUTs	-	-	%
Percent TTs	-	-	%
Prop.Total Trucks, PT	0.0150	0.0150	
Heavy Vehicle PCE, ET	2.000	2.000	
Heavy Vehicle Adj., fHV	0.985	0.985	
Terrain Type	Level	Level	
Percent Grade	-	-	%
Grade Length	-	-	mi
Demand Adj.Factor, DAF	1.000	1.000	
Demand Flow Rate, v	13836	1218	pc/h

 Step 2: Estimate the Approaching Flow Rate in Lanes 1 and 2

Estimating Flow in Lanes 1 and 2 for Off-Ramps			
Adjacent Upstream On-Ramp Equilibrium Distance, LEQ	-		ft
Adjacent Downstream Off-Ramp Equilibrium Distance, LEQ	-		ft
Prop. Freeway Veh. in Lanes 1 and 2, PFD	0.436		
Flow Rate in Lanes 1 and 2, v12	5669		pc/h

 Step 3: Estimate Capacity of Ramp-Freeway Junction and Compare Flow Rates

Capacity Checks

	Actual	Maximum	Violation?
vF	13836	11750	Yes
vR	1218	2100	No
v12	5669	4400	Yes
	Freeway	Ramp	
Unadjusted Capacity, cmd	11750	2100	pc/h
Driver Population	All Familiar	All Familiar	
Driver Population CAF	1.000	1.000	
Weather Type	Non-Severe Weather	Non-Severe Weather	
Weather Type CAF	1.000	1.000	
Incident Type	No Incident	-	
Final Capacity Adj. Factor, CAF	1.000	1.000	
Adjusted Capacity, cmda	11750	2100	pc/h

Step 4: Estimate Density in Ramp Influence Area and Determine LOS

Demand Flow Rate in Lanes 1 and 2, v12	5669	pc/h
Length of Deceleration Lane, LA	150	ft
Density in Off-Ramp Influence Area, DR	51.7	pc/mi/ln
Density in Off-Ramp Influence Area, DR	-	veh/mi/ln
Level of Service, LOS	F	

Step 5: Estimate Speeds in the Vicinity of Ramp-Freeway Junctions

Freeway Free-Flow Speed, FFS	67.6	mi/h
Ramp Free-Flow Speed, SFR	45.0	mi/h
Driver Population	All Familiar	
Driver Population SAF	1.000	
Weather Type	Non-Severe Weather	
Weather Type SAF	1.000	
Final Speed Adjustment Factor, SAF	1.000	
Demand Flow Rate on Freeway, vF4eff	11069	pc/h
Demand Flow Rate in Lanes 1 and 2, v12	5669	pc/h
Number of Outer Lanes on Freeway, NO	2	ln
Speed Index for Off-Ramp, DS	-	
Average Speed in Ramp Influence Area, SR	57.2	mi/h
Average Flow in Outer Lanes, vOA	2700	pc/h/ln
Average Speed in Outer Lanes of Freeway, SO	67.5	mi/h
Average Speed for Off-Ramp Junction, S	-	mi/h
Density Across All Lanes, D	-	pc/mi/ln

HCS7 Freeway Weaving Segments Text Report

FREEWAY WEAIVING SEGMENT ANALYSIS

File Name: Weave_SR57S_LincolnOn_Balloff_PM.xuf
 Analyst: Mladen Popovic
 Agency: Mladen Popovic
 Jurisdiction: Caltrans
 Date: 8/15/2018
 Analysis Year: 2018
 Time Period Analyzed: 2035 PM Peak Hour
 Project Description: SR-57 S, Lincoln Ave on-ramp to Ball Rd off-ramp, Ball Road
 Basin EIR
 Units: U.S. Customary

LOS and Performance Measures

Demand Flow Rate, v	10673	pc/h
Capacity, cW	9128	pc/h
Volume-to-Capacity Ratio, v/c	1.14	
Average Speed, S	-	mi/h
Density, D	-	pc/mi/ln
Level of Service, LOS	F	

Step 1: Input Data

Segment Type	Freeway	
Number of Lanes, N	4	ln
Free-Flow Speed, FFS	66.8	mi/h
Weaving Configuration	One-Sided	
Number of Maneuver Lanes, NWL	2	ln
Short Length, LS	3575	ft
Interchange Density, ID	1.33	int/mi
Terrain Type	Level	
Percent Grade	-	%
Grade Length	-	mi
On-Ramp Terrain Type	Level	
Percent Grade	-	%
Grade Length	-	mi
Off-Ramp Terrain Type	Level	
Percent Grade	-	%
Grade Length	-	mi
Minimum Ramp-to-Freeway Lane Changes, LCRF	1	lc/pc
Minimum Freeway-to-Ramp Lane Changes, LCFR	1	lc/pc
Minimum Ramp-to-Ramp Lane Changes, LCRR	0	lc/pc
Freeway-to-Freeway Demand, VFF	8353	veh/h
Ramp-to-Freeway Demand, VRF	260	veh/h
Freeway-to-Ramp Demand, VFR	1153	veh/h
Ramp-to-Ramp Demand, VRR	26	veh/h
Peak Hour Factor, PHF	0.94	
Percent Total Trucks	2.50	%
Percent Single-Unit Trucks, SUT	-	%
Percent Tractor-Trailers, TT	-	%

Step 2: Adjust Volume

Volume Components

	VFF	VRF	VRR	VFR	
Demand Volume, Vi	8353	260	26	1153	veh/h
Peak Hour Factor, PHF	0.94	0.94	0.94	0.94	
Percent Total Trucks	2.50	2.50	2.50	2.50	%
Percent Single-Unit Trucks, SUT	-	-	-	-	%
Percent Tractor-Trailers, TT	-	-	-	-	%
Proportion of Total Trucks, PT	0.0250	0.0250	0.0250	0.0250	
Heavy Vehicle PCE, ET	2.000	2.000	2.000	2.000	
Heavy Vehicle Adjustment Factor, fHV	0.976	0.976	0.976	0.976	

Demand Adjustment Factor, DAF	1.000	1.000	1.000	1.000	
Flow Rate, vi	9105	283	28	1257	pc/h
Weaving Flow Rate, vW	1540				pc/h
Non-Weaving Flow Rate, vNW	9133				pc/h
Total Flow Rate, v	10673				pc/h
Volume Ratio, VR	0.144				

Step 3: Determine Configuration Characteristics

Weaving Configuration	One-Sided			
Minimum Ramp-to-Freeway Lane Changes, LCRF	1			1c/pc
Minimum Freeway-to-Ramp Lane Changes, LCFR	1			1c/pc
Minimum Ramp-to-Ramp Lane Changes, LCRR	0			1c/pc
Ramp-to-Freeway Flow Rate, vRF	283			pc/h
Freeway-to-Ramp Flow Rate, vFR	1257			pc/h
Ramp-to-Ramp Flow Rate, vRR	28			pc/h
Minimum Weaving Lane-Changing Rate, LCMIN	0			1c/h

Step 4: Determine Maximum Weaving Length

Volume Ratio, VR	0.144			
Number of Maneuver Lanes, NWL	2			1n
Maximum Weaving Segment Length, LMAX	3972			ft
Short Length, LS	3575			ft

Step 5: Determine Weaving Segment Capacity

Volume Ratio, VR	0.144			
Short Length, LS	3575			ft
Number of Maneuver Lanes, NWL	2			1n
Number of Lanes, N	4			1n
Heavy Vehicle Adjustment Factor, fHV	0.976			
Freeway Segment Capacity, cIFL	2368			pc/h/1n
Density-Based Capacity, cIWL	2338			pc/h/1n
Demand Flow-Based Capacity, cIW	16667			pc/h
Weaving Segment Capacity, cW	9128			veh/h
Unadjusted Capacity of Weaving Area, cW	9128			veh/h
Driver Population	All Familiar			
Driver Population CAF	1.000			
Weather Type	Non-Severe Weather			
Weather Type CAF	1.000			
Incident Type	No Incident			
Incident Type CAF	1.000			
Final Capacity Adjustment Factor, CAF	1.000			
Adjusted Capacity of Weaving Area, cwa	9128			veh/h
Adjusted Capacity of Weaving Area	9352			pc/h
Volume-to-Capacity Ratio, v/c	1.14			

Step 6: Determine Lane-Changing Rates

Minimum Weaving Lane-Changing Rate, LCMIN	0			1c/h
Short Length, LS	3575			ft
Number of Lanes, N	4			1n
Interchange Density, ID	1.33			int/mi
Non-Weaving Flow Rate, vNW	9133			pc/h
Non-Weaving Vehicle Index, INW	-			
Weaving Lane-Changing Rate, LCW	-			1c/h
Non-Weaving Lane-Changing Rate, LCNW	-			1c/h
Total Lane-Changing Rate, LCALL	-			1c/h

Step 7: Determine Average Speeds of Weaving and Non-Weaving Vehicles

Free-Flow Speed, FFS	66.8			mi/h
Driver Population	All Familiar			
Driver Population SAF	1.000			
Weather Type	Non-Severe Weather			

Weather Type SAF	1.000	
Final Speed Adjustment Factor, SAF	1.000	
Total Lane-Changing Rate, LCALL	-	lc/h
Short Length, LS	3575	ft
Weaving Intensity Factor, W	-	
Minimum Average Weaving Speed, SMIN	15	mi/h
Maximum Average Weaving Speed, SMAX	66.8	mi/h
Average Weaving Speed, SW	-	mi/h
Average Non-Weaving Speed, SNW	-	mi/h
Average Speed, S	-	mi/h

Step 8: Determine LOS

Demand Flow Rate, v	10673	pc/h
Number of Lanes, N	4	ln
Average Speed, S	-	mi/h
Density, D	-	pc/mi/ln
Level of Service, LOS	F	

This Freeway Weaving Segment text report was created in HCS™ Freeways Version 7.5 on 8/16/2018 09:33:48

HCS7 Freeway Merge Text Report

FREEWAY MERGE ANALYSIS

File Name: Merge_SR57S_OnRamp_WB_Ball_PM.xuf
 Analyst: Mladen Popovic
 Agency: Dudek
 Jurisdiction: Caltrans
 Date: 8/14/2018
 Analysis Year: 2018
 Time Period Analyzed: 2035 PM Peak Hour
 Project Description: SR-57 S, Ball Road on-ramp (WB Ball Rd), Ball Road Basin
 EIR
 Units: U.S. Customary

LOS and Performance Measures

Density in On-Ramp (Merge) Influence Area, DR	43.4	pc/mi/ln
Level of Service, LOS	F	
Average Flow in Outer Lanes, vOA	5400	pc/mi/ln
Average Speed in Ramp Influence Area, SR	39.0	mi/h
Average Speed in Outer Lanes of Freeway, SO	57.9	mi/h
Average Speed for On-Ramp (Merge) Junction, S	-	mi/h
Density Across All Lanes, D	-	pc/mi/ln

Step 1: Specify Inputs and Convert Demand Volumes to Demand Flow Rates

Freeway Data			
Number of Freeway Lanes	4		ln
Freeway Free-Flow Speed, FFS	66.8		mi/h
Segment Length	1500		ft
Multilane Highway or C-D Roadway?	Freeway		
Demand Volume, V	9246		veh/h
Peak Hour Factor, PHF	0.94		
Ramp Data			
Number of Ramp Lanes	1		ln
Ramp Free-Flow Speed, SFR	25.0		mi/h
Ramp Side	Right		
Length of First Acceleration Lane, LA or LA1	575		ft
Length of Second Acceleration Lane, LA2	-		ft
Junction Components			
	Freeway	Ramp	
Demand Volume, V	9246	625	veh/h
Peak Hour Factor, PHF	0.94	0.94	
Percent Total Trucks	2.50	2.50	%
Percent SUTs	-	-	%
Percent TTs	-	-	%
Prop.Total Trucks, PT	0.0250	0.0250	
Heavy Vehicle PCE, ET	2.000	2.000	
Heavy Vehicle Adj., fHV	0.976	0.976	
Terrain Type	Level	Level	
Percent Grade	-	-	%
Grade Length	-	-	mi
Demand Adj.Factor, DAF	1.000	1.000	
Demand Flow Rate, v	10078	681	pc/h

Step 2: Estimate the Approaching Flow Rate in Lanes 1 and 2

Estimating Flow in Lanes 1 and 2 for On-Ramps			
Adjacent Upstream Off-Ramp Equilibrium Distance, LEQ	-		ft
Adjacent Downstream Off-Ramp Equilibrium Distance, LEQ	-		ft
Prop. Freeway Veh. in Lanes 1 and 2, PFM	0.133		
Flow Rate in Lanes 1 and 2, v12	4678		pc/h

Step 3: Estimate Capacity of Ramp-Freeway Junction and Compare Flow Rates

Capacity Checks

	Actual	Maximum	Violation?
vFO	10759	9400	Yes
vR	681	1900	No
vR12	5359	4600	Yes
	Freeway	Ramp	
Unadjusted Capacity, cmd	9400	1900	pc/h
Driver Population	All Familiar	All Familiar	
Driver Population CAF	1.000	1.000	
Weather Type	Non-Severe Weather	Non-Severe Weather	
Weather Type CAF	1.000	1.000	
Incident Type	No Incident	-	
Final Capacity Adj. Factor, CAF	1.000	1.000	
Adjusted Capacity, cmda	9400	1900	pc/h

Step 4: Estimate Density in Ramp Influence Area and Determine LOS

Demand Flow Rate on Ramp, vR	681	pc/h
Demand Flow Rate in Lanes 1 and 2, v12	4678	pc/h
Length of Acceleration Lane, LA	575	ft
Density in On-Ramp Influence Area, DR	43.4	pc/mi/ln
Density in On-Ramp Influence Area, DR	-	veh/mi/ln
Level of Service, LOS	F	

Step 5: Estimate Speeds in the Vicinity of Ramp-Freeway Junctions

Freeway Free-Flow Speed, FFS	66.8	mi/h
Ramp Free-Flow Speed, SFR	25.0	mi/h
Length of Acceleration Lane, LA	575	ft
Driver Population	All Familiar	
Driver Population SAF	1.000	
Weather Type	Non-Severe Weather	
Weather Type SAF	1.000	
Final Speed Adjustment Factor, SAF	1.000	
Demand Flow Rate on Freeway, vF	10078	pc/h
Demand Flow Rate in Lanes 1 and 2, v12	4678	pc/h
Total Demand Flow Entering On-Ramp Infl. Area, vR12	5359	pc/h
Number of Outer Lanes on Freeway, NO	2	ln
Speed Index for On-Ramp, MS	-	
Average Speed in Ramp Influence Area, SR	39.0	mi/h
Average Flow in Outer Lanes, vOA	2700	pc/h/ln
Average Speed in Outer Lanes of Freeway, SO	57.9	mi/h
Average Speed for On-Ramp Junction, S	-	mi/h
Density Across All Lanes, D	-	pc/mi/ln

This Freeway Merge Segment text report was created in HCS™ Freeways Version 7.5 on 8/15/2018 16:29:56

HCS7 Freeway Weaving Segments Text Report

FREEWAY WEAVING SEGMENT ANALYSIS

File Name: Weave_SR57S_KatellaOn_Balloff_PM.xuf
 Analyst: Mladen Popovic
 Agency: Mladen Popovic
 Jurisdiction: Caltrans
 Date: 8/15/2018
 Analysis Year: 2018
 Time Period Analyzed: 2035 PM Peak Hour
 Project Description: SR-57 S, Ball Rd On-Ramp to Katella Ave Off-Ramp, Ball Road
 Basin EIR
 Units: U.S. Customary

LOS and Performance Measures

Demand Flow Rate, v	11791	pc/h
Capacity, cW	9062	pc/h
Volume-to-Capacity Ratio, v/c	1.28	
Average Speed, S	-	mi/h
Density, D	-	pc/mi/ln
Level of Service, LOS	F	

Step 1: Input Data

Segment Type	Freeway	
Number of Lanes, N	4	ln
Free-Flow Speed, FFS	70.9	mi/h
Weaving Configuration	One-Sided	
Number of Maneuver Lanes, NWL	2	ln
Short Length, LS	2490	ft
Interchange Density, ID	1.33	int/mi
Terrain Type	Level	
Percent Grade	-	%
Grade Length	-	mi
On-Ramp Terrain Type	Level	
Percent Grade	-	%
Grade Length	-	mi
Off-Ramp Terrain Type	Level	
Percent Grade	-	%
Grade Length	-	mi
Minimum Ramp-to-Freeway Lane Changes, LCRF	1	lc/pc
Minimum Freeway-to-Ramp Lane Changes, LCFR	1	lc/pc
Minimum Ramp-to-Ramp Lane Changes, LCRR	0	lc/pc
Freeway-to-Freeway Demand, VFF	9558	veh/h
Ramp-to-Freeway Demand, VRF	535	veh/h
Freeway-to-Ramp Demand, VFR	738	veh/h
Ramp-to-Ramp Demand, VRR	54	veh/h
Peak Hour Factor, PHF	0.94	
Percent Total Trucks	1.80	%
Percent Single-Unit Trucks, SUT	-	%
Percent Tractor-Trailers, TT	-	%

Step 2: Adjust Volume

Volume Components

	VFF	VRF	VRR	VFR	
Demand Volume, Vi	9558	535	54	738	veh/h
Peak Hour Factor, PHF	0.94	0.94	0.94	0.94	
Percent Total Trucks	1.80	1.80	1.80	1.80	%
Percent Single-Unit Trucks, SUT	-	-	-	-	%
Percent Tractor-Trailers, TT	-	-	-	-	%
Proportion of Total Trucks, PT	0.0180	0.0180	0.0180	0.0180	
Heavy Vehicle PCE, ET	2.000	2.000	2.000	2.000	
Heavy Vehicle Adjustment Factor, fHV	0.982	0.982	0.982	0.982	

Demand Adjustment Factor, DAF	1.000	1.000	1.000	1.000	
Flow Rate, vi	10354	580	58	799	pc/h
Weaving Flow Rate, vW	1379				pc/h
Non-Weaving Flow Rate, vNW	10412				pc/h
Total Flow Rate, v	11791				pc/h
Volume Ratio, VR	0.117				

Step 3: Determine Configuration Characteristics

Weaving Configuration	One-Sided				
Minimum Ramp-to-Freeway Lane Changes, LCRF	1				lc/pc
Minimum Freeway-to-Ramp Lane Changes, LCFR	1				lc/pc
Minimum Ramp-to-Ramp Lane Changes, LCRR	0				lc/pc
Ramp-to-Freeway Flow Rate, vRF	580				pc/h
Freeway-to-Ramp Flow Rate, vFR	799				pc/h
Ramp-to-Ramp Flow Rate, vRR	58				pc/h
Minimum Weaving Lane-Changing Rate, LCMIN	0				lc/h

Step 4: Determine Maximum Weaving Length

Volume Ratio, VR	0.117				
Number of Maneuver Lanes, NWL	2				ln
Maximum Weaving Segment Length, LMAX	3705				ft
Short Length, LS	2490				ft

Step 5: Determine Weaving Segment Capacity

Volume Ratio, VR	0.117				
Short Length, LS	2490				ft
Number of Maneuver Lanes, NWL	2				ln
Number of Lanes, N	4				ln
Heavy Vehicle Adjustment Factor, fHV	0.982				
Freeway Segment Capacity, cIFL	2400				pc/h/ln
Density-Based Capacity, cIWL	2307				pc/h/ln
Demand Flow-Based Capacity, cIW	20513				pc/h
Weaving Segment Capacity, cW	9062				veh/h
Unadjusted Capacity of Weaving Area, cW	9062				veh/h
Driver Population	All Familiar				
Driver Population CAF	1.000				
Weather Type	Non-Severe Weather				
Weather Type CAF	1.000				
Incident Type	No Incident				
Incident Type CAF	1.000				
Final Capacity Adjustment Factor, CAF	1.000				
Adjusted Capacity of Weaving Area, cwa	9062				veh/h
Adjusted Capacity of Weaving Area	9227				pc/h
Volume-to-Capacity Ratio, v/c	1.28				

Step 6: Determine Lane-Changing Rates

Minimum Weaving Lane-Changing Rate, LCMIN	0				lc/h
Short Length, LS	2490				ft
Number of Lanes, N	4				ln
Interchange Density, ID	1.33				int/mi
Non-Weaving Flow Rate, vNW	10412				pc/h
Non-Weaving Vehicle Index, INW	-				
Weaving Lane-Changing Rate, LCW	-				lc/h
Non-Weaving Lane-Changing Rate, LCNW	-				lc/h
Total Lane-Changing Rate, LCALL	-				lc/h

Step 7: Determine Average Speeds of Weaving and Non-Weaving Vehicles

Free-Flow Speed, FFS	70.9				mi/h
Driver Population	All Familiar				
Driver Population SAF	1.000				
Weather Type	Non-Severe Weather				

Weather Type SAF	1.000	
Final Speed Adjustment Factor, SAF	1.000	
Total Lane-Changing Rate, LCALL	-	lc/h
Short Length, LS	2490	ft
Weaving Intensity Factor, W	-	
Minimum Average Weaving Speed, SMIN	15	mi/h
Maximum Average Weaving Speed, SMAX	70.9	mi/h
Average Weaving Speed, SW	-	mi/h
Average Non-Weaving Speed, SNW	-	mi/h
Average Speed, S	-	mi/h

Step 8: Determine LOS

Demand Flow Rate, v	11791	pc/h
Number of Lanes, N	4	ln
Average Speed, S	-	mi/h
Density, D	-	pc/mi/ln
Level of Service, LOS	F	

This Freeway Weaving Segment text report was created in HCS™ Freeways Version 7.5 on 8/21/2018 13:35:23

HCS7 Freeway Merge Text Report

FREEWAY MERGE ANALYSIS

File Name: Merge_SR57N_OnRamp_EB_Katella_AM.xuf
 Analyst: Mladen Popovic
 Agency: Dudek
 Jurisdiction: Caltrans
 Date: 8/14/2018
 Analysis Year: 2018
 Time Period Analyzed: 2035 plus Project AM Peak Hour
 Project Description: SR-57 N, Katella Avenue on-ramp (EB Katella Ave), Ball Road
 Basin EIR
 Units: U.S. Customary

LOS and Performance Measures

Density in On-Ramp (Merge) Influence Area, DR	27.1	pc/mi/ln
Level of Service, LOS	C	
Average Flow in Outer Lanes, vOA	3748	pc/mi/ln
Average Speed in Ramp Influence Area, SR	60.4	mi/h
Average Speed in Outer Lanes of Freeway, SO	67.5	mi/h
Average Speed for On-Ramp (Merge) Junction, S	64.0	mi/h
Density Across All Lanes, D	29.8	pc/mi/ln

Step 1: Specify Inputs and Convert Demand Volumes to Demand Flow Rates

Freeway Data			
Number of Freeway Lanes	5		ln
Freeway Free-Flow Speed, FFS	72.4		mi/h
Segment Length	1500		ft
Multilane Highway or C-D Roadway?	Freeway		
Demand Volume, V	8058		veh/h
Peak Hour Factor, PHF	0.94		
Ramp Data			
Number of Ramp Lanes	1		ln
Ramp Free-Flow Speed, SFR	25.0		mi/h
Ramp Side	Right		
Length of First Acceleration Lane, LA or LA1	575		ft
Length of Second Acceleration Lane, LA2	-		ft
Junction Components			
	Freeway	Ramp	
Demand Volume, V	8058	715	veh/h
Peak Hour Factor, PHF	0.94	0.94	
Percent Total Trucks	2.00	2.00	%
Percent SUTs	-	-	%
Percent TTs	-	-	%
Prop.Total Trucks, PT	0.0200	0.0200	
Heavy Vehicle PCE, ET	2.000	2.000	
Heavy Vehicle Adj., fHV	0.980	0.980	
Terrain Type	Level	Level	
Percent Grade	-	-	%
Grade Length	-	-	mi
Demand Adj.Factor, DAF	1.000	1.000	
Demand Flow Rate, v	8747	776	pc/h

Step 2: Estimate the Approaching Flow Rate in Lanes 1 and 2

Estimating Flow in Lanes 1 and 2 for On-Ramps			
Adjacent Upstream Off-Ramp Equilibrium Distance, LEQ	-		ft
Adjacent Downstream Off-Ramp Equilibrium Distance, LEQ	-		ft
Prop. Freeway Veh. in Lanes 1 and 2, PFM	0.121		
Flow Rate in Lanes 1 and 2, v12	2499		pc/h

Step 3: Estimate Capacity of Ramp-Freeway Junction and Compare Flow Rates

Capacity Checks

	Actual	Maximum	Violation?
vFO	9523	12000	No
vR	776	1900	No
vR12	3275	4600	No
	Freeway	Ramp	
Unadjusted Capacity, cmd	12000	1900	pc/h
Driver Population	All Familiar	All Familiar	
Driver Population CAF	1.000	1.000	
Weather Type	Non-Severe Weather	Non-Severe Weather	
Weather Type CAF	1.000	1.000	
Incident Type	No Incident	-	
Final Capacity Adj. Factor, CAF	1.000	1.000	
Adjusted Capacity, cmda	12000	1900	pc/h

Step 4: Estimate Density in Ramp Influence Area and Determine LOS

Demand Flow Rate on Ramp, vR	776	pc/h
Demand Flow Rate in Lanes 1 and 2, v12	2499	pc/h
Length of Acceleration Lane, LA	575	ft
Density in On-Ramp Influence Area, DR	27.1	pc/mi/ln
Density in On-Ramp Influence Area, DR	26.6	veh/mi/ln
Level of Service, LOS	C	

Step 5: Estimate Speeds in the Vicinity of Ramp-Freeway Junctions

Freeway Free-Flow Speed, FFS	72.4	mi/h
Ramp Free-Flow Speed, SFR	25.0	mi/h
Length of Acceleration Lane, LA	575	ft
Driver Population	All Familiar	
Driver Population SAF	1.000	
Weather Type	Non-Severe Weather	
Weather Type SAF	1.000	
Final Speed Adjustment Factor, SAF	1.000	
Demand Flow Rate on Freeway, vF4eff	6247	pc/h
Demand Flow Rate in Lanes 1 and 2, v12	2499	pc/h
Total Demand Flow Entering On-Ramp Infl. Area, vR12	3275	pc/h
Number of Outer Lanes on Freeway, NO	2	ln
Speed Index for On-Ramp, MS	0.395	
Average Speed in Ramp Influence Area, SR	60.4	mi/h
Average Flow in Outer Lanes, vOA	1874	pc/h/ln
Average Speed in Outer Lanes of Freeway, SO	67.5	mi/h
Average Speed for On-Ramp Junction, S	64.0	mi/h
Density Across All Lanes, D	29.8	pc/mi/ln

HCS7 Freeway Weaving Segments Text Report

FREEWAY WEAIVING SEGMENT ANALYSIS

File Name: Weave_SR57N_KatellaOn_Balloff_AM.xuf
 Analyst: Mladen Popovic
 Agency: Mladen Popovic
 Jurisdiction: Caltrans
 Date: 8/15/2018
 Analysis Year: 2018
 Time Period Analyzed: 2035 plus Project AM Peak Hour
 Project Description: SR-57 N, Katella Ave on-ramp to Ball Rd off-ramp, Ball Road
 Basin EIR
 Units: U.S. Customary

LOS and Performance Measures

Demand Flow Rate, v	9590	pc/h
Capacity, cW	10159	pc/h
Volume-to-Capacity Ratio, v/c	0.84	
Average Speed, S	55.5	mi/h
Density, D	34.6	pc/mi/ln
Level of Service, LOS	D	

Step 1: Input Data

Segment Type	Freeway	
Number of Lanes, N	5	ln
Free-Flow Speed, FFS	72.7	mi/h
Weaving Configuration	One-Sided	
Number of Maneuver Lanes, NWL	2	ln
Short Length, LS	2130	ft
Interchange Density, ID	1.33	int/mi
Terrain Type	Level	
Percent Grade	-	%
Grade Length	-	mi
On-Ramp Terrain Type	Level	
Percent Grade	-	%
Grade Length	-	mi
Off-Ramp Terrain Type	Level	
Percent Grade	-	%
Grade Length	-	mi
Minimum Ramp-to-Freeway Lane Changes, LCRF	1	lc/pc
Minimum Freeway-to-Ramp Lane Changes, LCFR	1	lc/pc
Minimum Ramp-to-Ramp Lane Changes, LCRR	0	lc/pc
Freeway-to-Freeway Demand, VFF	7109	veh/h
Ramp-to-Freeway Demand, VRF	141	veh/h
Freeway-to-Ramp Demand, VFR	759	veh/h
Ramp-to-Ramp Demand, VRR	14	veh/h
Peak Hour Factor, PHF	0.94	
Percent Total Trucks	12.40	%
Percent Single-Unit Trucks, SUT	-	%
Percent Tractor-Trailers, TT	-	%

Step 2: Adjust Volume

Volume Components

	VFF	VRF	VRR	VFR	
Demand Volume, Vi	7109	141	14	759	veh/h
Peak Hour Factor, PHF	0.94	0.94	0.94	0.94	
Percent Total Trucks	12.40	12.40	12.40	12.40	%
Percent Single-Unit Trucks, SUT	-	-	-	-	%
Percent Tractor-Trailers, TT	-	-	-	-	%
Proportion of Total Trucks, PT	0.1240	0.1240	0.1240	0.1240	
Heavy Vehicle PCE, ET	2.000	2.000	2.000	2.000	
Heavy Vehicle Adjustment Factor, fHV	0.890	0.890	0.890	0.890	

Demand Adjustment Factor, DAF	1.000	1.000	1.000	1.000	
Flow Rate, vi	8497	169	17	907	pc/h
Weaving Flow Rate, vW	1076				pc/h
Non-Weaving Flow Rate, vNW	8514				pc/h
Total Flow Rate, v	9590				pc/h
Volume Ratio, VR	0.112				

Step 3: Determine Configuration Characteristics

Weaving Configuration	One-Sided				
Minimum Ramp-to-Freeway Lane Changes, LCRF	1				lc/pc
Minimum Freeway-to-Ramp Lane Changes, LCFR	1				lc/pc
Minimum Ramp-to-Ramp Lane Changes, LCRR	0				lc/pc
Ramp-to-Freeway Flow Rate, vRF	169				pc/h
Freeway-to-Ramp Flow Rate, vFR	907				pc/h
Ramp-to-Ramp Flow Rate, vRR	17				pc/h
Minimum Weaving Lane-Changing Rate, LCMIN	1076				lc/h

Step 4: Determine Maximum Weaving Length

Volume Ratio, VR	0.112				
Number of Maneuver Lanes, NWL	2				ln
Maximum Weaving Segment Length, LMAX	3656				ft
Short Length, LS	2130				ft

Step 5: Determine Weaving Segment Capacity

Volume Ratio, VR	0.112				
Short Length, LS	2130				ft
Number of Maneuver Lanes, NWL	2				ln
Number of Lanes, N	5				ln
Heavy Vehicle Adjustment Factor, fHV	0.890				
Freeway Segment Capacity, cIFL	2400				pc/h/ln
Density-Based Capacity, cIWL	2283				pc/h/ln
Demand Flow-Based Capacity, cIW	21429				pc/h
Weaving Segment Capacity, cW	10159				veh/h
Unadjusted Capacity of Weaving Area, cW	10159				veh/h
Driver Population	All Familiar				
Driver Population CAF	1.000				
Weather Type	Non-Severe Weather				
Weather Type CAF	1.000				
Incident Type	No Incident				
Incident Type CAF	1.000				
Final Capacity Adjustment Factor, CAF	1.000				
Adjusted Capacity of Weaving Area, cwa	10159				veh/h
Adjusted Capacity of Weaving Area	11415				pc/h
Volume-to-Capacity Ratio, v/c	0.84				

Step 6: Determine Lane-Changing Rates

Minimum Weaving Lane-Changing Rate, LCMIN	1076				lc/h
Short Length, LS	2130				ft
Number of Lanes, N	5				ln
Interchange Density, ID	1.33				int/mi
Non-Weaving Flow Rate, vNW	8514				pc/h
Non-Weaving Vehicle Index, INW	2412				
Weaving Lane-Changing Rate, LCW	1897				lc/h
Non-Weaving Lane-Changing Rate, LCNW	3588				lc/h
Total Lane-Changing Rate, LCALL	5485				lc/h

Step 7: Determine Average Speeds of Weaving and Non-Weaving Vehicles

Free-Flow Speed, FFS	72.7				mi/h
Driver Population	All Familiar				
Driver Population SAF	1.000				
Weather Type	Non-Severe Weather				

Weather Type SAF	1.000	
Final Speed Adjustment Factor, SAF	1.000	
Total Lane-Changing Rate, LCALL	5485	lc/h
Short Length, LS	2130	ft
Weaving Intensity Factor, W	0.477	
Minimum Average Weaving Speed, SMIN	15	mi/h
Maximum Average Weaving Speed, SMAX	72.7	mi/h
Average Weaving Speed, SW	54.1	mi/h
Average Non-Weaving Speed, SNW	55.7	mi/h
Average Speed, S	55.5	mi/h

Step 8: Determine LOS

Demand Flow Rate, v	9590	pc/h
Number of Lanes, N	5	ln
Average Speed, S	55.5	mi/h
Density, D	34.6	pc/mi/ln
Level of Service, LOS	D	

This Freeway Weaving Segment text report was created in HCS™ Freeways Version 7.5 on 8/21/2018 13:26:29

HCS7 Freeway Merge Text Report

FREEWAY MERGE ANALYSIS

File Name: Merge_SR57N_OnRamp_EB_Ball_AM.xuf
 Analyst: Mladen Popovic
 Agency: Dudek
 Jurisdiction: Caltrans
 Date: 8/14/2018
 Analysis Year: 2018
 Time Period Analyzed: 2035 plus Project AM Peak Hour
 Project Description: SR-57 N, Ball Road on-ramp (EB Ball Rd), Ball Road Basin
 EIR
 Units: U.S. Customary

LOS and Performance Measures

Density in On-Ramp (Merge) Influence Area, DR	26.2	pc/mi/ln
Level of Service, LOS	C	
Average Flow in Outer Lanes, vOA	4005	pc/mi/ln
Average Speed in Ramp Influence Area, SR	60.9	mi/h
Average Speed in Outer Lanes of Freeway, SO	67.3	mi/h
Average Speed for On-Ramp (Merge) Junction, S	64.3	mi/h
Density Across All Lanes, D	30.1	pc/mi/ln

Step 1: Specify Inputs and Convert Demand Volumes to Demand Flow Rates

Freeway Data			
Number of Freeway Lanes	5		ln
Freeway Free-Flow Speed, FFS	72.7		mi/h
Segment Length	1500		ft
Multilane Highway or C-D Roadway?	Freeway		
Demand Volume, V	7676		veh/h
Peak Hour Factor, PHF	0.94		
Ramp Data			
Number of Ramp Lanes	1		ln
Ramp Free-Flow Speed, SFR	25.0		mi/h
Ramp Side	Right		
Length of First Acceleration Lane, LA or LA1	600		ft
Length of Second Acceleration Lane, LA2	-		ft
Junction Components			
	Freeway	Ramp	
Demand Volume, V	7676	413	veh/h
Peak Hour Factor, PHF	0.94	0.94	
Percent Total Trucks	12.40	12.40	%
Percent SUTs	-	-	%
Percent TTs	-	-	%
Prop.Total Trucks, PT	0.1240	0.1240	
Heavy Vehicle PCE, ET	2.000	2.000	
Heavy Vehicle Adj., fHV	0.890	0.890	
Terrain Type	Level	Level	
Percent Grade	-	-	%
Grade Length	-	-	mi
Demand Adj.Factor, DAF	1.000	1.000	
Demand Flow Rate, v	9175	494	pc/h

Step 2: Estimate the Approaching Flow Rate in Lanes 1 and 2

Estimating Flow in Lanes 1 and 2 for On-Ramps			
Adjacent Upstream Off-Ramp Equilibrium Distance, LEQ	-		ft
Adjacent Downstream Off-Ramp Equilibrium Distance, LEQ	-		ft
Prop. Freeway Veh. in Lanes 1 and 2, PFM	0.156		
Flow Rate in Lanes 1 and 2, v12	2670		pc/h

Step 3: Estimate Capacity of Ramp-Freeway Junction and Compare Flow Rates

Capacity Checks

	Actual	Maximum	Violation?
vFO	9669	12000	No
vR	494	1900	No
vR12	3164	4600	No
	Freeway	Ramp	
Unadjusted Capacity, cmd	12000	1900	pc/h
Driver Population	All Familiar	All Familiar	
Driver Population CAF	1.000	1.000	
Weather Type	Non-Severe Weather	Non-Severe Weather	
Weather Type CAF	1.000	1.000	
Incident Type	No Incident	-	
Final Capacity Adj. Factor, CAF	1.000	1.000	
Adjusted Capacity, cmda	12000	1900	pc/h

Step 4: Estimate Density in Ramp Influence Area and Determine LOS

Demand Flow Rate on Ramp, vR	494	pc/h
Demand Flow Rate in Lanes 1 and 2, v12	2670	pc/h
Length of Acceleration Lane, LA	600	ft
Density in On-Ramp Influence Area, DR	26.2	pc/mi/ln
Density in On-Ramp Influence Area, DR	23.3	veh/mi/ln
Level of Service, LOS	C	

Step 5: Estimate Speeds in the Vicinity of Ramp-Freeway Junctions

Freeway Free-Flow Speed, FFS	72.7	mi/h
Ramp Free-Flow Speed, SFR	25.0	mi/h
Length of Acceleration Lane, LA	600	ft
Driver Population	All Familiar	
Driver Population SAF	1.000	
Weather Type	Non-Severe Weather	
Weather Type SAF	1.000	
Final Speed Adjustment Factor, SAF	1.000	
Demand Flow Rate on Freeway, vF4eff	6675	pc/h
Demand Flow Rate in Lanes 1 and 2, v12	2670	pc/h
Total Demand Flow Entering On-Ramp Infl. Area, vR12	3164	pc/h
Number of Outer Lanes on Freeway, NO	2	ln
Speed Index for On-Ramp, MS	0.383	
Average Speed in Ramp Influence Area, SR	60.9	mi/h
Average Flow in Outer Lanes, vOA	2003	pc/h/ln
Average Speed in Outer Lanes of Freeway, SO	67.3	mi/h
Average Speed for On-Ramp Junction, S	64.3	mi/h
Density Across All Lanes, D	30.1	pc/mi/ln

HCS7 Freeway Merge Text Report

FREEWAY MERGE ANALYSIS

File Name: Merge_SR57N_OnRamp_WB_Ball_AM.xuf
 Analyst: Mladen Popovic
 Agency: Dudek
 Jurisdiction: Caltrans
 Date: 8/14/2018
 Analysis Year: 2018
 Time Period Analyzed: 2035 plus Project AM Peak Hour
 Project Description: SR-57 N, Ball Road on-ramp (WB Ball Rd), Ball Road Basin
 EIR
 Units: U.S. Customary

LOS and Performance Measures

Density in On-Ramp (Merge) Influence Area, DR	24.7	pc/mi/ln
Level of Service, LOS	C	
Average Flow in Outer Lanes, vOA	3916	pc/mi/ln
Average Speed in Ramp Influence Area, SR	62.8	mi/h
Average Speed in Outer Lanes of Freeway, SO	68.4	mi/h
Average Speed for On-Ramp (Merge) Junction, S	65.9	mi/h
Density Across All Lanes, D	28.6	pc/mi/ln

Step 1: Specify Inputs and Convert Demand Volumes to Demand Flow Rates

Freeway Data			
Number of Freeway Lanes	5		ln
Freeway Free-Flow Speed, FFS	73.6		mi/h
Segment Length	1500		ft
Multilane Highway or C-D Roadway?	Freeway		
Demand Volume, V	8265		veh/h
Peak Hour Factor, PHF	0.94		
Ramp Data			
Number of Ramp Lanes	1		ln
Ramp Free-Flow Speed, SFR	45.0		mi/h
Ramp Side	Right		
Length of First Acceleration Lane, LA or LA1	650		ft
Length of Second Acceleration Lane, LA2	-		ft
Junction Components			
	Freeway	Ramp	
Demand Volume, V	8265	360	veh/h
Peak Hour Factor, PHF	0.94	0.94	
Percent Total Trucks	2.70	2.70	%
Percent SUTs	-	-	%
Percent TTs	-	-	%
Prop.Total Trucks, PT	0.0270	0.0270	
Heavy Vehicle PCE, ET	2.000	2.000	
Heavy Vehicle Adj., fHV	0.974	0.974	
Terrain Type	Level	Level	
Percent Grade	-	-	%
Grade Length	-	-	mi
Demand Adj.Factor, DAF	1.000	1.000	
Demand Flow Rate, v	9027	393	pc/h

Step 2: Estimate the Approaching Flow Rate in Lanes 1 and 2

Estimating Flow in Lanes 1 and 2 for On-Ramps			
Adjacent Upstream Off-Ramp Equilibrium Distance, LEQ	-		ft
Adjacent Downstream Off-Ramp Equilibrium Distance, LEQ	-		ft
Prop. Freeway Veh. in Lanes 1 and 2, PFM	0.169		
Flow Rate in Lanes 1 and 2, v12	2611		pc/h

Step 3: Estimate Capacity of Ramp-Freeway Junction and Compare Flow Rates

Capacity Checks

	Actual	Maximum	Violation?
vFO	9420	12000	No
vR	393	2100	No
vR12	3004	4600	No
	Freeway	Ramp	
Unadjusted Capacity, cmd	12000	2100	pc/h
Driver Population	All Familiar	All Familiar	
Driver Population CAF	1.000	1.000	
Weather Type	Non-Severe Weather	Non-Severe Weather	
Weather Type CAF	1.000	1.000	
Incident Type	No Incident	-	
Final Capacity Adj. Factor, CAF	1.000	1.000	
Adjusted Capacity, cmda	12000	2100	pc/h

 Step 4: Estimate Density in Ramp Influence Area and Determine LOS

Demand Flow Rate on Ramp, vR	393	pc/h
Demand Flow Rate in Lanes 1 and 2, v12	2611	pc/h
Length of Acceleration Lane, LA	650	ft
Density in On-Ramp Influence Area, DR	24.7	pc/mi/ln
Density in On-Ramp Influence Area, DR	24.1	veh/mi/ln
Level of Service, LOS	C	

 Step 5: Estimate Speeds in the Vicinity of Ramp-Freeway Junctions

Freeway Free-Flow Speed, FFS	73.6	mi/h
Ramp Free-Flow Speed, SFR	45.0	mi/h
Length of Acceleration Lane, LA	650	ft
Driver Population	All Familiar	
Driver Population SAF	1.000	
Weather Type	Non-Severe Weather	
Weather Type SAF	1.000	
Final Speed Adjustment Factor, SAF	1.000	
Demand Flow Rate on Freeway, vF4eff	6527	pc/h
Demand Flow Rate in Lanes 1 and 2, v12	2611	pc/h
Total Demand Flow Entering On-Ramp Infl. Area, vR12	3004	pc/h
Number of Outer Lanes on Freeway, NO	2	ln
Speed Index for On-Ramp, MS	0.341	
Average Speed in Ramp Influence Area, SR	62.8	mi/h
Average Flow in Outer Lanes, vOA	1958	pc/h/ln
Average Speed in Outer Lanes of Freeway, SO	68.4	mi/h
Average Speed for On-Ramp Junction, S	65.9	mi/h
Density Across All Lanes, D	28.6	pc/mi/ln

This Freeway Merge Segment text report was created in HCS™ Freeways Version 7.5 on 8/15/2018 16:09:19

HCS7 Freeway Diverge Text Report

FREEWAY DIVERGE ANALYSIS

File Name: Diverge_SR57N_OffRamp_Lincoln_AM.xuf
 Analyst: Mladen Popovic
 Agency: Dudek
 Jurisdiction: Caltrans
 Date: 8/15/2018
 Analysis Year: 2018
 Time Period Analyzed: 2035 plus Project AM Peak Hour
 Project Description: SR-57 N, Lincoln Avenue off-ramp, Ball Road Basin EIR
 Units: U.S. Customary

LOS and Performance Measures

Density in Off-Ramp (Diverge) Influence Area, DR	32.4	pc/mi/ln
Level of Service, LOS	D	
Average Flow in Outer Lanes, vOA	3787	pc/mi/ln
Average Speed in Ramp Influence Area, SR	62.7	mi/h
Average Speed in Outer Lanes of Freeway, SO	77.3	mi/h
Average Speed for Off-Ramp (Diverge) Junction, S	69.6	mi/h
Density Across All Lanes, D	25.9	pc/mi/ln

Step 1: Specify Inputs and Convert Demand Volumes to Demand Flow Rates

Freeway Data			
Number of Freeway Lanes	5		ln
Freeway Free-Flow Speed, FFS	73.6		mi/h
Segment Length	1500		ft
Multilane Highway or C-D Roadway?	Freeway		
Demand Volume, V	8265		veh/h
Peak Hour Factor, PHF	0.94		

Ramp Data			
Number of Ramp Lanes	1		ln
Ramp Free-Flow Speed, SFR	45.0		mi/h
Ramp Side	Right		
Length of First Deceleration Lane, LD or LD1	150		ft
Length of Second Deceleration Lane, LD2	-		ft

Junction Components		Freeway	Ramp	
Demand Volume, V	8265	465		veh/h
Peak Hour Factor, PHF	0.94	0.94		
Percent Total Trucks	2.70	2.70		%
Percent SUTs	-	-		%
Percent TTs	-	-		%
Prop.Total Trucks, PT	0.0270	0.0270		
Heavy Vehicle PCE, ET	2.000	2.000		
Heavy Vehicle Adj., fHV	0.974	0.974		
Terrain Type	Level	Level		
Percent Grade	-	-		%
Grade Length	-	-		mi
Demand Adj.Factor, DAF	1.000	1.000		
Demand Flow Rate, v	9027	508		pc/h

Step 2: Estimate the Approaching Flow Rate in Lanes 1 and 2

Estimating Flow in Lanes 1 and 2 for Off-Ramps			
Adjacent Upstream On-Ramp Equilibrium Distance, LEQ	-		ft
Adjacent Downstream Off-Ramp Equilibrium Distance, LEQ	-		ft
Prop. Freeway Veh. in Lanes 1 and 2, PFD	0.436		
Flow Rate in Lanes 1 and 2, v12	3435		pc/h

Step 3: Estimate Capacity of Ramp-Freeway Junction and Compare Flow Rates

Capacity Checks

	Actual	Maximum	Violation?
vF	9027	12000	No
vR	508	2100	No
v12	3435	4400	No
	Freeway	Ramp	
Unadjusted Capacity, cmd	12000	2100	pc/h
Driver Population	All Familiar	All Familiar	
Driver Population CAF	1.000	1.000	
Weather Type	Non-Severe Weather	Non-Severe Weather	
Weather Type CAF	1.000	1.000	
Incident Type	No Incident	-	
Final Capacity Adj. Factor, CAF	1.000	1.000	
Adjusted Capacity, cmda	12000	2100	pc/h

Step 4: Estimate Density in Ramp Influence Area and Determine LOS

Demand Flow Rate in Lanes 1 and 2, v12	3435	pc/h
Length of Deceleration Lane, LA	150	ft
Density in Off-Ramp Influence Area, DR	32.4	pc/mi/ln
Density in Off-Ramp Influence Area, DR	31.6	veh/mi/ln
Level of Service, LOS	D	

Step 5: Estimate Speeds in the Vicinity of Ramp-Freeway Junctions

Freeway Free-Flow Speed, FFS	73.6	mi/h
Ramp Free-Flow Speed, SFR	45.0	mi/h
Driver Population	All Familiar	
Driver Population SAF	1.000	
Weather Type	Non-Severe Weather	
Weather Type SAF	1.000	
Final Speed Adjustment Factor, SAF	1.000	
Demand Flow Rate on Freeway, vF4eff	7222	pc/h
Demand Flow Rate in Lanes 1 and 2, v12	3435	pc/h
Number of Outer Lanes on Freeway, NO	2	ln
Speed Index for Off-Ramp, DS	0.344	
Average Speed in Ramp Influence Area, SR	62.7	mi/h
Average Flow in Outer Lanes, vOA	1893	pc/h/ln
Average Speed in Outer Lanes of Freeway, SO	77.3	mi/h
Average Speed for Off-Ramp Junction, S	69.6	mi/h
Density Across All Lanes, D	25.9	pc/mi/ln

HCS7 Freeway Weaving Segments Text Report

FREEWAY WEAIVING SEGMENT ANALYSIS

File Name: Weave_SR57S_LincolnOn_Balloff_AM.xuf
 Analyst: Mladen Popovic
 Agency: Mladen Popovic
 Jurisdiction: Caltrans
 Date: 8/15/2018
 Analysis Year: 2018
 Time Period Analyzed: 2035 plus Project AM Peak Hour
 Project Description: SR-57 S, Lincoln Ave on-ramp to Ball Rd off-ramp, Ball Road
 Basin EIR
 Units: U.S. Customary

LOS and Performance Measures

Demand Flow Rate, v	15376	pc/h
Capacity, cW	9120	pc/h
Volume-to-Capacity Ratio, v/c	1.64	
Average Speed, S	-	mi/h
Density, D	-	pc/mi/ln
Level of Service, LOS	F	

Step 1: Input Data

Segment Type	Freeway	
Number of Lanes, N	4	ln
Free-Flow Speed, FFS	65.3	mi/h
Weaving Configuration	One-Sided	
Number of Maneuver Lanes, NWL	2	ln
Short Length, LS	3575	ft
Interchange Density, ID	1.33	int/mi
Terrain Type	Level	
Percent Grade	-	%
Grade Length	-	mi
On-Ramp Terrain Type	Level	
Percent Grade	-	%
Grade Length	-	mi
Off-Ramp Terrain Type	Level	
Percent Grade	-	%
Grade Length	-	mi
Minimum Ramp-to-Freeway Lane Changes, LCRF	1	lc/pc
Minimum Freeway-to-Ramp Lane Changes, LCFR	1	lc/pc
Minimum Ramp-to-Ramp Lane Changes, LCRR	0	lc/pc
Freeway-to-Freeway Demand, VFF	12448	veh/h
Ramp-to-Freeway Demand, VRF	282	veh/h
Freeway-to-Ramp Demand, VFR	1276	veh/h
Ramp-to-Ramp Demand, VRR	28	veh/h
Peak Hour Factor, PHF	0.94	
Percent Total Trucks	3.00	%
Percent Single-Unit Trucks, SUT	-	%
Percent Tractor-Trailers, TT	-	%

Step 2: Adjust Volume

Volume Components

	VFF	VRF	VRR	VFR	
Demand Volume, Vi	12448	282	28	1276	veh/h
Peak Hour Factor, PHF	0.94	0.94	0.94	0.94	
Percent Total Trucks	3.00	3.00	3.00	3.00	%
Percent Single-Unit Trucks, SUT	-	-	-	-	%
Percent Tractor-Trailers, TT	-	-	-	-	%
Proportion of Total Trucks, PT	0.0300	0.0300	0.0300	0.0300	
Heavy Vehicle PCE, ET	2.000	2.000	2.000	2.000	
Heavy Vehicle Adjustment Factor, fHV	0.971	0.971	0.971	0.971	

Demand Adjustment Factor, DAF	1.000	1.000	1.000	1.000	
Flow Rate, vi	13638	309	31	1398	pc/h
Weaving Flow Rate, vW	1707				pc/h
Non-Weaving Flow Rate, vNW	13669				pc/h
Total Flow Rate, v	15376				pc/h
Volume Ratio, VR	0.111				

Step 3: Determine Configuration Characteristics

Weaving Configuration	One-Sided				
Minimum Ramp-to-Freeway Lane Changes, LCRF	1				lc/pc
Minimum Freeway-to-Ramp Lane Changes, LCFR	1				lc/pc
Minimum Ramp-to-Ramp Lane Changes, LCRR	0				lc/pc
Ramp-to-Freeway Flow Rate, vRF	309				pc/h
Freeway-to-Ramp Flow Rate, vFR	1398				pc/h
Ramp-to-Ramp Flow Rate, vRR	31				pc/h
Minimum Weaving Lane-Changing Rate, LCMIN	0				lc/h

Step 4: Determine Maximum Weaving Length

Volume Ratio, VR	0.111				
Number of Maneuver Lanes, NWL	2				ln
Maximum Weaving Segment Length, LMAX	3647				ft
Short Length, LS	3575				ft

Step 5: Determine Weaving Segment Capacity

Volume Ratio, VR	0.111				
Short Length, LS	3575				ft
Number of Maneuver Lanes, NWL	2				ln
Number of Lanes, N	4				ln
Heavy Vehicle Adjustment Factor, fHV	0.971				
Freeway Segment Capacity, cIFL	2353				pc/h/ln
Density-Based Capacity, cIWL	2348				pc/h/ln
Demand Flow-Based Capacity, cIW	21622				pc/h
Weaving Segment Capacity, cW	9120				veh/h
Unadjusted Capacity of Weaving Area, cW	9120				veh/h
Driver Population	All Familiar				
Driver Population CAF	1.000				
Weather Type	Non-Severe Weather				
Weather Type CAF	1.000				
Incident Type	No Incident				
Incident Type CAF	1.000				
Final Capacity Adjustment Factor, CAF	1.000				
Adjusted Capacity of Weaving Area, cwa	9120				veh/h
Adjusted Capacity of Weaving Area	9393				pc/h
Volume-to-Capacity Ratio, v/c	1.64				

Step 6: Determine Lane-Changing Rates

Minimum Weaving Lane-Changing Rate, LCMIN	0				lc/h
Short Length, LS	3575				ft
Number of Lanes, N	4				ln
Interchange Density, ID	1.33				int/mi
Non-Weaving Flow Rate, vNW	13669				pc/h
Non-Weaving Vehicle Index, INW	-				
Weaving Lane-Changing Rate, LCW	-				lc/h
Non-Weaving Lane-Changing Rate, LCNW	-				lc/h
Total Lane-Changing Rate, LCALL	-				lc/h

Step 7: Determine Average Speeds of Weaving and Non-Weaving Vehicles

Free-Flow Speed, FFS	65.3				mi/h
Driver Population	All Familiar				
Driver Population SAF	1.000				
Weather Type	Non-Severe Weather				

Weather Type SAF	1.000	
Final Speed Adjustment Factor, SAF	1.000	
Total Lane-Changing Rate, LCALL	-	lc/h
Short Length, LS	3575	ft
Weaving Intensity Factor, W	-	
Minimum Average Weaving Speed, SMIN	15	mi/h
Maximum Average Weaving Speed, SMAX	65.3	mi/h
Average Weaving Speed, SW	-	mi/h
Average Non-Weaving Speed, SNW	-	mi/h
Average Speed, S	-	mi/h

Step 8: Determine LOS

Demand Flow Rate, v	15376	pc/h
Number of Lanes, N	4	ln
Average Speed, S	-	mi/h
Density, D	-	pc/mi/ln
Level of Service, LOS	F	

This Freeway Weaving Segment text report was created in HCS™ Freeways Version 7.5 on 8/16/2018 10:09:51

HCS7 Freeway Merge Text Report

FREEWAY MERGE ANALYSIS

File Name: Merge_SR57S_OnRamp_WB_Ball_AM.xuf
 Analyst: Mladen Popovic
 Agency: Dudek
 Jurisdiction: Caltrans
 Date: 8/14/2018
 Analysis Year: 2018
 Time Period Analyzed: 2035 plus Project AM Peak Hour
 Project Description: SR-57 S, Ball Road on-ramp (WB Ball Rd), Ball Road Basin
 EIR
 Units: U.S. Customary

LOS and Performance Measures

Density in On-Ramp (Merge) Influence Area, DR	76.5	pc/mi/ln
Level of Service, LOS	F	
Average Flow in Outer Lanes, vOA	5400	pc/mi/ln
Average Speed in Ramp Influence Area, SR	0.0	mi/h
Average Speed in Outer Lanes of Freeway, SO	56.4	mi/h
Average Speed for On-Ramp (Merge) Junction, S	-	mi/h
Density Across All Lanes, D	-	pc/mi/ln

Step 1: Specify Inputs and Convert Demand Volumes to Demand Flow Rates

Freeway Data			
Number of Freeway Lanes	4		ln
Freeway Free-Flow Speed, FFS	65.3		mi/h
Segment Length	1500		ft
Multilane Highway or C-D Roadway?	Freeway		
Demand Volume, V	13442		veh/h
Peak Hour Factor, PHF	0.94		
Ramp Data			
Number of Ramp Lanes	1		ln
Ramp Free-Flow Speed, SFR	25.0		mi/h
Ramp Side	Right		
Length of First Acceleration Lane, LA or LA1	575		ft
Length of Second Acceleration Lane, LA2	-		ft
Junction Components			
	Freeway	Ramp	
Demand Volume, V	13442	219	veh/h
Peak Hour Factor, PHF	0.94	0.94	
Percent Total Trucks	3.00	3.00	%
Percent SUTs	-	-	%
Percent TTs	-	-	%
Prop.Total Trucks, PT	0.0300	0.0300	
Heavy Vehicle PCE, ET	2.000	2.000	
Heavy Vehicle Adj., fHV	0.971	0.971	
Terrain Type	Level	Level	
Percent Grade	-	-	%
Grade Length	-	-	mi
Demand Adj.Factor, DAF	1.000	1.000	
Demand Flow Rate, v	14727	240	pc/h

Step 2: Estimate the Approaching Flow Rate in Lanes 1 and 2

Estimating Flow in Lanes 1 and 2 for On-Ramps			
Adjacent Upstream Off-Ramp Equilibrium Distance, LEQ	-		ft
Adjacent Downstream Off-Ramp Equilibrium Distance, LEQ	-		ft
Prop. Freeway Veh. in Lanes 1 and 2, PFM	0.188		
Flow Rate in Lanes 1 and 2, v12	9327		pc/h

Step 3: Estimate Capacity of Ramp-Freeway Junction and Compare Flow Rates

Capacity Checks

	Actual	Maximum	Violation?
vFO	14967	9400	Yes
vR	240	1900	No
vR12	9567	4600	Yes
	Freeway	Ramp	
Unadjusted Capacity, cmd	9400	1900	pc/h
Driver Population	All Familiar	All Familiar	
Driver Population CAF	1.000	1.000	
Weather Type	Non-Severe Weather	Non-Severe Weather	
Weather Type CAF	1.000	1.000	
Incident Type	No Incident	-	
Final Capacity Adj. Factor, CAF	1.000	1.000	
Adjusted Capacity, cmda	9400	1900	pc/h

Step 4: Estimate Density in Ramp Influence Area and Determine LOS

Demand Flow Rate on Ramp, vR	240	pc/h
Demand Flow Rate in Lanes 1 and 2, v12	9327	pc/h
Length of Acceleration Lane, LA	575	ft
Density in On-Ramp Influence Area, DR	76.5	pc/mi/ln
Density in On-Ramp Influence Area, DR	-	veh/mi/ln
Level of Service, LOS	F	

Step 5: Estimate Speeds in the Vicinity of Ramp-Freeway Junctions

Freeway Free-Flow Speed, FFS	65.3	mi/h
Ramp Free-Flow Speed, SFR	25.0	mi/h
Length of Acceleration Lane, LA	575	ft
Driver Population	All Familiar	
Driver Population SAF	1.000	
Weather Type	Non-Severe Weather	
Weather Type SAF	1.000	
Final Speed Adjustment Factor, SAF	1.000	
Demand Flow Rate on Freeway, vF	14727	pc/h
Demand Flow Rate in Lanes 1 and 2, v12	9327	pc/h
Total Demand Flow Entering On-Ramp Infl. Area, vR12	9567	pc/h
Number of Outer Lanes on Freeway, NO	2	ln
Speed Index for On-Ramp, MS	-	
Average Speed in Ramp Influence Area, SR	0.0	mi/h
Average Flow in Outer Lanes, vOA	2700	pc/h/ln
Average Speed in Outer Lanes of Freeway, SO	56.4	mi/h
Average Speed for On-Ramp Junction, S	-	mi/h
Density Across All Lanes, D	-	pc/mi/ln

HCS7 Freeway Weaving Segments Text Report

FREEWAY WEAIVING SEGMENT ANALYSIS

File Name: Weave_SR57S_KatellaOn_Balloff_AM.xuf
 Analyst: Mladen Popovic
 Agency: Mladen Popovic
 Jurisdiction: Caltrans
 Date: 8/15/2018
 Analysis Year: 2018
 Time Period Analyzed: 2035 plus Project AM Peak Hour
 Project Description: SR-57 S, Ball Rd On-Ramp to Katella Ave Off-Ramp, Ball Road
 Basin EIR
 Units: U.S. Customary

LOS and Performance Measures

Demand Flow Rate, v	16036	pc/h
Capacity, cW	9126	pc/h
Volume-to-Capacity Ratio, v/c	1.72	
Average Speed, S	-	mi/h
Density, D	-	pc/mi/ln
Level of Service, LOS	F	

Step 1: Input Data

Segment Type	Freeway	
Number of Lanes, N	4	ln
Free-Flow Speed, FFS	72.0	mi/h
Weaving Configuration	One-Sided	
Number of Maneuver Lanes, NWL	2	ln
Short Length, LS	2490	ft
Interchange Density, ID	1.33	int/mi
Terrain Type	Level	
Percent Grade	-	%
Grade Length	-	mi
On-Ramp Terrain Type	Level	
Percent Grade	-	%
Grade Length	-	mi
Off-Ramp Terrain Type	Level	
Percent Grade	-	%
Grade Length	-	mi
Minimum Ramp-to-Freeway Lane Changes, LCRF	1	lc/pc
Minimum Freeway-to-Ramp Lane Changes, LCFR	1	lc/pc
Minimum Ramp-to-Ramp Lane Changes, LCRR	0	lc/pc
Freeway-to-Freeway Demand, VFF	13401	veh/h
Ramp-to-Freeway Demand, VRF	624	veh/h
Freeway-to-Ramp Demand, VFR	686	veh/h
Ramp-to-Ramp Demand, VRR	62	veh/h
Peak Hour Factor, PHF	0.94	
Percent Total Trucks	2.00	%
Percent Single-Unit Trucks, SUT	-	%
Percent Tractor-Trailers, TT	-	%

Step 2: Adjust Volume

Volume Components

	VFF	VRF	VRR	VFR	
Demand Volume, Vi	13401	624	62	686	veh/h
Peak Hour Factor, PHF	0.94	0.94	0.94	0.94	
Percent Total Trucks	2.00	2.00	2.00	2.00	%
Percent Single-Unit Trucks, SUT	-	-	-	-	%
Percent Tractor-Trailers, TT	-	-	-	-	%
Proportion of Total Trucks, PT	0.0200	0.0200	0.0200	0.0200	
Heavy Vehicle PCE, ET	2.000	2.000	2.000	2.000	
Heavy Vehicle Adjustment Factor, fHV	0.980	0.980	0.980	0.980	

Demand Adjustment Factor, DAF	1.000	1.000	1.000	1.000	
Flow Rate, vi	14547	677	67	745	pc/h
Weaving Flow Rate, vW	1422				pc/h
Non-Weaving Flow Rate, vNW	14614				pc/h
Total Flow Rate, v	16036				pc/h
Volume Ratio, VR	0.089				

Step 3: Determine Configuration Characteristics

Weaving Configuration	One-Sided				
Minimum Ramp-to-Freeway Lane Changes, LCRF	1				lc/pc
Minimum Freeway-to-Ramp Lane Changes, LCFR	1				lc/pc
Minimum Ramp-to-Ramp Lane Changes, LCRR	0				lc/pc
Ramp-to-Freeway Flow Rate, vRF	677				pc/h
Freeway-to-Ramp Flow Rate, vFR	745				pc/h
Ramp-to-Ramp Flow Rate, vRR	67				pc/h
Minimum Weaving Lane-Changing Rate, LCMIN	0				lc/h

Step 4: Determine Maximum Weaving Length

Volume Ratio, VR	0.089				
Number of Maneuver Lanes, NWL	2				ln
Maximum Weaving Segment Length, LMAX	3433				ft
Short Length, LS	2490				ft

Step 5: Determine Weaving Segment Capacity

Volume Ratio, VR	0.089				
Short Length, LS	2490				ft
Number of Maneuver Lanes, NWL	2				ln
Number of Lanes, N	4				ln
Heavy Vehicle Adjustment Factor, fHV	0.980				
Freeway Segment Capacity, cIFL	2400				pc/h/ln
Density-Based Capacity, cIWL	2328				pc/h/ln
Demand Flow-Based Capacity, cIW	26966				pc/h
Weaving Segment Capacity, cW	9126				veh/h
Unadjusted Capacity of Weaving Area, cW	9126				veh/h
Driver Population	All Familiar				
Driver Population CAF	1.000				
Weather Type	Non-Severe Weather				
Weather Type CAF	1.000				
Incident Type	No Incident				
Incident Type CAF	1.000				
Final Capacity Adjustment Factor, CAF	1.000				
Adjusted Capacity of Weaving Area, cwa	9126				veh/h
Adjusted Capacity of Weaving Area	9312				pc/h
Volume-to-Capacity Ratio, v/c	1.72				

Step 6: Determine Lane-Changing Rates

Minimum Weaving Lane-Changing Rate, LCMIN	0				lc/h
Short Length, LS	2490				ft
Number of Lanes, N	4				ln
Interchange Density, ID	1.33				int/mi
Non-Weaving Flow Rate, vNW	14614				pc/h
Non-Weaving Vehicle Index, INW	-				
Weaving Lane-Changing Rate, LCW	-				lc/h
Non-Weaving Lane-Changing Rate, LCNW	-				lc/h
Total Lane-Changing Rate, LCALL	-				lc/h

Step 7: Determine Average Speeds of Weaving and Non-Weaving Vehicles

Free-Flow Speed, FFS	72.0				mi/h
Driver Population	All Familiar				
Driver Population SAF	1.000				
Weather Type	Non-Severe Weather				

Weather Type SAF	1.000	
Final Speed Adjustment Factor, SAF	1.000	
Total Lane-Changing Rate, LCALL	-	lc/h
Short Length, LS	2490	ft
Weaving Intensity Factor, W	-	
Minimum Average Weaving Speed, SMIN	15	mi/h
Maximum Average Weaving Speed, SMAX	72.0	mi/h
Average Weaving Speed, SW	-	mi/h
Average Non-Weaving Speed, SNW	-	mi/h
Average Speed, S	-	mi/h

Step 8: Determine LOS

Demand Flow Rate, v	16036	pc/h
Number of Lanes, N	4	ln
Average Speed, S	-	mi/h
Density, D	-	pc/mi/ln
Level of Service, LOS	F	

This Freeway Weaving Segment text report was created in HCS™ Freeways Version 7.5 on 8/21/2018 13:36:48

HCS7 Freeway Merge Text Report

FREEWAY MERGE ANALYSIS

File Name: Merge_SR57N_OnRamp_EB_Katella_PM.xuf
 Analyst: Mladen Popovic
 Agency: Dudek
 Jurisdiction: Caltrans
 Date: 8/14/2018
 Analysis Year: 2018
 Time Period Analyzed: 2035 plus Project PM Peak Hour
 Project Description: SR-57 N, Katella Avenue on-ramp (EB Katella Ave), Ball Road
 Basin EIR
 Units: U.S. Customary

LOS and Performance Measures

Density in On-Ramp (Merge) Influence Area, DR	28.0	pc/mi/ln
Level of Service, LOS	C	
Average Flow in Outer Lanes, vOA	3748	pc/mi/ln
Average Speed in Ramp Influence Area, SR	60.0	mi/h
Average Speed in Outer Lanes of Freeway, SO	67.5	mi/h
Average Speed for On-Ramp (Merge) Junction, S	63.7	mi/h
Density Across All Lanes, D	30.3	pc/mi/ln

Step 1: Specify Inputs and Convert Demand Volumes to Demand Flow Rates

Freeway Data			
Number of Freeway Lanes	5		ln
Freeway Free-Flow Speed, FFS	72.4		mi/h
Segment Length	1500		ft
Multilane Highway or C-D Roadway?	Freeway		
Demand Volume, V	8058		veh/h
Peak Hour Factor, PHF	0.94		
Ramp Data			
Number of Ramp Lanes	1		ln
Ramp Free-Flow Speed, SFR	25.0		mi/h
Ramp Side	Right		
Length of First Acceleration Lane, LA or LA1	575		ft
Length of Second Acceleration Lane, LA2	-		ft
Junction Components			
	Freeway	Ramp	
Demand Volume, V	8058	824	veh/h
Peak Hour Factor, PHF	0.94	0.94	
Percent Total Trucks	2.00	2.00	%
Percent SUTs	-	-	%
Percent TTs	-	-	%
Prop.Total Trucks, PT	0.0200	0.0200	
Heavy Vehicle PCE, ET	2.000	2.000	
Heavy Vehicle Adj., fHV	0.980	0.980	
Terrain Type	Level	Level	
Percent Grade	-	-	%
Grade Length	-	-	mi
Demand Adj.Factor, DAF	1.000	1.000	
Demand Flow Rate, v	8747	894	pc/h

Step 2: Estimate the Approaching Flow Rate in Lanes 1 and 2

Estimating Flow in Lanes 1 and 2 for On-Ramps			
Adjacent Upstream Off-Ramp Equilibrium Distance, LEQ	-		ft
Adjacent Downstream Off-Ramp Equilibrium Distance, LEQ	-		ft
Prop. Freeway Veh. in Lanes 1 and 2, PFM	0.106		
Flow Rate in Lanes 1 and 2, v12	2499		pc/h

Step 3: Estimate Capacity of Ramp-Freeway Junction and Compare Flow Rates

Capacity Checks

	Actual	Maximum	Violation?
vFO	9641	12000	No
vR	894	1900	No
vR12	3393	4600	No
	Freeway	Ramp	
Unadjusted Capacity, cmd	12000	1900	pc/h
Driver Population	All Familiar	All Familiar	
Driver Population CAF	1.000	1.000	
Weather Type	Non-Severe Weather	Non-Severe Weather	
Weather Type CAF	1.000	1.000	
Incident Type	No Incident	-	
Final Capacity Adj. Factor, CAF	1.000	1.000	
Adjusted Capacity, cmda	12000	1900	pc/h

Step 4: Estimate Density in Ramp Influence Area and Determine LOS

Demand Flow Rate on Ramp, vR	894	pc/h
Demand Flow Rate in Lanes 1 and 2, v12	2499	pc/h
Length of Acceleration Lane, LA	575	ft
Density in On-Ramp Influence Area, DR	28.0	pc/mi/ln
Density in On-Ramp Influence Area, DR	27.4	veh/mi/ln
Level of Service, LOS	C	

Step 5: Estimate Speeds in the Vicinity of Ramp-Freeway Junctions

Freeway Free-Flow Speed, FFS	72.4	mi/h
Ramp Free-Flow Speed, SFR	25.0	mi/h
Length of Acceleration Lane, LA	575	ft
Driver Population	All Familiar	
Driver Population SAF	1.000	
Weather Type	Non-Severe Weather	
Weather Type SAF	1.000	
Final Speed Adjustment Factor, SAF	1.000	
Demand Flow Rate on Freeway, vF4eff	6247	pc/h
Demand Flow Rate in Lanes 1 and 2, v12	2499	pc/h
Total Demand Flow Entering On-Ramp Infl. Area, vR12	3393	pc/h
Number of Outer Lanes on Freeway, NO	2	ln
Speed Index for On-Ramp, MS	0.408	
Average Speed in Ramp Influence Area, SR	60.0	mi/h
Average Flow in Outer Lanes, vOA	1874	pc/h/ln
Average Speed in Outer Lanes of Freeway, SO	67.5	mi/h
Average Speed for On-Ramp Junction, S	63.7	mi/h
Density Across All Lanes, D	30.3	pc/mi/ln

HCS7 Freeway Weaving Segments Text Report

FREEWAY WEAIVING SEGMENT ANALYSIS

File Name: Weave_SR57N_KatellaOn_Balloff_PM.xuf
 Analyst: Mladen Popovic
 Agency: Mladen Popovic
 Jurisdiction: Caltrans
 Date: 8/15/2018
 Analysis Year: 2018
 Time Period Analyzed: 2035 plus Project PM Peak Hour
 Project Description: SR-57 N, Katella Ave on-ramp to Ball Rd off-ramp, Ball Road
 Basin EIR
 Units: U.S. Customary

LOS and Performance Measures

Demand Flow Rate, v	15410	pc/h
Capacity, cW	10429	pc/h
Volume-to-Capacity Ratio, v/c	1.36	
Average Speed, S	-	mi/h
Density, D	-	pc/mi/ln
Level of Service, LOS	F	

Step 1: Input Data

Segment Type	Freeway	
Number of Lanes, N	5	ln
Free-Flow Speed, FFS	69.1	mi/h
Weaving Configuration	One-Sided	
Number of Maneuver Lanes, NWL	2	ln
Short Length, LS	2130	ft
Interchange Density, ID	1.33	int/mi
Terrain Type	Level	
Percent Grade	-	%
Grade Length	-	mi
On-Ramp Terrain Type	Level	
Percent Grade	-	%
Grade Length	-	mi
Off-Ramp Terrain Type	Level	
Percent Grade	-	%
Grade Length	-	mi
Minimum Ramp-to-Freeway Lane Changes, LCRF	1	lc/pc
Minimum Freeway-to-Ramp Lane Changes, LCFR	1	lc/pc
Minimum Ramp-to-Ramp Lane Changes, LCRR	0	lc/pc
Freeway-to-Freeway Demand, VFF	11493	veh/h
Ramp-to-Freeway Demand, VRF	644	veh/h
Freeway-to-Ramp Demand, VFR	1152	veh/h
Ramp-to-Ramp Demand, VRR	64	veh/h
Peak Hour Factor, PHF	0.94	
Percent Total Trucks	8.10	%
Percent Single-Unit Trucks, SUT	-	%
Percent Tractor-Trailers, TT	-	%

Step 2: Adjust Volume

Volume Components

	VFF	VRF	VRR	VFR	
Demand Volume, Vi	11493	644	64	1152	veh/h
Peak Hour Factor, PHF	0.94	0.94	0.94	0.94	
Percent Total Trucks	8.10	8.10	8.10	12.40	%
Percent Single-Unit Trucks, SUT	-	-	-	-	%
Percent Tractor-Trailers, TT	-	-	-	-	%
Proportion of Total Trucks, PT	0.0810	0.0810	0.0810	0.1240	
Heavy Vehicle PCE, ET	2.000	2.000	2.000	2.000	
Heavy Vehicle Adjustment Factor, fHV	0.925	0.925	0.925	0.890	

Demand Adjustment Factor, DAF	1.000	1.000	1.000	1.000	
Flow Rate, vi	13218	741	74	1377	pc/h
Weaving Flow Rate, vW	2118				pc/h
Non-Weaving Flow Rate, vNW	13292				pc/h
Total Flow Rate, v	15410				pc/h
Volume Ratio, VR	0.137				

Step 3: Determine Configuration Characteristics

Weaving Configuration	One-Sided				
Minimum Ramp-to-Freeway Lane Changes, LCRF	1				lc/pc
Minimum Freeway-to-Ramp Lane Changes, LCFR	1				lc/pc
Minimum Ramp-to-Ramp Lane Changes, LCRR	0				lc/pc
Ramp-to-Freeway Flow Rate, vRF	741				pc/h
Freeway-to-Ramp Flow Rate, vFR	1377				pc/h
Ramp-to-Ramp Flow Rate, vRR	74				pc/h
Minimum Weaving Lane-Changing Rate, LCMIN	0				lc/h

Step 4: Determine Maximum Weaving Length

Volume Ratio, VR	0.137				
Number of Maneuver Lanes, NWL	2				ln
Maximum Weaving Segment Length, LMAX	3902				ft
Short Length, LS	2130				ft

Step 5: Determine Weaving Segment Capacity

Volume Ratio, VR	0.137				
Short Length, LS	2130				ft
Number of Maneuver Lanes, NWL	2				ln
Number of Lanes, N	5				ln
Heavy Vehicle Adjustment Factor, fHV	0.925				
Freeway Segment Capacity, cIFL	2391				pc/h/ln
Density-Based Capacity, cIWL	2255				pc/h/ln
Demand Flow-Based Capacity, cIW	17518				pc/h
Weaving Segment Capacity, cW	10429				veh/h
Unadjusted Capacity of Weaving Area, cW	10429				veh/h
Driver Population	All Familiar				
Driver Population CAF	1.000				
Weather Type	Non-Severe Weather				
Weather Type CAF	1.000				
Incident Type	No Incident				
Incident Type CAF	1.000				
Final Capacity Adjustment Factor, CAF	1.000				
Adjusted Capacity of Weaving Area, cwa	10429				veh/h
Adjusted Capacity of Weaving Area	11313				pc/h
Volume-to-Capacity Ratio, v/c	1.36				

Step 6: Determine Lane-Changing Rates

Minimum Weaving Lane-Changing Rate, LCMIN	0				lc/h
Short Length, LS	2130				ft
Number of Lanes, N	5				ln
Interchange Density, ID	1.33				int/mi
Non-Weaving Flow Rate, vNW	13292				pc/h
Non-Weaving Vehicle Index, INW	-				
Weaving Lane-Changing Rate, LCW	-				lc/h
Non-Weaving Lane-Changing Rate, LCNW	-				lc/h
Total Lane-Changing Rate, LCALL	-				lc/h

Step 7: Determine Average Speeds of Weaving and Non-Weaving Vehicles

Free-Flow Speed, FFS	69.1				mi/h
Driver Population	All Familiar				
Driver Population SAF	1.000				
Weather Type	Non-Severe Weather				

Weather Type SAF	1.000	
Final Speed Adjustment Factor, SAF	1.000	
Total Lane-Changing Rate, LCALL	-	lc/h
Short Length, LS	2130	ft
Weaving Intensity Factor, W	-	
Minimum Average Weaving Speed, SMIN	15	mi/h
Maximum Average Weaving Speed, SMAX	69.1	mi/h
Average Weaving Speed, SW	-	mi/h
Average Non-Weaving Speed, SNW	-	mi/h
Average Speed, S	-	mi/h

Step 8: Determine LOS

Demand Flow Rate, v	15410	pc/h
Number of Lanes, N	5	ln
Average Speed, S	-	mi/h
Density, D	-	pc/mi/ln
Level of Service, LOS	F	

This Freeway Weaving Segment text report was created in HCS™ Freeways Version 7.5 on 8/21/2018 13:28:01

HCS7 Freeway Merge Text Report

FREEWAY MERGE ANALYSIS

File Name: Merge_SR57N_OnRamp_EB_Ball_PM.xuf
 Analyst: Mladen Popovic
 Agency: Dudek
 Jurisdiction: Caltrans
 Date: 8/14/2018
 Analysis Year: 2018
 Time Period Analyzed: 2035 plus Project PM Peak Hour
 Project Description: SR-57 N, Ball Road on-ramp (EB Ball Rd), Ball Road Basin
 EIR
 Units: U.S. Customary

LOS and Performance Measures

Density in On-Ramp (Merge) Influence Area, DR	51.0	pc/mi/ln
Level of Service, LOS	F	
Average Flow in Outer Lanes, vOA	5400	pc/mi/ln
Average Speed in Ramp Influence Area, SR	0.5	mi/h
Average Speed in Outer Lanes of Freeway, SO	60.2	mi/h
Average Speed for On-Ramp (Merge) Junction, S	-	mi/h
Density Across All Lanes, D	-	pc/mi/ln

Step 1: Specify Inputs and Convert Demand Volumes to Demand Flow Rates

Freeway Data			
Number of Freeway Lanes	5		ln
Freeway Free-Flow Speed, FFS	69.1		mi/h
Segment Length	1500		ft
Multilane Highway or C-D Roadway?	Freeway		
Demand Volume, V	11754		veh/h
Peak Hour Factor, PHF	0.94		
Ramp Data			
Number of Ramp Lanes	1		ln
Ramp Free-Flow Speed, SFR	25.0		mi/h
Ramp Side	Right		
Length of First Acceleration Lane, LA or LA1	600		ft
Length of Second Acceleration Lane, LA2	-		ft
Junction Components			
	Freeway	Ramp	
Demand Volume, V	11754	639	veh/h
Peak Hour Factor, PHF	0.94	0.94	
Percent Total Trucks	8.10	8.10	%
Percent SUTs	-	-	%
Percent TTs	-	-	%
Prop.Total Trucks, PT	0.0810	0.0810	
Heavy Vehicle PCE, ET	2.000	2.000	
Heavy Vehicle Adj., fHV	0.925	0.925	
Terrain Type	Level	Level	
Percent Grade	-	-	%
Grade Length	-	-	mi
Demand Adj.Factor, DAF	1.000	1.000	
Demand Flow Rate, v	13518	735	pc/h

Step 2: Estimate the Approaching Flow Rate in Lanes 1 and 2

Estimating Flow in Lanes 1 and 2 for On-Ramps			
Adjacent Upstream Off-Ramp Equilibrium Distance, LEQ	-		ft
Adjacent Downstream Off-Ramp Equilibrium Distance, LEQ	-		ft
Prop. Freeway Veh. in Lanes 1 and 2, PFM	0.126		
Flow Rate in Lanes 1 and 2, v12	5618		pc/h

Step 3: Estimate Capacity of Ramp-Freeway Junction and Compare Flow Rates

Capacity Checks

	Actual	Maximum	Violation?
vFO	14253	11750	Yes
vR	735	1900	No
vR12	6353	4600	Yes
	Freeway	Ramp	
Unadjusted Capacity, cmd	11750	1900	pc/h
Driver Population	All Familiar	All Familiar	
Driver Population CAF	1.000	1.000	
Weather Type	Non-Severe Weather	Non-Severe Weather	
Weather Type CAF	1.000	1.000	
Incident Type	No Incident	-	
Final Capacity Adj. Factor, CAF	1.000	1.000	
Adjusted Capacity, cmda	11750	1900	pc/h

 Step 4: Estimate Density in Ramp Influence Area and Determine LOS

Demand Flow Rate on Ramp, vR	735	pc/h
Demand Flow Rate in Lanes 1 and 2, v12	5618	pc/h
Length of Acceleration Lane, LA	600	ft
Density in On-Ramp Influence Area, DR	51.0	pc/mi/ln
Density in On-Ramp Influence Area, DR	-	veh/mi/ln
Level of Service, LOS	F	

 Step 5: Estimate Speeds in the Vicinity of Ramp-Freeway Junctions

Freeway Free-Flow Speed, FFS	69.1	mi/h
Ramp Free-Flow Speed, SFR	25.0	mi/h
Length of Acceleration Lane, LA	600	ft
Driver Population	All Familiar	
Driver Population SAF	1.000	
Weather Type	Non-Severe Weather	
Weather Type SAF	1.000	
Final Speed Adjustment Factor, SAF	1.000	
Demand Flow Rate on Freeway, vF4eff	11018	pc/h
Demand Flow Rate in Lanes 1 and 2, v12	5618	pc/h
Total Demand Flow Entering On-Ramp Infl. Area, vR12	6353	pc/h
Number of Outer Lanes on Freeway, NO	2	ln
Speed Index for On-Ramp, MS	-	
Average Speed in Ramp Influence Area, SR	0.5	mi/h
Average Flow in Outer Lanes, vOA	2700	pc/h/ln
Average Speed in Outer Lanes of Freeway, SO	60.2	mi/h
Average Speed for On-Ramp Junction, S	-	mi/h
Density Across All Lanes, D	-	pc/mi/ln

HCS7 Freeway Merge Text Report

FREEWAY MERGE ANALYSIS

File Name: Merge_SR57N_OnRamp_WB_Ball_PM.xuf
 Analyst: Mladen Popovic
 Agency: Dudek
 Jurisdiction: Caltrans
 Date: 8/14/2018
 Analysis Year: 2018
 Time Period Analyzed: 2035 plus Project PM Peak Hour
 Project Description: SR-57 N, Ball Road on-ramp (WB Ball Rd), Ball Road Basin
 EIR
 Units: U.S. Customary

LOS and Performance Measures

Density in On-Ramp (Merge) Influence Area, DR	54.6	pc/mi/ln
Level of Service, LOS	F	
Average Flow in Outer Lanes, vOA	5400	pc/mi/ln
Average Speed in Ramp Influence Area, SR	0.0	mi/h
Average Speed in Outer Lanes of Freeway, SO	58.7	mi/h
Average Speed for On-Ramp (Merge) Junction, S	-	mi/h
Density Across All Lanes, D	-	pc/mi/ln

Step 1: Specify Inputs and Convert Demand Volumes to Demand Flow Rates

Freeway Data			
Number of Freeway Lanes	5		ln
Freeway Free-Flow Speed, FFS	67.6		mi/h
Segment Length	1500		ft
Multilane Highway or C-D Roadway?	Freeway		
Demand Volume, V	12811		veh/h
Peak Hour Factor, PHF	0.94		
Ramp Data			
Number of Ramp Lanes	1		ln
Ramp Free-Flow Speed, SFR	45.0		mi/h
Ramp Side	Right		
Length of First Acceleration Lane, LA or LA1	650		ft
Length of Second Acceleration Lane, LA2	-		ft
Junction Components			
	Freeway	Ramp	
Demand Volume, V	12811	859	veh/h
Peak Hour Factor, PHF	0.94	0.94	
Percent Total Trucks	1.50	1.50	%
Percent SUTs	-	-	%
Percent TTs	-	-	%
Prop.Total Trucks, PT	0.0150	0.0150	
Heavy Vehicle PCE, ET	2.000	2.000	
Heavy Vehicle Adj., fHV	0.985	0.985	
Terrain Type	Level	Level	
Percent Grade	-	-	%
Grade Length	-	-	mi
Demand Adj.Factor, DAF	1.000	1.000	
Demand Flow Rate, v	13836	928	pc/h

Step 2: Estimate the Approaching Flow Rate in Lanes 1 and 2

Estimating Flow in Lanes 1 and 2 for On-Ramps			
Adjacent Upstream Off-Ramp Equilibrium Distance, LEQ	-		ft
Adjacent Downstream Off-Ramp Equilibrium Distance, LEQ	-		ft
Prop. Freeway Veh. in Lanes 1 and 2, PFM	0.102		
Flow Rate in Lanes 1 and 2, v12	5936		pc/h

Step 3: Estimate Capacity of Ramp-Freeway Junction and Compare Flow Rates

Capacity Checks

	Actual	Maximum	Violation?
vFO	14764	11750	Yes
vR	928	2100	No
vR12	6864	4600	Yes
	Freeway	Ramp	
Unadjusted Capacity, cmd	11750	2100	pc/h
Driver Population	All Familiar	All Familiar	
Driver Population CAF	1.000	1.000	
Weather Type	Non-Severe Weather	Non-Severe Weather	
Weather Type CAF	1.000	1.000	
Incident Type	No Incident	-	
Final Capacity Adj. Factor, CAF	1.000	1.000	
Adjusted Capacity, cmda	11750	2100	pc/h

Step 4: Estimate Density in Ramp Influence Area and Determine LOS

Demand Flow Rate on Ramp, vR	928	pc/h
Demand Flow Rate in Lanes 1 and 2, v12	5936	pc/h
Length of Acceleration Lane, LA	650	ft
Density in On-Ramp Influence Area, DR	54.6	pc/mi/ln
Density in On-Ramp Influence Area, DR	-	veh/mi/ln
Level of Service, LOS	F	

Step 5: Estimate Speeds in the Vicinity of Ramp-Freeway Junctions

Freeway Free-Flow Speed, FFS	67.6	mi/h
Ramp Free-Flow Speed, SFR	45.0	mi/h
Length of Acceleration Lane, LA	650	ft
Driver Population	All Familiar	
Driver Population SAF	1.000	
Weather Type	Non-Severe Weather	
Weather Type SAF	1.000	
Final Speed Adjustment Factor, SAF	1.000	
Demand Flow Rate on Freeway, vF4eff	11336	pc/h
Demand Flow Rate in Lanes 1 and 2, v12	5936	pc/h
Total Demand Flow Entering On-Ramp Infl. Area, vR12	6864	pc/h
Number of Outer Lanes on Freeway, NO	2	ln
Speed Index for On-Ramp, MS	-	
Average Speed in Ramp Influence Area, SR	0.0	mi/h
Average Flow in Outer Lanes, vOA	2700	pc/h/ln
Average Speed in Outer Lanes of Freeway, SO	58.7	mi/h
Average Speed for On-Ramp Junction, S	-	mi/h
Density Across All Lanes, D	-	pc/mi/ln

This Freeway Merge Segment text report was created in HCS™ Freeways Version 7.5 on 8/15/2018 16:09:38

HCS7 Freeway Diverge Text Report

FREEWAY DIVERGE ANALYSIS

File Name: Diverge_SR57N_OffRamp_Lincoln_PM.xuf
 Analyst: Mladen Popovic
 Agency: Dudek
 Jurisdiction: Caltrans
 Date: 8/15/2018
 Analysis Year: 2018
 Time Period Analyzed: 2035 plus Project PM Peak Hour
 Project Description: SR-57 N, Lincoln Avenue off-ramp, Ball Road Basin EIR
 Units: U.S. Customary

LOS and Performance Measures

Density in Off-Ramp (Diverge) Influence Area, DR	51.7	pc/mi/ln
Level of Service, LOS	F	
Average Flow in Outer Lanes, vOA	5400	pc/mi/ln
Average Speed in Ramp Influence Area, SR	57.1	mi/h
Average Speed in Outer Lanes of Freeway, SO	67.5	mi/h
Average Speed for Off-Ramp (Diverge) Junction, S	-	mi/h
Density Across All Lanes, D	-	pc/mi/ln

Step 1: Specify Inputs and Convert Demand Volumes to Demand Flow Rates

Freeway Data			
Number of Freeway Lanes	5		ln
Freeway Free-Flow Speed, FFS	67.6		mi/h
Segment Length	1500		ft
Multilane Highway or C-D Roadway?	Freeway		
Demand Volume, V	12811		veh/h
Peak Hour Factor, PHF	0.94		

Ramp Data			
Number of Ramp Lanes	1		ln
Ramp Free-Flow Speed, SFR	45.0		mi/h
Ramp Side	Right		
Length of First Deceleration Lane, LD or LD1	150		ft
Length of Second Deceleration Lane, LD2	-		ft

Junction Components		Freeway	Ramp	
Demand Volume, V		12811	1137	veh/h
Peak Hour Factor, PHF		0.94	0.94	
Percent Total Trucks		1.50	1.50	%
Percent SUTs		-	-	%
Percent TTs		-	-	%
Prop.Total Trucks, PT		0.0150	0.0150	
Heavy Vehicle PCE, ET		2.000	2.000	
Heavy Vehicle Adj., fHV		0.985	0.985	
Terrain Type		Level	Level	
Percent Grade		-	-	%
Grade Length		-	-	mi
Demand Adj.Factor, DAF		1.000	1.000	
Demand Flow Rate, v		13836	1228	pc/h

Step 2: Estimate the Approaching Flow Rate in Lanes 1 and 2

Estimating Flow in Lanes 1 and 2 for Off-Ramps			
Adjacent Upstream On-Ramp Equilibrium Distance, LEQ	-		ft
Adjacent Downstream Off-Ramp Equilibrium Distance, LEQ	-		ft
Prop. Freeway Veh. in Lanes 1 and 2, PFD	0.436		
Flow Rate in Lanes 1 and 2, v12	5669		pc/h

Step 3: Estimate Capacity of Ramp-Freeway Junction and Compare Flow Rates

Capacity Checks

	Actual	Maximum	Violation?
vF	13836	11750	Yes
vR	1228	2100	No
v12	5669	4400	Yes
	Freeway	Ramp	
Unadjusted Capacity, cmd	11750	2100	pc/h
Driver Population	All Familiar	All Familiar	
Driver Population CAF	1.000	1.000	
Weather Type	Non-Severe Weather	Non-Severe Weather	
Weather Type CAF	1.000	1.000	
Incident Type	No Incident	-	
Final Capacity Adj. Factor, CAF	1.000	1.000	
Adjusted Capacity, cmda	11750	2100	pc/h

Step 4: Estimate Density in Ramp Influence Area and Determine LOS

Demand Flow Rate in Lanes 1 and 2, v12	5669	pc/h
Length of Deceleration Lane, LA	150	ft
Density in Off-Ramp Influence Area, DR	51.7	pc/mi/ln
Density in Off-Ramp Influence Area, DR	-	veh/mi/ln
Level of Service, LOS	F	

Step 5: Estimate Speeds in the Vicinity of Ramp-Freeway Junctions

Freeway Free-Flow Speed, FFS	67.6	mi/h
Ramp Free-Flow Speed, SFR	45.0	mi/h
Driver Population	All Familiar	
Driver Population SAF	1.000	
Weather Type	Non-Severe Weather	
Weather Type SAF	1.000	
Final Speed Adjustment Factor, SAF	1.000	
Demand Flow Rate on Freeway, vF4eff	11069	pc/h
Demand Flow Rate in Lanes 1 and 2, v12	5669	pc/h
Number of Outer Lanes on Freeway, NO	2	ln
Speed Index for Off-Ramp, DS	-	
Average Speed in Ramp Influence Area, SR	57.1	mi/h
Average Flow in Outer Lanes, vOA	2700	pc/h/ln
Average Speed in Outer Lanes of Freeway, SO	67.5	mi/h
Average Speed for Off-Ramp Junction, S	-	mi/h
Density Across All Lanes, D	-	pc/mi/ln

HCS7 Freeway Weaving Segments Text Report

FREEWAY WEAIVING SEGMENT ANALYSIS

File Name: Weave_SR57S_LincolnOn_Balloff_PM.xuf
 Analyst: Mladen Popovic
 Agency: Mladen Popovic
 Jurisdiction: Caltrans
 Date: 8/15/2018
 Analysis Year: 2018
 Time Period Analyzed: 2035 plus Project PM Peak Hour
 Project Description: SR-57 S, Lincoln Ave on-ramp to Ball Rd off-ramp, Ball Road
 Basin EIR
 Units: U.S. Customary

LOS and Performance Measures

Demand Flow Rate, v	10429	pc/h
Capacity, cW	9128	pc/h
Volume-to-Capacity Ratio, v/c	1.12	
Average Speed, S	-	mi/h
Density, D	-	pc/mi/ln
Level of Service, LOS	F	

Step 1: Input Data

Segment Type	Freeway	
Number of Lanes, N	4	ln
Free-Flow Speed, FFS	66.8	mi/h
Weaving Configuration	One-Sided	
Number of Maneuver Lanes, NWL	2	ln
Short Length, LS	3575	ft
Interchange Density, ID	1.33	int/mi
Terrain Type	Level	
Percent Grade	-	%
Grade Length	-	mi
On-Ramp Terrain Type	Level	
Percent Grade	-	%
Grade Length	-	mi
Off-Ramp Terrain Type	Level	
Percent Grade	-	%
Grade Length	-	mi
Minimum Ramp-to-Freeway Lane Changes, LCRF	1	lc/pc
Minimum Freeway-to-Ramp Lane Changes, LCFR	1	lc/pc
Minimum Ramp-to-Ramp Lane Changes, LCRR	0	lc/pc
Freeway-to-Freeway Demand, VFF	8177	veh/h
Ramp-to-Freeway Demand, VRF	211	veh/h
Freeway-to-Ramp Demand, VFR	1159	veh/h
Ramp-to-Ramp Demand, VRR	21	veh/h
Peak Hour Factor, PHF	0.94	
Percent Total Trucks	2.50	%
Percent Single-Unit Trucks, SUT	-	%
Percent Tractor-Trailers, TT	-	%

Step 2: Adjust Volume

Volume Components

	VFF	VRF	VRR	VFR	
Demand Volume, Vi	8177	211	21	1159	veh/h
Peak Hour Factor, PHF	0.94	0.94	0.94	0.94	
Percent Total Trucks	2.50	2.50	2.50	2.50	%
Percent Single-Unit Trucks, SUT	-	-	-	-	%
Percent Tractor-Trailers, TT	-	-	-	-	%
Proportion of Total Trucks, PT	0.0250	0.0250	0.0250	0.0250	
Heavy Vehicle PCE, ET	2.000	2.000	2.000	2.000	
Heavy Vehicle Adjustment Factor, fHV	0.976	0.976	0.976	0.976	

Demand Adjustment Factor, DAF	1.000	1.000	1.000	1.000	
Flow Rate, vi	8913	230	23	1263	pc/h
Weaving Flow Rate, vW	1493				pc/h
Non-Weaving Flow Rate, vNW	8936				pc/h
Total Flow Rate, v	10429				pc/h
Volume Ratio, VR	0.143				

Step 3: Determine Configuration Characteristics

Weaving Configuration	One-Sided				
Minimum Ramp-to-Freeway Lane Changes, LCRF	1				lc/pc
Minimum Freeway-to-Ramp Lane Changes, LCFR	1				lc/pc
Minimum Ramp-to-Ramp Lane Changes, LCRR	0				lc/pc
Ramp-to-Freeway Flow Rate, vRF	230				pc/h
Freeway-to-Ramp Flow Rate, vFR	1263				pc/h
Ramp-to-Ramp Flow Rate, vRR	23				pc/h
Minimum Weaving Lane-Changing Rate, LCMIN	0				lc/h

Step 4: Determine Maximum Weaving Length

Volume Ratio, VR	0.143				
Number of Maneuver Lanes, NWL	2				ln
Maximum Weaving Segment Length, LMAX	3962				ft
Short Length, LS	3575				ft

Step 5: Determine Weaving Segment Capacity

Volume Ratio, VR	0.143				
Short Length, LS	3575				ft
Number of Maneuver Lanes, NWL	2				ln
Number of Lanes, N	4				ln
Heavy Vehicle Adjustment Factor, fHV	0.976				
Freeway Segment Capacity, cIFL	2368				pc/h/ln
Density-Based Capacity, cIWL	2338				pc/h/ln
Demand Flow-Based Capacity, cIW	16783				pc/h
Weaving Segment Capacity, cW	9128				veh/h
Unadjusted Capacity of Weaving Area, cW	9128				veh/h
Driver Population	All Familiar				
Driver Population CAF	1.000				
Weather Type	Non-Severe Weather				
Weather Type CAF	1.000				
Incident Type	No Incident				
Incident Type CAF	1.000				
Final Capacity Adjustment Factor, CAF	1.000				
Adjusted Capacity of Weaving Area, cwa	9128				veh/h
Adjusted Capacity of Weaving Area	9352				pc/h
Volume-to-Capacity Ratio, v/c	1.12				

Step 6: Determine Lane-Changing Rates

Minimum Weaving Lane-Changing Rate, LCMIN	0				lc/h
Short Length, LS	3575				ft
Number of Lanes, N	4				ln
Interchange Density, ID	1.33				int/mi
Non-Weaving Flow Rate, vNW	8936				pc/h
Non-Weaving Vehicle Index, INW	-				
Weaving Lane-Changing Rate, LCW	-				lc/h
Non-Weaving Lane-Changing Rate, LCNW	-				lc/h
Total Lane-Changing Rate, LCALL	-				lc/h

Step 7: Determine Average Speeds of Weaving and Non-Weaving Vehicles

Free-Flow Speed, FFS	66.8				mi/h
Driver Population	All Familiar				
Driver Population SAF	1.000				
Weather Type	Non-Severe Weather				

Weather Type SAF	1.000	
Final Speed Adjustment Factor, SAF	1.000	
Total Lane-Changing Rate, LCALL	-	lc/h
Short Length, LS	3575	ft
Weaving Intensity Factor, W	-	
Minimum Average Weaving Speed, SMIN	15	mi/h
Maximum Average Weaving Speed, SMAX	66.8	mi/h
Average Weaving Speed, SW	-	mi/h
Average Non-Weaving Speed, SNW	-	mi/h
Average Speed, S	-	mi/h

Step 8: Determine LOS

Demand Flow Rate, v	10429	pc/h
Number of Lanes, N	4	ln
Average Speed, S	-	mi/h
Density, D	-	pc/mi/ln
Level of Service, LOS	F	

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HCS7 Freeway Merge Text Report

FREEWAY MERGE ANALYSIS

File Name: Merge_SR57S_OnRamp_WB_Ball_PM.xuf
 Analyst: Mladen Popovic
 Agency: Dudek
 Jurisdiction: Caltrans
 Date: 8/14/2018
 Analysis Year: 2018
 Time Period Analyzed: 2035 PM Peak Hour
 Project Description: SR-57 S, Ball Road on-ramp (WB Ball Rd), Ball Road Basin
 EIR
 Units: U.S. Customary

LOS and Performance Measures

Density in On-Ramp (Merge) Influence Area, DR	42.6	pc/mi/ln
Level of Service, LOS	F	
Average Flow in Outer Lanes, vOA	5400	pc/mi/ln
Average Speed in Ramp Influence Area, SR	41.0	mi/h
Average Speed in Outer Lanes of Freeway, SO	57.9	mi/h
Average Speed for On-Ramp (Merge) Junction, S	-	mi/h
Density Across All Lanes, D	-	pc/mi/ln

Step 1: Specify Inputs and Convert Demand Volumes to Demand Flow Rates

Freeway Data			
Number of Freeway Lanes	4		ln
Freeway Free-Flow Speed, FFS	66.8		mi/h
Segment Length	1500		ft
Multilane Highway or C-D Roadway?	Freeway		
Demand Volume, V	9125		veh/h
Peak Hour Factor, PHF	0.94		
Ramp Data			
Number of Ramp Lanes	1		ln
Ramp Free-Flow Speed, SFR	25.0		mi/h
Ramp Side	Right		
Length of First Acceleration Lane, LA or LA1	575		ft
Length of Second Acceleration Lane, LA2	-		ft
Junction Components			
	Freeway	Ramp	
Demand Volume, V	9125	653	veh/h
Peak Hour Factor, PHF	0.94	0.94	
Percent Total Trucks	2.50	2.50	%
Percent SUTs	-	-	%
Percent TTs	-	-	%
Prop.Total Trucks, PT	0.0250	0.0250	
Heavy Vehicle PCE, ET	2.000	2.000	
Heavy Vehicle Adj., fHV	0.976	0.976	
Terrain Type	Level	Level	
Percent Grade	-	-	%
Grade Length	-	-	mi
Demand Adj.Factor, DAF	1.000	1.000	
Demand Flow Rate, v	9946	712	pc/h

Step 2: Estimate the Approaching Flow Rate in Lanes 1 and 2

Estimating Flow in Lanes 1 and 2 for On-Ramps			
Adjacent Upstream Off-Ramp Equilibrium Distance, LEQ	-		ft
Adjacent Downstream Off-Ramp Equilibrium Distance, LEQ	-		ft
Prop. Freeway Veh. in Lanes 1 and 2, PFM	0.129		
Flow Rate in Lanes 1 and 2, v12	4546		pc/h

Step 3: Estimate Capacity of Ramp-Freeway Junction and Compare Flow Rates

Capacity Checks

	Actual	Maximum	Violation?
vFO	10658	9400	Yes
vR	712	1900	No
vR12	5258	4600	Yes
	Freeway	Ramp	
Unadjusted Capacity, cmd	9400	1900	pc/h
Driver Population	All Familiar	All Familiar	
Driver Population CAF	1.000	1.000	
Weather Type	Non-Severe Weather	Non-Severe Weather	
Weather Type CAF	1.000	1.000	
Incident Type	No Incident	-	
Final Capacity Adj. Factor, CAF	1.000	1.000	
Adjusted Capacity, cmda	9400	1900	pc/h

 Step 4: Estimate Density in Ramp Influence Area and Determine LOS

Demand Flow Rate on Ramp, vR	712	pc/h
Demand Flow Rate in Lanes 1 and 2, v12	4546	pc/h
Length of Acceleration Lane, LA	575	ft
Density in On-Ramp Influence Area, DR	42.6	pc/mi/ln
Density in On-Ramp Influence Area, DR	-	veh/mi/ln
Level of Service, LOS	F	

 Step 5: Estimate Speeds in the Vicinity of Ramp-Freeway Junctions

Freeway Free-Flow Speed, FFS	66.8	mi/h
Ramp Free-Flow Speed, SFR	25.0	mi/h
Length of Acceleration Lane, LA	575	ft
Driver Population	All Familiar	
Driver Population SAF	1.000	
Weather Type	Non-Severe Weather	
Weather Type SAF	1.000	
Final Speed Adjustment Factor, SAF	1.000	
Demand Flow Rate on Freeway, vF	9946	pc/h
Demand Flow Rate in Lanes 1 and 2, v12	4546	pc/h
Total Demand Flow Entering On-Ramp Infl. Area, vR12	5258	pc/h
Number of Outer Lanes on Freeway, NO	2	ln
Speed Index for On-Ramp, MS	-	
Average Speed in Ramp Influence Area, SR	41.0	mi/h
Average Flow in Outer Lanes, vOA	2700	pc/h/ln
Average Speed in Outer Lanes of Freeway, SO	57.9	mi/h
Average Speed for On-Ramp Junction, S	-	mi/h
Density Across All Lanes, D	-	pc/mi/ln

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HCS7 Freeway Weaving Segments Text Report

FREEWAY WEAVING SEGMENT ANALYSIS

File Name: Weave_SR57S_KatellaOn_Balloff_PM.xuf
 Analyst: Mladen Popovic
 Agency: Mladen Popovic
 Jurisdiction: Caltrans
 Date: 8/15/2018
 Analysis Year: 2018
 Time Period Analyzed: 2035 plus Project PM Peak Hour
 Project Description: SR-57 S, Ball Rd On-Ramp to Katella Ave Off-Ramp, Ball Road
 Basin EIR
 Units: U.S. Customary

LOS and Performance Measures

Demand Flow Rate, v	11585	pc/h
Capacity, cW	9074	pc/h
Volume-to-Capacity Ratio, v/c	1.25	
Average Speed, S	-	mi/h
Density, D	-	pc/mi/ln
Level of Service, LOS	F	

Step 1: Input Data

Segment Type	Freeway	
Number of Lanes, N	4	ln
Free-Flow Speed, FFS	70.9	mi/h
Weaving Configuration	One-Sided	
Number of Maneuver Lanes, NWL	2	ln
Short Length, LS	2490	ft
Interchange Density, ID	1.33	int/mi
Terrain Type	Level	
Percent Grade	-	%
Grade Length	-	mi
On-Ramp Terrain Type	Level	
Percent Grade	-	%
Grade Length	-	mi
Off-Ramp Terrain Type	Level	
Percent Grade	-	%
Grade Length	-	mi
Minimum Ramp-to-Freeway Lane Changes, LCRF	1	lc/pc
Minimum Freeway-to-Ramp Lane Changes, LCFR	1	lc/pc
Minimum Ramp-to-Ramp Lane Changes, LCRR	0	lc/pc
Freeway-to-Freeway Demand, VFF	9435	veh/h
Ramp-to-Freeway Demand, VRF	530	veh/h
Freeway-to-Ramp Demand, VFR	677	veh/h
Ramp-to-Ramp Demand, VRR	53	veh/h
Peak Hour Factor, PHF	0.94	
Percent Total Trucks	1.80	%
Percent Single-Unit Trucks, SUT	-	%
Percent Tractor-Trailers, TT	-	%

Step 2: Adjust Volume

Volume Components

	VFF	VRF	VRR	VFR	
Demand Volume, Vi	9435	530	53	677	veh/h
Peak Hour Factor, PHF	0.94	0.94	0.94	0.94	
Percent Total Trucks	1.80	1.80	1.80	1.80	%
Percent Single-Unit Trucks, SUT	-	-	-	-	%
Percent Tractor-Trailers, TT	-	-	-	-	%
Proportion of Total Trucks, PT	0.0180	0.0180	0.0180	0.0180	
Heavy Vehicle PCE, ET	2.000	2.000	2.000	2.000	
Heavy Vehicle Adjustment Factor, fHV	0.982	0.982	0.982	0.982	

Demand Adjustment Factor, DAF	1.000	1.000	1.000	1.000	
Flow Rate, vi	10221	574	57	733	pc/h
Weaving Flow Rate, vW	1307				pc/h
Non-Weaving Flow Rate, vNW	10278				pc/h
Total Flow Rate, v	11585				pc/h
Volume Ratio, VR	0.113				

Step 3: Determine Configuration Characteristics

Weaving Configuration	One-Sided				
Minimum Ramp-to-Freeway Lane Changes, LCRF	1				lc/pc
Minimum Freeway-to-Ramp Lane Changes, LCFR	1				lc/pc
Minimum Ramp-to-Ramp Lane Changes, LCRR	0				lc/pc
Ramp-to-Freeway Flow Rate, vRF	574				pc/h
Freeway-to-Ramp Flow Rate, vFR	733				pc/h
Ramp-to-Ramp Flow Rate, vRR	57				pc/h
Minimum Weaving Lane-Changing Rate, LCMIN	0				lc/h

Step 4: Determine Maximum Weaving Length

Volume Ratio, VR	0.113				
Number of Maneuver Lanes, NWL	2				ln
Maximum Weaving Segment Length, LMAX	3666				ft
Short Length, LS	2490				ft

Step 5: Determine Weaving Segment Capacity

Volume Ratio, VR	0.113				
Short Length, LS	2490				ft
Number of Maneuver Lanes, NWL	2				ln
Number of Lanes, N	4				ln
Heavy Vehicle Adjustment Factor, fHV	0.982				
Freeway Segment Capacity, cIFL	2400				pc/h/ln
Density-Based Capacity, cIWL	2310				pc/h/ln
Demand Flow-Based Capacity, cIW	21239				pc/h
Weaving Segment Capacity, cW	9074				veh/h
Unadjusted Capacity of Weaving Area, cW	9074				veh/h
Driver Population	All Familiar				
Driver Population CAF	1.000				
Weather Type	Non-Severe Weather				
Weather Type CAF	1.000				
Incident Type	No Incident				
Incident Type CAF	1.000				
Final Capacity Adjustment Factor, CAF	1.000				
Adjusted Capacity of Weaving Area, cwa	9074				veh/h
Adjusted Capacity of Weaving Area	9239				pc/h
Volume-to-Capacity Ratio, v/c	1.25				

Step 6: Determine Lane-Changing Rates

Minimum Weaving Lane-Changing Rate, LCMIN	0				lc/h
Short Length, LS	2490				ft
Number of Lanes, N	4				ln
Interchange Density, ID	1.33				int/mi
Non-Weaving Flow Rate, vNW	10278				pc/h
Non-Weaving Vehicle Index, INW	-				
Weaving Lane-Changing Rate, LCW	-				lc/h
Non-Weaving Lane-Changing Rate, LCNW	-				lc/h
Total Lane-Changing Rate, LCALL	-				lc/h

Step 7: Determine Average Speeds of Weaving and Non-Weaving Vehicles

Free-Flow Speed, FFS	70.9				mi/h
Driver Population	All Familiar				
Driver Population SAF	1.000				
Weather Type	Non-Severe Weather				

Weather Type SAF	1.000	
Final Speed Adjustment Factor, SAF	1.000	
Total Lane-Changing Rate, LCALL	-	lc/h
Short Length, LS	2490	ft
Weaving Intensity Factor, W	-	
Minimum Average Weaving Speed, SMIN	15	mi/h
Maximum Average Weaving Speed, SMAX	70.9	mi/h
Average Weaving Speed, SW	-	mi/h
Average Non-Weaving Speed, SNW	-	mi/h
Average Speed, S	-	mi/h

Step 8: Determine LOS

Demand Flow Rate, v	11585	pc/h
Number of Lanes, N	4	ln
Average Speed, S	-	mi/h
Density, D	-	pc/mi/ln
Level of Service, LOS	F	

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