			2013								2040 No Build								2040 Build							
		Weave / Merge / Diverge	Ramp	Ramp Truck	Mainline Volume		Mainline Truck	LOS		Density (pc/mi/ln)		Ramp	Ramp Truck	Mainline Volume		Mainline Truck	LOS		Density (pc/mi/ln)		Ramp	Ramp Truck	Mainline Volume		Mainline Truck	LOS		Density (pc/mi/ln)	
Interchange	Movement	Length	DHV	Percentage	AM	PM	Percentage	AM	PM	AM	PM	DHV	Percentage	AM	PM	Percentage	AM	PM	AM	PM	DHV	Percentage	AM	PM	Percentage	AM	PM	AM	PM
Interstate 24	Southbound Diverge	230	40	0.22	400	310	0.22	A	A	6.4	5.5	50	0.25	540	420	0.25	A	A	8.0	6.7	50	0.25	540	420	0.25	A	A	8.0	6.7
Lovers Lane	Northbound Diverge	220	160	0.1	300	390	0.22	A	A	5.5	6.4	230	0.14	380	500	0.25	A	A	6.4	7.6	230	0.14	380	500	0.25	A	A	6.4	7.6
Lovers Lane	Northbound Merge	1130	60	0.1	230	270	0.17	A	A	1.1	1.4	90	0.14	250	300	0.21	A	A	1.6	2.0	90	0.14	250	300	0.21	A	A	1.6	2.0
Lovers Lane	Southbound Diverge	720	60	0.1	500	460	0.17	A	A	3.0	2.5	90	0.14	570	520	0.21	A	A	3.8	3.3	90	0.14	570	520	0.21	A	A	3.8	3.3
Lovers Lane	Southbound Merge	1030	15	0.1	430	340	0.22	A	A	3.3	2.4	20	0.14	570	450	0.25	A	A	4.8	3.6	20	0.14	570	450	0.25	A	A	4.8	3.6
US 68B	Northbound Merge	980	200	0.1	520	390	0.16	A	A	5.9	4.7	290	0.14	480	340	0.2	A	A	6.4	5.1	290	0.14	480	340	0.2	A	A	6.4	5.1
US 68B	Southbound Diverge	270	250	0.1	340	470	0.16	A	A	5.3	6.7	370	0.14	260	400	0.2	A	A	4.6	6.0	370	0.14	260	400	0.2	A	A	4.6	6.0
US 68B	Southbound Merge	1010	170	0.1	390	350	0.17	A	A	4.3	3.9	250	0.14	410	360	0.21	A	A	5.2	4.8	250	0.14	410	360	0.21	A	A	5.2	4.8
US 41A	Northbound Diverge	240	200	0.1	520	390	0.16	A	A	7.5	6.1	260	0.14	510	370	0.2	A	A	7.4	6.0	260	0.14	510	370	0.2	A	A	7.4	6.0
US 41A	Northbound Merge	940	420	0.1	300	380	0.15	A	A	6.0	6.7	550	0.14	410	510	0.18	A	A	8.3	9.2	550	0.14	410	510	0.18	A	A	8.3	9.2
US 41A	Southbound Diverge	1890	360	0.1	420	350	0.15	A	A	*	*	470	0.14	570	470	0.18	A	A	*	*	470	0.14	570	470	0.18	A	A	*	*
US 41A	Southbound Merge	1480	240	0.1	350	480	0.16	A	A	1.5	2.7	300	0.14	330	470	0.2	A	A	2.0	3.3	300	0.14	330	470	0.2	A	A	2.0	3.3
US 41	Northbound Diverge	250	160	0.1	560	640	0.15	A	A	7.5	6.1	240	0.14	720	820	0.18	A	A	7.4	6.0	240	0.14	720	820	0.18	A	A	7.4	6.0
US 41	Northbound Merge	780	250	0.1	380	640	0.15	A	A	6.0	6.7	360	0.14	480	820	0.18	A	A	8.3	9.2	360	0.14	480	820	0.18	A	A	8.3	9.2
US 41	Southbound Diverge	240	250	0.1	620	370	0.15	A	A	*	*	370	0.14	790	450	0.18	A	A	*	*	370	0.14	790	450	0.18	A	A	*	*
US 41	Southbound Merge	800	190	0.1	590	520	0.15	A	A	1.5	2.7	290	0.14	750	650	0.18	A	A	2.0	3.3	290	0.14	750	650	0.18	A	A	2.0	3.3
US 68	Northbound Diverge	200	200	0.1	430	690	0.15	A	A	6.9	9.5	280	0.14	560	900	0.18	A	B	8.3	11.8	280	0.14	560	900	0.18	A	B	8.3	11.8
US 68	Northbound Merge	910	90	0.1	400	690	0.15	A	A	4.3	7.0	120	0.14	530	900	0.18	A	A	5.8	9.3	120	0.14	530	900	0.18	A	A	5.8	9.3
US 68	Southbound Diverge	220	110	0.1	700	410	0.15	A	A	9.5	6.5	150	0.14	900	530	0.18	B	A	11.6	7.8	150	0.14	900	530	0.18	B	A	11.6	7.8
US 68	Southbound Merge	730	200	0.1	670	420	0.15	A	A	8.8	6.5	280	0.14	880	540	0.18	B	A	11.7	8.4	280	0.14	880	540	0.18	B	A	11.7	8.4
KY 1682	Northbound Weave On	260	80	0.1	180	470	0.15	A	A	3.8	5.5	100	0.14	240	610	0.18	A	A	5.2	7.6	100	0.14	240	610	0.18	A	A	5.2	7.6
KY 1682	Northbound Weave Off		310	0.1								410	0.14								410	0.14							
KY 1682	Southbound Weave On	260	320	0.1	390	310	0.15	A	A	5.0	4.5	420	0.14	490	390	0.18	A	A	6.7	6.1	420	0.14	490	390	0.18	A	A	6.7	6.1
KY 1682	Southbound Weave Off		60	0.1								80	0.14								80	0.14							
US 41	Northbound Merge	1030	30	0.2	330	460	0.15	A	A	2.4	3.6	40	0.23	440	620	0.18	A	A	3.5	5.2	40	0.23	440	620	0.18	A	A	3.5	5.2
US 41	Southbound Diverge	250	30	0.2	410	430	0.15	A	A	6.2	6.4	40	0.23	520	550	0.18	A	A	7.4	7.7	40	0.23	520	550	0.18	A	A	7.4	7.7

* - indicates that the calculated density would be negligible for those ramps.

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: AM Design Hour
Freeway/Dir of Travel: ETB Parkway Southbound
Junction: Interstate 24
Jurisdiction: KYTC
Analysis Year: 2013 Existing
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	400	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	40	vph
Length of first accel/decel lane	230	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	400	40		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	111	11		v
Trucks and buses	22	22		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %		%
Length	0.00 mi	0.00 mi		mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.901	0.901	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	493	49	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 493 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	493	4800	No
$v_{FO} = v_F - v_R$	444	4800	No
v_R	49	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 493 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	493	4400	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_R - 0.009 L_D$ = 6.4 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.302	
Space mean speed in ramp influence area,	S_R = 61.5	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 61.5	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: AM Design Hour
Freeway/Dir of Travel: ETB Parkway Southbound
Junction: Interstate 24
Jurisdiction: KYTC
Analysis Year: 2040 No Build
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	540	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	50	vph
Length of first accel/decel lane	230	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	540	50		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	150	14		v
Trucks and buses	25	25		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %		%
Length	0.00 mi	0.00 mi		mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.889	0.889	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	675	63	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 675 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	675	4800	No
$v_{FO} = v_F - v_R$	612	4800	No
v_R	63	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 675 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	675	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 8.0 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.304	
Space mean speed in ramp influence area,	S_R = 61.5	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 61.5	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: ETB Parkway Southbound
Junction: Interstate 24
Jurisdiction: KYTC
Analysis Year: 2013 Existing
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	310	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	40	vph
Length of first accel/decel lane	230	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	310	40		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	86	11		v
Trucks and buses	22	22		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.901	0.901	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	382	49	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 382 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	382	4800	No
$v_{FO} = v_F - v_R$	333	4800	No
v_R	49	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 382 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	382	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 5.5 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.302	
Space mean speed in ramp influence area,	S_R = 61.5	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 61.5	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: ETB Parkway Southbound
Junction: Interstate 24
Jurisdiction: KYTC
Analysis Year: 2040 No Build
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	420	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	50	vph
Length of first accel/decel lane	230	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	420	50		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	117	14		v
Trucks and buses	25	25		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.889	0.889	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	525	63	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 525 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	525	4800	No
$v_{FO} = v_F - v_R$	462	4800	No
v_R	63	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 525 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	525	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 6.7 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.304	
Space mean speed in ramp influence area,	S_R = 61.5	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 61.5	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.50

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: AM Design Hour
Freeway/Dir of Travel: ETB Parkway Northbound
Junction: Lovers Ln
Jurisdiction: KYTC
Analysis Year: 2013 Existing
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	300	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	160	vph
Length of first accel/decel lane	220	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	300	160		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	83	44		v
Trucks and buses	22	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %		%
Length	0.00 mi	0.00 mi		mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.901	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	370	187	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 370 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	370	4800	No
$v_{FO} = v_F - v_R$	183	4800	No
v_R	187	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 370 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	370	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 5.5 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.315	
Space mean speed in ramp influence area,	S_R = 61.2	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 61.2	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: AM Design Hour
Freeway/Dir of Travel: ETB Parkway Northbound
Junction: Lovers Ln
Jurisdiction: KYTC
Analysis Year: 2040 No Build
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	380	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	230	vph
Length of first accel/decel lane	220	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	380	230		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	106	64		v
Trucks and buses	25	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %		%
Length	0.00 mi	0.00 mi		mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.889	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	475	273	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 475 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	475	4800	No
$v_{FO} = v_F - v_R$	202	4800	No
v_R	273	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 475 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	475	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 6.4 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.323	
Space mean speed in ramp influence area,	S_R = 61.0	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 61.0	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: ETB Parkway Northbound
Junction: Lovers Ln
Jurisdiction: KYTC
Analysis Year: 2013 Existing
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	390	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	160	vph
Length of first accel/decel lane	220	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	390	160		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	108	44		v
Trucks and buses	22	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %		%
Length	0.00 mi	0.00 mi		mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.901	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	481	187	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 481 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	481	4800	No
$v_{FO} = v_F - v_R$	294	4800	No
v_R	187	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 481 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	481	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 6.4 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable, D_S = 0.315

Space mean speed in ramp influence area, S_R = 61.2 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 61.2 mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: ETB Parkway Northbound
Junction: Lovers Ln
Jurisdiction: KYTC
Analysis Year: 2040 No Build
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	500	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	230	vph
Length of first accel/decel lane	220	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	500	230		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	139	64		v
Trucks and buses	25	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %		%
Length	0.00 mi	0.00 mi		mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.889	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	625	273	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 625 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	625	4800	No
$v_{FO} = v_F - v_R$	352	4800	No
v_R	273	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 625 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	625	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 7.6 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.323	
Space mean speed in ramp influence area,	S_R = 61.0	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 61.0	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.50

Phone: Fax:
E-mail:

Merge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: AM Design Hour
Freeway/Dir of Travel: EBT Parkway Northbound
Junction: Lovers Lane
Jurisdiction: KYTC
Analysis Year: 2013 Existing
Description: Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	230	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	60	vph
Length of first accel/decel lane	1130	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	230	60		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	64	17		v
Trucks and buses	17	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.922	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	277	70	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 277 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	347	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 277 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	347	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 1.1 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.247	
Space mean speed in ramp influence area,	S_R = 63.1	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 63.1	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	
Agency/Co.:	Qk4
Date performed:	4/10/2014
Analysis time period:	AM Design Hour
Freeway/Dir of Travel:	EBT Parkway Northbound
Junction:	Lovers Lane
Jurisdiction:	KYTC
Analysis Year:	2040 No Build
Description:	Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	250	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	90	vph
Length of first accel/decel lane	1130	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	250	90		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	69	25		v
Trucks and buses	21	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.905	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	307	107	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 307 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	414	4800	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 307 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	414	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 1.6 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.248	
Space mean speed in ramp influence area,	S_R = 63.1	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 63.1	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	
Agency/Co.:	Qk4
Date performed:	4/10/2014
Analysis time period:	PM Design Hour
Freeway/Dir of Travel:	EBT Parkway Northbound
Junction:	Lovers Lane
Jurisdiction:	KYTC
Analysis Year:	2013 Existing
Description:	Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	270	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	60	vph
Length of first accel/decel lane	1130	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	270	60		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	75	17		v
Trucks and buses	17	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.922	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	326	70	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 326 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	396	4800	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 326 (Equation 13-15, 13-16, 18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	396	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 1.4 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.248	
Space mean speed in ramp influence area,	S_R = 63.1	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 63.1	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.50

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	
Agency/Co.:	Qk4
Date performed:	4/10/2014
Analysis time period:	PM Design Hour
Freeway/Dir of Travel:	EBT Parkway Northbound
Junction:	Lovers Lane
Jurisdiction:	KYTC
Analysis Year:	2040 No Build
Description:	Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	300	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	90	vph
Length of first accel/decel lane	1130	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	300	90		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	83	25		v
Trucks and buses	21	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.905	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	368	107	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 368 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	475	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 368 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	475	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 2.0 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.248	
Space mean speed in ramp influence area,	S_R = 63.1	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 63.1	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.50

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: AM Design Hour
Freeway/Dir of Travel: ETB Parkway Southbound
Junction: Lovers Ln
Jurisdiction: KYTC
Analysis Year: 2013 Existing
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	500	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	60	vph
Length of first accel/decel lane	720	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	500	60		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	139	17		v
Trucks and buses	17	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.922	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	603	70	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 603 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	603	4800	No
$v_{FO} = v_F - v_R$	533	4800	No
v_R	70	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 603 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	603	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 3.0 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable, D_S = 0.304

Space mean speed in ramp influence area, S_R = 61.5 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 61.5 mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	
Agency/Co.:	Qk4
Date performed:	4/10/2014
Analysis time period:	AM Design Hour
Freeway/Dir of Travel:	ETB Parkway Southbound
Junction:	Lovers Ln
Jurisdiction:	KYTC
Analysis Year:	2040 No Build
Description:	ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	570	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	90	vph
Length of first accel/decel lane	720	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	570	90		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	158	25		v
Trucks and buses	21	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.905	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	700	107	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 700 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	700	4800	No
$v_{FO} = v_F - v_R$	593	4800	No
v_R	107	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 700 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	700	4400	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_R - 0.009 L_{12}$ = 3.8 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable, D_S = 0.308

Space mean speed in ramp influence area, S_R = 61.4 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 61.4 mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: ETB Parkway Southbound
Junction: Lovers Ln
Jurisdiction: KYTC
Analysis Year: 2013 Existing
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	460	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	60	vph
Length of first accel/decel lane	720	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	460	60		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	128	17		v
Trucks and buses	17	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.922	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	555	70	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 555 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	555	4800	No
$v_{FO} = v_F - v_R$	485	4800	No
v_R	70	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 555 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	555	4400	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_R - 0.009 L_{12}$ = 2.5 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable, D_S = 0.304

Space mean speed in ramp influence area, S_R = 61.5 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 61.5 mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	
Agency/Co.:	Qk4
Date performed:	4/10/2014
Analysis time period:	PM Design Hour
Freeway/Dir of Travel:	ETB Parkway Southbound
Junction:	Lovers Ln
Jurisdiction:	KYTC
Analysis Year:	2040 No Build
Description:	ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	520	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	90	vph
Length of first accel/decel lane	720	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	520	90		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	144	25		v
Trucks and buses	21	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.905	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	638	107	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 638 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	638	4800	No
$v_{FO} = v_F - v_R$	531	4800	No
v_R	107	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 638 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	638	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 3.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable, D_S = 0.308

Space mean speed in ramp influence area, S_R = 61.4 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 61.4 mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.50

Phone: Fax:
E-mail:

Merge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: AM Design Hour
Freeway/Dir of Travel: EBT Parkway Southbound
Junction: Lovers Lane
Jurisdiction: KYTC
Analysis Year: 2013 Existing
Description: Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	430	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	15	vph
Length of first accel/decel lane	1030	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	430	15		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	119	4		v
Trucks and buses	22	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.901	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	530	18	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 530 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	548	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 530 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	548	4600	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 3.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.256	
Space mean speed in ramp influence area,	S_R = 62.8	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 62.8	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.50

Phone: Fax:
E-mail:

Merge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: AM Design Hour
Freeway/Dir of Travel: EBT Parkway Southbound
Junction: Lovers Lane
Jurisdiction: KYTC
Analysis Year: 2040 No Build
Description: Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	570	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	20	vph
Length of first accel/decel lane	1030	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	570	20		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	158	6		v
Trucks and buses	25	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.889	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	713	24	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 713 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	737	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 713 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	737	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 4.8 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.257	
Space mean speed in ramp influence area,	S_R = 62.8	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 62.8	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.50

Phone: Fax:
E-mail:

Merge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: EBT Parkway Southbound
Junction: Lovers Lane
Jurisdiction: KYTC
Analysis Year: 2013 Existing
Description: Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	340	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	15	vph
Length of first accel/decel lane	1030	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	340	15		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	94	4		v
Trucks and buses	22	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.901	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	419	18	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 419 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	437	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 419 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	437	4600	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 2.4 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.255	
Space mean speed in ramp influence area,	S_R = 62.9	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 62.9	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.50

Phone: Fax:
E-mail:

Merge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: EBT Parkway Southbound
Junction: Lovers Lane
Jurisdiction: KYTC
Analysis Year: 2040 No Build
Description: Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	450	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	20	vph
Length of first accel/decel lane	1030	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	450	20		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	125	6		v
Trucks and buses	25	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.889	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	563	24	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 563 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	587	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 563 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	587	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 3.6 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.256	
Space mean speed in ramp influence area,	S_R = 62.8	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 62.8	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.50

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	
Agency/Co.:	Qk4
Date performed:	4/10/2014
Analysis time period:	AM Design Hour
Freeway/Dir of Travel:	EBT Parkway Northbound
Junction:	US 68B
Jurisdiction:	KYTC
Analysis Year:	2013 Existing
Description:	Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	520	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	200	vph
Length of first accel/decel lane	980	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	520	200		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	144	56		v
Trucks and buses	16	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.926	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	624	233	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 624 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	857	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 624 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	857	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 5.9 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.262	
Space mean speed in ramp influence area,	S_R = 62.7	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 62.7	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.50

Phone: Fax:
E-mail:

Merge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: AM Design Hour
Freeway/Dir of Travel: EBT Parkway Northbound
Junction: US 68B
Jurisdiction: KYTC
Analysis Year: 2040 No Build
Description: Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	480	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	290	vph
Length of first accel/decel lane	980	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	480	290		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	133	81		v
Trucks and buses	20	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.909	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	587	345	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 587 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	932	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 587 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	932	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 6.4 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.262	
Space mean speed in ramp influence area,	S_R = 62.7	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 62.7	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.50

Phone: Fax:
E-mail:

Merge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: EBT Parkway Northbound
Junction: US 68B
Jurisdiction: KYTC
Analysis Year: 2013 Existing
Description: Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	390	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	200	vph
Length of first accel/decel lane	980	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	390	200		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	108	56		v
Trucks and buses	16	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.926	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	468	233	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 468 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	701	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 468 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	701	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 4.7 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.260	
Space mean speed in ramp influence area,	S_R = 62.7	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 62.7	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.50

Phone: Fax:
E-mail:

Merge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: EBT Parkway Northbound
Junction: US 68B
Jurisdiction: KYTC
Analysis Year: 2040 No Build
Description: Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	340	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	290	vph
Length of first accel/decel lane	980	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	340	290		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	94	81		v
Trucks and buses	20	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.909	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	416	345	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 416 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	761	4800	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 416 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	761	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 5.1 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.261	
Space mean speed in ramp influence area,	S_R = 62.7	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 62.7	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.50

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: AM Design Hour
Freeway/Dir of Travel: ETB Parkway Southbound
Junction: US 68B
Jurisdiction: KYTC
Analysis Year: 2013
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	340	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	250	vph
Length of first accel/decel lane	270	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	340	250		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	94	69		v
Trucks and buses	16	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %		%
Length	0.00 mi	0.00 mi		mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.926	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	408	292	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 408 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	408	4800	No
$v_{FO} = v_F - v_R$	116	4800	No
v_R	292	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 408 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	408	4400	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086\, v_R - 0.009\, L_{12}$ = 5.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable, D_S = 0.324

Space mean speed in ramp influence area, S_R = 60.9 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 60.9 mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: AM Design Hour
Freeway/Dir of Travel: ETB Parkway Southbound
Junction: US 68B
Jurisdiction: KYTC
Analysis Year: 2040 No Build
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	260	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	370	vph
Length of first accel/decel lane	270	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	260	370		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	72	103		v
Trucks and buses	20	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %		%
Length	0.00 mi	0.00 mi		mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.909	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	318	440	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 318 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	318	4800	No
$v_{FO} = v_F - v_R$	-122	4800	No
v_R	440	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 318 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	318	4400	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086\, v_R - 0.009\, L_D$ = 4.6 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable, D_S = 0.338

Space mean speed in ramp influence area, S_R = 60.5 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 60.5 mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.50

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: ETB Parkway Southbound
Junction: US 68B
Jurisdiction: KYTC
Analysis Year: 2013
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	470	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	250	vph
Length of first accel/decel lane	270	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	470	250		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	131	69		v
Trucks and buses	16	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %		%
Length	0.00 mi	0.00 mi		mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.926	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	564	292	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 564 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	564	4800	No
$v_{FO} = v_F - v_R$	272	4800	No
v_R	292	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 564 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	564	4400	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086\, v_R - 0.009\, L_{12}$ = 6.7 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.324	
Space mean speed in ramp influence area,	S_R = 60.9	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 60.9	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: ETB Parkway Southbound
Junction: US 68B
Jurisdiction: KYTC
Analysis Year: 2040 No Build
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	400	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	370	vph
Length of first accel/decel lane	270	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	400	370		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	111	103		v
Trucks and buses	20	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %		%
Length	0.00 mi	0.00 mi		mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.909	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	489	440	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 489 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	489	4800	No
$v_{FO} = v_F - v_R$	49	4800	No
v_R	440	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 489 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	489	4400	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086\, v_R - 0.009\, L_D$ = 6.0 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.338	
Space mean speed in ramp influence area,	S_R = 60.5	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 60.5	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.50

Phone: Fax:
E-mail:

Merge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: AM Design Hour
Freeway/Dir of Travel: EBT Parkway Southbound
Junction: US 68B
Jurisdiction: KYTC
Analysis Year: 2013 Existing
Description: Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	390	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	170	vph
Length of first accel/decel lane	1010	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	390	170		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	108	47		v
Trucks and buses	17	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.922	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	470	198	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 470 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	668	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 470 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	668	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 4.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.258	
Space mean speed in ramp influence area,	S_R = 62.8	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 62.8	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.50

Phone: Fax:
E-mail:

Merge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: AM Design Hour
Freeway/Dir of Travel: EBT Parkway Southbound
Junction: US 68B
Jurisdiction: KYTC
Analysis Year: 2040 No Build
Description: Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	410	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	250	vph
Length of first accel/decel lane	1010	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	410	250		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	114	69		v
Trucks and buses	21	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.905	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	503	297	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 503 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	800	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 503 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	800	4600	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 5.2 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.259	
Space mean speed in ramp influence area,	S_R = 62.7	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 62.7	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.50

Phone: Fax:
E-mail:

Merge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: EBT Parkway Southbound
Junction: US 68B
Jurisdiction: KYTC
Analysis Year: 2013 Existing
Description: Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	350	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	170	vph
Length of first accel/decel lane	1010	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	350	170		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	97	47		v
Trucks and buses	17	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.922	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	422	198	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 422 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	620	4800	No

v_3 or v_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 422 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	620	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 3.9 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.258	
Space mean speed in ramp influence area,	S_R = 62.8	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 62.8	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.50

Phone: Fax:
E-mail:

Merge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: EBT Parkway Southbound
Junction: US 68B
Jurisdiction: KYTC
Analysis Year: 2040 No Build
Description: Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	360	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	250	vph
Length of first accel/decel lane	1010	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	360	250		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	100	69		v
Trucks and buses	21	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.905	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	442	297	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 442 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	739	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 442 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	739	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 4.8 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.258	
Space mean speed in ramp influence area,	S_R = 62.8	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 62.8	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: AM Design Hour
Freeway/Dir of Travel: ETB Parkway Northbound
Junction: US 41A
Jurisdiction: KYTC
Analysis Year: 2013
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	520	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	200	vph
Length of first accel/decel lane	240	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	520	200		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	144	56		v
Trucks and buses	16	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.926	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	624	233	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 624 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	624	4800	No
$v_{FO} = v_F - v_R$	391	4800	No
v_R	233	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 624 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	624	4400	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086\, v_R - 0.009\, L_D$ = 7.5 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable, D_S = 0.319

Space mean speed in ramp influence area, S_R = 61.1 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 61.1 mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	
Agency/Co.:	Qk4
Date performed:	4/10/2014
Analysis time period:	AM Design Hour
Freeway/Dir of Travel:	ETB Parkway Northbound
Junction:	US 41A
Jurisdiction:	KYTC
Analysis Year:	2040 No Build
Description:	ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	510	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	260	vph
Length of first accel/decel lane	240	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	510	260		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	142	72		v
Trucks and buses	20	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.909	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	623	309	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 623 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	623	4800	No
$v_{FO} = v_F - v_R$	314	4800	No
v_R	309	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12}/2 No

If yes, v_{12A} = 623 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	623	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 7.4 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable, D_S = 0.326

Space mean speed in ramp influence area, S_R = 60.9 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 60.9 mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: ETB Parkway Northbound
Junction: US 41A
Jurisdiction: KYTC
Analysis Year: 2013
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	390	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	200	vph
Length of first accel/decel lane	240	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	390	200		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	108	56		v
Trucks and buses	16	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.926	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	468	233	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 468 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	468	4800	No
$v_{FO} = v_F - v_R$	235	4800	No
v_R	233	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 468 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	468	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 6.1 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.319	
Space mean speed in ramp influence area,	S_R = 61.1	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 61.1	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: ETB Parkway Northbound
Junction: US 41A
Jurisdiction: KYTC
Analysis Year: 2040 No Build
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	370	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	260	vph
Length of first accel/decel lane	240	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	370	260		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	103	72		v
Trucks and buses	20	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.909	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	452	309	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 452 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	452	4800	No
$v_{FO} = v_F - v_R$	143	4800	No
v_R	309	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 452 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	452	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 6.0 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable, D_S = 0.326

Space mean speed in ramp influence area, S_R = 60.9 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 60.9 mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	
Agency/Co.:	Qk4
Date performed:	4/10/2014
Analysis time period:	AM Design Hour
Freeway/Dir of Travel:	EBT Parkway Northbound
Junction:	US 41A
Jurisdiction:	KYTC
Analysis Year:	2013 Existing
Description:	Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	300	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	420	vph
Length of first accel/decel lane	940	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	300	420		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	83	117		v
Trucks and buses	15	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.930	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	358	490	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 358 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	848	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 358 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	848	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 6.0 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.264	
Space mean speed in ramp influence area,	S_R = 62.6	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 62.6	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: AM Design Hour
Freeway/Dir of Travel: EBT Parkway Northbound
Junction: US 41A
Jurisdiction: KYTC
Analysis Year: 2040 No Build
Description: Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	410	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	550	vph
Length of first accel/decel lane	940	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	410	550		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	114	153		v
Trucks and buses	18	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.917	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	497	654	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 497 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1151	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 497 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	1151	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 8.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.268	
Space mean speed in ramp influence area,	S_R = 62.5	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 62.5	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.50

Phone: Fax:
E-mail:

Merge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: EBT Parkway Northbound
Junction: US 41A
Jurisdiction: KYTC
Analysis Year: 2013 Existing
Description: Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	380	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	420	vph
Length of first accel/decel lane	940	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	380	420		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	106	117		v
Trucks and buses	15	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.930	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	454	490	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 454 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	944	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 454 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	944	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 6.7 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.265	
Space mean speed in ramp influence area,	S_R = 62.6	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 62.6	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.50

Phone: Fax:
E-mail:

Merge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: EBT Parkway Northbound
Junction: US 41A
Jurisdiction: KYTC
Analysis Year: 2040 No Build
Description: Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	510	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	550	vph
Length of first accel/decel lane	940	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	510	550		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	142	153		v
Trucks and buses	18	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.917	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	618	654	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 618 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1272	4800	No

v_3 or v_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 618 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	1272	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 9.2 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.269	
Space mean speed in ramp influence area,	S_R = 62.5	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 62.5	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: AM Design Hour
Freeway/Dir of Travel: ETB Parkway Northbound
Junction: US 41
Jurisdiction: KYTC
Analysis Year: 2013 Existing
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	560	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	160	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	560	160		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	156	44		v
Trucks and buses	15	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.930	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	669	187	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 669 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	669	4800	No
$v_{FO} = v_F - v_R$	482	4800	No
v_R	187	2000	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 669 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	669	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 7.8 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.445	
Space mean speed in ramp influence area,	S_R = 57.5	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 57.5	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: AM Design Hour
Freeway/Dir of Travel: ETB Parkway Northbound
Junction: US 41
Jurisdiction: KYTC
Analysis Year: 2040 No Build
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	720	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	240	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	720	240		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	200	67		v
Trucks and buses	18	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.917	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	872	285	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 872 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	872	4800	No
$v_{FO} = v_F - v_R$	587	4800	No
v_R	285	2000	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 872 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	872	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 9.5 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable, D_S = 0.454

Space mean speed in ramp influence area, S_R = 57.3 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 57.3 mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: ETB Parkway Northbound
Junction: US 41
Jurisdiction: KYTC
Analysis Year: 2013 Existing
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	640	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	160	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	640	160		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	178	44		v
Trucks and buses	15	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.930	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	764	187	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 764 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	764	4800	No
$v_{FO} = v_F - v_R$	577	4800	No
v_R	187	2000	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 764 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	764	4400	No

Level of Service Determination (if not F)

Density, $D_D = 4.252 + 0.0086 v_R - 0.009 L_{12}$ = 8.6 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.445	
Space mean speed in ramp influence area,	S_R = 57.5	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 57.5	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: ETB Parkway Northbound
Junction: US 41
Jurisdiction: KYTC
Analysis Year: 2040 No Build
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	820	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	240	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	820	240		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	228	67		v
Trucks and buses	18	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.917	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	993	285	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 993 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	993	4800	No
$v_{FO} = v_F - v_R$	708	4800	No
v_R	285	2000	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 993 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	993	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 10.5 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.454	
Space mean speed in ramp influence area,	S_R = 57.3	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 57.3	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	
Agency/Co.:	Qk4
Date performed:	4/10/2014
Analysis time period:	AM Design Hour
Freeway/Dir of Travel:	EBT Parkway Northbound
Junction:	US 41
Jurisdiction:	KYTC
Analysis Year:	2013 Existing
Description:	Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	380	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	250	vph
Length of first accel/decel lane	780	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	380	250		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	106	69		v
Trucks and buses	15	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.930	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	454	292	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 454 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	746	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 454 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	746	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 6.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.275	
Space mean speed in ramp influence area,	S_R = 62.3	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 62.3	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.50

Phone: Fax:
E-mail:

Merge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: AM Design Hour
Freeway/Dir of Travel: EBT Parkway Northbound
Junction: US 41
Jurisdiction: KYTC
Analysis Year: 2040 No Build
Description: Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	480	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	360	vph
Length of first accel/decel lane	780	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	480	360		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	133	100		v
Trucks and buses	18	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.917	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	581	428	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 581 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1009	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 581 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	1009	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 8.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.277	
Space mean speed in ramp influence area,	S_R = 62.2	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 62.2	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.50

Phone: Fax:
E-mail:

Merge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: EBT Parkway Northbound
Junction: US 41
Jurisdiction: KYTC
Analysis Year: 2013 Existing
Description: Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	640	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	250	vph
Length of first accel/decel lane	780	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	640	250		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	178	69		v
Trucks and buses	15	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.930	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	764	292	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 764 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1056	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 764 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	1056	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 8.7 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.278	
Space mean speed in ramp influence area,	S_R = 62.2	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 62.2	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: AM Design Hour
Freeway/Dir of Travel: ETB Parkway Northbound
Junction: US 68
Jurisdiction: KYTC
Analysis Year: 2013 Existing
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	430	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	200	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	430	200		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	119	56		v
Trucks and buses	15	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %		%
Length	0.00 mi	0.00 mi		mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.930	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	514	233	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 514 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	514	4800	No
$v_{FO} = v_F - v_R$	281	4800	No
v_R	233	2000	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 514 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	514	4400	No

Level of Service Determination (if not F)

Density, $D_D = 4.252 + 0.0086 v_R - 0.009 L_{12}$ = 6.9 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable, D_S = 0.449

Space mean speed in ramp influence area, S_R = 57.4 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 57.4 mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: AM Design Hour
Freeway/Dir of Travel: ETB Parkway Northbound
Junction: US 68
Jurisdiction: KYTC
Analysis Year: 2040 No Build
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	560	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	280	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	560	280		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	156	78		v
Trucks and buses	18	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.917	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	678	333	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 678 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	678	4800	No
$v_{FO} = v_F - v_R$	345	4800	No
v_R	333	2000	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 678 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	678	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086 v_{12} - 0.009 L_D$ = 8.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.458	
Space mean speed in ramp influence area,	S_R = 57.2	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 57.2	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: ETB Parkway Northbound
Junction: US 68
Jurisdiction: KYTC
Analysis Year: 2013 Existing
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	690	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	200	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	690	200		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	192	56		v
Trucks and buses	15	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.930	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	824	233	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 824 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	824	4800	No
$v_{FO} = v_F - v_R$	591	4800	No
v_R	233	2000	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 824 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	824	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 9.5 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.449	
Space mean speed in ramp influence area,	S_R = 57.4	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 57.4	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	
Agency/Co.:	Qk4
Date performed:	4/10/2014
Analysis time period:	PM Design Hour
Freeway/Dir of Travel:	ETB Parkway Northbound
Junction:	US 68
Jurisdiction:	KYTC
Analysis Year:	2040 No Build
Description:	ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	900	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	280	vph
Length of first accel/decel lane	200	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	900	280		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	250	78		v
Trucks and buses	18	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %		%
Length	0.00 mi	0.00 mi		mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.917	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	1090	333	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1090 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	1090	4800	No
$v_{FO} = v_F - v_R$	757	4800	No
v_R	333	2000	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 1090 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	1090	4400	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086 v_R - 0.009 L_{12}$ = 11.8 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable, D_S = 0.458

Space mean speed in ramp influence area, S_R = 57.2 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 57.2 mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.50

Phone: Fax:
E-mail:

Merge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: AM Design Hour
Freeway/Dir of Travel: EBT Parkway Northbound
Junction: US 68
Jurisdiction: KYTC
Analysis Year: 2013 Existing
Description: Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	400	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	90	vph
Length of first accel/decel lane	910	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	400	90		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	111	25		v
Trucks and buses	15	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.930	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	478	105	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 478 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	583	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 478 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	583	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 4.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.264	
Space mean speed in ramp influence area,	S_R = 62.6	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 62.6	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	
Agency/Co.:	Qk4
Date performed:	4/10/2014
Analysis time period:	AM Design Hour
Freeway/Dir of Travel:	EBT Parkway Northbound
Junction:	US 68
Jurisdiction:	KYTC
Analysis Year:	2040 No Build
Description:	Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	530	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	120	vph
Length of first accel/decel lane	910	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	530	120		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	147	33		v
Trucks and buses	18	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.917	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	642	143	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 642 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	785	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 642 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	785	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 5.8 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.266	
Space mean speed in ramp influence area,	S_R = 62.6	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 62.6	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	
Agency/Co.:	Qk4
Date performed:	4/10/2014
Analysis time period:	PM Design Hour
Freeway/Dir of Travel:	EBT Parkway Northbound
Junction:	US 68
Jurisdiction:	KYTC
Analysis Year:	2013 Existing
Description:	Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	690	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	90	vph
Length of first accel/decel lane	910	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	690	90		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	192	25		v
Trucks and buses	15	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.930	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	824	105	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 824 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	929	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 824 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	929	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 7.0 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.267	
Space mean speed in ramp influence area,	S_R = 62.5	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 62.5	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: EBT Parkway Northbound
Junction: US 68
Jurisdiction: KYTC
Analysis Year: 2040 No Build
Description: Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	900	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	120	vph
Length of first accel/decel lane	910	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	900	120		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	250	33		v
Trucks and buses	18	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.917	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	1090	143	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1090 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1233	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 1090 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	1233	4600	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 9.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.271	
Space mean speed in ramp influence area,	S_R = 62.4	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 62.4	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: AM Design Hour
Freeway/Dir of Travel: ETB Parkway Southbound
Junction: US 68
Jurisdiction: KYTC
Analysis Year: 2013 Existing
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	700	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	110	vph
Length of first accel/decel lane	220	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	700	110		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	194	31		v
Trucks and buses	15	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.930	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	836	128	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 836 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	836	4800	No
$v_{FO} = v_F - v_R$	708	4800	No
v_R	128	2000	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 836 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	836	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 9.5 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable, D_S = 0.440

Space mean speed in ramp influence area, S_R = 57.7 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 57.7 mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: AM Design Hour
Freeway/Dir of Travel: ETB Parkway Southbound
Junction: US 68
Jurisdiction: KYTC
Analysis Year: 2040 No Build
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	900	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	150	vph
Length of first accel/decel lane	220	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	900	150		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	250	42		v
Trucks and buses	18	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.917	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	1090	178	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1090 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	1090	4800	No
$v_{FO} = v_F - v_R$	912	4800	No
v_R	178	2000	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 1090 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	1090	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 11.6 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.444	
Space mean speed in ramp influence area,	S_R = 57.6	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 57.6	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: ETB Parkway Southbound
Junction: US 68
Jurisdiction: KYTC
Analysis Year: 2013 Existing
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	410	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	110	vph
Length of first accel/decel lane	220	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	410	110		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	114	31		v
Trucks and buses	15	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.930	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	490	128	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 490 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	490	4800	No
$v_{FO} = v_F - v_R$	362	4800	No
v_R	128	2000	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 490 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	490	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 6.5 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.440	
Space mean speed in ramp influence area,	S_R = 57.7	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 57.7	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: ETB Parkway Southbound
Junction: US 68
Jurisdiction: KYTC
Analysis Year: 2040 No Build
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	530	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	150	vph
Length of first accel/decel lane	220	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	530	150		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	147	42		v
Trucks and buses	18	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.917	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	642	178	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 642 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	642	4800	No
$v_{FO} = v_F - v_R$	464	4800	No
v_R	178	2000	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 642 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	642	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 7.8 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.444	
Space mean speed in ramp influence area,	S_R = 57.6	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 57.6	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	
Agency/Co.:	Qk4
Date performed:	4/10/2014
Analysis time period:	AM Design Hour
Freeway/Dir of Travel:	EBT Parkway Southbound
Junction:	US 68
Jurisdiction:	KYTC
Analysis Year:	2013 Existing
Description:	Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	670	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	200	vph
Length of first accel/decel lane	730	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	670	200		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	186	56		v
Trucks and buses	15	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.930	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	800	233	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 800 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1033	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 800 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	1033	4600	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 8.8 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.281	
Space mean speed in ramp influence area,	S_R = 62.1	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 62.1	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.50

Phone: Fax:
E-mail:

Merge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: AM Design Hour
Freeway/Dir of Travel: EBT Parkway Southbound
Junction: US 68
Jurisdiction: KYTC
Analysis Year: 2040 No Build
Description: Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	880	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	280	vph
Length of first accel/decel lane	730	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	880	280		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	244	78		v
Trucks and buses	18	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.917	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	1066	333	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1066 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1399	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 1066 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	1399	4600	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 11.7 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	M_S = 0.286	
Space mean speed in ramp influence area,	S_R = 62.0	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 62.0	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.50

Phone: Fax:
E-mail:

Merge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: EBT Parkway Southbound
Junction: US 68
Jurisdiction: KYTC
Analysis Year: 2013 Existing
Description: Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	420	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	200	vph
Length of first accel/decel lane	730	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	420	200		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	117	56		v
Trucks and buses	15	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.930	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	502	233	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 502 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	735	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 502 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	735	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 6.5 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.278	
Space mean speed in ramp influence area,	S_R = 62.2	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 62.2	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.50

Phone: Fax:
E-mail:

Merge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: EBT Parkway Southbound
Junction: US 68
Jurisdiction: KYTC
Analysis Year: 2040 No Build
Description: Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	540	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	280	vph
Length of first accel/decel lane	730	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	540	280		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	150	78		v
Trucks and buses	18	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.917	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	654	333	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 654 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	987	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 654 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	987	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 8.4 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.280	
Space mean speed in ramp influence area,	S_R = 62.1	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 62.1	mph

HCS 2010: Freeway Weaving Release 6.50

Phone: Fax:
E-mail:

Operational Analysis

Analyst:
Agency/Co.: Qk4
Date Performed: 4/10/2014
Analysis Time Period: AM Design Hour
Freeway/Dir of Travel: ETB Parkway Northbound
Weaving Location: KY 1682
Analysis Year: 2013 Existing
Description: Edward T Breathitt Pkwy Interstate 69 Upgrade

Inputs

Segment Type	Freeway	
Weaving configuration	One-Sided	
Number of lanes, N	3	ln
Weaving segment length, LS	300	ft
Freeway free-flow speed, FFS	70	mi/h
Minimum segment speed, SMIN	15	mi/h
Freeway maximum capacity, cIFL	2200*	pc/h/ln
Terrain type	Level	
Grade	0.00	%
Length	0.00	mi

Conversion to pc/h Under Base Conditions

	Volume Components				
	VFF	VRF	VFR	VRR	
Volume, V	180	80	310	0	veh/h
Peak hour factor, PHF	0.90	0.90	0.90	0.94	
Peak 15-min volume, v15	50	22	86	0	
Trucks and buses	15	10	10	0	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.930	0.952	0.952	1.000	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	215	93	362	0	pc/h

Volume ratio, VR 0.679

Configuration Characteristics

Number of maneuver lanes, NWL	2	ln
Interchange density, ID	0.3	int/mi
Minimum RF lane changes, LCRF	1	lc/pc
Minimum FR lane changes, LCFR	1	lc/pc
Minimum RR lane changes, LCRR		lc/pc
Minimum weaving lane changes, LCMIN	455	lc/h
Weaving lane changes, LCW	455	lc/h
Non-weaving vehicle index, INW	2	
Non-weaving lane change, LCNW	0	lc/h
Total lane changes, LCALL	455	lc/h

Weaving and Non-Weaving Speeds

Weaving intensity factor, W 0.314

Average weaving speed, SW	56.9	mi/h
Average non-weaving speed, SNW	65.7	mi/h

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	59.4	mi/h
Weaving segment density, D	3.8	pc/mi/ln
Level of service, LOS	A	
Weaving segment v/c ratio	0.190	
Weaving segment flow rate, v	624	veh/h
Weaving segment capacity, cW	3288	veh/h

Limitations on Weaving Segments

If limit reached, see note.

	Minimum	Maximum	Actual	Note
Weaving length (ft)	300	9994	300	a,b
		Maximum	Analyzed	
Density-based capacty, cIWL (pc/h/ln)		2200*	1458	c
		Maximum	Analyzed	
v/c ratio		1.00	0.190	d

Notes:

a. In weaving segments shorter than 300 ft, weaving vehicles are assumed to make only necessary lane changes.
b. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments."
c. The density-based capacity exceeds the capacity of a basic freeway segment, under equivalent ideal conditions.
d. Volumes exceed the weaving segment capacity. The level of service is F.

HCS 2010: Freeway Weaving Release 6.50

Phone: Fax:
E-mail:

Operational Analysis

Analyst:
Agency/Co.: Qk4
Date Performed: 4/10/2014
Analysis Time Period: AM Design Hour
Freeway/Dir of Travel: ETB Parkway Northbound
Weaving Location: KY 1682
Analysis Year: 2040 No Build
Description: Edward T Breathitt Pkwy Interstate 69 Upgrade

Inputs

Segment Type	Freeway	
Weaving configuration	One-Sided	
Number of lanes, N	3	ln
Weaving segment length, LS	300	ft
Freeway free-flow speed, FFS	70	mi/h
Minimum segment speed, SMIN	15	mi/h
Freeway maximum capacity, cIFL	2200*	pc/h/ln
Terrain type	Level	
Grade	0.00	%
Length	0.00	mi

Conversion to pc/h Under Base Conditions

	Volume Components				
	VFF	VRF	VFR	VRR	
Volume, V	240	100	410	0	veh/h
Peak hour factor, PHF	0.90	0.90	0.90	0.94	
Peak 15-min volume, v15	67	28	114	0	
Trucks and buses	18	14	14	0	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.917	0.935	0.935	1.000	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	291	119	487	0	pc/h

Volume ratio, VR 0.676

Configuration Characteristics

Number of maneuver lanes, NWL	2	ln
Interchange density, ID	0.3	int/mi
Minimum RF lane changes, LCRF	1	lc/pc
Minimum FR lane changes, LCFR	1	lc/pc
Minimum RR lane changes, LCRR		lc/pc
Minimum weaving lane changes, LCMIN	606	lc/h
Weaving lane changes, LCW	606	lc/h
Non-weaving vehicle index, INW	3	
Non-weaving lane change, LCNW	0	lc/h
Total lane changes, LCALL	606	lc/h

Weaving and Non-Weaving Speeds

Weaving intensity factor, W 0.394

Average weaving speed, SW	54.5	mi/h
Average non-weaving speed, SNW	64.2	mi/h

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	57.3	mi/h
Weaving segment density, D	5.2	pc/mi/ln
Level of service, LOS	A	
Weaving segment v/c ratio	0.253	
Weaving segment flow rate, v	823	veh/h
Weaving segment capacity, cW	3259	veh/h

Limitations on Weaving Segments

If limit reached, see note.

	Minimum	Maximum	Actual	Note
Weaving length (ft)	300	9950	300	a,b
		Maximum	Analyzed	
Density-based capacty, cIWL (pc/h/ln)		2200*	1462	c
		Maximum	Analyzed	
v/c ratio		1.00	0.253	d

Notes:

a. In weaving segments shorter than 300 ft, weaving vehicles are assumed to make only necessary lane changes.
b. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments."
c. The density-based capacity exceeds the capacity of a basic freeway segment, under equivalent ideal conditions.
d. Volumes exceed the weaving segment capacity. The level of service is F.

HCS 2010: Freeway Weaving Release 6.50

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	
Agency/Co.:	Qk4
Date Performed:	4/10/2014
Analysis Time Period:	PM Design Hour
Freeway/Dir of Travel:	ETB Parkway Northbound
Weaving Location:	KY 1682
Analysis Year:	2013 Existing
Description:	Edward T Breathitt Pkwy Interstate 69 Upgrade

Inputs

Segment Type	Freeway	
Weaving configuration	One-Sided	
Number of lanes, N	3	ln
Weaving segment length, LS	300	ft
Freeway free-flow speed, FFS	70	mi/h
Minimum segment speed, SMIN	15	mi/h
Freeway maximum capacity, cIFL	2200*	pc/h/ln
Terrain type	Level	
Grade	0.00	%
Length	0.00	mi

Conversion to pc/h Under Base Conditions

	Volume Components				
	VFF	VRF	VFR	VRR	
Volume, V	470	80	310	0	veh/h
Peak hour factor, PHF	0.90	0.90	0.90	0.94	
Peak 15-min volume, v15	131	22	86	0	
Trucks and buses	15	10	10	0	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.930	0.952	0.952	1.000	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	561	93	362	0	pc/h

Volume ratio, VR 0.448

Configuration Characteristics

Number of maneuver lanes, NWL	2	ln
Interchange density, ID	0.3	int/mi
Minimum RF lane changes, LCRF	1	lc/pc
Minimum FR lane changes, LCFR	1	lc/pc
Minimum RR lane changes, LCRR		lc/pc
Minimum weaving lane changes, LCMIN	455	lc/h
Weaving lane changes, LCW	455	lc/h
Non-weaving vehicle index, INW	5	
Non-weaving lane change, LCNW	0	lc/h
Total lane changes, LCALL	455	lc/h

Weaving and Non-Weaving Speeds

Weaving intensity factor, W 0.314

Average weaving speed, SW	56.9	mi/h
Average non-weaving speed, SNW	65.1	mi/h

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	61.1	mi/h
Weaving segment density, D	5.5	pc/mi/ln
Level of service, LOS	A	
Weaving segment v/c ratio	0.203	
Weaving segment flow rate, v	946	veh/h
Weaving segment capacity, cW	4660	veh/h

Limitations on Weaving Segments

If limit reached, see note.

	Minimum	Maximum	Actual	Note
Weaving length (ft)	300	7223	300	a,b
		Maximum	Analyzed	
Density-based capacty, cIWL (pc/h/ln)		2200*	1670	c
		Maximum	Analyzed	
v/c ratio		1.00	0.203	d

Notes:

a. In weaving segments shorter than 300 ft, weaving vehicles are assumed to make only necessary lane changes.
b. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments."
c. The density-based capacity exceeds the capacity of a basic freeway segment, under equivalent ideal conditions.
d. Volumes exceed the weaving segment capacity. The level of service is F.

HCS 2010: Freeway Weaving Release 6.50

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	
Agency/Co.:	Qk4
Date Performed:	4/10/2014
Analysis Time Period:	PM Design Hour
Freeway/Dir of Travel:	ETB Parkway Northbound
Weaving Location:	KY 1682
Analysis Year:	2040 No Build
Description:	Edward T Breathitt Pkwy Interstate 69 Upgrade

Inputs

Segment Type	Freeway	
Weaving configuration	One-Sided	
Number of lanes, N	3	ln
Weaving segment length, LS	300	ft
Freeway free-flow speed, FFS	70	mi/h
Minimum segment speed, SMIN	15	mi/h
Freeway maximum capacity, cIFL	2200*	pc/h/ln
Terrain type	Level	
Grade	0.00	%
Length	0.00	mi

Conversion to pc/h Under Base Conditions

	Volume Components				
	VFF	VRF	VFR	VRR	
Volume, V	610	100	410	0	veh/h
Peak hour factor, PHF	0.90	0.90	0.90	0.94	
Peak 15-min volume, v15	169	28	114	0	
Trucks and buses	18	14	14	0	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.917	0.935	0.935	1.000	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	739	119	487	0	pc/h

Volume ratio, VR	0.451	

Configuration Characteristics

Number of maneuver lanes, NWL	2	ln
Interchange density, ID	0.3	int/mi
Minimum RF lane changes, LCRF	1	lc/pc
Minimum FR lane changes, LCFR	1	lc/pc
Minimum RR lane changes, LCRR		lc/pc
Minimum weaving lane changes, LCMIN	606	lc/h
Weaving lane changes, LCW	606	lc/h
Non-weaving vehicle index, INW	7	
Non-weaving lane change, LCNW	0	lc/h
Total lane changes, LCALL	606	lc/h

Weaving and Non-Weaving Speeds

Weaving intensity factor, W	0.394	

Average weaving speed, SW	54.5	mi/h
Average non-weaving speed, SNW	63.5	mi/h

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	59.1	mi/h
Weaving segment density, D	7.6	pc/mi/ln
Level of service, LOS	A	
Weaving segment v/c ratio	0.269	
Weaving segment flow rate, v	1234	veh/h
Weaving segment capacity, cW	4591	veh/h

Limitations on Weaving Segments

If limit reached, see note.

	Minimum	Maximum	Actual	Note
Weaving length (ft)	300	7254	300	a,b
		Maximum	Analyzed	
Density-based capacty, cIWL (pc/h/ln)		2200*	1668	c
		Maximum	Analyzed	
v/c ratio		1.00	0.269	d

Notes:

a. In weaving segments shorter than 300 ft, weaving vehicles are assumed to make only necessary lane changes.
b. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments."
c. The density-based capacity exceeds the capacity of a basic freeway segment, under equivalent ideal conditions.
d. Volumes exceed the weaving segment capacity. The level of service is F.

HCS 2010: Freeway Weaving Release 6.50

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	
Agency/Co.:	Qk4
Date Performed:	4/10/2014
Analysis Time Period:	AM Design Hour
Freeway/Dir of Travel:	ETB Parkway Southbound
Weaving Location:	KY 1682
Analysis Year:	2013 Existing
Description:	Edward T Breathitt Pkwy Interstate 69 Upgrade

Inputs

Segment Type	Freeway	
Weaving configuration	One-Sided	
Number of lanes, N	3	ln
Weaving segment length, LS	300	ft
Freeway free-flow speed, FFS	70	mi/h
Minimum segment speed, SMIN	15	mi/h
Freeway maximum capacity, cIFL	2200*	pc/h/ln
Terrain type	Level	
Grade	0.00	%
Length	0.00	mi

Conversion to pc/h Under Base Conditions

	Volume Components				
	VFF	VRF	VFR	VRR	
Volume, V	390	320	60	0	veh/h
Peak hour factor, PHF	0.90	0.90	0.90	0.94	
Peak 15-min volume, v15	108	89	17	0	
Trucks and buses	15	10	10	0	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.930	0.952	0.952	1.000	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	466	373	70	0	pc/h

Volume ratio, VR 0.487

Configuration Characteristics

Number of maneuver lanes, NWL	2	ln
Interchange density, ID	0.3	int/mi
Minimum RF lane changes, LCRF	1	lc/pc
Minimum FR lane changes, LCFR	1	lc/pc
Minimum RR lane changes, LCRR		lc/pc
Minimum weaving lane changes, LCMIN	443	lc/h
Weaving lane changes, LCW	443	lc/h
Non-weaving vehicle index, INW	4	
Non-weaving lane change, LCNW	0	lc/h
Total lane changes, LCALL	443	lc/h

Weaving and Non-Weaving Speeds

Weaving intensity factor, W 0.307

Average weaving speed, SW	57.1	mi/h
Average non-weaving speed, SNW	65.4	mi/h

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	61.0	mi/h
Weaving segment density, D	5.0	pc/mi/ln
Level of service, LOS	A	
Weaving segment v/c ratio	0.185	
Weaving segment flow rate, v	846	veh/h
Weaving segment capacity, cW	4563	veh/h

Limitations on Weaving Segments

If limit reached, see note.

	Minimum	Maximum	Actual	Note
Weaving length (ft)	300	7679	300	a,b
		Maximum	Analyzed	
Density-based capacty, cIWL (pc/h/ln)		2200*	1635	c
		Maximum	Analyzed	
v/c ratio		1.00	0.185	d

Notes:

a. In weaving segments shorter than 300 ft, weaving vehicles are assumed to make only necessary lane changes.
b. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments."
c. The density-based capacity exceeds the capacity of a basic freeway segment, under equivalent ideal conditions.
d. Volumes exceed the weaving segment capacity. The level of service is F.

HCS 2010: Freeway Weaving Release 6.50

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	
Agency/Co.:	Qk4
Date Performed:	4/10/2014
Analysis Time Period:	AM Design Hour
Freeway/Dir of Travel:	ETB Parkway Southbound
Weaving Location:	KY 1682
Analysis Year:	2040 No Build
Description:	Edward T Breathitt Pkwy Interstate 69 Upgrade

Inputs

Segment Type	Freeway	
Weaving configuration	One-Sided	
Number of lanes, N	3	ln
Weaving segment length, LS	300	ft
Freeway free-flow speed, FFS	70	mi/h
Minimum segment speed, SMIN	15	mi/h
Freeway maximum capacity, cIFL	2200*	pc/h/ln
Terrain type	Level	
Grade	0.00	%
Length	0.00	mi

Conversion to pc/h Under Base Conditions

	Volume Components				
	VFF	VRF	VFR	VRR	
Volume, V	490	420	80	0	veh/h
Peak hour factor, PHF	0.90	0.90	0.90	0.94	
Peak 15-min volume, v15	136	117	22	0	
Trucks and buses	18	14	14	0	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.917	0.935	0.935	1.000	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	593	499	95	0	pc/h
Volume ratio, VR		0.500			

Configuration Characteristics

Number of maneuver lanes, NWL	2	ln
Interchange density, ID	0.3	int/mi
Minimum RF lane changes, LCRF	1	lc/pc
Minimum FR lane changes, LCFR	1	lc/pc
Minimum RR lane changes, LCRR		lc/pc
Minimum weaving lane changes, LCMIN	594	lc/h
Weaving lane changes, LCW	594	lc/h
Non-weaving vehicle index, INW	5	
Non-weaving lane change, LCNW	0	lc/h
Total lane changes, LCALL	594	lc/h

Weaving and Non-Weaving Speeds

Weaving intensity factor, W	0.387

Average weaving speed, SW	54.6	mi/h
Average non-weaving speed, SNW	63.8	mi/h

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	58.9	mi/h
Weaving segment density, D	6.7	pc/mi/ln
Level of service, LOS	A	
Weaving segment v/c ratio	0.247	
Weaving segment flow rate, v	1089	veh/h
Weaving segment capacity, cW	4400	veh/h

Limitations on Weaving Segments

If limit reached, see note.

	Minimum	Maximum	Actual	Note
Weaving length (ft)	300	7831	300	a,b
		Maximum	Analyzed	
Density-based capacty, cIWL (pc/h/ln)		2200*	1624	c
		Maximum	Analyzed	
v/c ratio		1.00	0.247	d

Notes:

a. In weaving segments shorter than 300 ft, weaving vehicles are assumed to make only necessary lane changes.
b. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments."
c. The density-based capacity exceeds the capacity of a basic freeway segment, under equivalent ideal conditions.
d. Volumes exceed the weaving segment capacity. The level of service is F.

HCS 2010: Freeway Weaving Release 6.50

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	
Agency/Co.:	Qk4
Date Performed:	4/10/2014
Analysis Time Period:	PM Design Hour
Freeway/Dir of Travel:	ETB Parkway Southbound
Weaving Location:	KY 1682
Analysis Year:	2013 Existing
Description:	Edward T Breathitt Pkwy Interstate 69 Upgrade

Inputs

Segment Type	Freeway	
Weaving configuration	One-Sided	
Number of lanes, N	3	ln
Weaving segment length, LS	300	ft
Freeway free-flow speed, FFS	70	mi/h
Minimum segment speed, SMIN	15	mi/h
Freeway maximum capacity, cIFL	2200*	pc/h/ln
Terrain type	Level	
Grade	0.00	%
Length	0.00	mi

Conversion to pc/h Under Base Conditions

	Volume Components				
	VFF	VRF	VFR	VRR	
Volume, V	310	320	60	0	veh/h
Peak hour factor, PHF	0.90	0.90	0.90	0.94	
Peak 15-min volume, v15	86	89	17	0	
Trucks and buses	15	10	10	0	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.930	0.952	0.952	1.000	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	370	373	70	0	pc/h

Volume ratio, VR 0.545

Configuration Characteristics

Number of maneuver lanes, NWL	2	ln
Interchange density, ID	0.3	int/mi
Minimum RF lane changes, LCRF	1	lc/pc
Minimum FR lane changes, LCFR	1	lc/pc
Minimum RR lane changes, LCRR		lc/pc
Minimum weaving lane changes, LCMIN	443	lc/h
Weaving lane changes, LCW	443	lc/h
Non-weaving vehicle index, INW	3	
Non-weaving lane change, LCNW	0	lc/h
Total lane changes, LCALL	443	lc/h

Weaving and Non-Weaving Speeds

Weaving intensity factor, W 0.307

Average weaving speed, SW	57.1	mi/h
Average non-weaving speed, SNW	65.5	mi/h

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	60.6	mi/h
Weaving segment density, D	4.5	pc/mi/ln
Level of service, LOS	A	
Weaving segment v/c ratio	0.185	
Weaving segment flow rate, v	757	veh/h
Weaving segment capacity, cW	4097	veh/h

Limitations on Weaving Segments

If limit reached, see note.

	Minimum	Maximum	Actual	Note
Weaving length (ft)	300	8356	300	a,b
		Maximum	Analyzed	
Density-based capacty, cIWL (pc/h/ln)		2200*	1584	c
		Maximum	Analyzed	
v/c ratio		1.00	0.185	d

Notes:

a. In weaving segments shorter than 300 ft, weaving vehicles are assumed to make only necessary lane changes.
b. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments."
c. The density-based capacity exceeds the capacity of a basic freeway segment, under equivalent ideal conditions.
d. Volumes exceed the weaving segment capacity. The level of service is F.

HCS 2010: Freeway Weaving Release 6.50

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	
Agency/Co.:	Qk4
Date Performed:	4/10/2014
Analysis Time Period:	PM Design Hour
Freeway/Dir of Travel:	ETB Parkway Southbound
Weaving Location:	KY 1682
Analysis Year:	2040 No Build
Description:	Edward T Breathitt Pkwy Interstate 69 Upgrade

Inputs

Segment Type	Freeway	
Weaving configuration	One-Sided	
Number of lanes, N	3	ln
Weaving segment length, LS	300	ft
Freeway free-flow speed, FFS	70	mi/h
Minimum segment speed, SMIN	15	mi/h
Freeway maximum capacity, cIFL	2200*	pc/h/ln
Terrain type	Level	
Grade	0.00	%
Length	0.00	mi

Conversion to pc/h Under Base Conditions

	Volume Components				
	VFF	VRF	VFR	VRR	
Volume, V	390	420	80	0	veh/h
Peak hour factor, PHF	0.90	0.90	0.90	0.94	
Peak 15-min volume, v15	108	117	22	0	
Trucks and buses	18	14	14	0	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.917	0.935	0.935	1.000	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	472	499	95	0	pc/h

Volume ratio, VR	0.557	

Configuration Characteristics

Number of maneuver lanes, NWL	2	ln
Interchange density, ID	0.3	int/mi
Minimum RF lane changes, LCRF	1	lc/pc
Minimum FR lane changes, LCFR	1	lc/pc
Minimum RR lane changes, LCRR		lc/pc
Minimum weaving lane changes, LCMIN	594	lc/h
Weaving lane changes, LCW	594	lc/h
Non-weaving vehicle index, INW	4	
Non-weaving lane change, LCNW	0	lc/h
Total lane changes, LCALL	594	lc/h

Weaving and Non-Weaving Speeds

Weaving intensity factor, W	0.387	

Average weaving speed, SW	54.6	mi/h
Average non-weaving speed, SNW	64.0	mi/h

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	58.4	mi/h
Weaving segment density, D	6.1	pc/mi/ln
Level of service, LOS	A	
Weaving segment v/c ratio	0.248	
Weaving segment flow rate, v	978	veh/h
Weaving segment capacity, cW	3951	veh/h

Limitations on Weaving Segments

If limit reached, see note.

	Minimum	Maximum	Actual	Note
Weaving length (ft)	300	8503	300	a,b
		Maximum	Analyzed	
Density-based capacty, cIWL (pc/h/ln)		2200*	1572	c
		Maximum	Analyzed	
v/c ratio		1.00	0.248	d

Notes:

a. In weaving segments shorter than 300 ft, weaving vehicles are assumed to make only necessary lane changes.
b. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments."
c. The density-based capacity exceeds the capacity of a basic freeway segment, under equivalent ideal conditions.
d. Volumes exceed the weaving segment capacity. The level of service is F.

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	
Agency/Co.:	Qk4
Date performed:	4/10/2014
Analysis time period:	AM Design Hour
Freeway/Dir of Travel:	EBT Parkway Northbound
Junction:	US 41 (North)
Jurisdiction:	KYTC
Analysis Year:	2013 Existing
Description:	Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	330	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	30	vph
Length of first accel/decel lane	1030	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	330	30		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	92	8		v
Trucks and buses	15	20		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.930	0.909	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	394	37	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 394 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	431	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 394 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	431	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 2.4 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.255	
Space mean speed in ramp influence area,	S_R = 62.9	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 62.9	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: AM Design Hour
Freeway/Dir of Travel: EBT Parkway Northbound
Junction: US 41 (North)
Jurisdiction: KYTC
Analysis Year: 2040 No Build
Description: Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	440	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	40	vph
Length of first accel/decel lane	1030	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	440	40		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	122	11		v
Trucks and buses	18	23		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.917	0.897	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	533	50	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 533 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	583	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 533 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	583	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 3.5 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.256	
Space mean speed in ramp influence area,	S_R = 62.8	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 62.8	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.50

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	
Agency/Co.:	Qk4
Date performed:	4/10/2014
Analysis time period:	PM Design Hour
Freeway/Dir of Travel:	EBT Parkway Northbound
Junction:	US 41 (North)
Jurisdiction:	KYTC
Analysis Year:	2013 Existing
Description:	Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	460	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	30	vph
Length of first accel/decel lane	1030	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	460	30		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	128	8		v
Trucks and buses	15	20		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.930	0.909	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	549	37	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 549 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	586	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 549 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	586	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 3.6 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.256	
Space mean speed in ramp influence area,	S_R = 62.8	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 62.8	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: EBT Parkway Northbound
Junction: US 41 (North)
Jurisdiction: KYTC
Analysis Year: 2040 No Build
Description: Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	620	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	40	vph
Length of first accel/decel lane	1030	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	620	40		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	172	11		v
Trucks and buses	18	23		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.917	0.897	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	751	50	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 751 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	801	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 751 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	801	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 5.2 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.258	
Space mean speed in ramp influence area,	S_R = 62.8	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 62.8	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: AM Design Hour
Freeway/Dir of Travel: ETB Parkway Southbound
Junction: US 41
Jurisdiction: KYTC
Analysis Year: 2013 Existing
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	410	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	30	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	410	30		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	114	8		v
Trucks and buses	15	20		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.930	0.909	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	490	37	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 490 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	490	4800	No
$v_{FO} = v_F - v_R$	453	4800	No
v_R	37	2000	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 490 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	490	4400	No

Level of Service Determination (if not F)

Density, $D_D = 4.252 + 0.0086 v_R - 0.009 L_{12}$ = 6.2 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.431	
Space mean speed in ramp influence area,	S_R = 57.9	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 57.9	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: AM Design Hour
Freeway/Dir of Travel: ETB Parkway Southbound
Junction: US 41
Jurisdiction: KYTC
Analysis Year: 2040 No Build
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	520	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	40	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	520	40		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	144	11		v
Trucks and buses	18	23		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.917	0.897	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	630	50	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 630 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	630	4800	No
$v_{FO} = v_F - v_R$	580	4800	No
v_R	50	2000	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 630 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	630	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 7.4 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.433	
Space mean speed in ramp influence area,	S_R = 57.9	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 57.9	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: ETB Parkway Southbound
Junction: US 41
Jurisdiction: KYTC
Analysis Year: 2013 Existing
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	430	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	30	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	430	30		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	119	8		v
Trucks and buses	15	20		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %		%
Length	0.00 mi	0.00 mi		mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.930	0.909	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	514	37	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 514 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	514	4800	No
$v_{FO} = v_F - v_R$	477	4800	No
v_R	37	2000	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 514 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	514	4400	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086\, v_R - 0.009\, L_D$ = 6.4 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.431	
Space mean speed in ramp influence area,	S_R = 57.9	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 57.9	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: ETB Parkway Southbound
Junction: US 41
Jurisdiction: KYTC
Analysis Year: 2040 No Build
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	550	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	40	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	550	40		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	153	11		v
Trucks and buses	18	23		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.917	0.897	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	666	50	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 666 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	666	4800	No
$v_{FO} = v_F - v_R$	616	4800	No
v_R	50	2000	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 666 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	666	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 7.7 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.433	
Space mean speed in ramp influence area,	S_R = 57.9	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 57.9	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	
Agency/Co.:	Qk4
Date performed:	8/1/2014
Analysis time period:	AM Design Hour
Freeway/Dir of Travel:	EBT Parkway Northbound
Junction:	US 62
Jurisdiction:	KYTC
Analysis Year:	2013 No Build
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	295	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	95	vph
Length of first accel/decel lane	290	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	295	95		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	82	26		v
Trucks and buses	15	15		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.930	0.930	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	352	113	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 352 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	352	4800	No
$v_{FO} = v_F - v_R$	239	4800	No
v_R	113	2000	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 352 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	352	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 4.7 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.438	
Space mean speed in ramp influence area,	S_R = 57.7	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 57.7	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.50

Phone: Fax:
E-mail:

Merge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 8/1/2014
Analysis time period: AM Design Hour
Freeway/Dir of Travel: EBT Parkway Northbound
Junction: US 62
Jurisdiction: KYTC
Analysis Year: 2013 NB
Description:

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	405	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	55	vph
Length of first accel/decel lane	430	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	405	55		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	113	15		v
Trucks and buses	15	15		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.930	0.930	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	484	66	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 484 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	550	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 484 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	550	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 7.0 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.298	
Space mean speed in ramp influence area,	S_R = 61.7	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 61.7	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	
Agency/Co.:	Qk4
Date performed:	8/1/2014
Analysis time period:	AM Design Hour
Freeway/Dir of Travel:	EBT Parkway Southbound
Junction:	US 62
Jurisdiction:	KYTC
Analysis Year:	2013 No Build
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	610	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	30	vph
Length of first accel/decel lane	390	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	610	30		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	169	8		v
Trucks and buses	15	15		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.930	0.930	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	729	36	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 729 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	729	4800	No
$v_{FO} = v_F - v_R$	693	4800	No
v_R	36	2000	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 729 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	729	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 7.0 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.431	
Space mean speed in ramp influence area,	S_R = 57.9	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 57.9	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	
Agency/Co.:	Qk4
Date performed:	8/1/2014
Analysis time period:	AM Design Hour
Freeway/Dir of Travel:	EBT Parkway Southbound
Junction:	US 62
Jurisdiction:	KYTC
Analysis Year:	2013 NB
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	340	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	200	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	340	200		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	94	56		v
Trucks and buses	15	15		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.930	0.930	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	406	239	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 406 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	645	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 406 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	645	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 8.8 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.311	
Space mean speed in ramp influence area,	S_R = 61.3	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 61.3	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	
Agency/Co.:	Qk4
Date performed:	8/1/2014
Analysis time period:	AM Design Hour
Freeway/Dir of Travel:	EBT Parkway Northbound
Junction:	US 62
Jurisdiction:	KYTC
Analysis Year:	2040 No Build
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	350	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	150	vph
Length of first accel/decel lane	290	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	350	150		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	97	42		v
Trucks and buses	18	18		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %		%
Length	0.00 mi	0.00 mi		mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.917	0.917	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	424	182	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 424 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	424	4800	No
$v_{FO} = v_F - v_R$	242	4800	No
v_R	182	2000	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 424 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	424	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 5.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.444	
Space mean speed in ramp influence area,	S_R = 57.6	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 57.6	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.50

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	
Agency/Co.:	Qk4
Date performed:	8/1/2014
Analysis time period:	AM Design Hour
Freeway/Dir of Travel:	EBT Parkway Northbound
Junction:	US 62
Jurisdiction:	KYTC
Analysis Year:	2040 NB
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	500	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	90	vph
Length of first accel/decel lane	430	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	500	90		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	139	25		v
Trucks and buses	18	18		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.917	0.917	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	606	109	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 606 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	715	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 606 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	715	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 8.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.299	
Space mean speed in ramp influence area,	S_R = 61.6	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 61.6	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	
Agency/Co.:	Qk4
Date performed:	8/1/2014
Analysis time period:	AM Design Hour
Freeway/Dir of Travel:	EBT Parkway Southbound
Junction:	US 62
Jurisdiction:	KYTC
Analysis Year:	2040 No Build
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	760	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	50	vph
Length of first accel/decel lane	390	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	760	50		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	211	14		v
Trucks and buses	18	18		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.917	0.917	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	920	61	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 920 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	920	4800	No
$v_{FO} = v_F - v_R$	859	4800	No
v_R	61	2000	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 920 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	920	4400	No

Level of Service Determination (if not F)

Density, $D_D = 4.252 + 0.0086 v_R - 0.009 L_{12}$ = 8.7 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.433	
Space mean speed in ramp influence area,	S_R = 57.9	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 57.9	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	
Agency/Co.:	Qk4
Date performed:	8/1/2014
Analysis time period:	AM Design Hour
Freeway/Dir of Travel:	EBT Parkway Southbound
Junction:	US 62
Jurisdiction:	KYTC
Analysis Year:	2040 NB
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	380	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	320	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	380	320		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	106	89		v
Trucks and buses	18	18		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.917	0.917	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	460	388	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 460 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	848	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 460 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	848	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 10.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	M_S = 0.313	
Space mean speed in ramp influence area,	S_R = 61.2	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 61.2	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 8/1/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: EBT Parkway Northbound
Junction: US 62
Jurisdiction: KYTC
Analysis Year: 2013 No Build
Description:

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	330	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	210	vph
Length of first accel/decel lane	290	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	330	210		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	92	58		v
Trucks and buses	15	15		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %		%
Length	0.00 mi	0.00 mi		mi
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.930	0.930	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	394	251	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 394 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	394	4800	No
$v_{FO} = v_F - v_R$	143	4800	No
v_R	251	2000	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 394 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	394	4400	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086\, v_R - 0.009\, L_D$ = 5.0 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable, D_S = 0.451

Space mean speed in ramp influence area, S_R = 57.4 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 57.4 mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.50

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	
Agency/Co.:	Qk4
Date performed:	8/1/2014
Analysis time period:	PM Design Hour
Freeway/Dir of Travel:	EBT Parkway Northbound
Junction:	US 62
Jurisdiction:	KYTC
Analysis Year:	2013 NB
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	605	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	35	vph
Length of first accel/decel lane	430	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	605	35		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	168	10		v
Trucks and buses	15	15		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.930	0.930	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	723	42	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 723 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	765	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 723 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	765	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 8.7 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.299	
Space mean speed in ramp influence area,	S_R = 61.6	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 61.6	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	
Agency/Co.:	Qk4
Date performed:	8/1/2014
Analysis time period:	PM Design Hour
Freeway/Dir of Travel:	EBT Parkway Southbound
Junction:	US 62
Jurisdiction:	KYTC
Analysis Year:	2013 No Build
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	405	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	55	vph
Length of first accel/decel lane	390	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	405	55		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	113	15		v
Trucks and buses	15	15		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.930	0.930	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	484	66	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 484 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	484	4800	No
$v_{FO} = v_F - v_R$	418	4800	No
v_R	66	2000	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 484 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	484	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 4.9 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.434	
Space mean speed in ramp influence area,	S_R = 57.8	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 57.8	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	
Agency/Co.:	Qk4
Date performed:	8/1/2014
Analysis time period:	PM Design Hour
Freeway/Dir of Travel:	EBT Parkway Southbound
Junction:	US 62
Jurisdiction:	KYTC
Analysis Year:	2013 NB
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	270	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	120	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	270	120		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	75	33		v
Trucks and buses	15	15		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.930	0.930	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	322	143	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 322 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	465	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 322 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	465	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 7.5 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.310	
Space mean speed in ramp influence area,	S_R = 61.3	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 61.3	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 8/1/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: EBT Parkway Northbound
Junction: US 62
Jurisdiction: KYTC
Analysis Year: 2040 No Build
Description:

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	370	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	330	vph
Length of first accel/decel lane	290	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	370	330		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	103	92		v
Trucks and buses	18	18		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.917	0.917	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	448	400	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 448 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	448	4800	No
$v_{FO} = v_F - v_R$	48	4800	No
v_R	400	2000	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 448 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	448	4400	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086\, v_R - 0.009\, L_{12}$ = 5.5 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.464	
Space mean speed in ramp influence area,	S_R = 57.0	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 57.0	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	
Agency/Co.:	Qk4
Date performed:	8/1/2014
Analysis time period:	PM Design Hour
Freeway/Dir of Travel:	EBT Parkway Northbound
Junction:	US 62
Jurisdiction:	KYTC
Analysis Year:	2040 NB
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	750	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	60	vph
Length of first accel/decel lane	430	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	750	60		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	208	17		v
Trucks and buses	18	18		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.917	0.917	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	908	73	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 908 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	981	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 908 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	981	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 10.4 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	M_S = 0.301	
Space mean speed in ramp influence area,	S_R = 61.6	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 61.6	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.50

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	
Agency/Co.:	Qk4
Date performed:	8/1/2014
Analysis time period:	PM Design Hour
Freeway/Dir of Travel:	EBT Parkway Southbound
Junction:	US 62
Jurisdiction:	KYTC
Analysis Year:	2040 No Build
Description:	

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	500	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	90	vph
Length of first accel/decel lane	390	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	500	90		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	139	25		v
Trucks and buses	18	18		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.917	0.917	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	606	109	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 606 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	606	4800	No
$v_{FO} = v_F - v_R$	497	4800	No
v_R	109	2000	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 606 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	606	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086 v_{12} - 0.009 L_D$ = 6.0 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable, D_S = 0.438

Space mean speed in ramp influence area, S_R = 57.7 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 57.7 mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	
Agency/Co.:	Qk4
Date performed:	8/1/2014
Analysis time period:	PM Design Hour
Freeway/Dir of Travel:	EBT Parkway Southbound
Junction:	US 62
Jurisdiction:	KYTC
Analysis Year:	2040 NB
Description:	

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	310	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	190	vph
Length of first accel/decel lane	250	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	310	190		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	86	53		v
Trucks and buses	18	18		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.917	0.917	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	375	230	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 375 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	605	4800	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 375 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	605	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 8.5 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.311	
Space mean speed in ramp influence area,	S_R = 61.3	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 61.3	mph

HCS 2010: Freeway Weaving Release 6.50

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	JJL
Agency/Co.:	Qk4
Date Performed:	9/2/2014
Analysis Time Period:	Design Hour
Freeway/Dir of Travel:	ETB Parkway
Weaving Location:	US 62 to I69
Analysis Year:	2040
Description:	

Inputs

Segment Type	Freeway	
Weaving configuration	One-Sided	
Number of lanes, N	2	ln
Weaving segment length, LS	4350	ft
Freeway free-flow speed, FFS	70	mi/h
Minimum segment speed, SMIN	60	mi/h
Freeway maximum capacity, cIFL	2400	pc/h/ln
Terrain type	Rolling	
Grade		%
Length		mi

Conversion to pc/h Under Base Conditions

	Volume Components				
	VFF	VRF	VFR	VRR	
Volume, V	540	90	210	0	veh/h
Peak hour factor, PHF	0.90	0.90	0.90	0.94	
Peak 15-min volume, v15	150	25	58	0	
Trucks and buses	18	18	18	0	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	2.5	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	2.0	
Heavy vehicle adjustment, fHV	0.787	0.787	0.787	1.000	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	762	127	296	0	pc/h
Volume ratio, VR		0.357			

Configuration Characteristics

Number of maneuver lanes, NWL	2	ln
Interchange density, ID	1.0	int/mi
Minimum RF lane changes, LCRF	1	lc/pc
Minimum FR lane changes, LCFR	1	lc/pc
Minimum RR lane changes, LCRR		lc/pc
Minimum weaving lane changes, LCMIN	423	lc/h
Weaving lane changes, LCW	596	lc/h
Non-weaving vehicle index, INW	331	
Non-weaving lane change, LCNW	2129	lc/h
Total lane changes, LCALL	2725	lc/h

Weaving and Non-Weaving Speeds

Weaving intensity factor, W	0.156

Average weaving speed, SW	68.6	mi/h
Average non-weaving speed, SNW	64.1	mi/h

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	65.7	mi/h
Weaving segment density, D	9.0	pc/mi/ln
Level of service, LOS	A	
Weaving segment v/c ratio	0.262	
Weaving segment flow rate, v	934	veh/h
Weaving segment capacity, cW	3556	veh/h

Limitations on Weaving Segments

If limit reached, see note.

	Minimum	Maximum	Actual	Note
Weaving length (ft)	300	6203	4350	a,b
		Maximum	Analyzed	
Density-based capacty, cIWL (pc/h/ln)		2400	2258	c
		Maximum	Analyzed	
v/c ratio		1.00	0.262	d

Notes:

a. In weaving segments shorter than 300 ft, weaving vehicles are assumed to make only necessary lane changes.
b. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments."
c. The density-based capacity exceeds the capacity of a basic freeway segment, under equivalent ideal conditions.
d. Volumes exceed the weaving segment capacity. The level of service is F.

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: AM Design Hour
Freeway/Dir of Travel: ETB Parkway Northbound
Junction: US 41A
Jurisdiction: KYTC
Analysis Year: 2013
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	520	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	200	vph
Length of first accel/decel lane	240	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	520	200		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	144	56		v
Trucks and buses	16	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.926	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	624	233	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 624 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	624	4800	No
$v_{FO} = v_F - v_R$	391	4800	No
v_R	233	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 624 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	624	4400	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086\, v_R - 0.009\, L_D$ = 7.5 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable, D_S = 0.319

Space mean speed in ramp influence area, S_R = 61.1 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 61.1 mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: AM Design Hour
Freeway/Dir of Travel: ETB Parkway Northbound
Junction: US 41A
Jurisdiction: KYTC
Analysis Year: 2013
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	520	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	200	vph
Length of first accel/decel lane	240	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	520	200		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	144	56		v
Trucks and buses	16	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.926	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	624	233	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 624 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	624	4800	No
$v_{FO} = v_F - v_R$	391	4800	No
v_R	233	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 624 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	624	4400	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086\, v_R - 0.009\, L_D$ = 7.5 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable, D_S = 0.319

Space mean speed in ramp influence area, S_R = 61.1 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 61.1 mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	
Agency/Co.:	Qk4
Date performed:	4/10/2014
Analysis time period:	AM Design Hour
Freeway/Dir of Travel:	ETB Parkway Northbound
Junction:	US 41A
Jurisdiction:	KYTC
Analysis Year:	2040 No Build
Description:	ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	510	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	260	vph
Length of first accel/decel lane	240	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	510	260		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	142	72		v
Trucks and buses	20	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.909	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	623	309	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 623 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	623	4800	No
$v_{FO} = v_F - v_R$	314	4800	No
v_R	309	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12}/2 No

If yes, v_{12A} = 623 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	623	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 7.4 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable, D_S = 0.326

Space mean speed in ramp influence area, S_R = 60.9 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 60.9 mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:	
Agency/Co.:	Qk4
Date performed:	4/10/2014
Analysis time period:	AM Design Hour
Freeway/Dir of Travel:	ETB Parkway Northbound
Junction:	US 41A
Jurisdiction:	KYTC
Analysis Year:	2040 No Build
Description:	ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	510	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	260	vph
Length of first accel/decel lane	240	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	510	260		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	142	72		v
Trucks and buses	20	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.909	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	623	309	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 623 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	623	4800	No
$v_{FO} = v_F - v_R$	314	4800	No
v_R	309	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12}/2 No

If yes, v_{12A} = 623 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	623	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 7.4 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable, D_S = 0.326

Space mean speed in ramp influence area, S_R = 60.9 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 60.9 mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: ETB Parkway Northbound
Junction: US 41A
Jurisdiction: KYTC
Analysis Year: 2013
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	390	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	200	vph
Length of first accel/decel lane	240	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	390	200		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	108	56		v
Trucks and buses	16	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.926	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	468	233	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 468 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	468	4800	No
$v_{FO} = v_F - v_R$	235	4800	No
v_R	233	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 468 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	468	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 6.1 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.319	
Space mean speed in ramp influence area,	S_R = 61.1	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 61.1	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: ETB Parkway Northbound
Junction: US 41A
Jurisdiction: KYTC
Analysis Year: 2013
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	390	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	200	vph
Length of first accel/decel lane	240	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	390	200		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	108	56		v
Trucks and buses	16	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.926	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	468	233	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 468 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	468	4800	No
$v_{FO} = v_F - v_R$	235	4800	No
v_R	233	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 468 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	468	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 6.1 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.319	
Space mean speed in ramp influence area,	S_R = 61.1	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 61.1	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: ETB Parkway Northbound
Junction: US 41A
Jurisdiction: KYTC
Analysis Year: 2040 No Build
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	370	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	260	vph
Length of first accel/decel lane	240	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	370	260		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	103	72		v
Trucks and buses	20	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.909	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	452	309	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 452 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	452	4800	No
$v_{FO} = v_F - v_R$	143	4800	No
v_R	309	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 452 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	452	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 6.0 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable, D_S = 0.326

Space mean speed in ramp influence area, S_R = 60.9 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 60.9 mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: ETB Parkway Northbound
Junction: US 41A
Jurisdiction: KYTC
Analysis Year: 2040 No Build
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	370	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	260	vph
Length of first accel/decel lane	240	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	370	260		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	103	72		v
Trucks and buses	20	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.909	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	452	309	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 452 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	452	4800	No
$v_{FO} = v_F - v_R$	143	4800	No
v_R	309	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 452 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	452	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 6.0 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable, D_S = 0.326

Space mean speed in ramp influence area, S_R = 60.9 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 60.9 mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	
Agency/Co.:	Qk4
Date performed:	4/10/2014
Analysis time period:	AM Design Hour
Freeway/Dir of Travel:	EBT Parkway Northbound
Junction:	US 41A
Jurisdiction:	KYTC
Analysis Year:	2013 Existing
Description:	Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	300	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	420	vph
Length of first accel/decel lane	940	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	300	420		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	83	117		v
Trucks and buses	15	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.930	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	358	490	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 358 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	848	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 358 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	848	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 6.0 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.264	
Space mean speed in ramp influence area,	S_R = 62.6	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 62.6	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	
Agency/Co.:	Qk4
Date performed:	4/10/2014
Analysis time period:	AM Design Hour
Freeway/Dir of Travel:	EBT Parkway Northbound
Junction:	US 41A
Jurisdiction:	KYTC
Analysis Year:	2013 Existing
Description:	Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	300	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	420	vph
Length of first accel/decel lane	940	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	300	420		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	83	117		v
Trucks and buses	15	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.930	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	358	490	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 358 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	848	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 358 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	848	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 6.0 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.264	
Space mean speed in ramp influence area,	S_R = 62.6	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 62.6	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: AM Design Hour
Freeway/Dir of Travel: EBT Parkway Northbound
Junction: US 41A
Jurisdiction: KYTC
Analysis Year: 2040 No Build
Description: Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	410	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	550	vph
Length of first accel/decel lane	940	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	410	550		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	114	153		v
Trucks and buses	18	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.917	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	497	654	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 497 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1151	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 497 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	1151	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 8.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.268	
Space mean speed in ramp influence area,	S_R = 62.5	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 62.5	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: AM Design Hour
Freeway/Dir of Travel: EBT Parkway Northbound
Junction: US 41A
Jurisdiction: KYTC
Analysis Year: 2040 No Build
Description: Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	410	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	550	vph
Length of first accel/decel lane	940	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	410	550		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	114	153		v
Trucks and buses	18	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.917	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	497	654	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 497 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1151	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 497 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	1151	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 8.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.268	
Space mean speed in ramp influence area,	S_R = 62.5	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 62.5	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.50

Phone: Fax:
E-mail:

Merge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: EBT Parkway Northbound
Junction: US 41A
Jurisdiction: KYTC
Analysis Year: 2013 Existing
Description: Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	380	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	420	vph
Length of first accel/decel lane	940	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	380	420		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	106	117		v
Trucks and buses	15	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.930	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	454	490	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 454 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	944	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 454 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	944	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 6.7 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.265	
Space mean speed in ramp influence area,	S_R = 62.6	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 62.6	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.50

Phone: Fax:
E-mail:

Merge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: EBT Parkway Northbound
Junction: US 41A
Jurisdiction: KYTC
Analysis Year: 2013 Existing
Description: Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	380	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	420	vph
Length of first accel/decel lane	940	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	380	420		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	106	117		v
Trucks and buses	15	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.930	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	454	490	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 454 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	944	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 454 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	944	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 6.7 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.265	
Space mean speed in ramp influence area,	S_R = 62.6	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 62.6	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.50

Phone: Fax:
E-mail:

Merge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: EBT Parkway Northbound
Junction: US 41A
Jurisdiction: KYTC
Analysis Year: 2040 No Build
Description: Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	510	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	550	vph
Length of first accel/decel lane	940	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	510	550		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	142	153		v
Trucks and buses	18	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.917	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	618	654	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 618 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1272	4800	No

v_3 or v_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 618 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	1272	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 9.2 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.269	
Space mean speed in ramp influence area,	S_R = 62.5	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 62.5	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.50

Phone: Fax:
E-mail:

Merge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: EBT Parkway Northbound
Junction: US 41A
Jurisdiction: KYTC
Analysis Year: 2040 No Build
Description: Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	510	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	550	vph
Length of first accel/decel lane	940	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	510	550		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	142	153		v
Trucks and buses	18	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.917	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	618	654	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 618 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1272	4800	No

v_3 or v_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 618 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	1272	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 9.2 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.269	
Space mean speed in ramp influence area,	S_R = 62.5	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 62.5	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.50

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: AM Design Hour
Freeway/Dir of Travel: ETB Parkway Southbound
Junction: US 41A
Jurisdiction: KYTC
Analysis Year: 2013
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	420	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	360	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	420	360		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	117	100		v
Trucks and buses	15	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.930	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	502	420	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 502 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	502	4800	No
$v_{FO} = v_F - v_R$	82	4800	No
v_R	420	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 502 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	502	4400	No

Level of Service Determination (if not F)

Density, $D_D = 4.252 + 0.0086\, v_R - 0.009\, L_{12}$ = -4.9 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.336	
Space mean speed in ramp influence area,	S_R = 60.6	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 60.6	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.50

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: AM Design Hour
Freeway/Dir of Travel: ETB Parkway Southbound
Junction: US 41A
Jurisdiction: KYTC
Analysis Year: 2040 No Build
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	570	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	470	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	570	470		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	158	131		v
Trucks and buses	18	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.917	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	690	559	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 690 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	690	4800	No
$v_{FO} = v_F - v_R$	131	4800	No
v_R	559	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 690 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	690	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = -3.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.348	
Space mean speed in ramp influence area,	S_R = 60.2	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 60.2	mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: ETB Parkway Southbound
Junction: US 41A
Jurisdiction: KYTC
Analysis Year: 2013
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	350	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	360	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	350	360		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	97	100		v
Trucks and buses	15	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.930	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	418	420	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 418 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	418	4800	No
$v_{FO} = v_F - v_R$	-2	4800	No
v_R	420	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 418 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	418	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = -5.7 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable, D_S = 0.336

Space mean speed in ramp influence area, S_R = 60.6 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 60.6 mph

Phone: Fax:
E-mail:

Diverge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: ETB Parkway Southbound
Junction: US 41A
Jurisdiction: KYTC
Analysis Year: 2040 No Build
Description: ETB Pkwy Interstate 69 Upgrade

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	470	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	45.0	mph
Volume on ramp	470	vph
Length of first accel/decel lane	1500	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	470	470		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	131	131		v
Trucks and buses	18	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.917	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	569	559	pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 569 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	569	4800	No
$v_{FO} = v_F - v_R$	10	4800	No
v_R	559	2100	No
v_3 or v_{av34}	0 pc/h	(Equation 13-14 or 13-17)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 v_{12} /2	No	

If yes, v_{12A} = 569 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	569	4400	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = -4.4 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.348	
Space mean speed in ramp influence area,	S_R = 60.2	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 60.2	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.50

Phone: Fax:
E-mail:

Merge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: AM Design Hour
Freeway/Dir of Travel: EBT Parkway Southbound
Junction: US 41A
Jurisdiction: KYTC
Analysis Year: 2013 Existing
Description: Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	350	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	240	vph
Length of first accel/decel lane	1480	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	350	240		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	97	67		v
Trucks and buses	16	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.926	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	420	280	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 420 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	700	4800	No

v_3 or v_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 420 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	700	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 1.5 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.225	
Space mean speed in ramp influence area,	S_R = 63.7	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 63.7	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.50

Phone: Fax:
E-mail:

Merge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: AM Design Hour
Freeway/Dir of Travel: EBT Parkway Southbound
Junction: US 41A
Jurisdiction: KYTC
Analysis Year: 2040 No Build
Description: Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	330	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	300	vph
Length of first accel/decel lane	1480	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	330	300		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	92	83		v
Trucks and buses	20	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.909	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	403	357	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 403 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	760	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 403 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	760	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 2.0 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.226	
Space mean speed in ramp influence area,	S_R = 63.7	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 63.7	mph

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	
Agency/Co.:	Qk4
Date performed:	4/10/2014
Analysis time period:	PM Design Hour
Freeway/Dir of Travel:	EBT Parkway Southbound
Junction:	US 41A
Jurisdiction:	KYTC
Analysis Year:	2013 Existing
Description:	Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	480	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	240	vph
Length of first accel/decel lane	1480	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	480	240		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	133	67		v
Trucks and buses	16	10		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.926	0.952	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	576	280	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 576 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	856	4800	No

v_3 or v_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 576 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	856	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 2.7 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.227	
Space mean speed in ramp influence area,	S_R = 63.7	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 63.7	mph

HCS 2010: Freeway Merge and Diverge Segments Release 6.50

Phone: Fax:
E-mail:

Merge Analysis

Analyst:
Agency/Co.: Qk4
Date performed: 4/10/2014
Analysis time period: PM Design Hour
Freeway/Dir of Travel: EBT Parkway Southbound
Junction: US 41A
Jurisdiction: KYTC
Analysis Year: 2040 No Build
Description: Edward T Breathitt Parkway Interstate 69 Upgrade

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	70.0	mph
Volume on freeway	470	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	300	vph
Length of first accel/decel lane	1480	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	470	300		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	131	83		v
Trucks and buses	20	14		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		

Heavy vehicle adjustment, fHV	0.909	0.935	
Driver population factor, fP	1.00	1.00	
Flow rate, vp	574	357	pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 574 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	931	4800	No

v_3 or v_{av34} = 0 pc/h (Equation 13-14 or 13-17)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 574 (Equation 13-15, 13-16, 13-18, or 13-19)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	931	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734 v_R + 0.0078 v_{12} - 0.00627 L_A$ = 3.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.227	
Space mean speed in ramp influence area,	S_R = 63.6	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 63.6	mph

HCS 2010: Freeway Weaving Release 6.50

Phone: Fax:
E-mail:

Operational Analysis

Analyst:	JJL
Agency/Co.:	Qk4
Date Performed:	9/2/2014
Analysis Time Period:	Design Hour
Freeway/Dir of Travel:	ETB Parkway
Weaving Location:	US 62 to I69
Analysis Year:	2040
Description:	

Inputs

Segment Type	Freeway	
Weaving configuration	One-Sided	
Number of lanes, N	2	ln
Weaving segment length, LS	4350	ft
Freeway free-flow speed, FFS	70	mi/h
Minimum segment speed, SMIN	60	mi/h
Freeway maximum capacity, cIFL	2400	pc/h/ln
Terrain type	Rolling	
Grade		%
Length		mi

Conversion to pc/h Under Base Conditions

	Volume Components				
	VFF	VRF	VFR	VRR	
Volume, V	540	90	210	0	veh/h
Peak hour factor, PHF	0.90	0.90	0.90	0.94	
Peak 15-min volume, v15	150	25	58	0	
Trucks and buses	18	18	18	0	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	2.5	2.5	2.5	2.5	
Recreational vehicle PCE, ER	2.0	2.0	2.0	2.0	
Heavy vehicle adjustment, fHV	0.787	0.787	0.787	1.000	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	762	127	296	0	pc/h
Volume ratio, VR		0.357			

Configuration Characteristics

Number of maneuver lanes, NWL	2	ln
Interchange density, ID	1.0	int/mi
Minimum RF lane changes, LCRF	1	lc/pc
Minimum FR lane changes, LCFR	1	lc/pc
Minimum RR lane changes, LCRR		lc/pc
Minimum weaving lane changes, LCMIN	423	lc/h
Weaving lane changes, LCW	596	lc/h
Non-weaving vehicle index, INW	331	
Non-weaving lane change, LCNW	2129	lc/h
Total lane changes, LCALL	2725	lc/h

Weaving and Non-Weaving Speeds

Weaving intensity factor, W	0.156

Average weaving speed, SW	68.6	mi/h
Average non-weaving speed, SNW	64.1	mi/h

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	65.7	mi/h
Weaving segment density, D	9.0	pc/mi/ln
Level of service, LOS	A	
Weaving segment v/c ratio	0.262	
Weaving segment flow rate, v	934	veh/h
Weaving segment capacity, cW	3556	veh/h

Limitations on Weaving Segments

If limit reached, see note.

	Minimum	Maximum	Actual	Note
Weaving length (ft)	300	6203	4350	a,b
		Maximum	Analyzed	
Density-based capacty, cIWL (pc/h/ln)		2400	2258	c
		Maximum	Analyzed	
v/c ratio		1.00	0.262	d

Notes:

a. In weaving segments shorter than 300 ft, weaving vehicles are assumed to make only necessary lane changes.
b. Weaving segments longer than the calculated maximum length should be treated as isolated merge and diverge areas using the procedures of Chapter 13, "Freeway Merge and Diverge Segments."
c. The density-based capacity exceeds the capacity of a basic freeway segment, under equivalent ideal conditions.
d. Volumes exceed the weaving segment capacity. The level of service is F.