

RAMPS AND RAMP JUNCTIONS WORKSHEET									
General Information					Site Information				
Analyst		JRE		Freeway/Dir of Travel		I-80 Eastbound			
Agency or Company		AECOM		Junction		Int. 303 to Rt 611			
Date Performed		1/3/2014		Jurisdiction					
Analysis Time Period		A.M. Peak Hour		Analysis Year		Alt2A 2045			
Project Description Interstate 80 Reconstruction									
Inputs									
Upstream Adj Ramp		Number of Lanes, N				Downstream Adj Ramp			
<input type="checkbox"/> Yes <input type="checkbox"/> On		Acceleration Lane Length, L_A				<input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> On			
<input checked="" type="checkbox"/> No <input type="checkbox"/> Off		Deceleration Lane Length L_D				<input type="checkbox"/> No <input type="checkbox"/> Off			
$L_{up} =$ ft		Freeway Volume, V_F				$L_{down} =$ 1750 ft			
$V_u =$ veh/h		Ramp Volume, V_R				$V_D =$ 190 veh/h			
		Freeway Free-Flow Speed, S_{FF}							
		Ramp Free-Flow Speed, S_{FR}							
Conversion to pc/h Under Base Conditions									
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$	
Freeway	2746	0.94	Rolling	10	1	0.862	0.95	3567	
Ramp	337	0.72	Rolling	1	0	0.985	0.95	500	
UpStream									
DownStream	190	0.72	Rolling	1	0	0.985	0.95	282	
Merge Areas					Diverge Areas				
Estimation of v_{12}					Estimation of v_{12}				
$V_{12} = V_F (P_{FM})$					$V_{12} = V_R + (V_F - V_R)P_{FD}$				
(Equation 13-6 or 13-7)					(Equation 13-12 or 13-13)				
$L_{EQ} =$					$L_{EQ} =$				
using Equation (Exhibit 13-6)					1.000 using Equation (Exhibit 13-7)				
$P_{FM} =$					$P_{FD} =$				
$V_{12} =$ pc/h					$V_{12} =$ 3567 pc/h				
V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)					V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)				
Is V_3 or $V_{av34} > 2,700$ pc/h? <input type="checkbox"/> Yes <input type="checkbox"/> No					Is V_3 or $V_{av34} > 2,700$ pc/h? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				
Is V_3 or $V_{av34} > 1.5 * V_{12}/2$ <input type="checkbox"/> Yes <input type="checkbox"/> No					Is V_3 or $V_{av34} > 1.5 * V_{12}/2$ <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				
If Yes, $V_{12a} =$ pc/h (Equation 13-16, 13-18, or 13-19)					If Yes, $V_{12a} =$ pc/h (Equation 13-16, 13-18, or 13-19)				
Capacity Checks					Capacity Checks				
	Actual	Capacity		LOS F?		Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8			V_F	3567	Exhibit 13-8	4800	No
			$V_{FO} = V_F - V_R$	3067	Exhibit 13-8	4800	No		
			V_R	500	Exhibit 13-10	4000	No		
Flow Entering Merge Influence Area					Flow Entering Diverge Influence Area				
	Actual	Max Desirable		Violation?		Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8			V_{12}	3567	Exhibit 13-8	4400:All	No
Level of Service Determination (if not F)					Level of Service Determination (if not F)				
$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$					$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$				
$D_R =$ (pc/mi/ln)					$D_R =$ 3.4 (pc/mi/ln)				
LOS = (Exhibit 13-2)					LOS = A (Exhibit 13-2)				
Speed Determination					Speed Determination				
$M_S =$ (Exhibit 13-11)					$D_S =$ 0.473 (Exhibit 13-12)				
$S_R =$ mph (Exhibit 13-11)					$S_R =$ 56.8 mph (Exhibit 13-12)				
$S_0 =$ mph (Exhibit 13-11)					$S_0 =$ N/A mph (Exhibit 13-12)				
$S =$ mph (Exhibit 13-13)					$S =$ 56.8 mph (Exhibit 13-13)				

RAMPS AND RAMP JUNCTIONS WORKSHEET									
General Information					Site Information				
Analyst		JRE		Freeway/Dir of Travel		I-80 Eastbound			
Agency or Company		AECOM		Junction		Int. 303 to Rt 611			
Date Performed		1/3/2014		Jurisdiction					
Analysis Time Period		P.M. Peak Hour		Analysis Year		Alt2A 2045			
Project Description Interstate 80 Reconstruction									
Inputs									
Upstream Adj Ramp		Number of Lanes, N				Downstream Adj Ramp			
<input type="checkbox"/> Yes <input type="checkbox"/> On		Acceleration Lane Length, L_A				<input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> On			
<input checked="" type="checkbox"/> No <input type="checkbox"/> Off		Deceleration Lane Length L_D				<input type="checkbox"/> No <input type="checkbox"/> Off			
$L_{up} =$ ft		Freeway Volume, V_F				$L_{down} =$ 1750 ft			
$V_u =$ veh/h		Ramp Volume, V_R				$V_D =$ 268 veh/h			
		Freeway Free-Flow Speed, S_{FF}							
		Ramp Free-Flow Speed, S_{FR}							
Conversion to pc/h Under Base Conditions									
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$	
Freeway	3456	0.94	Rolling	12	1	0.840	0.95	4605	
Ramp	449	0.97	Rolling	1	0	0.985	0.95	495	
UpStream									
DownStream	268	0.97	Rolling	1	0	0.985	0.95	295	
Merge Areas					Diverge Areas				
Estimation of v_{12}					Estimation of v_{12}				
$V_{12} = V_F (P_{FM})$					$V_{12} = V_R + (V_F - V_R)P_{FD}$				
$L_{EQ} =$ (Equation 13-6 or 13-7)					$L_{EQ} =$ (Equation 13-12 or 13-13)				
$P_{FM} =$ using Equation (Exhibit 13-6)					$P_{FD} =$ 1.000 using Equation (Exhibit 13-7)				
$V_{12} =$ pc/h					$V_{12} =$ 4605 pc/h				
V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)					V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)				
Is V_3 or $V_{av34} > 2,700$ pc/h? <input type="checkbox"/> Yes <input type="checkbox"/> No					Is V_3 or $V_{av34} > 2,700$ pc/h? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				
Is V_3 or $V_{av34} > 1.5 * V_{12}/2$ <input type="checkbox"/> Yes <input type="checkbox"/> No					Is V_3 or $V_{av34} > 1.5 * V_{12}/2$ <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				
If Yes, $V_{12a} =$ pc/h (Equation 13-16, 13-18, or 13-19)					If Yes, $V_{12a} =$ pc/h (Equation 13-16, 13-18, or 13-19)				
Capacity Checks					Capacity Checks				
	Actual	Capacity		LOS F?		Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8			V_F	4605	Exhibit 13-8	4800	No
			$V_{FO} = V_F - V_R$	4110	Exhibit 13-8	4800	No		
			V_R	495	Exhibit 13-10	4000	No		
Flow Entering Merge Influence Area					Flow Entering Diverge Influence Area				
	Actual	Max Desirable		Violation?		Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8			V_{12}	4605	Exhibit 13-8	4400:All	Yes
Level of Service Determination (if not F)					Level of Service Determination (if not F)				
$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$					$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$				
$D_R =$ (pc/mi/ln)					$D_R =$ 12.4 (pc/mi/ln)				
LOS = (Exhibit 13-2)					LOS = B (Exhibit 13-2)				
Speed Determination					Speed Determination				
$M_S =$ (Exhibit 13-11)					$D_S =$ 0.473 (Exhibit 13-12)				
$S_R =$ mph (Exhibit 13-11)					$S_R =$ 56.8 mph (Exhibit 13-12)				
$S_0 =$ mph (Exhibit 13-11)					$S_0 =$ N/A mph (Exhibit 13-12)				
$S =$ mph (Exhibit 13-13)					$S =$ 56.8 mph (Exhibit 13-13)				

3/17/2015

RAMPS AND RAMP JUNCTIONS WORKSHEET									
General Information					Site Information				
Analyst		JRE		Freeway/Dir of Travel		I-80 Westbound			
Agency or Company		AECOM		Junction		Int. 303 to Rt 611			
Date Performed		1/3/2014		Jurisdiction					
Analysis Time Period		P.M. Peak Hour		Analysis Year		Alt2A 2045			
Project Description Interstate 80 Reconstruction									
Inputs									
Upstream Adj Ramp		Number of Lanes, N				Downstream Adj Ramp			
<input type="checkbox"/> Yes <input type="checkbox"/> On		Acceleration Lane Length, L_A				<input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> On			
<input checked="" type="checkbox"/> No <input type="checkbox"/> Off		Deceleration Lane Length L_D				<input type="checkbox"/> No <input type="checkbox"/> Off			
$L_{up} =$ ft		Freeway Volume, V_F				$L_{down} =$ 1750 ft			
$V_u =$ veh/h		Ramp Volume, V_R				$V_D =$ 322 veh/h			
		Freeway Free-Flow Speed, S_{FF}							
		Ramp Free-Flow Speed, S_{FR}							
Conversion to pc/h Under Base Conditions									
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$	
Freeway	4440	0.94	Rolling	10	1	0.862	0.95	5768	
Ramp	204	0.72	Rolling	1	0	0.985	0.95	303	
UpStream									
DownStream	322	0.72	Rolling	1	0	0.985	0.95	478	
Merge Areas					Diverge Areas				
Estimation of v_{12}					Estimation of v_{12}				
$V_{12} = V_F (P_{FM})$					$V_{12} = V_R + (V_F - V_R)P_{FD}$				
(Equation 13-6 or 13-7)					(Equation 13-12 or 13-13)				
$L_{EQ} =$					$L_{EQ} =$				
using Equation (Exhibit 13-6)					0.602 using Equation (Exhibit 13-7)				
$P_{FM} =$					$P_{FD} =$				
$V_{12} =$ pc/h					$V_{12} =$ 3592 pc/h				
V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)					V_3 or V_{av34} 2176 pc/h (Equation 13-14 or 13-17)				
Is V_3 or $V_{av34} > 2,700$ pc/h? <input type="checkbox"/> Yes <input type="checkbox"/> No					Is V_3 or $V_{av34} > 2,700$ pc/h? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				
Is V_3 or $V_{av34} > 1.5 * V_{12}/2$ <input type="checkbox"/> Yes <input type="checkbox"/> No					Is V_3 or $V_{av34} > 1.5 * V_{12}/2$ <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				
If Yes, $V_{12a} =$ pc/h (Equation 13-16, 13-18, or 13-19)					If Yes, $V_{12a} =$ pc/h (Equation 13-16, 13-18, or 13-19)				
Capacity Checks					Capacity Checks				
	Actual	Capacity		LOS F?		Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8			V_F	5768	Exhibit 13-8	7200	No
			$V_{FO} = V_F - V_R$	5465	Exhibit 13-8	7200	No		
			V_R	303	Exhibit 13-10	2000	No		
Flow Entering Merge Influence Area					Flow Entering Diverge Influence Area				
	Actual	Max Desirable		Violation?		Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8			V_{12}	3592	Exhibit 13-8	4400:All	No
Level of Service Determination (if not F)					Level of Service Determination (if not F)				
$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$					$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$				
$D_R =$ (pc/mi/ln)					$D_R =$ 26.1 (pc/mi/ln)				
LOS = (Exhibit 13-2)					LOS = C (Exhibit 13-2)				
Speed Determination					Speed Determination				
$M_S =$ (Exhibit 13-11)					$D_S =$ 0.455 (Exhibit 13-12)				
$S_R =$ mph (Exhibit 13-11)					$S_R =$ 57.3 mph (Exhibit 13-12)				
$S_0 =$ mph (Exhibit 13-11)					$S_0 =$ 72.2 mph (Exhibit 13-12)				
$S =$ mph (Exhibit 13-13)					$S =$ 62.1 mph (Exhibit 13-13)				

RAMPS AND RAMP JUNCTIONS WORKSHEET									
General Information					Site Information				
Analyst		JRE		Freeway/Dir of Travel		I-80 Westbound			
Agency or Company		AECOM		Junction		Int. 305 to Main St & Rt 209			
Date Performed		8/2/2013		Jurisdiction					
Analysis Time Period		A.M. Peak Hour		Analysis Year		Alt2A 2045			
Project Description Interstate 80 Reconstruction									
Inputs									
Upstream Adj Ramp		Number of Lanes, N				Downstream Adj Ramp			
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> On		Acceleration Lane Length, L_A				<input type="checkbox"/> Yes <input type="checkbox"/> On			
<input type="checkbox"/> No <input checked="" type="checkbox"/> Off		Deceleration Lane Length L_D				<input checked="" type="checkbox"/> No <input type="checkbox"/> Off			
$L_{up} =$ 500 ft		Freeway Volume, V_F				$L_{down} =$ ft			
$V_u =$ 134 veh/h		Ramp Volume, V_R				$V_D =$ veh/h			
		Freeway Free-Flow Speed, S_{FF}							
		Ramp Free-Flow Speed, S_{FR}							
Conversion to pc/h Under Base Conditions									
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$	
Freeway	3106	0.93	Rolling	12	1	0.840	0.95	4184	
Ramp	1308	0.84	Rolling	1	0	0.985	0.95	1664	
UpStream	134	0.84	Rolling	1	0	0.985	0.95	170	
DownStream									
Merge Areas					Diverge Areas				
Estimation of v_{12}					Estimation of v_{12}				
$V_{12} = V_F (P_{FM})$					$V_{12} = V_R + (V_F - V_R)P_{FD}$				
(Equation 13-6 or 13-7)					(Equation 13-12 or 13-13)				
$L_{EQ} =$					$L_{EQ} =$				
using Equation (Exhibit 13-6)					0.260 using Equation (Exhibit 13-7)				
$P_{FM} =$					$P_{FD} =$				
$V_{12} =$ pc/h					$V_{12} =$ 2319 pc/h				
V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)					V_3 or V_{av34} 932 pc/h (Equation 13-14 or 13-17)				
Is V_3 or $V_{av34} > 2,700$ pc/h? <input type="checkbox"/> Yes <input type="checkbox"/> No					Is V_3 or $V_{av34} > 2,700$ pc/h? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				
Is V_3 or $V_{av34} > 1.5 * V_{12}/2$ <input type="checkbox"/> Yes <input type="checkbox"/> No					Is V_3 or $V_{av34} > 1.5 * V_{12}/2$ <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				
If Yes, $V_{12a} =$ pc/h (Equation 13-16, 13-18, or 13-19)					If Yes, $V_{12a} =$ pc/h (Equation 13-16, 13-18, or 13-19)				
Capacity Checks					Capacity Checks				
	Actual	Capacity		LOS F?		Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8			V_F	4184	Exhibit 13-8	9600	No
				$V_{FO} = V_F - V_R$	2520	Exhibit 13-8	9600	No	
				V_R	1664	Exhibit 13-10	4000	No	
Flow Entering Merge Influence Area					Flow Entering Diverge Influence Area				
	Actual	Max Desirable		Violation?		Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8			V_{12}	2319	Exhibit 13-8	4400:All	No
Level of Service Determination (if not F)					Level of Service Determination (if not F)				
$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$					$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$				
$D_R =$ (pc/mi/ln)					$D_R =$ 6.2 (pc/mi/ln)				
LOS = (Exhibit 13-2)					LOS = A (Exhibit 13-2)				
Speed Determination					Speed Determination				
$M_S =$ (Exhibit 13-11)					$D_S =$ 0.578 (Exhibit 13-12)				
$S_R =$ mph (Exhibit 13-11)					$S_R =$ 53.8 mph (Exhibit 13-12)				
$S_0 =$ mph (Exhibit 13-11)					$S_0 =$ 76.8 mph (Exhibit 13-12)				
$S =$ mph (Exhibit 13-13)					$S =$ 62.1 mph (Exhibit 13-13)				

RAMPS AND RAMP JUNCTIONS WORKSHEET									
General Information					Site Information				
Analyst		JRE		Freeway/Dir of Travel		I-80 Westbound			
Agency or Company		AECOM		Junction		Int. 305 to Main St & Rt 209			
Date Performed		8/2/2013		Jurisdiction					
Analysis Time Period		P.M. Peak Hour		Analysis Year		Alt2A 2045			
Project Description Interstate 80 Reconstruction									
Inputs									
Upstream Adj Ramp		Number of Lanes, N				Downstream Adj Ramp			
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> On		Acceleration Lane Length, L_A				<input type="checkbox"/> Yes <input type="checkbox"/> On			
<input type="checkbox"/> No <input checked="" type="checkbox"/> Off		Deceleration Lane Length L_D				<input checked="" type="checkbox"/> No <input type="checkbox"/> Off			
$L_{up} =$ 500 ft		Freeway Volume, V_F				$L_{down} =$ ft			
$V_U =$ 303 veh/h		Ramp Volume, V_R				$V_D =$ veh/h			
		Freeway Free-Flow Speed, S_{FF}							
		Ramp Free-Flow Speed, S_{FR}							
Conversion to pc/h Under Base Conditions									
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$	
Freeway	6447	0.96	Rolling	13	1	0.830	0.95	8518	
Ramp	2582	0.90	Rolling	1	0	0.985	0.95	3065	
UpStream	303	0.90	Rolling	1	0	0.985	0.95	360	
DownStream									
Merge Areas					Diverge Areas				
Estimation of v_{12}					Estimation of v_{12}				
$V_{12} = V_F (P_{FM})$					$V_{12} = V_R + (V_F - V_R)P_{FD}$				
$L_{EQ} =$ (Equation 13-6 or 13-7)					$L_{EQ} =$ (Equation 13-12 or 13-13)				
$P_{FM} =$ using Equation (Exhibit 13-6)					$P_{FD} =$ 0.450 using Equation (Exhibit 13-7)				
$V_{12} =$ pc/h					$V_{12} =$ 5519 pc/h				
V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)					V_3 or V_{av34} 2999 pc/h (Equation 13-14 or 13-17)				
Is V_3 or $V_{av34} > 2,700$ pc/h? <input type="checkbox"/> Yes <input type="checkbox"/> No					Is V_3 or $V_{av34} > 2,700$ pc/h? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No				
Is V_3 or $V_{av34} > 1.5 * V_{12}/2$ <input type="checkbox"/> Yes <input type="checkbox"/> No					Is V_3 or $V_{av34} > 1.5 * V_{12}/2$ <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				
If Yes, $V_{12a} =$ pc/h (Equation 13-16, 13-18, or 13-19)					If Yes, $V_{12a} =$ 5818 pc/h (Equation 13-16, 13-18, or 13-19)				
Capacity Checks					Capacity Checks				
	Actual	Capacity		LOS F?		Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8			V_F	8518	Exhibit 13-8	7200	Yes
				$V_{FO} = V_F - V_R$	5453	Exhibit 13-8	7200	No	
				V_R	3065	Exhibit 13-10	4000	No	
Flow Entering Merge Influence Area					Flow Entering Diverge Influence Area				
	Actual	Max Desirable		Violation?		Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8			V_{12}	5519	Exhibit 13-8	4400:All	Yes
Level of Service Determination (if not F)					Level of Service Determination (if not F)				
$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$					$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$				
$D_R =$ (pc/mi/ln)					$D_R =$ 36.3 (pc/mi/ln)				
LOS = (Exhibit 13-2)					LOS = F (Exhibit 13-2)				
Speed Determination					Speed Determination				
$M_S =$ (Exhibit 13-11)					$D_S =$ 0.704 (Exhibit 13-12)				
$S_R =$ mph (Exhibit 13-11)					$S_R =$ 50.3 mph (Exhibit 13-12)				
$S_0 =$ mph (Exhibit 13-11)					$S_0 =$ 70.2 mph (Exhibit 13-12)				
$S =$ mph (Exhibit 13-13)					$S =$ 55.3 mph (Exhibit 13-13)				

RAMPS AND RAMP JUNCTIONS WORKSHEET									
General Information					Site Information				
Analyst		JRE		Freeway/Dir of Travel		I-80 Westbound			
Agency or Company		AECOM		Junction		Int. 306 to Dreher Avenue			
Date Performed		1/3/2014		Jurisdiction					
Analysis Time Period		A.M. Peak Hour		Analysis Year		Alt 2A 2045			
Project Description Interstate 80 Reconstruction									
Inputs									
Upstream Adj Ramp		Number of Lanes, N				Downstream Adj Ramp			
<input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> On		Acceleration Lane Length, L_A				<input type="checkbox"/> Yes <input type="checkbox"/> On			
<input type="checkbox"/> No <input type="checkbox"/> Off		Deceleration Lane Length L_D				<input checked="" type="checkbox"/> No <input type="checkbox"/> Off			
$L_{up} =$ 3680 ft		Freeway Volume, V_F				$L_{down} =$ ft			
$V_u =$ 473 veh/h		Ramp Volume, V_R				$V_D =$ veh/h			
		Freeway Free-Flow Speed, S_{FF}							
		Ramp Free-Flow Speed, S_{FR}							
Conversion to pc/h Under Base Conditions									
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$	
Freeway	3240	0.91	Rolling	12	1	0.840	0.95	4460	
Ramp	313	0.66	Rolling	3	0	0.957	0.95	522	
UpStream	473	0.91	Rolling	6	0	0.917	0.95	596	
DownStream									
Merge Areas					Diverge Areas				
Estimation of v_{12}					Estimation of v_{12}				
$V_{12} = V_F (P_{FM})$					$V_{12} = V_R + (V_F - V_R)P_{FD}$				
$L_{EQ} =$ (Equation 13-6 or 13-7)					$L_{EQ} =$ (Equation 13-12 or 13-13)				
$P_{FM} =$ using Equation (Exhibit 13-6)					$P_{FD} =$ 0.436 using Equation (Exhibit 13-7)				
$V_{12} =$ pc/h					$V_{12} =$ 2239 pc/h				
V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)					V_3 or V_{av34} 1110 pc/h (Equation 13-14 or 13-17)				
Is V_3 or $V_{av34} > 2,700$ pc/h? <input type="checkbox"/> Yes <input type="checkbox"/> No					Is V_3 or $V_{av34} > 2,700$ pc/h? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				
Is V_3 or $V_{av34} > 1.5 * V_{12}/2$ <input type="checkbox"/> Yes <input type="checkbox"/> No					Is V_3 or $V_{av34} > 1.5 * V_{12}/2$ <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				
If Yes, $V_{12a} =$ pc/h (Equation 13-16, 13-18, or 13-19)					If Yes, $V_{12a} =$ pc/h (Equation 13-16, 13-18, or 13-19)				
Capacity Checks					Capacity Checks				
	Actual	Capacity		LOS F?		Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8			V_F	4460	Exhibit 13-8	9600	No
				$V_{FO} = V_F - V_R$	3938	Exhibit 13-8	9600	No	
				V_R	522	Exhibit 13-10	2000	No	
Flow Entering Merge Influence Area					Flow Entering Diverge Influence Area				
	Actual	Max Desirable		Violation?		Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8			V_{12}	2239	Exhibit 13-8	4400:All	No
Level of Service Determination (if not F)					Level of Service Determination (if not F)				
$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$					$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$				
$D_R =$ (pc/mi/ln)					$D_R =$ 22.2 (pc/mi/ln)				
LOS = (Exhibit 13-2)					LOS = C (Exhibit 13-2)				
Speed Determination					Speed Determination				
$M_S =$ (Exhibit 13-11)					$D_S =$ 0.475 (Exhibit 13-12)				
$S_R =$ mph (Exhibit 13-11)					$S_R =$ 56.7 mph (Exhibit 13-12)				
$S_0 =$ mph (Exhibit 13-11)					$S_0 =$ 76.4 mph (Exhibit 13-12)				
$S =$ mph (Exhibit 13-13)					$S =$ 65.0 mph (Exhibit 13-13)				

RAMPS AND RAMP JUNCTIONS WORKSHEET									
General Information					Site Information				
Analyst		JRE		Freeway/Dir of Travel		I-80 Westbound			
Agency or Company		AECOM		Junction		Int. 306 to Dreher Avenue			
Date Performed		1/3/2014		Jurisdiction					
Analysis Time Period		P.M. Peak Hour		Analysis Year		Alt 2A 2045			
Project Description Interstate 80 Reconstruction									
Inputs									
Upstream Adj Ramp		Number of Lanes, N				Downstream Adj Ramp			
<input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> On		Acceleration Lane Length, L_A				<input type="checkbox"/> Yes <input type="checkbox"/> On			
<input type="checkbox"/> No <input type="checkbox"/> Off		Deceleration Lane Length L_D				<input checked="" type="checkbox"/> No <input type="checkbox"/> Off			
$L_{up} = 3680$ ft		Freeway Volume, V_F				$L_{down} =$ ft			
$V_u = 790$ veh/h		Ramp Volume, V_R				$V_D =$ veh/h			
		Freeway Free-Flow Speed, S_{FF}							
		Ramp Free-Flow Speed, S_{FR}							
Conversion to pc/h Under Base Conditions									
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$	
Freeway	6750	0.96	Rolling	12	1	0.840	0.95	8808	
Ramp	680	0.82	Rolling	3	0	0.957	0.95	912	
UpStream	790	0.89	Rolling	1	0	0.985	0.95	948	
DownStream									
Merge Areas					Diverge Areas				
Estimation of v_{12}					Estimation of v_{12}				
$V_{12} = V_F (P_{FM})$					$V_{12} = V_R + (V_F - V_R)P_{FD}$				
$L_{EQ} =$ (Equation 13-6 or 13-7)					$L_{EQ} =$ (Equation 13-12 or 13-13)				
$P_{FM} =$ using Equation (Exhibit 13-6)					$P_{FD} =$ 0.436 using Equation (Exhibit 13-7)				
$V_{12} =$ pc/h					$V_{12} =$ 4355 pc/h				
V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)					V_3 or V_{av34} 2226 pc/h (Equation 13-14 or 13-17)				
Is V_3 or $V_{av34} > 2,700$ pc/h? <input type="checkbox"/> Yes <input type="checkbox"/> No					Is V_3 or $V_{av34} > 2,700$ pc/h? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				
Is V_3 or $V_{av34} > 1.5 * V_{12}/2$ <input type="checkbox"/> Yes <input type="checkbox"/> No					Is V_3 or $V_{av34} > 1.5 * V_{12}/2$ <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				
If Yes, $V_{12a} =$ pc/h (Equation 13-16, 13-18, or 13-19)					If Yes, $V_{12a} =$ pc/h (Equation 13-16, 13-18, or 13-19)				
Capacity Checks					Capacity Checks				
	Actual	Capacity		LOS F?		Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8			V_F	8808	Exhibit 13-8	9600	No
				$V_{FO} = V_F - V_R$	7896	Exhibit 13-8	9600	No	
				V_R	912	Exhibit 13-10	2000	No	
Flow Entering Merge Influence Area					Flow Entering Diverge Influence Area				
	Actual	Max Desirable		Violation?		Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8			V_{12}	4355	Exhibit 13-8	4400:All	No
Level of Service Determination (if not F)					Level of Service Determination (if not F)				
$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$					$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$				
$D_R =$ (pc/mi/ln)					$D_R =$ 40.4 (pc/mi/ln)				
LOS = (Exhibit 13-2)					LOS = E (Exhibit 13-2)				
Speed Determination					Speed Determination				
$M_S =$ (Exhibit 13-11)					$D_S =$ 0.510 (Exhibit 13-12)				
$S_R =$ mph (Exhibit 13-11)					$S_R =$ 55.7 mph (Exhibit 13-12)				
$S_0 =$ mph (Exhibit 13-11)					$S_0 =$ 72.0 mph (Exhibit 13-12)				
$S =$ mph (Exhibit 13-13)					$S =$ 62.9 mph (Exhibit 13-13)				