

APPENDIX C

2016 Existing Freeway HCS Operational Analysis

		F	REEWAY	(WEAV	ING WOF	RKSHEE	Г			
General	Informatio	on			Site Info	rmation				
Analyst Agency/Con Date Perforr Analysis Tin	npany ned ne Period	AECO AM	Л		Freeway/Dir Weaving Seg Analysis Yea	Freeway/Dir of Travel I-95 NB Weaving Segment Location Seg 1-Bet Copans & Sample Analysis Year EXISTING 2015/2016				
Project Desc	cription SW 10th	n Street SIMF	ł							
Inputs					r					
Weaving col Weaving nu Weaving seg Freeway free	nfiguration mber of lanes, N gment length, L _s e-flow speed, FF	S		One-Sided 4 1820ft 70 mph	Segment typ Freeway min Freeway ma: Terrain type		Freeway 15 2400 Leve			
Convers	sions to po	/h Unde	r Base Co	ondition	s	0	1	1	-	
	V (veh/h)	PHF	Truck (%)	RV (%)	Ε _Τ	E _R	f _{HV}	fp	v (pc/h)	
V _{FF}	4560	0.95	3	0	1.5	1.2	0.985	1.00	4872	
V _{RF}	340	0.97	2	0	1.5	1.2	0.990	1.00	354	
V _{FR}	710	0.90	2	0	1.5	1.2	0.990	1.00	797	
V _{RR}	0	0.97	2	0	1.5	1.2	0.990	1.00	0	
V _{NW}	4872		•		-		-	V =	6023	
V _W	1151							-	-	
VR	0.191									
Configu	ration Cha	racteris	tics		•					
Minimum m	aneuver lanes, N	N _{WL}		2 lc	Minimum we	eaving lane cl	nanges, LC _{MIN}		1151 lc/h	
Interchange	density, ID			0.8 int/mi	Weaving lan	e changes, L	.C _w		1540 lc/h	
Minimum R	F lane changes,	LC _{RF}		1 lc/pc	Non-weaving	g lane chang	es, LC _{NW}		1220 lc/h	
Minimum Ff	R lane changes,	LC _{FR}		1 lc/pc	Total lane ch	nanges, LC _{ALI}	L		2760 lc/h	
Minimum R	R lane changes,	LC _{RR}		lc/pc	Non-weaving	g vehicle inde	ex, I _{NW}		709	
Weavin	g Segment	Speed,	Density, I	_evel of	Service,	and Cap	oacity			
Weaving se Weaving se	gment flow rate, gment capacity,	v c _w	:	5940 veh/h 8666 veh/h	Weaving inte Weaving seg	ensity factor, gment speed	W , S		0.314 54.9 mph	
Weaving se	gment v/c ratio			0.685	Average wea	aving speed,	Sw		56.9 mph	
Weaving se	gment density, [)	27	7.4 pc/mi/ln	Average nor	n-weaving spo	eed, S _{NW}		54.5 mph	
Level of Ser	vice, LOS			С	Maximum we	eaving length	i, L _{max}		4445 ft	
Notes a. Weaving s Chapter 13, " b. For volume	egments longer th Freeway Merge a es that exceed the	an the calcula nd Diverge Se weaving seg	ted maximum le gments". nent capacity, th	ength should l	be treated as is rvice is "F".	solated merge	and diverge ar	eas using the	procedures of	

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	BASIC F	REEWAY SE	GMENTS WORKSHEET		
General Information			Site Information		
Analyst Agency or Company Date Performed Analysis Time Period	AECOM AM		Highway/Direction of Travel From/To Jurisdiction Analysis Year	I-95 NB Seg 2-B EXISTIN	et Sample Off & On IG 2015/2016
Project Description SW 10th	Street SIMR				
Oper.(LOS)			Des.(N)	Pla	anning Data
Flow Inputs					
Volume, V AADT Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D	4900	veh/h veh/day veh/h	Peak-Hour Factor, PHF %Trucks and Buses, P _T %RVs, P _R General Terrain: Grade % Length Up/Down %	0.85 3 0 Level mi	
Calculate Flow Adjustn	nents				
f _p E _T	1.00 1.5		E _R f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	1.2 0.985	
Speed Inputs			Calc Speed Adj and FFS	6	
Lane Width Rt-Side Lat. Clearance Number of Lanes, N Total Ramp Density, TRD FFS (measured) Base free-flow Speed, BFFS	3 70.0	ft ft ramps/mi mph mph	f _{∟w} f _{LC} TRD Adjustment FFS	70.0	mph mph mph mph
LOS and Performance	Measures		Design (N)		
<u>Operational (LOS)</u> v _p = (V or DDHV) / (PHF x N > S D = v _p / S LOS	(f _{HV} x f _p) 1950 63.5 30.7 D	pc/h/ln mph pc/mi/ln	$\frac{\text{Design (N)}}{\text{Design LOS}}$ $v_p = (V \text{ or DDHV}) / (PHF x N x)$ S $D = v_p / S$ Required Number of Lanes, N	f _{HV} x f _p)	pc/h/ln mph pc/mi/ln
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v _p - Flow rate LOS - Level of service DDHV - Directional design ho	S - Speed D - Density FFS - Free-flow BFFS - Base fre ur volume	speed ee-flow speed	E _R - Exhibits 11-10, 11-12 E _T - Exhibits 11-10, 11-11, 11- f _p - Page 11-18 LOS, S, FFS, v _p - Exhibits 11-2	13 2, 11-3	f _{LW} - Exhibit 11-8 f _{LC} - Exhibit 11-9 TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET										
General Infor	mation			Site Inform	mation					
Analyst			Fre	eeway/Dir of Tra	avel	I-95 NB				
Agency or Company	AEC	MC	Ju	nction		Seg 3-M	erge from	Sample EB		
Date Performed			Ju	risdiction						
Analysis Time Period	d AM		An	alysis Year		EXISTIN	IG 2015/2	016		
Project Description	SW 10th Stree	t SIMR								
Inputs		1								
Upstream Adi Ramp		Freeway Num	ber of Lanes, N	3					Downstrea	am Adi
		Ramp Numbe	er of Lanes, N	1					Ramp	,
Yes Or	ו	Acceleration I	ane Length, L	960					Vaa	
	-	Deceleration	ane Length L						IN 185	OII
NO Of	Ť	Ereeway Volu		4000					🗌 No	Off
l = ft			F	700					L _{down} =	2300 ft
-up It			e, v _R	/05					uowii	
V = veh/h	ı	Freeway Free	-Flow Speed, S _{FF}	70.0					V _D =	425 veh/h
Ramp Free-Flow Speed, S _{FR} 50									5	
Conversion t	Conversion to pc/h Under Base Conditions									
(pc/h)	V	PHF	Terrain	%Truck	%Rv	f	_\\/	f	v = V/PHF	x f _{uv} x f _n
(i)	(Ven/nr)	0.05		-	0	0.01	05	ρ		110 p
Freeway	4900	0.85	Level	3	0	0.9	85	1.00	5	851
Ramp	765	0.91	Level	2	0	0.9	90	1.00	5	349
DownStroom	DownStream 425 0.94 Level				0	0.0	00	1.00		E7
DownStream	Merge Areas				0	0.9	<u>90 </u>	1.00	2	107
Estimation of V					Fstimati	ion of	L V	iverge Areas		
					Lounau		• 12			
	V ₁₂ = V _F	(P _{FM})					V ₁₂ = '	V _R + (V _F - V _R)P _{FD}	
L _{EQ} =	(Equa	ation 13-6 o	r 13-7)		L _{E0} =		(Equation 13-	12 or 13-1	3)
P _{FM} =	0.604	using Equat	tion (Exhibit 13-6)		EQ P_n =			using Equatio	n (Exhibit 13	-7)
V ₁₂ =	3536	pc/h			го V =		,	nc/h		,
V. or V.	2315	pc/h (Equati	on 13-14 or 13-		* 12 V or V		1	oo/h (Equation 1	$2.14 \text{ or } 12.1^{\circ}$	7)
v 3 01 v av34	17)				v_3 or v_{av34}	> 0.70	0		3-14 01 13-1	()
Is V_3 or $V_{av34} > 2,70$	0 pc/h? 🗌 Ye	s 🗹 No			IS V ₃ OF V _{av3}	34 ~ Z,70				
Is V_3 or $V_{av34} > 1.5$	* V ₁₂ /2 🗹 Ye	s 🗌 No			is V_3 or V_{av3}	₃₄ > 1.5 °	V ₁₂ /2	JYes ∐No		
If Yes.V ₄₀₂ =	3536	pc/h (Equati	on 13-16, 13-		If Yes,V _{12a} =		1	DC/N (Equation 3-19)	n 13-16, 13	3-18, or
	18, or	13-19)						5 10)		
Capacity Che	CKS	1		r	Capacity	y Che	CKS			
L	Actual		Capacity	LOS F?			Actual	Car	pacity	LOS F?
					V _F			Exhibit 13-8	3	
V _{EO}	6700	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V _R		Exhibit 13-8	3	
10					Vn			Exhibit 13-	-	
					<u> </u>			10		
Flow Entering	g Merge In	fluence A	rea		Flow En	tering	<u> Dive</u>	rge Influen	ce Area	
	Actual	Max	Desirable	Violation?		A	ctual	Max Desi	rable	Violation?
V _{R12}	4385	Exhibit 13-8	4600:All	No	V ₁₂			Exhibit 13-8		
Level of Serv		Level of	Servi	ice De	terminatio	n (if not	F)			
$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$ $D_R = 4.252 + 0.0$.0086 V ₁₂ - 0.	.009 L _D		
D _R = 33.3 (pc/m	ni/ln)				D _R = (p	c/mi/ln)			
LOS = D (Exhibit	13-2)				LOS = (E	xhibit 1	13-2)			
Speed Determination Speed							ninatic	n		
					$D = / \Box$	vhihit 12	-12)			
$v_{\rm S} = 0.538$ (Exi	DIT 13-11)				⊂s (⊏. S = ~~		12 10 10			
S _R = 54.9 mph	(Exhibit 13-11)				rrr∼ m¢ ⊳_	אוונ⊐אוונ יוי ⊂ ייי	літо-т∠)			
S ₀ = 63.4 mph	(Exhibit 13-11)				o₀= m;	on (Exhit	dit 13-12)			
S = 57.6 mph	(Exhibit 13-13)				S= m;	oh (Exhik	oit 13-13)			

	BASIC F	REEWAY SE	GMENTS WORKSHEET		
General Information			Site Information		
Analyst			Highway/Direction of Travel	1-95 NB	ot Somple ER On & W/R
Agency or Company	AECOM		From/To	Зеу 4-60 Оп	
Date Performed Analysis Time Period	AM		Jurisdiction Analysis Year	EXISTIN	IG 2015/2016
Project Description SW 10th	Street SIMR				
✓ Oper.(LOS)			Des.(N)	Pla	nning Data
Flow Inputs					
Volume, V AADT Peak-Hr Prop. of AADT, K	5665	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P _T %RVs, P _R	0.85 3 0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length Up/Down %	Level mi	
Calculate Flow Adjustm	ents				
f _p	1.00		E _R	1.2	
Ē _T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.985	
Speed Inputs			Calc Speed Adj and FFS	6	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f _{LW}		mph
Number of Lanes, N	3		f _{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	70.0	mph	FFS	70.0	mph
Base free-flow Speed, BFFS		mph			
LOS and Performance M	leasures		Design (N)		
Operational (LOS) $v_p = (V \text{ or DDHV}) / (PHF x N x S)$ D = v_p / S LOS	f _{HV} x f _p) 2255 57.1 39.5 E	pc/h/ln mph pc/mi/ln	Design (N) Design LOS $v_p = (V \text{ or DDHV}) / (PHF x N x)$ S D = v_p / S Required Number of Lanes, N	f _{HV} x f _p)	pc/h/ln mph pc/mi/ln
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v _p - Flow rate LOS - Level of service DDHV - Directional design hou	S - Speed D - Density FFS - Free-flow BFFS - Base fre r volume	speed e-flow speed	E _R - Exhibits 11-10, 11-12 E _T - Exhibits 11-10, 11-11, 11- f _p - Page 11-18 LOS, S, FFS, v _p - Exhibits 11-2	13 2, 11-3	f _{LW} - Exhibit 11-8 f _{LC} - Exhibit 11-9 TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET										
General Info	ormation			Site Infor	mation					
Analyst			Fre	eeway/Dir of Tra	avel I	I-95 NB				
Agency or Compar	iy AEC	OM	Ju	nction	S	Seg 5-M	erge from	Sample WB		
Date Performed			Ju	risdiction						
Analysis Time Peri	od AM		An	alysis Year	ŀ	EXISTIN	IG 2015/20	16		
Project Description	SW 10th Stree	t SIMR								
Inputs		1								
Upstream Adi Ram	a	Freeway Num	ber of Lanes, N	3					Downstrea	m Adi
		Ramp Numbe	r of Lanes, N	1					Ramp	,
🗹 Yes 🛛 🗹 🔿	Dn	Acceleration L	ane Length, L	620						
		Deceleration I	ane Length L							
	Dff	Eroowov Volu		FCCF					No	Off
- 1240	£1.		ine, v _F	0000					I. =	ft
- _{up} 1340	п	Ramp volume	e, v _R	425					-down	
V _{II} = 765 veh/h									V _D =	veh/h
² u 700	VCII/II	Ramp Free-F	ow Speed, S _{FR}	50.0					D	
Conversion	to pc/h Un	der Base	Conditions							
(pc/h)	V	PHF	Terrain	%Truck	%Rv	f		f	v = V/PHF	x f _{uv} x f
(PC))	(Veh/hr)			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	,,,,,,		¬v	p		ну р
Freeway	5665	0.85	Level	3	0	0.9	85	1.00	67	65
Ramp	425	0.94	Level	2	0	0.9	90	1.00	4	57
UpStream	765	0.91	Level	2	0	0.9	90	1.00	84	19
DownStream Merce Areas								vorgo Arooo		
Merge Areas					Estimation of V					
Estimation of v ₁₂					LSumau		* 12			
	$V_{12} = V_F (P_{FM})$						$V_{12} = V_{12}$	/ _P + (V _F - V _P))P _{ED}	
L _{EQ} =	(Equ	ation 13-6 o	r 13-7)		L _{F0} =		'2 (F	Fountion 13-	12 or 13-13)
P _{FM} =	0.595	using Equat	ion (Exhibit 13-6)		EQ P =		(- []	sing Equation	n (Exhibit 13-	7)
V ₁₂ =	4024	pc/h			· FD V =			c/b		')
V or V	2741	pc/h (Equati	on 13-14 or 13-		12^{-12}		p	ulle / Faulation 1	2 1 4 - 1 1 1 7	\ \
v 3 01 v av34	17)				v ₃ 01 v _{av34}	. 0 70	р а "а —		3-14 OF 13-17)
Is V_3 or $V_{av34} > 2,7$	700 pc/h? 🗹 Ye	s 🗌 No			is v_3 or v_{av3}	₄ > 2,70				
Is V_3 or $V_{av34} > 1.5$	5 * V ₁₂ /2 🗹 Ye	s 🗌 No			Is V ₃ or V _{av3}	₄ > 1.5 *	V ₁₂ /2	Yes No		10
If Yes V ₁₀ =	4065	pc/h (Equati	on 13-16, 13-		lf Yes,V _{12a} =		13	c/h (Equatior	า 13-16, 13	-18, or
12a	18, or	13-19)						-13)		
Capacity Ch	ecks				Capacity	/ Che	cks			
	Actual		Capacity	LOS F?			Actual	Сар	acity	LOS F?
					V _F			Exhibit 13-8	}	
V _{EO}	7222	Exhibit 13-8		Yes	$V_{FO} = V_{F}$	- V _R		Exhibit 13-8	3	
10					V_			Exhibit 13-		
					YR			10		
Flow Enterin	ng Merge In	fluence A	rea		Flow En	tering	<u> Diver</u>	ge Influen	ce Area	
	Actual	Max	Desirable	Violation?		A	ctual	Max Desi	rable	Violation?
V _{R12}	V _{R12} 4522 Exhibit 13-8 4600:All No							Exhibit 13-8		
Level of Ser		Level of	Serv	ice Det	erminatio	n (if not l	5)			
D _R = 5.475	+ 0.00734 v _R + 0	0.0078 V ₁₂ - 0.	00627 L _A			D _R = 4.	252 + 0.0	0086 V ₁₂ - 0.	009 L _D	
D _R = 36.6 (pc/	/mi/ln)				D _R = (p	c/mi/ln)			
LOS = F (Exhib	it 13-2)				LOS = (E	xhibit 1	13-2)			
Speed Deter	need Determination									
						vhihit 10	_12)	-		
w _s = 0.618 (E	xidit 13-11)				⊂ _s (⊏) c -	∧11101L 13	-1 <i>2)</i>			
S _R = 52.7 mpl	h (Exhibit 13-11)				o _R - mp	אות (בxחוג	JIL 13-12)			
S ₀ = 61.1 mpl	h (Exhibit 13-11)				5 ₀ = mp	on (Exhil	oit 13-12)			
S = 55.5 mpl	h (Exhibit 13-13)				S = mp	oh (Exhil	oit 13-13)			

	BASIC F	REEWAY SE	GMENTS WORKSHEET		
General Information			Site Information		
Analyst Agency or Company Date Performed Analysis Time Period	AECOM		Highway/Direction of Travel From/To Jurisdiction	I-95 NB Seg 6-B	et Sample & 10th St
Project Description SW 10th	h Street SIMR			LAISTIN	NG 2013/2010
✓ Oper.(LOS)			Des.(N)	Pla	anning Data
Flow Inputs			· · /		0
Volume, V AADT Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D	5990	veh/h veh/day veh/h	Peak-Hour Factor, PHF %Trucks and Buses, P _T %RVs, P _R General Terrain: Grade % Length Up/Down %	0.95 3 0 Level mi	
Calculate Flow Adjustn	nents				
f _p E _T	1.00 1.5		E _R f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	1.2 0.985	
Speed Inputs			Calc Speed Adj and FFS	6	
Lane Width Rt-Side Lat. Clearance Number of Lanes, N Total Ramp Density, TRD FFS (measured) Base free-flow Speed, BFFS	3 70.0	ft ft ramps/mi mph mph	f _{∟w} f _{LC} TRD Adjustment FFS	70.0	mph mph mph mph
LOS and Performance	Measures		Design (N)		
<u>Operational (LOS)</u> v _p = (V or DDHV) / (PHF x N x S D = v _p / S LOS	x f _{HV} x f _p)2133 59.9 35.6 E	pc/h/ln mph pc/mi/ln	$\frac{\text{Design (N)}}{\text{Design LOS}}$ $v_p = (V \text{ or DDHV}) / (PHF x N x)$ S $D = v_p / S$ Required Number of Lanes, N	f _{HV} x f _p)	pc/h/ln mph pc/mi/ln
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v _p - Flow rate LOS - Level of service DDHV - Directional design ho	S - Speed D - Density FFS - Free-flow BFFS - Base freeur volume	speed ee-flow speed	E _R - Exhibits 11-10, 11-12 E _T - Exhibits 11-10, 11-11, 11- f _p - Page 11-18 LOS, S, FFS, v _p - Exhibits 11-	-13 2, 11-3	f _{LW} - Exhibit 11-8 f _{LC} - Exhibit 11-9 TRD - Page 11-11

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		RAMP	S AND RAM	P JUNCTI	ONS WC	RKS	HEET			
General Infor	rmation			Site Infor	mation					
Analyst			Fre	eeway/Dir of Tr	ravel I-95 NB					
Agency or Company	AEC	OM	Ju	nction		Seg 7-	Diverge to	10th St		
Date Performed			Ju	risdiction						
Analysis Time Period	d AM		An	alysis Year		EXIST	NG 2015/2	2016		
Project Description	SW 10th Stree	et SIMR								
Inputs		_							1	
Upstream Adj R	Ramp	Freeway Num	iber of Lanes, N	3					Downstrea	am Adj
		Ramp Numbe	er of Lanes, N	1					Ramp	
Yes L	On	Acceleration I	Lane Length, L _A						✓ Yes	✓ On
	Off	Deceleration	Lane Length L _D	250						
		Freeway Volu	ime, V _E	5990						U Off
L _{up} = f	ft	Ramp Volume	e. Vo	990					L _{down} =	1370 ft
ар 		Freeway Free	-Flow Speed S	70.0						
V _u = v	eh/h	Domp Froo E	low Speed S	10.0					V _D =	1360 veh/h
Comunicant				43.0						
Conversion t									1	
(pc/h)	(Veh/hr)	PHF	Terrain	%Truck	%Rv		f _{HV}	f _p	v = V/PHF	x f _{HV} x f _p
Freeway	5990	0.95	Level	3	0	0.	985	1.00	64	00
Ramp	990	0.94	Level	2	0	0.	990	1.00	1()64
UpStream										
DownStream 1360 0.96 Level 2					0	0.	990	1.00	14	31
				[Diverge Areas	-				
Estimation of	Estimation of v ₁₂					ion o	f v ₁₂			
	$V_{12} = V_{E}$	(P _{EM})					V ₁₂ =	· V _P + (V _F - V	/_)P	
L _{FO} =	(Faua	ation 13-6 or	13-7)		L _{FO} =		12	Equation 13-	12 or 13-13	5)
P =	usina	Equation (Exhibit 13-6)		EQ P =		0	551 usina Ec	uation (Evh	, ihit 13_7)
· FM V =	nc/h				· FD V =		0. 10	101 mo/h		
v_{12}^{-}	pc/n	Equation 40	44 40 47)		v_{12}		40	104 pc/m		
$v_3 \text{ or } v_{av34}$	рс/п (-14 0f 13-17)		v ₃ 01 v _{av34}		23	396 pc/n (Equ	Jation 13-14	4 or 13-17)
IS V_3 or $V_{av34} > 2,70$		s 🗌 No			Is V_3 of $V_{av34} > 2,700$ pc//? Yes V No					
Is V_3 or $V_{av34} > 1.5$	* V ₁₂ /2 ∐Ye	s No	40.40.40.55		Is V ₃ or V _{av}	₃₄ > 1.5	* V ₁₂ /2	∐Yes ⊻No	40.40.40	10 10
If Yes,V _{12a} =	pc/n (13-19)	Equation 13	-16, 13-18, or		If Yes,V _{12a} =	=	۲ 1	oc/n (Equation a)	1 13-16, 13	-18, or 13-
Capacity Che	ecks	/			Capacif	v Ch	ecks	5)		
	Actual		Capacity	LOS F?		<u>,</u>	Actual	C	apacity	LOS F?
					V_		6400	Exhibit 13-	8 7200	No
V		Evhibit 13.8			V = V	- V	5226	Evhibit 13	8 7200	No
* FO					VFO VF	- v R	0000		1200	NU
					V _R		1064	Exhibit 13-	10 2100	No
Flow Entering	g Merge In	fluence A	Area		Flow Er	<u>iterin</u>	g Dive	rge Influer	ice Area	1
	Actual	Max	Desirable	Violation?			Actual	Max Desira	ible	Violation?
V _{R12}		Exhibit 13-8			V ₁₂	4	1004	Exhibit 13-8	4400:All	No
Level of Service Determination (if not F)					Level of	f Ser	vice De	terminatio	on (if not	F)
$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$						D _R = 4	1.252 + 0	.0086 V ₁₂ - 0	.009 L _D	
D _R = (pc/mi/lr	1)				D _R = 36	6.4 (pc	/mi/ln)			
LOS = (Exhibit	13-2)				LOS = E	(Exhil	oit 13-2)			
Speed Determination						Deter	minatio	on		
M = (Exibit 1)	2 11)				$D_{1} = 0$	394 (F	xhibit 13	.12)		
					$S_{s} = 50.0 \text{ mph} (Exhibit 13-12)$					
S _R - mpn (Exr	101(13-11)				$S_{\rm R} = 71.3 \text{ mph} (Exhibit 13.12)$					
$S_0 = mph (Exh$	13-11)				v_0^- (1.5 mph (Exhibit 15-12)					
S = mph(Ext)	101t 13-13)				5 = 6	3.1 mph	(Exhibit	13-13)		
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2015 Existing Freeway_HCS Operational Analysis

	BASIC F	REEWAY SE	GMENTS WORKSHEET		
General Information			Site Information		
Analyst Agency or Company Date Performed	AECOM		Highway/Direction of Travel From/To Jurisdiction	I-95 NB Seg 8-B	et 10th St Off & On
Project Description SW 10th	AM Street SIMR			EXISTIN	NG 2015/2016
✓ Oper.(LOS)			Des.(N)	Pla	anning Data
Flow Inputs			()		3 • • •
Volume, V AADT Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D	5000	veh/h veh/day veh/h	Peak-Hour Factor, PHF %Trucks and Buses, P _T %RVs, P _R General Terrain: Grade % Length	0.95 3 0 Level mi	
Calculate Flow Adjustn	nents		Up/Down %		
f _p E _T	1.00 1.5		E _R f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	1.2 0.985	
Speed Inputs			Calc Speed Adj and FFS	6	
Lane Width Rt-Side Lat. Clearance Number of Lanes, N Total Ramp Density, TRD FFS (measured) Base free-flow Speed, BFFS	3 70.0	ft ft ramps/mi mph mph	f _{∟w} f _{LC} TRD Adjustment FFS	70.0	mph mph mph mph
LOS and Performance	Measures		Design (N)		
<u>Operational (LOS)</u> v _p = (V or DDHV) / (PHF x N > S D = v _p / S LOS	(f _{HV} x f _p) 1781 66.1 27.0 D	pc/h/ln mph pc/mi/ln	$\frac{\text{Design (N)}}{\text{Design LOS}}$ $v_p = (V \text{ or DDHV}) / (PHF x N x)$ S $D = v_p / S$ Required Number of Lanes, N	f _{HV} x f _p)	pc/h/ln mph pc/mi/ln
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v _p - Flow rate LOS - Level of service DDHV - Directional design ho	S - Speed D - Density FFS - Free-flow BFFS - Base fre ur volume	speed ee-flow speed	E _R - Exhibits 11-10, 11-12 E _T - Exhibits 11-10, 11-11, 11- f _p - Page 11-18 LOS, S, FFS, v _p - Exhibits 11-2	13 2, 11-3	f _{LW} - Exhibit 11-8 f _{LC} - Exhibit 11-9 TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET											
Genera	al Infor	mation			Site Infor	mation					
Analyst Agency or Date Perfo Analysis Ti	Company rmed ime Period	AECO	ОМ	Fr Ju Ju Ar	eeway/Dir of Tr inction irisdiction nalysis Year	avel	I-95 NB Seg 9-N EXISTII	Nerge from	n 10th St 2016		
Project De	scription	SW 10th Stree	t SIMR								
Inputs											
Upstream /	Adj Ramp		Freeway Num Ramp Numbe	ber of Lanes, N r of Lanes, N	3 1					Downstrea Ramp	m Adj
✓ Yes	🗌 On		Acceleration L	ane Length, L _A	1345					🗌 Yes	On
🗌 No	✓ Off		Freeway Volu	ne, V _F	5000					I No	Off
L _{up} =	1370 1	ft	Ramp Volume Freeway Free	e, V _R -Flow Speed, S	1360 70 0					L _{down} =	ft
V _u =	990 ve	eh/h	Ramp Free-Fl	ow Speed, S _{FR}	50.0					V _D =	veh/h
Conve	rsion to	o pc/h Uno	der Base	Conditions	1			li li			
(pc	:/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	1	HV	f _p	v = V/PHF	x f _{HV} x f _p
Freeway		5000	0.95	Level	3	0	0.9	985	1.00	53	42
Ramp		1360	0.96	Level	2	0	0.9	90	1.00	14	.31
UpStream	UpStream 990 0.94 Level				2	0	0.9	90	1.00	10	64
DownStream Merge Areas									Niverge Areas		
Estimation of v ₁₂						Estimati	ion o	f v ₁₂	nverge Areas		
	$V_{12} = V_{\rm E} (P_{\rm EM})$							V - Y		\D	
L _{EO} =		2259.60) (Equation	13-6 or 13-7)				v ₁₂ –	VR ⁺ (VF ⁻ VR	^{رار} FD	
		0.559	using Equat	ion (Exhibit 13-6))	EQ -		(Equation 13-	·12 01 13-13) 7)
$V_{40} =$		2986	oc/h	()		FD -		ı		on (Exhibit 13-	-1)
		2356	pc/h (Equati	on 13-14 or 13-		$V_{12} =$		I	oc/h	0 44 40 47	\ \
ls V ₃ or V _{av34}	ا _{عv34} > 2,70	17) 0 pc/h? 🗌 Ye	s 🗹 No			$V_3 \text{ or } V_{av34}$ Is $V_3 \text{ or } V_{av3}$	₃₄ > 2,70)0 pc/h? [Yes No	13-14 OF 13-17)
Is V ₃ or V	_{av34} > 1.5 *	V ₁₂ /2 Ve	s 🗌 No			Is V_3 or V_{av3}	₃₄ > 1.5	* V ₁₂ /2	Yes 🗌 No		
lf Yes,V _{12a}	=	3052 j 18, or	pc/h (Equati 13-19)	on 13-16, 13-		lf Yes,V _{12a} =		 1;	oc/h (Equatio 3-19)	n 13-16, 13	-18, or
Capaci	ity Che	cks	/			Capacity	y Che	ecks			
	-	Actual		apacity	LOS F?			Actual	Ca	pacity	LOS F?
						V _F			Exhibit 13-	8	
V _F	FO	6773	Exhibit 13-8		No	V _{FO} = V _F	- V _R		Exhibit 13-	8	
						V _R			10	-	
Flow E	ntering	n Merge In	fluence A	rea		Flow En	tering	g Divel	rge Influen	ice Area	
		Actual	Max	Desirable	Violation?		A	ctual	Max Desi	irable	Violation?
V _R	12	4483	Exhibit 13-8	4600:All	No	V ₁₂			Exhibit 13-8		
Level of Service Determination (if not F)						Level of	Serv	ice De	terminatio	n (if not l	F)
D _R	$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$ $D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$										
D _R = 3	$_{\rm R}$ = 31.4 (pc/mi/ln) $D_{\rm R}$ = (pc/mi/ln)										
LOS = 1	D (Exhibit	13-2)				LOS = (E	xhibit	13-2)			
Speed	Detern	nination				Speed D)eterr	ninatic	on		
M _s = (0.532 (Exit	pit 13-11)				D _s = (E	xhibit 13	3-12)			
S _R =	55.1 mph (Exhibit 13-11)				S _R = mp	oh (Exhi	bit 13-12)			
S ₀ = 6	 63.6 mph (Exhibit 13-11)				S ₀ = m	oh (Exhi	bit 13-12)			
S = .	57.7 mph (Exhibit 13-13)				S = mp	oh (Exhi	bit 13-13)			

	BASIC F	REEWAY SE	GMENTS WORKSHEET		
Conoral Information			Site Information		
Analyst Agency or Company	AECOM		Highway/Direction of Travel From/To	I-95 NB Seg 10-	Bet 10th St & Hillsboro
Date Performed Analysis Time Period	AM		Jurisdiction Analysis Year	EXISTIN	IG 2015/2016
Project Description SW 10th	n Street SIMR				
Oper.(LOS)			Des.(N)	🗌 Pla	anning Data
Flow Inputs					
Volume, V AADT Peak-Hr Prop. of AADT. K	6290	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P _T %RVs_P_	0.95 3 0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length Up/Down %	Level mi	
Calculate Flow Adjustn	nents				
f _p	1.00		E _R	1.2	
E _T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.985	
Speed Inputs			Calc Speed Adj and FFS	6	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f _{LW}		mph
Number of Lanes, N	3		f _{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	70.0	mph	FFS	70.0	mph
Base free-flow Speed, BFFS		mph			
LOS and Performance	Measures		Design (N)		
<u>Operational (LOS)</u> v _p = (V or DDHV) / (PHF x N x S D = v _p / S LOS	k f _{HV} x f _p)2240 57.5 39.0 E	pc/h/ln mph pc/mi/ln	Design (N) Design LOS $v_p = (V \text{ or DDHV}) / (PHF x N x)$ S D = v_p / S Required Number of Lanes, N	f _{HV} x f _p)	pc/h/ln mph pc/mi/ln
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v _p - Flow rate LOS - Level of service DDHV - Directional design ho	S - Speed D - Density FFS - Free-flow BFFS - Base fre ur volume	speed ee-flow speed	E _R - Exhibits 11-10, 11-12 E _T - Exhibits 11-10, 11-11, 11- f _p - Page 11-18 LOS, S, FFS, v _p - Exhibits 11-2	13 2, 11-3	f _{LW} - Exhibit 11-8 f _{LC} - Exhibit 11-9 TRD - Page 11-11

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	RAMPS AND RAMP JUNCTIONS WORKSHEET										
General Infor	rmation			Site Infor	mation						
Analyst			Fre	eeway/Dir of Tr	avel	I-95 NE	3				
Agency or Company	AEC	OM	Ju	nction		Seg 11	-Diverge to	Hillsboro EB			
Date Performed	d 0.14		Ju	risdiction		EVICTI		040			
Project Description	SW 10th Stree	t SIMR	All	lalysis real		EXIST	ING 2015/2	010			
Inputs											
		Freeway Num	ber of Lanes N	3					L .	A 11	
Upstream Adj H	lamp	Ramp Numbe	er of Lanes N	1					Downstrea	am Adj	
Yes	On		and Longth L	I						_	
			Lane Length, L _A	000					I ✓ Yes	l ✓ On	
I No □	Off			220					🗌 No	Off	
	4	Freeway volu	me, v _F	6290					1. =	1540 ft	
up −	l.	Ramp Volume	e, V _R	670					-down	1040 10	
V = v	eh/h	Freeway Free	-Flow Speed, S _{FF}	70.0					V _D =	510 veh/h	
u	-	Ramp Free-F	low Speed, S _{FR}	45.0					_		
Conversion t	o pc/h Und	der Base	Conditions								
(pc/h)	(pc/h) V PHF Terrain %True						f _{HV}	f _p	v = V/PHF	x f _{HV} x f _p	
Freeway 6290 0.95 Level 3					0	0.	985	1.00	67	720	
Ramp	670	0.76	Level	2	0	0.	990	1.00	8	90	
UpStream					ļ						
DownStream	DownStream 510 0.92 Level 2				0	0.	990	1.00	5	60	
Estimation		Ectimot	lion o	<u> </u>	liverge Areas						
Estimation of	v 12				ESumat		v 12				
	V ₁₂ = V _F	(P _{FM})					V ₁₂ =	V _R + (V _F - V	′ _R)P _{FD}		
L _{EQ} =	(Equa	ition 13-6 or	13-7)		L _{EQ} =		(Equation 13-	12 or 13-13	3)	
P _{FM} =	using	Equation (I	Exhibit 13-6)		P _{FD} =		0.	551 using Eq	uation (Exh	ibit 13-7)	
V ₁₂ =	pc/h				V ₁₂ =		41	03 pc/h			
V ₃ or V _{av34}	pc/h (Equation 13	-14 or 13-17)		$V_3^{}$ or $V_{av34}^{}$		26	617 pc/h (Equ	uation 13-1	4 or 13-17)	
Is V_3 or $V_{av34} > 2,70$	00 pc/h? 🗌 Ye	s 🗌 No			Is V_3 or V_{av}	_{/34} > 2,7	'00 pc/h? [Yes 🗹 No			
Is V_3 or $V_{av34} > 1.5$	* V ₁₂ /2	s 🗌 No			Is V_3 or $V_{av34} > 1.5 * V_{12}/2$ Yes No						
If Yes,V _{12a} =	pc/h (Equation 13	-16, 13-18, or		If Yes,V ₁₂₂ :	=	p	c/h (Equation	า 13-16, 13	-18, or 13-	
Canacity Cho	13-19)				Canacit	w Ch		9)			
	Actual		anacity	LOS F2		y ch	Actual	C	anacity	LOS F2	
	riotuui	Ĭ	apaony	2001:	V_		6720	Exhibit 13-	8 7200	No	
V		Evhihit 13.8			V = V	- V	5830	Exhibit 13	8 7200	No	
*F0					FO FO	= "R	000		10 0100	NU	
							890	Exhibit 13-	10 2100	NO	
Flow Entering	g Merge In	fluence A	lrea	Violation	Flow Er	nterin	g Dive	rge Influer	ice Area	Malatian	
V	Actual	IVIAX	Desirable	violation?	V			Evhibit 12.9		violation?	
	l vice Determ	Pinotion (if not E)			<u> </u>		Exhibit 15-0	4400.All		
Level of Service Determination (if not F)					Lever					<i>F)</i>	
$D_{\rm R} = 5.475 \pm 0.00734 V_{\rm R} \pm 0.0078 V_{12} \pm 0.00027 L_{\rm A}$					D - 0'	U _R – 4	+.232 + U	.0000 v ₁₂ - 0	.009 L _D		
$D_R = (pc/mi/ir)$	1) 40.0\				$D_R = 3$	7.6 (pc	/mi/in)				
LOS - (Exhibit 13-2) LOS -							oit 13-2)				
Speed Deterr	beed Determination					Deter	minatic	on (a)			
M _S = (Exibit 1	3-11)				D _s = 0.378 (Exhibit 13-12)						
S _R = mph (Exh	nibit 13-11)				S _R = 59.4 mph (Exhibit 13-12)						
S ₀ = mph (Exh	nibit 13-11)				S ₀ = 70.5 mph (Exhibit 13-12)						
S = mph (Exh	nibit 13-13)				S = 6	3.3 mph	(Exhibit	13-13)			
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2015 Existing Freeway_HCS Operational Analysis

	BASIC F	REEWAY SE	GMENTS WORKSHEET		
Concret Information			Site Information		
			Site information	1.05 ND	
Analyst Agency or Company Date Performed	AECOM		From/To	1-95 NB Seg 12-	Bet Hillsboro Off & On
Analysis Time Period	AM		Analysis Year	EXISTIN	NG 2015/2016
Project Description SW 10th	h Street SIMR				
Oper.(LOS)			Des.(N)	🗌 Pla	anning Data
Flow Inputs					
Volume, V AADT	5620	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P _T	0.95 3	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	%RVs, P _R General Terrain: Grade % Length Up/Down %	0 Level mi	
Calculate Flow Adjustr	nents				
f _p	1.00		E _R	1.2	
E _T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.985	
Speed Inputs			Calc Speed Adj and FFS	6	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f _{LW}		mph
Number of Lanes, N	3		f _{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	70.0	mph	FFS	70.0	mph
Base free-flow Speed, BFFS		mph			
LOS and Performance	Measures		Design (N)		
Operational (LOS) v _p = (V or DDHV) / (PHF x N x S D = v _p / S LOS	x f _{HV} x f _p) 2002 62.5 32.0 D	pc/h/ln mph pc/mi/ln	Design (N) Design LOS $v_p = (V \text{ or DDHV}) / (PHF x N x)$ S D = v_p / S Required Number of Lanes, N	f _{HV} x f _p)	pc/h/ln mph pc/mi/ln
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v _p - Flow rate LOS - Level of service DDHV - Directional design ho	S - Speed D - Density FFS - Free-flow BFFS - Base fre	speed ee-flow speed	E _R - Exhibits 11-10, 11-12 E _T - Exhibits 11-10, 11-11, 11- f _p - Page 11-18 LOS, S, FFS, v _p - Exhibits 11-	-13 2, 11-3	f _{LW} - Exhibit 11-8 f _{LC} - Exhibit 11-9 TRD - Page 11-11

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		F	REEWAY	(WEAV	ING WOF	RKSHEE	Г		
General	Informatio	on			Site Info	rmation			
Analyst Agency/Con Date Perforr Analysis Tim	npany ned ne Period	AECON AM	Л		Freeway/Dir of Travel I-95 NB Weaving Segment Location Seg 13-Bet Hillsboro On & Of Analysis Year EXISTING 2015/2016				
Project Desc	cription SW 10th	n Street SIMF	ł						
Inputs					1				
Weaving cor Weaving nu Weaving seg Freeway free	nfiguration mber of lanes, N gment length, L _s ə-flow speed, FF	S		One-Sided 4 790ft 70 mph	Segment typ Freeway min Freeway ma: Terrain type	Freeway 1 2400 Leve			
Convers	sions to po	/h Unde	r Base Co	ondition	s		•	1	
	V (veh/h)	PHF	Truck (%)	RV (%)	Ε _Τ	E _R	f _{HV}	fp	v (pc/h)
V _{FF}	5140	0.95	3	0	1.5	1.2	0.985	1.00	5492
V _{RF}	510	0.92	2	0	1.5	1.2	0.990	1.00	560
V _{FR}	480	0.91	2	0	1.5	1.2	0.990	1.00	533
V _{RR}	0	0.92	2	0	1.5	1.2	0.990	1.00	0
V _{NW}	5492							V =	6585
V _W	1093							-	
VR	0.166								
Configu	ration Cha	racteris	tics		•				
Minimum m	aneuver lanes, N	N _{WL}		2 lc	Minimum we	aving lane ch	nanges, LC _{MIN}		1093 lc/h
Interchange	density, ID			0.8 int/mi	Weaving lan	e changes, L	C _w		1314 lc/h
Minimum R	= lane changes,	LC _{RF}		1 lc/pc	Non-weaving	g lane change	es, LC _{NW}		789 lc/h
Minimum FF	R lane changes,	LC _{FR}		1 lc/pc	Total lane ch	nanges, LC _{ALI}	_		2103 lc/h
Minimum R	R lane changes,	LC _{RR}		lc/pc	Non-weaving	g vehicle inde	ex, I _{NW}		347
Weaving	g Segment	Speed,	Density, I	Level of	Service,	and Cap	acity		
Weaving se	gment flow rate,	v		6493 veh/h	Weaving inte	ensity factor,	W		0.489
Weaving se	gment capacity,	c _w		8433 veh/h	Weaving seg	gment speed,	S		53.8 mph
Weaving se	gment v/c ratio			0.770	Average wea	aving speed,	Sw		51.9 mph
Weaving se	gment density, [)	30	0.6 pc/mi/ln	In Average non-weaving speed, S _{NW}				54.2 mph
Level of Ser	vice, LOS			D	Maximum we	eaving length	, L _{MAX}		4191 ft
Notes			te d		- 4 4		and all		
a. vveaving s Chapter 13, " b. For volume	Freeway Merge a sthat exceed the	nd Diverge Se weaving segr	gments". nent capacity, th	ngth should l	vice is "F".	iolated merge	and diverge ar	eas using the	procedures of

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	BASIC F	REEWAY SE	GMENTS WORKSHEET		
Conoral Information			Site Information		
Analyst Agency or Company Date Performed	AECOM		Highway/Direction of Travel From/To	I-95 NB Seg 14-,	Bet Hillsboro Off & On
Analysis Time Period	AM		Analysis Year	EXISTIN	NG 2015/2016
Project Description SW 10th	h Street SIMR				
✓ Oper.(LOS)			Des.(N)	Pla	anning Data
Flow Inputs					
Volume, V AADT Peak-Hr Prop. of AADT, K	5650	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P _T %RVs, P _R	0.95 3 0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length Up/Down %	Level mi	
Calculate Flow Adjustn	nents				
f _p	1.00		E _R	1.2	
Ε _T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.985	
Speed Inputs			Calc Speed Adj and FFS	6	
Lane Width		ft			
Rt-Side Lat. Clearance	2	ft	t _{LW}		mph
Number of Lanes, N	3				mpn
FES (measured)	70.0	ramps/mi		70.0	mpn
Base free-flow Speed, BFFS	70.0	mph	rro	70.0	тірп
I OS and Performance	Moasuros		Design (N)		
$\frac{\text{Operational (LOS)}}{v_p = (V \text{ or DDHV}) / (PHF x N x)}$ S D = v_p / S LOS	x f _{HV} x f _p)2012 62.4 32.3 D	pc/h/ln mph pc/mi/ln	$\frac{\text{Design (N)}}{\text{Design LOS}}$ $v_p = (V \text{ or DDHV}) / (PHF x N x)$ S $D = v_p / S$ Required Number of Lanes, N	f _{HV} x f _p)	pc/h/ln mph pc/mi/ln
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v _p - Flow rate LOS - Level of service DDHV - Directional design ho	S - Speed D - Density FFS - Free-flow BFFS - Base freeur volume	speed ee-flow speed	E _R - Exhibits 11-10, 11-12 E _T - Exhibits 11-10, 11-11, 11- f _p - Page 11-18 LOS, S, FFS, v _p - Exhibits 11-	-13 2, 11-3	f _{LW} - Exhibit 11-8 f _{LC} - Exhibit 11-9 TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET											
General	Infori	nation			Site Infor	mation					
Analyst Agency or Co Date Perform Analysis Time	ompany ied e Period	AECO	ОМ	F J J A	reeway/Dir of Tr unction urisdiction nalysis Year	avel	I-95 N Seg 1 EXIST	IB 5-Merge fro FING 2015/2	m Hillsboro WB		
Project Descr	ription	SW 10th Stree	t SIMR								
Inputs											
Upstream Adj	j Ramp		Freeway Num Ramp Numbe	ber of Lanes, N or of Lanes, N	3 1					Downstrea Ramp	m Adj
✓ Yes	On		Acceleration L	ane Length, L _A	525					□ Yes	🗌 On
🗌 No	✓ Off		Deceleration I Freeway Volu	Lane Length L _D me, V _F	5650					🗹 No	Off
L _{up} =	2135 f	ť	Ramp Volume	e, V _R	660 70 0					L _{down} =	ft
V _u =	480 ve	h/h	Ramp Free-Fl	low Speed, S _{FR}	50.0					V _D =	veh/h
Conversion to pc/h Under Base Conditions											
(pc/h))	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f _{HV}	f _p	v = V/PHF	x f _{HV} x f _p
Freeway		5650	0.95	Level	3	0	0).985	1.00	60)37
Ramp		660	0.84	Level	2	0	0).990	1.00	7	94
UpStream		480	0.91	Level	2	0	0).990	1.00	5	33
DownStream	DownStream Merge Areas										
Merge Areas						Ectimot	ion	L	Diverge Areas		
Estimation of V ₁₂						Estimat		^{01 V} 12			
$V_{12} = V_F (P_{FM})$							$V_{40} = 1$	Vn + (Vr - Vn)P _{EP}		
L _{EQ} =		1907.93	(Equation	13-6 or 13-7)				12	Fountion 13-	.⁄ ⊧∪ 12 or 13-13	3)
P _{FM} =		0.592	using Equat	tion (Exhibit 13-6	5)	-EQ P =			using Equation	n (Evhibit 13	-7)
V ₁₂ =		3575	oc/h			FD			oo/b		-1)
		2462	oc/h (Equati	on 13-14 or 13	-	v ₁₂ –			pc/n	0 4 4 4 4 4	2)
v_3 or v_{av34}	> 0 700	17)) no/h2)(v_3 or v_{av34} Is V ₂ or V	>2	700 pc/h? [pc/h (Equation 1	3-14 or 13-1	")
IS V_3 or V_{av34}	4 > 2,700 > 1 5 *) pc/n? [] Ye	s ⊻No			Is V _a or V	34 –, ~, > 1.	5 * V ₄₀ /2			
If Yes,V _{12a} =	4 ~ 1.5	v ₁₂ /∠ ⊻ Yes 3575 µ	sNo pc/h (Equati	on 13-16, 13-		lf Yes,V _{12a} =	=	- ₁₂- ∟ 1;	pc/h (Equatio 3-19)	n 13-16, 13	-18, or
Canacity	(Cho		13-19)			Canacit	V Ch	ocke	,		
Capacity		Actual		anaoit <i>u</i>		Capach	y ch	Actual	Co	a a a itu	
		Actual		σμασιιγ	LUGT	V		Actual	Evhibit 13		2031?
Veo		6831	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V _R		Exhibit 13-	8	
FU						V _R			Exhibit 13 10	-	
Flow Ent	tering	Merge In	fluence A	rea		Flow En	nterii	ng Dive	rge Influen	ce Area	
		Actual	Max	Desirable	Violation?			Actual	Max Desi	irable	Violation?
V _{R12}		4369	Exhibit 13-8	4600:All	No	V ₁₂			Exhibit 13-8		
Level of	Servi	ce Detern	nination (if not F)	•	Level of	f Ser	vice De	terminatio	n (if not	F)
D _D = {	5.475 + (0.00734 v _p + ().0078 V ₁₀ - 0.	00627 L			D _D =	4.252 + 0	.0086 V ₁₂ - 0	.009 L _D	/
$D_{p} = 35.$	9 (pc/mi	/ln)	12	~		$D_{\rm p} = (r$	nc/mi/	ln)	12	D	
	Evhibit 1	3_2)					=vhihi) it 13_2)			
	LOS = (Exhibit 13-2)										
Speed D	elelu	mation				Speed L	Jele		///		
M _S = 0.5	576 (Exib	it 13-11)				∪ _s = (E		13-12)			
S _R = 53.	.9 mph (l	Exhibit 13-11)				o _R = m	pn (Ex	(nidit 13-12)			
S ₀ = 62.	.5 mph (l	Exhibit 13-11)				S ₀ = m	ph (Ex	hibit 13-12)			
S = 56.	.7 mph (l	Exhibit 13-13)				S= m	ph (Ex	hibit 13-13)			

	BASIC F	REEWAY SE	GMENTS WORKSHEET		
General Information			Site Information		
Analyst Agency or Company Date Performed Analysis Time Period	AECOM AM		Highway/Direction of Travel From/To Jurisdiction Analysis Year	I-95 NB Seg 16- EXISTIN	North of Hillsboro NG 2015/2016
Project Description SW 10t	h Street SIMR				
Oper.(LOS)			Des.(N)	🗌 Pla	anning Data
Flow Inputs					
Volume, V AADT Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D	6300	veh/h veh/day veh/h	Peak-Hour Factor, PHF %Trucks and Buses, P _T %RVs, P _R General Terrain: Grade % Length Up/Down %	0.95 3 0 Level mi	
Calculate Flow Adjustr	nents		·		
f	1.00		E _R	1.2	
E _T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.985	
Speed Inputs			Calc Speed Adj and FFS	6	
Lane Width Rt-Side Lat. Clearance Number of Lanes, N Total Ramp Density, TRD FFS (measured) Base free-flow Speed, BFFS	3 70.0	ft ft ramps/mi mph mph	f _{∟w} f _{LC} TRD Adjustment FFS	70.0	mph mph mph mph
LOS and Performance	Measures	-	Design (N)		
<u>Operational (LOS)</u> v _p = (V or DDHV) / (PHF x N) S D = v _p / S LOS	x f _{HV} x f _p) 2244 57.4 39.1 E	pc/h/ln mph pc/mi/ln	Design (N) Design LOS $v_p = (V \text{ or DDHV}) / (PHF x N x)$ S D = v_p / S Required Number of Lanes, N	f _{HV} x f _p)	pc/h/ln mph pc/mi/ln
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v _p - Flow rate LOS - Level of service DDHV - Directional design ho	S - Speed D - Density FFS - Free-flow BFFS - Base free our volume	speed ee-flow speed	E _R - Exhibits 11-10, 11-12 E _T - Exhibits 11-10, 11-11, 11- f _p - Page 11-18 LOS, S, FFS, v _p - Exhibits 11-	-13 2, 11-3	f _{LW} - Exhibit 11-8 f _{LC} - Exhibit 11-9 TRD - Page 11-11

HCS 2010TM Version 6.90

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		F	REEWA	(WEAV	ING WOF	RKSHEE	Г			
General	Informatio	on			Site Info	rmation				
Analyst Agency/Con Date Perforr Analysis Tim	npany ned ne Period	AECON PM	И		Freeway/Dir of Travel I-95 NB Weaving Segment Location Seg 1-Bet Copans & Sample Analysis Year EXISTING 2015/2016					
Project Desc	cription SW 10th	n Street SIMF	R							
Inputs					r					
Weaving cor Weaving nu Weaving seg Freeway free	nfiguration mber of lanes, N gment length, L _s e-flow speed, FF	S		One-Sided 4 1820ft 70 mph	Segment typ Freeway min Freeway ma: Terrain type	Freeway 15 2400 Leve				
Convers	sions to po	/h Unde	r Base Co	ondition	s		•	1	-	
	V (veh/h)	PHF	Truck (%)	RV (%)	Ε _Τ	E _R	f _{HV}	fp	v (pc/h)	
V _{FF}	4260	0.95	3	0	1.5	1.2	0.985	1.00	4551	
V _{RF}	400	0.95	2	0	1.5	1.2	0.990	1.00	425	
V _{FR}	1480	0.98	2	0	1.5	1.2	0.990	1.00	1525	
V _{RR}	0	0.95	2	0	1.5	1.2	0.990	1.00	0	
V _{NW}	4551							V =	6501	
V _W	1950									
VR	0.300									
Configu	ration Cha	racteris	tics		1					
Minimum m	aneuver lanes, N	√ _{WL}		2 lc	Minimum we	aving lane cl	nanges, LC _{MIN}		1950 lc/h	
Interchange	density, ID			0.8 int/mi	Weaving lan	e changes, L	.C _w		2339 lc/h	
Minimum RI	F lane changes,	LC _{RF}		1 lc/pc	Non-weaving	g lane change	es, LC _{NW}		1154 lc/h	
Minimum FF	R lane changes,	LC _{FR}		1 lc/pc	Total lane ch	nanges, LC _{ALI}	L		3493 lc/h	
Minimum RI	R lane changes,	LC _{RR}		lc/pc	Non-weaving	g vehicle inde	ex, I _{NW}		663	
Weaving	g Segment	Speed,	Density, I	_evel of	Service,	and Cap	oacity			
Weaving se Weaving se	gment flow rate, gment capacity,	v c _w		6416 veh/h 7883 veh/h	Weaving inte Weaving sec	ensity factor, gment speed,	W , S		0.378 50.0 mph	
Weaving se	gment v/c ratio			0.814	Average wea	aving speed,	Sw		54.9 mph	
Weaving se	gment density, [)	32	2.5 pc/mi/ln	h Average non-weaving speed, S_{NW}				48.2 mph	
Level of Ser	vice, LOS			D	Maximum weaving length, L _{MAX} 5583 ft					
Notes a. Weaving se Chapter 13, " b. For volume	egments longer th Freeway Merge a as that exceed the	an the calcula nd Diverge Se weaving segr	ted maximum le gments". nent capacity, tl	ength should l	be treated as is	solated merge	and diverge ar	eas using the	procedures of	

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	BASIC F	REEWAY SE	GMENTS WORKSHEET		
General Information			Site Information		
Analyst Agency or Company Date Performed	AECOM		Highway/Direction of Travel From/To Jurisdiction	I-95 NB Seg 2-B	et Sample Off & On
Analysis Time Period	PM		Analysis Year	EXISTIN	IG 2015/2016
Project Description SW 10tr	n Street SIMR				unning Data
			Des.(N)		anning Data
	4660	vab/b	Deale Hour Feater, DUF	0.04	
AADT Rock Hr Bron of AADT K	4000	veh/day	Peak-Hour Factor, PHF %Trucks and Buses, PT %RV/s	0.94 3 0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length Up/Down %	U Level mi	
Calculate Flow Adjustn	nents				
f _p	1.00		E _R	1.2	
É _T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.985	
Speed Inputs			Calc Speed Adj and FFS	6	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f _{LW}		mph
Number of Lanes, N	3		f _{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	70.0	mph	FFS	70.0	mph
Base free-flow Speed, BFFS		mph			
LOS and Performance	Measures		Design (N)		
<u>Operational (LOS)</u> v _p = (V or DDHV) / (PHF x N x S D = v _p / S LOS	x f _{HV} x f _p) 1677 67.4 24.9 C	pc/h/ln mph pc/mi/ln	<u>Design (N)</u> Design LOS v _p = (V or DDHV) / (PHF x N x S D = v _p / S Required Number of Lanes, N	f _{HV} x f _p)	pc/h/ln mph pc/mi/ln
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v _p - Flow rate LOS - Level of service DDHV - Directional design ho	S - Speed D - Density FFS - Free-flow BFFS - Base freeur volume	speed ee-flow speed	E _R - Exhibits 11-10, 11-12 E _T - Exhibits 11-10, 11-11, 11- f _p - Page 11-18 LOS, S, FFS, v _p - Exhibits 11-2	-13 2, 11-3	f _{LW} - Exhibit 11-8 f _{LC} - Exhibit 11-9 TRD - Page 11-11

HCS 2010TM Version 6.90

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RAMPS AND RAMP JUNCTIONS WORKSHEET										
General Infor	mation			Site Inform	mation					
Analyst			Fre	eeway/Dir of Tra	avel	I-95 N	В			
Agency or Company	AECO	MC	Ju	nction		Seg 3-	-Merge from	n Sample EB		
Date Performed			Ju	risdiction						
Analysis Time Period	PM		An	alysis Year		EXIST	ING 2015/2	.016		
	SW 10th Stree	t SIMR								
inputs		F N	han aft an a N							
Upstream Adj Ramp		Freeway Num	ider of Lanes, N	3					Downstrea	ım Adj
		Ramp Numbe	er of Lanes, N	1					Ramp	
		Acceleration L	_ane Length, L _A	960					🗹 Yes	🗹 On
🗹 No 🛛 Off	F	Deceleration I	Lane Length L _D						No	Off
		Freeway Volu	ime, V _F	4660						
L _{up} = ft		Ramp Volume	e, V _R	565					L _{down} =	2300 ft
	Freeway Free-Flow Speed, S _{FF} 70.0								V -	225 vob/b
v _u = ven/h		Ramp Free-Fl	low Speed, S _{FR}	50.0					v _D –	SSS Ven/II
Conversion to	o pc/h Und	der Base	Conditions							
(pc/h)	V	PHF	Terrain	%Truck	%Rv		f _{HV}	f	v = V/PHF	х f _{нv} х f _n
Eroowov	(ven/nr)	0.04	Loval	2	0		0.005	1 00	E	
Pieeway	4000	0.94	Level	3	0		.965	1.00	5	00
LinStream	200	0.97	Levei	2	0		.990	1.00	0	00
DownStream	DownStream 335 0.93 Level				0	0	.990	1.00	3	64
	Merge Areas				, v)iverge Areas		
Estimation of	Estimation of v ₁₂					Estimation of v ₁₂				
$V_{in} = V_{in} (P_{rin})$							12			
=	(Equa	, FM / ation 13-6 o	r 13_7)				V ₁₂ =	v _R + (v _F - v _R)P _{FD}	
-EQ P =	0 604		tion (Exhibit 13.6)		L _{EQ} =			Equation 13-	12 or 13-13	3)
· FM V =	2044	using Lquai			P _{FD} =		I	using Equatio	n (Exhibit 13	-7)
v 12 -	3041 p	oc/h (Equati	on 13 14 or 13		V ₁₂ =		I	oc/h		
V ₃ or V _{av34}	17)	JC/II (⊏quali	011 13-14 01 13-		$V_3^{}$ or $V_{av34}^{}$			pc/h (Equation 1	3-14 or 13-17	7)
Is V ₃ or V _{av34} > 2,70	0 pc/h? Yes	s 🗸 No			Is V_3 or V_{av3}	₃₄ > 2,7	700 pc/h?	Yes 🗌 No		
Is V_3 or $V_{3y34} > 1.5 *$	V ₁₂ /2 Ves	s 🗌 No			Is V_3 or V_{av3}	₃₄ > 1.5	5 * V ₁₂ /2	Yes No		
	3041 g	oc/h (Equati	on 13-16, 13-		If Yes,V ₁₂₂ =	:		c/h (Equation	n 13-16, 13	8-18, or
11 Tes, v _{12a} –	18, or	13-19)			12a		1.	3-19)		
Capacity Che	cks				Capacit	y Ch	ecks			
	Actual	0	Capacity	LOS F?			Actual	Cap	pacity	LOS F?
					V _F			Exhibit 13-8	3	
V _{FO}	5620	Exhibit 13-8		No	V _{FO} = V _F	- V _R		Exhibit 13-8	3	
					Vp			Exhibit 13-	-	
Elow Entoring	Norgo In	fluonoo	1.00			torir		10		
FIOW Entering	Actual	Max	Desirable	Violation?	FIOW EII		Actual	Max Desi	rable	Violation?
V _{P12}	3629	Exhibit 13-8	4600:All	No	V ₁₂			Exhibit 13-8		
Level of Service Determination (if not F)					Level of	⁻ Ser	vice De	terminatio	n (if not	F)
D _R = 5.475 +	$D_{R} = 5.475 + 0.00734 v_{R} + 0.0078 V_{12} - 0.00627 L_{A}$ $D_{R} = 4.252 + 0.0086 V_{12} - 0.009 L_{D}$									
D _R = 27.5 (pc/m	i/ln)	12			D _R = (n	c/mi/	ln)	12	D	
OS = C (Exhibit)	, 13-2)				10S = (F	xhibi	t 13-2)			
Speed Detern	nination				Speed F)eter	rminatio	on		
M = 0.272 (Evil)	oit 12 11)				D_= (F	xhibit	13-12)			
$V_{\rm S}^{-} = 0.372$ (EXII	JIL 10-11)				s (⊑ S_= mi	nh (Fy	hibit 13-12)			
$v_{\rm R}^-$ 59.6 mph (S.= m	r(⊏∧ nh (⊏v	hihit 13_12)			
$S_0 = 64.6 \text{ mph} ($						pri (⊏X nh (⊏	hibit 10-12)			
p = 61.3 mph (Exhibit 13-13)				ວ= m	pn (Ex	nidit 13-13)			

	BASIC F	REEWAY SE	GMENTS WORKSHEET		
General Information			Site Information		
Analyst			Highway/Direction of Travel	1-95 NB	ot Sample ER On & WR
Agency or Company	AECOM		From/To	On	
Date Performed Analysis Time Period	PM		Jurisdiction Analysis Year	EXISTIN	IG 2015/2016
Project Description SW 10th	Street SIMR				
✓ Oper.(LOS)			Des.(N)	Pla	nning Data
Flow Inputs					
Volume, V AADT Peak-Hr Prop. of AADT, K	5225	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P _T %RVs, P _B	0.94 3 0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length Up/Down %	Level mi	
Calculate Flow Adjustm	nents				
f	1.00		Ep	1.2	
E _T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.985	
Speed Inputs			Calc Speed Adj and FFS	6	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f _{I W}		mph
Number of Lanes, N	3		f _{IC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	70.0	mph	FFS	70.0	mph
Base free-flow Speed, BFFS		mph			
LOS and Performance I	Measures		Design (N)		
<u>Operational (LOS)</u> v _p = (V or DDHV) / (PHF x N x S D = v _p / S LOS	t f _{HV} x f _p) 1881 64.6 29.1 D	pc/h/ln mph pc/mi/ln	Design (N) Design LOS $v_p = (V \text{ or DDHV}) / (PHF x N x)$ S D = v_p / S Required Number of Lanes, N	f _{HV} x f _p)	pc/h/ln mph pc/mi/ln
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v _p - Flow rate LOS - Level of service DDHV - Directional design ho	S - Speed D - Density FFS - Free-flow BFFS - Base fre ur volume	speed e-flow speed	E _R - Exhibits 11-10, 11-12 E _T - Exhibits 11-10, 11-11, 11- f _p - Page 11-18 LOS, S, FFS, v _p - Exhibits 11-2	13 2, 11-3	f _{LW} - Exhibit 11-8 f _{LC} - Exhibit 11-9 TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET											
Genera	l Infor	mation			Site Infor	mation					
Analyst				Fr	eeway/Dir of Tra	avel	I-95 N	В			
Agency or (Company	AEC	MC	Ju	Inction		Seg 5-	-Merge from	Sample WB		
Date Perfor	med			Ju	irisdiction						
Analysis Tir	me Period	PM		Ar	nalysis Year		EXIST	ING 2015/2	016		
Project Des	scription	SW 10th Stree	t SIMR								
Inputs			1							1	
Upstream A	Adj Ramp		Freeway Num	ber of Lanes, N	3					Downstrea	m Adj
			Ramp Numbe	r of Lanes, N	1					Ramp	-
I Yes	🗹 On		Acceleration L	ane Length, L _A	620					∏ Yes	On
			Deceleration I	Lane Length Lp							
			Freeway Volu	me V_	5225					I No	Off
L =	2150	ft	Ramp Volume		225					L _{down} =	ft
up	2100			^{z, v} R	333					down	
V., =	565 ve	eh/h	Freeway Free	-Flow Speed, S _{FF}	70.0					V _D =	veh/h
			Ramp Free-Fl	ow Speed, S _{FR}	50.0						
Conver	sion to	o pc/h Uno	der Base	Conditions	r		_				
(pc/	/h)	V () (ab/br)	PHF	Terrain	%Truck	%Rv		f _{HV}	f _n	v = V/PHF	x f _{HV} x f _n
Eroowov	,	(Ven/ni)	0.04	Loval	2	0		0.05	1.00	50	10
Fleeway		0220	0.94	Level	3	0		.965	1.00	50	24
Ramp		335	0.93	Level	2	0	0	.990	1.00	3	54
DevenStream		505	0.97	Level	2	0	0	.990	1.00	5	58
Merge Areas									iverae Areas		
Estimation of V						Diverge Areas					
								12			
$V_{12} = V_F (P_{FM})$								V ₁₂ = V	/ _R + (V _F - V _R)P _{FD}	
L _{EQ} =		(Equa	ation 13-6 o	r 13-7)		L _{E0} =		(Equation 13-	12 or 13-13	5)
P _{FM} =		0.595	using Equat	tion (Exhibit 13-6)	1	P =			ising Equatio	n (Exhibit 13-	, .7)
V ₁₂ =		3356	oc/h					r	ong Equato		• /
V or V		2286	oc/h (Equati	on 13-14 or 13-		v_{12}^{-}		4	JC/II ⊳o/h /⊑awatian 1	0 11 10 17	`
v ₃ 01 v _{av34}		17)				v ₃ 01 v _{av34}		700 // 0	c/n (Equation 1	13-14 Of 13-17)
Is V ₃ or V _{av}	_{v34} > 2,70	0 pc/h? 🗌 Ye	s 🗹 No			IS V ₃ or V _{av3}	₃₄ > 2,1	/ UU pc/n ?			
Is V_3 or V_{av}	_{v34} > 1.5 *	V ₁₂ /2 Ve	s 🗌 No			Is V ₃ or V _{av3}	₃₄ > 1.5	5 ^ V ₁₂ /2			10
If Yes V.	=	3356	pc/h (Equati	on 13-16, 13-		If Yes,V _{12a} =	:	۲ 13	oc/h (Equation	n 13-16, 13	-18, or
12a		18, or	13-19)						5-19)		
Capacit	ty Che	cks			v	Capacity	y Ch	ecks			
<u> </u>		Actual	<u> </u>	Capacity	LOS F?			Actual	Car	pacity	LOS F?
						V _F			Exhibit 13-8	8	
V _E		6006	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V _R		Exhibit 13-8	8	
'	0					V			Exhibit 13-	-	
						۷R			10		
Flow Er	ntering	Merge In	fluence A	rea		Flow En	terir	ng Diver	ge Influen	ce Area	
		Actual	Max	Desirable	Violation?		_	Actual	Max Desi	irable	Violation?
V _{R1}	V _{R12} 3720 Exhibit 13-8 4600:All No					V ₁₂			Exhibit 13-8		
Level of Service Determination (if not F)						Level of	^r Ser	vice De	terminatio	n (if not l	F)
D _R =	$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$ $D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$										
$D_{R} = 3$	0.4 (pc/m	i/ln)				D _R = (n	c/mi/l	ln)	.=	2	
) (Exhihit [.]	13-2)				IOS = (F	xhibi	, t 13-2)			
Speed	nood Determination										
Sheen	Dereill	mation						12 40)	11		
M _S = 0	.420 (Exit	oit 13-11)				υ _s – (Ε		13-12)			
S _R = 5	68.2 mph (Exhibit 13-11)				S _R = m	ph (Ex	hibit 13-12)			
S ₀ = 6	3.6 mph (Exhibit 13-11)				S ₀ = m	ph (Ex	hibit 13-12)			
S = 6	60.2 mph (Exhibit 13-13)				S= m	ph (Ex	hibit 13-13)			

	BASIC F	REEWAY SE	GMENTS WORKSHEET		
General Information			Site Information		
Analyst Agency or Company Date Performed Analysis Time Period	AECOM PM		Highway/Direction of Travel From/To Jurisdiction Analysis Year	I-95 NB Seg 6-B EXISTIN	et Sample & 10th St IG 2015/2016
Project Description SW 10th	h Street SIMR		,		
✓ Oper.(LOS)			Des.(N)	Pla	anning Data
Flow Inputs					
Volume, V AADT Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D	5660	veh/h veh/day veh/h	Peak-Hour Factor, PHF %Trucks and Buses, P _T %RVs, P _R General Terrain: Grade % Length	0.95 3 0 Level mi	
Calculate Flow Adjustr	nonte		Up/Down %		
	1.00 1.5		E _R f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	1.2 0.985	
Speed Inputs			Calc Speed Adj and FFS	6	
Lane Width Rt-Side Lat. Clearance Number of Lanes, N Total Ramp Density, TRD FFS (measured) Base free-flow Speed, BFFS	3 70.0	ft ft ramps/mi mph mph	f _{∟w} f _{LC} TRD Adjustment FFS	70.0	mph mph mph mph
LOS and Performance	Measures		Design (N)		
<u>Operational (LOS)</u> v _p = (V or DDHV) / (PHF x N x S D = v _p / S LOS	x f _{HV} x f _p) 2016 62.3 32.4 D	pc/h/ln mph pc/mi/ln	Design (N) Design LOS $v_p = (V \text{ or DDHV}) / (PHF x N x)$ S D = v_p / S Required Number of Lanes, N	f _{HV} x f _p)	pc/h/ln mph pc/mi/ln
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v _p - Flow rate LOS - Level of service DDHV - Directional design ho	S - Speed D - Density FFS - Free-flow BFFS - Base fre ur volume	speed ee-flow speed	E _R - Exhibits 11-10, 11-12 E _T - Exhibits 11-10, 11-11, 11- f _p - Page 11-18 LOS, S, FFS, v _p - Exhibits 11-2	13 2, 11-3	f _{LW} - Exhibit 11-8 f _{LC} - Exhibit 11-9 TRD - Page 11-11

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		RAMP	S AND RAM	P JUNCTI	ONS WC	RKS	HEET				
General Infor	rmation			Site Infor	mation						
Analyst			Fr	eeway/Dir of Tr	avel	I-95 NE	3				
Agency or Company	AEC	OM	Ju	nction		Seg 7-	Diverge to	10th St			
Date Performed			Ju	risdiction							
Analysis Time Perio	d PM		Ar	alysis Year		EXISTING 2015/2016					
Project Description	SW 10th Stree	et SIMR									
Inputs									1		
Upstream Adj F	Ramp	Freeway Num	nber of Lanes, N	3					Downstrea	am Adj	
		Ramp Numbe	er of Lanes, N	1					Ramp		
Yes L	□On	Acceleration I	Lane Length, L _A						✓ Yes	✓ On	
	Off	Deceleration	Lane Length L _n	250							
		Freeway Volu	ıme, V _⊏	5660					I 🗆 NO	U Off	
L _{up} = 1	ft	, Ramp Volume	р V_	1220					L _{down} =	1370 ft	
up		Erooway Eroc	Elow Spood S	70.0							
$V_u = v$	/eh/h	Dema Free F	law Greed, S _{FF}	70.0					V _D =	1090 veh/h	
		Ramp Free-F	low Speed, S _{FR}	45.0							
Conversion t									1		
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f _{HV}	f _p	v = V/PHF	$ m x~f_{HV}~x~f_{p}$	
Freeway	5660	0.95	Level	3	0	0.	985	1.00	60	47	
Ramp	1220	0.91	Level	2	0	0.	990	1.00	13	54	
UpStream											
DownStream 1090 0.93 Level 2					0	0.	990	1.00	11	84	
Merge Areas					Diverge Areas						
Estimation of v ₁₂					Estimat	ion o	of v ₁₂				
	$V_{12} = V_{E}$	(P _{EM})					V ₁₂ =	V _P + (V _F - V			
 =	(Faus	tion 13-6 or	13-7)		l == =		12	Fountion 13-	עי י⊐ 12 or 13-13)	
-EQ P =		Equation (Evaluation $(13-6)$		-EQ P =		0	5/17 using Eq	uption (Evhi	/ hit 13 7)	
'FM -	using	Lquation ('FD		0.	047 usiny ⊏u		bit 13-7)	
v ₁₂ –	pc/n				v ₁₂ –		35	19 pc/n			
V ₃ OF V _{av34}	pc/n (Equation 13	3-14 or 13-17)		V ₃ Or V _{av34}		21	28 pc/h (Equ	uation 13-14	1 or 13-17)	
Is V_3 or $V_{av34} > 2,70$	00 pc/h? 🗌 Ye	s 🗌 No			Is V ₃ or V _{av}	_{/34} > 2,7	00 pc/h?	_Yes ⊻No			
Is V_3 or $V_{av34} > 1.5$	*V ₁₂ /2	s 🗌 No			Is V ₃ or V _{av}	, ₃₄ > 1.5	* V ₁₂ /2	Yes 🗹 No			
lf Yes,V _{12a} =	pc/h (Equation 13	8-16, 13-18, or		If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13- 19)						
Canacity Che	ncks)			Canacit	v Ch	ocks	9)			
			anacity	LOS F2		<u>y 011</u>	Actual	C	anacity	LOS E2	
	Actual		Japaony		V_		6047	Evhibit 13		No.	
N/					*F		10047		0 7200		
v _{FO}		Exhibit 13-8			$v_{FO} = v_F$	- v _R	4693	Exhibit 13-	8 7200	NO	
					V _R		1354	Exhibit 13-	10 2100	No	
Flow Entering	g Merge In	fluence A	Area		Flow Er	nterin	g Dive	rge Influer	nce Area		
	Actual	Max	Desirable	Violation?			Actual	Max Desira	ble	Violation?	
V _{R12}		Exhibit 13-8			V ₁₂	;	3919	Exhibit 13-8	4400:All	No	
Level of Serv	Level of Service Determination (if not F)					f Serv	vice De	terminatio	on (if not	F)	
D _R = 5.475 + 0.00734 v _R + 0.0078 V ₁₂ - 0.00627 L _A						D _R = 4	1.252 + 0	.0086 V ₁₂ - 0	.009 L _D		
D _R = (pc/mi/lr	ו)				$D_{\rm p} = 35.7 ({\rm pc/mi/ln})$						
LOS = (Exhibit	13-2)				LOS = F	(Exhil	oit 13-2)				
Speed Determination					Sneed I	Deter	minatic	n			
						420 (E	vhihit 12	12)			
$W_{S} = (Exibit 1)$	3-11)				$D_{\rm s} = 0.420$ (Exhibit 13-12)						
S _R = mph (Exh	nibit 13-11)				S _R = 58.2 mph (Exhibit 13-12)						
S ₀ = mph (Exh	nibit 13-11)				S ₀ = 72.4 mph (Exhibit 13-12)						
S = mph (Ext	nibit 13-13)				S = 62	2.5 mph	(Exhibit	13-13)			
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2015 Existing Freeway_HCS Operational Analysis

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	BASIC F	REEWAY SE	GMENTS WORKSHEET		
General Information			Site Information		
Analyst Agency or Company Date Performed	AECOM		Highway/Direction of Travel From/To Jurisdiction	I-95 NB Seg 8-B	et 10th St Off & On
Analysis Time Period	PM		Analysis Year	EXISTIN	NG 2015/2016
Project Description SW 10th	h Street SIMR				
Oper.(LOS)			Des.(N)	Pla	anning Data
Flow Inputs					
Volume, V AADT Peak-Hr Prop. of AADT, K	4440	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P _T %RVs, P _R	0.98 3 0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length Up/Down %	Level mi	
Calculate Flow Adjustn	nents				
f _p	1.00		E _R	1.2	
Ε _T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.985	
Speed Inputs			Calc Speed Adj and FFS	6	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f _{LW}		mph
Number of Lanes, N	3		f _{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	70.0	mph	FFS	70.0	mph
Base free-flow Speed, BFFS		mph			
LOS and Performance	Measures		Design (N)		
<u>Operational (LOS)</u> v _p = (V or DDHV) / (PHF x N) S D = v _p / S LOS	x f _{HV} x f _p) 1533 68.7 22.3 C	pc/h/ln mph pc/mi/ln	Design (N) Design LOS $v_p = (V \text{ or DDHV}) / (PHF x N x)$ S D = v_p / S Required Number of Lanes, N	f _{HV} x f _p)	pc/h/ln mph pc/mi/ln
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v _p - Flow rate LOS - Level of service DDHV - Directional design ho	S - Speed D - Density FFS - Free-flow BFFS - Base fre ur volume	speed ee-flow speed	E _R - Exhibits 11-10, 11-12 E _T - Exhibits 11-10, 11-11, 11- f _p - Page 11-18 LOS, S, FFS, v _p - Exhibits 11-2	.13 2, 11-3	f _{LW} - Exhibit 11-8 f _{LC} - Exhibit 11-9 TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET											
Genera	l Infor	mation			Site Infor	mation					
Analyst Agency or (Date Perfor Analysis Tii	Company rmed me Period	AEC(PM	ОМ	Fi Ju Ji Ai	reeway/Dir of Tr unction urisdiction nalysis Year	avel	I-95 N Seg 9 EXIST	B -Merge from TING 2015/2	n 10th St 2016		
Project Des	scription	SW 10th Stree	t SIMR								
Inputs											
Upstream A	Adj Ramp		Freeway Nurr Ramp Numbe	ber of Lanes, N r of Lanes, N	3 1					Downstrea Ramp	m Adj
🗹 Yes	On		Acceleration L	ane Length, L _A	1345					Yes	On
🗌 No	✓ Off		Deceleration I Freeway Volu	Lane Lengtn L _D me, V _F	4440					✓ No	Off
L _{up} =	1370 1	ft	Ramp Volume Freeway Free	e, V _R -Flow Speed, S _{EE}	1090 70 0					L _{down} =	ft
V _u =	1220 v	reh/h	Ramp Free-Fl	ow Speed, S _{FR}	50.0					V _D =	veh/h
Conver	rsion to	p pc/h Und	der Base	Conditions	1	r				,	
(pc/	/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f _{HV}	f _p	v = V/PHF	x f _{HV} x f _p
Freeway		4440	0.98	Level	3	0	0	.985	1.00	45	i99
Ramp		1090	0.98	Level	2	0	0	.990	1.00	11	23
UpStream		1220	0.91	Level	2	0	0	.990	1.00	13	354
DownStrea	am		Merce Areas					 Г)iverne Areas		
Estima	Estimation of v ₁₂					Estimation of v ₁₂					
	$V_{12} = V_F (P_{FM})$							V = '	V + (V - V))P	
L _{FO} =	L _{FO} = 2034.69 (Equation 13-6 or 13-7)					_		* 12	"R ' ("F "R	12 or 13 13	2)
P _{EM} =		0.573	using Equat	ion (Exhibit 13-6)	EQ D -			Equation 13-	·12 01 13-13	7)
$V_{12} =$		2636	oc/h			FD		l l	using Equatio		.1)
V_2 or V_{av24}		1963	pc/h (Equati	on 13-14 or 13-		v ₁₂ – V ₂ or V		I	oc/n pc/h (Equation 1	13-14 or 13-17)
Is V ₃ or V _a	_{v34} > 2,70	17) 0 pc/h? 🗌 Ye:	s 🗹 No			Is V_3 or V_{av}	₃₄ > 2,1	700 pc/h?	Yes No		/
Is V ₃ or V _a	_{v34} > 1.5 *	V ₁₂ /2 Ve	s 🗌 No			Is V_3 or V_{av}	₃₄ > 1.9	5 * V ₁₂ /2	Yes 🗌 No		
If Yes,V _{12a}	=	2636 18. or	pc/h (Equati 13-19)	on 13-16, 13-		lf Yes,V _{12a} =	=	 1;	oc/h (Equatio 3-19)	n 13-16, 13	-18, or
Capaci	ty Che	cks	/			Capacit	y Ch	ecks			
	-	Actual		apacity	LOS F?	Actual Capacity LOS F?					
						V _F			Exhibit 13-	8	
V _F	0	5722	Exhibit 13-8		No	V _{FO} = V _F	- V _R		Exhibit 13-	8	
						V _R			10		
Flow E	ntering	Merge In	fluence A	rea		Flow En	<u>iterii</u>	ng Dive	rge Influen	ice Area	
		Actual	Max	Desirable	Violation?		_	Actual	Max Desi	irable	Violation?
V _R	12	3759	Exhibit 13-8	4600:All	NO	v ₁₂		<u> </u>	Exhibit 13-8		-)
Level o	of Servi	ice Detern	nination (if not F)		Level of	Ser	vice De	terminatio	n (if not i	-)
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	
$D_{R} = 25.8 (pc/mi/ln) \qquad D_{R} = (pc/mi/ln)$						ln) + 12 2)					
LOS = C (Exhibit 13-2)					LUG - (E		(1J-Z)				
speed	Detern	ination				speea L	Jetel)/]		
M _S = 0).354 (Exik	bit 13-11)				∪ _s = (E S = ∽	xnibit ` nh (⊑v	13-12) hihit 13-12)			
S _R = 6	50.1 mph (Exhibit 13-11)				e – m	pii(EX	hibit 10-12)			
$S_0 = 6$	64.7 mph (Exhibit 13-11)				S₀− m	pn (Ex				
5 = 6	51.6 mph (Exhibit 13-13)				s= m	ph (Ex	nibit 13-13)			

	BASIC F	REEWAY SE	GMENTS WORKSHEET			
Conoral Information			Site Information			
Analyst Agency or Company	AECOM		Highway/Direction of Travel From/To	I-95 NB Seg 10-	Bet 10th St & Hillsboro	
Analysis Time Period	PM		Analysis Year	EXISTING 2015/2016		
Project Description SW 10th	n Street SIMR					
Oper.(LOS)			Des.(N)	🗌 Pla	anning Data	
Flow Inputs						
Volume, V AADT Peak-Hr Prop. of AADT_K	5550	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P _T %RVs, P ₂	0.98 3 0		
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length Up/Down %	Level mi		
Calculate Flow Adjustm	nents					
f _p	1.00		E _R	1.2		
Ε _T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.985		
Speed Inputs			Calc Speed Adj and FFS	6		
Lane Width		ft				
Rt-Side Lat. Clearance		ft	f _{LW}		mph	
Number of Lanes, N	3		f _{LC}		mph	
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph	
FFS (measured)	70.0	mph	FFS	70.0	mph	
Base free-flow Speed, BFFS		mph				
LOS and Performance I	Measures		Design (N)			
<u>Operational (LOS)</u> v _p = (V or DDHV) / (PHF x N x S D = v _p / S LOS	x f _{HV} x f _p) 1916 64.1 29.9 D	pc/h/ln mph pc/mi/ln	<u>Design (N)</u> Design LOS v _p = (V or DDHV) / (PHF x N x S D = v _p / S Required Number of Lanes, N	f _{HV} x f _p)	pc/h/ln mph pc/mi/ln	
Glossary			Factor Location			
N - Number of lanes V - Hourly volume v _p - Flow rate LOS - Level of service DDHV - Directional design ho	S - Speed D - Density FFS - Free-flow BFFS - Base fre ur volume	speed ee-flow speed	E _R - Exhibits 11-10, 11-12 E _T - Exhibits 11-10, 11-11, 11- f _p - Page 11-18 LOS, S, FFS, v _p - Exhibits 11-2	-13 2, 11-3	f _{LW} - Exhibit 11-8 f _{LC} - Exhibit 11-9 TRD - Page 11-11	

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RAMPS AND RAMP JUNCTIONS WORKSHEET										
General Infor	rmation			Site Infor	mation					
Analyst			Fre	eeway/Dir of Tr	avel	I-95 NE	3			
Agency or Company	AEC	OM	Ju	nction		Seg 11	-Diverge to	Hillsboro EB		
Date Performed			Ju	risdiction						
Analysis Time Perio	d PM		An	alysis Year		EXISTI	NG 2015/2	2016		
	SW 10th Stree	E SIMR								
inputs									1	
Upstream Adj F	Ramp	Freeway Num	iber of Lanes, N	3					Downstre	am Adj
		Ramp Numbe	er of Lanes, N	1					Ramp	
	_]On	Acceleration I	ane Length, L _A						🗹 Yes	On
. No □	Off	Deceleration I	Lane Length L _D	220						□ Off
		Freeway Volu	me, V _F	5550						
L _{up} =	ft	Ramp Volume	e, V _P	630					L _{down} =	1560 ft
		Freeway Free	-Flow Speed, S _{EE}	70.0					V _	
$V_u = v$	/eh/h	Ramp Free-F	low Speed, S _{FR}	45.0					v _D =	5/5 veh/h
Conversion t	to pc/h Un	der Base	Conditions						1	
(nc/h)	V	рце	Torrain	%Truck	%.Dv		f	f		yf yf
(pc/ii)	(Veh/hr)	ГПГ	Terrain	/011UCK	/0Г\V		'HV	'p	v = v/i i ii	^ ' HV ^ ' p
Freeway	5550	0.98	Level	3	0	0.	985	1.00	5	748
Ramp	630	0.84	Level	2	0	0.	990	1.00	7	58
UpStream								4.00	<u> </u>	15
DownStream	5/5	0.90 Marga Araga	Level	2	0	0.	990	1.00	6	45
Estimation	stimation of V ₄₀					tion	fv	Iverge Areas		
							12			
$V_{12} = V_F (P_{FM})$							V ₁₂ =	• V _R + (V _F - V	′ _R)P _{FD}	
L _{EQ} =	(Equa	ation 13-6 or	13-7)		L _{EQ} =		(Equation 13-	12 or 13-13	3)
P _{FM} =	using	Equation (I	Exhibit 13-6)		P _{FD} =		0.	581 using Eq	uation (Exh	ibit 13-7)
V ₁₂ =	pc/h				V ₁₂ =		36	659 pc/h		
V ₃ or V _{av34}	pc/h (Equation 13	-14 or 13-17)		$V_3^{}$ or $V_{av34}^{}$		20)89 pc/h (Equ	uation 13-1	4 or 13-17)
Is V_3 or $V_{av34} > 2,70$	00 pc/h? 🗌 Ye	s 🗌 No			Is V_3 or V_{av}	_{/34} > 2,7	00 pc/h?	Yes 🗹 No		
Is V_3 or $V_{av34} > 1.5$	* V ₁₂ /2 Ye	s 🗌 No			Is V_3 or V_{av}	, ₃₄ > 1.5	* V ₁₂ /2	Yes 🗹 No		
If Yes.V ₄₀₋ =	pc/h (Equation 13	-16, 13-18, or		If Yes, V_{122} = pc/h (Equation 13-16, 13-18, or 13-					
	13-19))				0h	19	9)		
	ecks				Capacit	y Ch	ecks			
	Actual		apacity	LUSF?	V		Actual			LUSF?
					V _F		5748	EXMDIL 13-	0 7200	NO
V _{FO}		Exhibit 13-8			$V_{FO} = V_{FO}$	- V _R	4990	Exhibit 13-	·8 7200	No
					V _R		758	Exhibit 13-	10 2100	No
Flow Enterin	g Merge In	fluence A	lrea		Flow Er	nterin	g Dive	rge Influer	nce Area	
	Actual	Max	Desirable	Violation?		/	Actual	Max Desira	ble	Violation?
V _{R12}		Exhibit 13-8			V ₁₂	3	3659	Exhibit 13-8	4400:All	No
Level of Serv	vice Detern	nination (if not F)		Level of	f Serv	vice De	terminatio	on (if not	F)
D _R = 5.475 + 0	.00734 v _R +	0.0078 V ₁₂ ·	- 0.00627 L _A			D _R = 4	1.252 + 0	.0086 V ₁₂ - 0	.009 L _D	
D _R = (pc/mi/lr	ר)				D _R = 33	3.7 (pc	/mi/ln)			
LOS = (Exhibit	13-2)				LOS = D	(Exhil	oit 13-2)			
Speed Deterr	Speed Determination				Speed L	Deter	minatio	on		
M _s = (Exibit 1	= (Exibit 13-11)					.366 (E	xhibit 13-	-12)		
S _p = mnh (F׳	= mph (Exhibit 13-11)				S _R = 59.7 mph (Exhibit 13-12)					
S _o = mnh (Fyl	hibit 13-11)				$S_0 = 72.5 \text{ mph}$ (Exhibit 13-12)					
S = mph (Ext	hibit 13-13)				S = 6	3.8 mnh	(Exhibit	13-13)		
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2015 Existing Freeway_HCS Operational Analysis

	BASIC F	REEWAY SE	GMENTS WORKSHEET			
Conoral Information			Site Information			
Analyst Agency or Company Date Deformed	AECOM		Highway/Direction of Travel From/To	I-95 NB Seg 12-	Bet Hillsboro Off & On	
Analysis Time Period	PM		Analysis Year	EXISTING 2015/2016		
Project Description SW 10th	n Street SIMR					
Oper.(LOS)			Des.(N)	🗌 Pla	anning Data	
Flow Inputs						
Volume, V AADT Rock Hr Bron, of AADT, K	4920	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P _T %P\/s_P	0.98 3 0		
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length Up/Down %	U Level mi		
Calculate Flow Adjustn	nents					
f _p	1.00		E _R	1.2		
E _T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.985		
Speed Inputs			Calc Speed Adj and FFS	6		
Lane Width		ft				
Rt-Side Lat. Clearance		ft	f _{LW}		mph	
Number of Lanes, N	3		f _{LC}		mph	
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph	
FFS (measured)	70.0	mph	FFS	70.0	mph	
Base free-flow Speed, BFFS		mph				
LOS and Performance	Measures		Design (N)			
<u>Operational (LOS)</u> v _p = (V or DDHV) / (PHF x N > S D = v _p / S LOS	(f _{HV} x f _p) 1699 67.1 25.3 C	pc/h/ln mph pc/mi/ln	<u>Design (N)</u> Design LOS v _p = (V or DDHV) / (PHF x N x S D = v _p / S Required Number of Lanes, N	f _{HV} x f _p)	pc/h/ln mph pc/mi/ln	
Glossary			Factor Location			
N - Number of lanes V - Hourly volume v _p - Flow rate LOS - Level of service DDHV - Directional design ho	S - Speed D - Density FFS - Free-flow BFFS - Base fre ur volume	speed ee-flow speed	E _R - Exhibits 11-10, 11-12 E _T - Exhibits 11-10, 11-11, 11- f _p - Page 11-18 LOS, S, FFS, v _p - Exhibits 11-2	-13 2, 11-3	f _{LW} - Exhibit 11-8 f _{LC} - Exhibit 11-9 TRD - Page 11-11	

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		F	REEWA	WEAV	ING WOF	RKSHEE	Г					
General	Informatio	on			Site Info	rmation						
Analyst Agency/Con Date Perforr Analysis Tin	npany ned ne Period	AECON PM	Л		Freeway/Dir Weaving Seg Analysis Yea	Freeway/Dir of Travel I-95 NB Weaving Segment Location Seg 13-Bet Hillsboro On & Off Analysis Year EXISTING 2015/2016						
Project Desc	cription SW 10th	n Street SIMF	ł									
Inputs					r							
Weaving col Weaving nu Weaving seg Freeway free	Weaving configuration One-Sider Weaving number of lanes, N Weaving segment length, L _s Weaving segment length, L _s 7901 Freeway free-flow speed, FFS 70 mpl Conversions to pc/h Under Base Condition					Segment type Freeway minimum speed, S _{MIN} Freeway maximum capacity, C _{IFL} Terrain type						
Convers	sions to po	:/h Unde	r Base Co	ondition	s	0	1	1	-			
	V (veh/h)	PHF	Truck (%)	RV (%)	Ε _Τ	E _R	f _{HV}	fp	v (pc/h)			
V _{FF}	4410	0.98	3	0	1.5	1.2	0.985	1.00	4568			
V _{RF}	575	0.90	2	0	1.5	1.2	0.990	1.00	645			
V _{FR}	510	0.86	2	0	1.5	1.2	0.990	1.00	599			
V _{RR}	0 0.92 2 0				1.5	1.2	0.990	1.00	0			
V _{NW}	4568					-		V =	5812			
V _w	1244							-	-			
VR	0.214											
Configu	ration Cha	racteris	tics		•							
Minimum m	aneuver lanes, N	N _{WL}		2 lc	Minimum we	eaving lane cl	nanges, LC _{MIN}		1244 lc/h			
Interchange	density, ID			0.8 int/mi	Weaving lan	e changes, L	.C _w		1465 lc/h			
Minimum R	F lane changes,	LC _{RF}		1 lc/pc	Non-weaving	g lane change	es, LC _{NW}		599 lc/h			
Minimum Ff	R lane changes,	LC _{FR}		1 lc/pc	Total lane ch	nanges, LC _{ALI}	L		2064 lc/h			
Minimum R	R lane changes,	LC _{RR}		lc/pc	Non-weaving	g vehicle inde	ex, I _{NW}		289			
Weaving	g Segment	Speed,	Density, I	Level of	Service,	and Cap	oacity					
Weaving se Weaving se	gment flow rate, gment capacity,	v c _w		5732 veh/h 8284 veh/h	Weaving inte Weaving seg	ensity factor, gment speed,	W , S		0.482 53.6 mph			
Weaving se	gment v/c ratio			0.692	Average wea	aving speed,	Sw		52.1 mph			
Weaving se	gment density, [)	27	7.1 pc/mi/ln	Average nor	n-weaving spe	eed, S _{NW}		54.1 mph			
Level of Ser	VICE, LOS			С	Maximum weaving length, L _{MAX} 4680 ft							
Notes a. Weaving s Chapter 13, " b. For volume	egments longer th Freeway Merge a es that exceed the	nan the calcula nd Diverge Se weaving segr	ted maximum le gments". nent capacity, tl	ength should l	be treated as is rvice is "F".	solated merge	and diverge ar	eas using the	procedures of			

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	BASIC F	REEWAY SE	GMENTS WORKSHEET			
Conoral Information			Site Information			
Analyst Agency or Company	AECOM		Highway/Direction of Travel From/To	I-95 NB Seg 14-	Bet Hillsboro Off & On	
Date Performed Analysis Time Period	PM		Analysis Year	EXISTING 2015/2016		
Project Description SW 10th	h Street SIMR					
Oper.(LOS)			Des.(N)	Pla	anning Data	
Flow Inputs						
Volume, V AADT	4985	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P _T	0.98 3		
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	%RVs, P _R General Terrain: Grade % Length Up/Down %	0 Level mi		
Calculate Flow Adjustr	nents					
f _p	1.00		E _R	1.2		
Ε _T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.985		
Speed Inputs			Calc Speed Adj and FFS	6		
Lane Width		ft				
Rt-Side Lat. Clearance	0	ft	† _{LW}		mph	
Number of Lanes, N	3		ILC		mpn	
FES (measured)	70.0	mph		70.0	mph	
Base free-flow Speed, BFFS	70.0	mph		70.0	прп	
LOS and Performance	Measures	-	Design (N)			
<u>Operational (LOS)</u> v _p = (V or DDHV) / (PHF x N : S D = v _p / S LOS	x f _{HV} x f _p) 1721 66.9 25.7 C	pc/h/ln mph pc/mi/ln	$\frac{\text{Design (N)}}{\text{Design LOS}}$ $v_p = (V \text{ or DDHV}) / (PHF x N x)$ S $D = v_p / S$ Required Number of Lanes, N	f _{HV} x f _p)	pc/h/ln mph pc/mi/ln	
Glossary			Factor Location			
N - Number of lanes V - Hourly volume v _p - Flow rate LOS - Level of service DDHV - Directional design ho	S - Speed D - Density FFS - Free-flow BFFS - Base free our volume	speed ee-flow speed	E _R - Exhibits 11-10, 11-12 E _T - Exhibits 11-10, 11-11, 11- f _p - Page 11-18 LOS, S, FFS, v _p - Exhibits 11-2	13 2, 11-3	f _{LW} - Exhibit 11-8 f _{LC} - Exhibit 11-9 TRD - Page 11-11	

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RAMPS AND RAMP JUNCTIONS WORKSHEET											
Genera	l Infor	mation			Site Infor	mation					
Analyst				Fr	eeway/Dir of Tra	avel	I-95 N	В			
Agency or C	Company	AEC	MC	Ju	Inction		Seg 1	5-Merge fror	n Hillsboro WB		
Date Perfor	med			Ju	risdiction						
Analysis Tir	me Period	PM		Ar	nalysis Year		EXIST	ING 2015/2	016		
Project Des	scription	SW 10th Stree	t SINK								
inputs				her of Longo N							
Upstream A	Adj Ramp		Freeway Num	iber of Lanes, N	3					Downstrea	m Adj
Vos			Ramp Numbe	er of Lanes, N	1					Ramp	
105			Acceleration L	_ane Length, L _A	525					🗌 Yes	On
🗌 No	✓ Off		Deceleration I	Lane Length L _D						V No	□ Off
			Freeway Volu	ime, V _F	4985						
L _{up} =	2135	ft	Ramp Volume	e, V _R	595					L _{down} =	ft
			Freeway Free	-Flow Speed, S _{FF}	70.0					V -	voh/h
V _u =	510 ve	eh/h	Ramp Free-Fl	low Speed, S _{FR}	50.0					v _D –	ven/n
Conver	sion to	o pc/h Und	der Base	Conditions							
(pc/	′h)	V (Voh/hr)	PHF	Terrain	%Truck	%Rv		f _{HV}	f _p	v = V/PHF	x f _{HV} x f _p
Freeway	-	/085	0.08	ا مربوا	3	0		985	1.00	51	63
Ramn		595	0.30	Level	2	0		905	1.00	6	16
UnStream		510	0.55		2	0		990	1.00	5	40 DQ
DownStrea	am	010	0.00	20001			+		1.00	0.	55
			Merge Areas					i D	iverge Areas		
Estimat	tion of	v ₁₂				Estimati	ion d	of v ₁₂			
	$V_{12} = V_F (P_{FM})$							\/ _ \			
$_{-=0} = 1689.23$ (Equation 13-6 or 13-7)								v ₁₂ – v	$V_{\rm R}$ + ($V_{\rm F}$ - $V_{\rm R}$	/ ^P FD	
		0 592	using Equat	tion (Exhibit 13-6)		EQ -		(Equation 13-	12 OF 13-13	5) _`
V ₄₀ =		3058	oc/h	(,		FD -		L	ising Equatio	n (Exhibit 13-	()
12		2105	oc/h (Equati	on 13-14 or 13-		V ₁₂ =		þ)C/h		
v ₃ or v _{av34}		17)	· · · ·			V ₃ or V _{av34}		 	oc/h (Equation 1	3-14 or 13-1/)
Is V_3 or V_{av}	_{v34} > 2,70	0 pc/h? 🗌 Ye	s 🗹 No			Is V ₃ or V _{av3}	₃₄ > 2,	/00 pc/h?	∐Yes ∐No		
Is V_3 or V_{a_1}	_{v34} > 1.5 *	V ₁₂ /2 Ve	s 🗌 No			Is V ₃ or V _{av3}	₃₄ > 1.9	5 * V ₁₂ /2	Yes No		10
If Yes,V ₁₂₀ :	=	3058	pc/h (Equati	on 13-16, 13-		If Yes,V _{12a} =	:	۴ 13	oc/h (Equatioi 3-19)	n 13-16, 13	-18, or
Canacit	ty Cho	18, or	13-19)			Canacit	v Ch	ocks	,,		
Capacit	ly Che	Actual		`anacity		Actual Capacity LOS F2					
<u> </u>		Actual		Japacity	LUGTY	V		Actual	Evhibit 13 9		L031?
						V -V	<u></u>			, ,	
V _F	0	5809	Exhibit 13-8		No	v _{FO} – v _F	- v _R		Exhibit 13-0	3	
						V _R			Exhibit 13-	-	
Flow Er	ntering	g Merge In	fluence A	rea	•	Flow En	terii	ng Diver	ge Influen	ce Area	<u> </u>
		Actual	Max	Desirable	Violation?			Actual	Max Desi	rable	Violation?
V _{R1}	12	3704	Exhibit 13-8	4600:All	No	V ₁₂			Exhibit 13-8		
Level o	f Serv	ice Detern	nination (if not F)		Level of	^r Ser	vice De	terminatio	n (if not l	F)
$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$ D_R						D _R =	4.252 + 0.	0086 V ₁₂ - 0.	009 L _D		
D _R = 3	0.8 (pc/m	i/ln)				D _R = (p	c/mi/	ln)			
LOS = D) (Exhibit	13-2)				LOS = (E	Exhibi	t 13-2)			
Speed I	Detern	nination				Speed D	Deter	rminatio	n		
M _S = 0	.427 (Exit	pit 13-11)				D _s = (E	xhibit	13-12)			
S _P = 5	, 1 dam 0.8	Exhibit 13-11)				S _R = m	ph (Ex	hibit 13-12)			
S₀= 6	4.2 mph (Exhibit 13-11)				S ₀ = m	ph (Ex	hibit 13-12)			
S= 6	0.1 mph (Exhibit 13-13)				S = mi	ph (Ex	, hibit 13-13)			
	· · ·	,				1	· ·	/			

	BASIC F	REEWAY SE	GMENTS WORKSHEET		
Conoral Information			Site Information		
Analyst Agency or Company Date Performed Analysis Time Period	AECOM PM		Highway/Direction of Travel From/To Jurisdiction Analysis Year	I-95 NB Seg 16- EXISTIN	North of Hillsboro IG 2015/2016
Project Description SW 10th	h Street SIMR				
Oper.(LOS)			Des.(N)	Pla	anning Data
Flow Inputs					
Volume, V AADT Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D	5580	veh/h veh/day veh/h	Peak-Hour Factor, PHF %Trucks and Buses, P _T %RVs, P _R General Terrain: Grade % Length Up/Down %	0.98 4 0 Level mi	
Calculate Flow Adjustr	nents				
f _ρ Ε _Τ	1.00 1.5		E _R f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	1.2 0.980	
Speed Inputs			Calc Speed Adj and FFS	6	
Lane Width Rt-Side Lat. Clearance Number of Lanes, N Total Ramp Density, TRD FFS (measured) Base free-flow Speed, BFFS	3 70.0	ft ft ramps/mi mph mph	f _{∟w} f _{LC} TRD Adjustment FFS	70.0	mph mph mph mph
LOS and Performance	Measures		Design (N)		
<u>Operational (LOS)</u> v _p = (V or DDHV) / (PHF x N x S D = v _p / S LOS	x f _{HV} x f _p) 1936 63.7 30.4 D	pc/h/ln mph pc/mi/ln	Design (N) Design LOS $v_p = (V \text{ or DDHV}) / (PHF x N x)$ S D = v_p / S Required Number of Lanes, N	f _{HV} x f _p)	pc/h/ln mph pc/mi/ln
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v _p - Flow rate LOS - Level of service DDHV - Directional design ho	S - Speed D - Density FFS - Free-flow BFFS - Base free our volume	speed ee-flow speed	E _R - Exhibits 11-10, 11-12 E _T - Exhibits 11-10, 11-11, 11- f _p - Page 11-18 LOS, S, FFS, v _p - Exhibits 11-2	13 2, 11-3	f _{LW} - Exhibit 11-8 f _{LC} - Exhibit 11-9 TRD - Page 11-11

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	BASIC F	REEWAY SE	GMENTS WORKSHEET			
Concret Information			Site Information			
				105.00		
Analyst Agency or Company Date Performed	AECOM		From/To	I-95 SB Seg 1-B	et Hillsboro & Palmetto	
Analysis Time Period	AM		Analysis Year	EXISTING 2015/2016		
Project Description SW 10th	h Street SIMR					
Oper.(LOS)			Des.(N)	Pla	anning Data	
Flow Inputs						
Volume, V AADT	4700	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P _T	0.96 3		
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	%RVs, P _R General Terrain: Grade % Length Up/Down %	0 Level mi		
Calculate Flow Adjustn	nents					
f _p	1.00		E _R	1.2		
E _T	1.5		f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.985		
Speed Inputs			Calc Speed Adj and FFS	6		
Lane Width		ft				
Rt-Side Lat. Clearance		ft	f _{LW}		mph	
Number of Lanes, N	3		f _{LC}		mph	
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph	
FFS (measured)	70.0	mph	FFS	70.0	mph	
Base free-flow Speed, BFFS		mph				
LOS and Performance	Measures		Design (N)			
<u>Operational (LOS)</u> v _p = (V or DDHV) / (PHF x N x S D = v _p / S LOS	x f _{HV} x f _p) 1656 67.6 24.5 C	pc/h/ln mph pc/mi/ln	Design (N) Design LOS $v_p = (V \text{ or DDHV}) / (PHF x N x)$ S D = v_p / S Required Number of Lanes, N	f _{HV} x f _p)	pc/h/ln mph pc/mi/ln	
Glossary			Factor Location			
N - Number of lanes V - Hourly volume v _p - Flow rate LOS - Level of service DDHV - Directional design ho	S - Speed D - Density FFS - Free-flow BFFS - Base free our volume	speed ee-flow speed	E _R - Exhibits 11-10, 11-12 E _T - Exhibits 11-10, 11-11, 11- f _p - Page 11-18 LOS, S, FFS, v _p - Exhibits 11-2	13 2, 11-3	f _{LW} - Exhibit 11-8 f _{LC} - Exhibit 11-9 TRD - Page 11-11	

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RAMPS AND RAMP JUNCTIONS WORKSHEET											
General Infor	rmation			Site Infor	mation						
Analyst			Fr	eeway/Dir of Tr	avel	I-95 SE	3				
Agency or Company	AEC	ОМ	Ju	nction		Seg 2-	Diverge to	Hillsboro			
Date Performed			Ju	risdiction		· ·	Ū.				
Analysis Time Perio	d AM		Ar	alysis Year		EXIST	NG 2015/2	2016			
Project Description	SW 10th Stree	t SIMR									
Inputs		1									
Upstream Adj F	Ramp	Freeway Num	ber of Lanes, N	3					Downstrea	am Adj	
		Ramp Numbe	er of Lanes, N	1					Ramp	.,	
Yes	On	Acceleration I	ane Length, L						Vaa	On	
		Deceleration	lane Length L	1500					res	™ On	
I INO L	_] Off	Eroowov Volu		4700					🗌 No	Off	
	ft		inne, v _F	4700					1. =	2175 ft	
L L L L L L L L L L L L L L L L L L L	it i	Ramp Volume	e, V _R	1150					-down	2110 10	
V = v	eh/h	Freeway Free	e-Flow Speed, S _{FF}	70.0					V _D =	600 veh/h	
l u v	Chin	Ramp Free-F	low Speed, S _{FR}	45.0							
Conversion t	o pc/h Un	der Base	Conditions								
(nc/h)	V	DHE	Terrain	%Truck	%Pv		f	f		yf yf	
(pc/ii)	(Veh/hr)		Terrain	70 TTUCK	/0111		'HV	'p	v v/i i ii	Λ'HV Λ'p	
Freeway	4700	0.96	Level	3	0	0.	985	1.00	49	69	
Ramp	1150	0.92	Level	2	0	0.	990	1.00	12	62	
UpStream											
DownStream	600	0.88	Level	2	0	0.	990	1.00	68	39	
	<u> </u>	Merge Areas				-		Diverge Areas			
Estimation of	stimation of V ₁₂					ion o	of V ₁₂				
V ₁₂ = V _F (P _{FM})							V ₁₂ =	: V _R + (V _F - V	′ _R)P _{FD}		
L _{E0} =	$L_{ro} = (Fquation 13-6 \text{ or } 13-7)$						(Equation 13-	12 or 13-13)	
P =	usina	Equation (Exhibit 13-6)				, 0	578 Jusina Ec	utation (Exhi	, hit 13-7)	
Г FM V =	nc/h				V =		0. 3/	101 nc/h			
12 VorV	pc/h	Equation 12	(14 or 12 17)		^v 12		-د ۱۸	104 pc/li	ation 10 1	1 10 17)	
$v_3 O v_{av34}$	pc/ii (-14 01 13-17)		v ₃ 01 v _{av34}	. 0 7) ۱۵ مه (۵۵ م	bob pc/n (Equ	Jation 13-14	+ 0f 13-17)	
$15 v_3 \text{ or } v_{av34} > 2,70$		s 🗌 No			IS V ₃ Or V _{av}	₃₄ > 2,1		_Yes ⊻No			
Is V_3 or $V_{av34} > 1.5$	*V ₁₂ /2 UYe	s 🗌 No			Is V ₃ or V _{av}	, ₃₄ > 1.5	* V ₁₂ /2	Yes 🗹 No			
lf Yes,V _{12a} =	pc/h (13_10)	Equation 13	-16, 13-18, or		If Yes,V _{12a} = pc/h (Equation 13-16, 13-18, or 13- 19)						
Canacity Che	10-10)				Canacity Checks						
	Actual		anacity		Actual Canacity LOS F2						
	Actual		Japacity	LUGT	V					LUGT	
					V _F		4909		0 1200	INO	
V _{FO}		Exhibit 13-8			$V_{FO} = V_{F}$	- V _R	3707	Exhibit 13-	8 7200	No	
					V _R		1262	Exhibit 13-	10 2100	No	
Flow Enterin	g Merge In	fluence A	lrea		Flow Er	nterin	g Dive	rge Influer	nce Area		
	Actual	Max	Desirable	Violation?			Actual	Max Desira	ble	Violation?	
V _{R12}		Exhibit 13-8			V ₁₂		3404	Exhibit 13-8	4400:All	No	
Level of Serv	vice Detern	nination (if not F)		Level of	fSer	vice De	terminatio	n (if not	F)	
$D_{p} = 5.475 + 0$.00734 v _p +	0.0078 V ₄₀	- 0.00627 L			$D_{p} = 4$	1.252 + 0	.0086 V ₄₀ - 0	.009 Lp	/	
$D_{\rm R} = (n_0/m_1/m_1)$					D = 20	- K 0 0 (no	/mi/ln)	12	D		
$D_R = (pc/m/n)$	1)				$P_R = 20$	0.0 (pc	///////////////////////////////////////				
LOS = (Exhibit	13-2)				LOS = C	(Exhi	bit 13-2)				
Speed Deteri	Speed Determination					Deter	minatio	on			
M _s = (Exibit 1	s ⁼ (Exibit 13-11)				D _s = 0.	.412 (E	xhibit 13-	-12)			
$S_{p} = mnh (Fxt)$	nibit 13-11)				S _R = 58.5 mph (Exhibit 13-12)						
$S_{a} = mnh (Evt)$	nihit 13_11)				$S_0 = 74.6 \text{ mph}$ (Exhibit 13-12)						
S = mnh (Ext	nibit 13-13)				S = 6'	27 mnh	(Exhibit	13-13)			
	hv of Elorido	Pighte Deserved						10 10)	Concratad: 10	122/2018 12:05	
Judit @ 2010 OlliveISI	cy or i roriua, All R	agina iseseiveu			TUS2010''''	version	0.90		Concrated. 10/	22/2010 12.00	

2015 Existing Freeway_HCS Operational Analysis

	BASIC F	REEWAY SE	GMENTS WORKSHEET		
General Information			Site Information		
Analyst Agency or Company Date Performed Analysis Time Period	AECOM AM		Highway/Direction of Travel From/To Jurisdiction Analysis Year	I-95 SB Seg 3-B EXISTIN	et Off & On Ramps IG 2015/2016
Project Description SW 10th	Street SIMR				
Oper.(LOS)			Des.(N)	Pla	anning Data
Flow Inputs					
Volume, V AADT Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D	3550	veh/h veh/day veh/h	Peak-Hour Factor, PHF %Trucks and Buses, P _T %RVs, P _R General Terrain: Grade % Length Up/Down %	0.96 3 0 Level mi	
Calculate Flow Adjustn	nents				
f _p E _T	1.00 1.5		E _R f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	1.2 0.985	
Speed Inputs			Calc Speed Adj and FFS	6	
Lane Width Rt-Side Lat. Clearance Number of Lanes, N Total Ramp Density, TRD FFS (measured) Base free-flow Speed, BFFS	3 70.0	ft ft ramps/mi mph mph	f _{∟w} f _{LC} TRD Adjustment FFS	70.0	mph mph mph mph
LOS and Performance	Measures		Design (N)		
<u>Operational (LOS)</u> v _p = (V or DDHV) / (PHF x N > S D = v _p / S LOS	x f _{HV} x f _p) 1251 70.0 17.9 B	pc/h/ln mph pc/mi/ln	$\frac{\text{Design (N)}}{\text{Design LOS}}$ $v_p = (V \text{ or DDHV}) / (PHF x N x)$ S $D = v_p / S$ Required Number of Lanes, N	f _{HV} x f _p)	pc/h/ln mph pc/mi/ln
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v _p - Flow rate LOS - Level of service DDHV - Directional design ho	S - Speed D - Density FFS - Free-flow BFFS - Base fre ur volume	speed ee-flow speed	E _R - Exhibits 11-10, 11-12 E _T - Exhibits 11-10, 11-11, 11- f _p - Page 11-18 LOS, S, FFS, v _p - Exhibits 11-2	13 2, 11-3	f _{LW} - Exhibit 11-8 f _{LC} - Exhibit 11-9 TRD - Page 11-11

HCS 2010TM Version 6.90

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RAMPS AND RAMP JUNCTIONS WORKSHEET										
General Info	rmation			Site Infor	mation					
Analyst Agency or Company Date Performed Analysis Time Perio	/ AEC	OM	Fr Ju Ju Ai	eeway/Dir of Tr inction irisdiction nalysis Year	avel	I95/SE Seg 4 EXIST	B -Merge fron FING 2015/2	n Hillsboro WB 2016		
Project Description	SW 10th Stree	t SIMR								
Inputs										
Upstream Adj Ramp)	Freeway Nurr Ramp Numbe	ber of Lanes, N r of Lanes, N	3 1					Downstrea Ramp	am Adj
Yes O	n	Acceleration I	ane Length, L _A	945					🗹 Yes	🗹 On
No O	ff	Deceleration Freeway Volu	Lane Lengtn L _D me, V _F	3550					🗌 No	Off
L _{up} = ft		Ramp Volume, V _R 600 Freeway Free-Flow Speed, S 70,0						L _{down} =	2080 ft	
V _u = veh/ł	n	Ramp Free-F	low Speed, S _{FF}	70.0 50.0					V _D =	700 veh/h
Conversion t	to pc/h Un	der Base	Conditions							
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f _{HV}	f _p	v = V/PHF	x f _{HV} x f _p
Freeway	3550	0.96	Level	3	0	(0.985	1.00	3	753
Ramp	600	0.88	Level	2	0	().990	1.00	6	689
UpStream									<u> </u>	
DownStream	700	0.83	Level	2	0	(0.990	1.00	8	352
Estimation o	£ . ,	Merge Areas			Ectimot	ion		Diverge Areas		
Estimation o	¹ ¹ ¹ ¹				Estimat		01 V ₁₂			
$V_{12} = V_F (P_{FM})$							$V_{12} = $	Vn + (Vr - Vn)P _{ED}	
L _{EQ} =	(Equ	ation 13-6 o	r 13-7)				12	Fountion 13-	-12 or 13-1	3)
P _{FM} =	0.604	using Equat	tion (Exhibit 13-6))	-EQ P =			using Equation	n (Evhibit 1?	-7)
V ₁₂ =	2267	pc/h			FD			oo/b		-1)
	1486	, pc/h (Equati	on 13-14 or 13-		v ₁₂ –			pc/n	10 11 10 1 ⁻	
$v_3 \text{ or } v_{av34}$	17)				v ₃ or v _{av34} Is V ₂ or V	<u>_</u> ₄ > 2.	700 pc/h? [pc/h (Equation 1	3-14 or 13-1	()
$15 V_3 01 V_{av34} > 2,70$	*)/ /2Ye	s ⊻ino			Is V ₂ or V	، م > 1	5*V/2			
If Yes, $V_{12a} =$	v ₁₂ /2 ⊻ Ye 2267	sNo pc/h (Equati	on 13-16, 13-		lf Yes,V _{12a} =	=	 	pc/h (Equatio 3-19)	n 13-16, 13	3-18, or
Canacity Ch		13-19)			Canacit	V CP	ocks			
	Actual		anacity			y cr	Actual	Ca	nacity	
	Actual		apacity	LUGF?	V		Actual	Evhibit 12		LUGF?
V	4442	Evhihit 13.8		No	$V_{FO} = V_{F}$	- V _D		Exhibit 13-	8	
*FO	4442			NO	V _R			Exhibit 13	-	
Flow Enterin	a Merae In	fluence A	rea	1	Flow En	nterii	na Dive	rae Influen	ice Area	
	Actual	Max	Desirable	Violation?		T	Actual	Max Desi	irable	Violation?
V _{P12}	2956	Exhibit 13-8	4600:All	No	V ₁₂			Exhibit 13-8		
Level of Serv	vice Detern	nination (if not F)	<u></u>	Level of	f Ser	vice De	terminatio	n (if not	F)
$D_{-} = 5475 +$	+ 0 00734 v _ + (0 0078 V 0	006271.			D_ =	4 252 + 0	0086 V 0	0091-	- /
D = 223 (no/n	ni/In)	12 0.	A		n - (r	PR no/mi/	1.202 · 0	.0000 12 0	.000 LD	
$D_{\rm R}^{-} = 22.3 ({\rm pc/r})$	11/11)				$P_R = (k$	JC/III/	(III) († 40.0)			
LOS = C (Exhibit 13-2)					LOS = (E		It 13-2)			
Speed Determination S					Speed L	Jete	rminatio	on		
M _S = 0.301 (Ex	ibit 13-11)				D _s = (E	Exhibit	13-12)			
S _R = 61.6 mph	(Exhibit 13-11)				S _R = m	iph (Ex	(hibit 13-12)			
S ₀ = 66.5 mph	(Exhibit 13-11)				S ₀ = m	iph (Ex	(hibit 13-12)			
S = 63.1 mph	(Exhibit 13-13)				S= m	iph (Ex	(hibit 13-13)			

	BASIC FR	REEWAY SEC	GMENTS WORKSHEE	Т	
General Information			Site Information		
Analyst			Highway/Direction of Trave	el <i>I-95 SB</i>	t M/R On & ER On
Agency or Company	AECOM		From/To	Ramps	
Date Performed Analysis Time Period	AM		Jurisdiction Analysis Year	EXISTIN	G 2015/2016
Project Description SW 10th St	treet SIMR				
Oper.(LOS)			es.(N)	Plar	nning Data
Flow Inputs					
Volume, V AADT Rook Hr Brop. of AADT. K	4150	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P _T %P\/s_P	0.96 3	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length Up/Down %	Level mi	
Calculate Flow Adjustmer	nts				
f.	1 00		En	12	
E _T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	[)] <i>0.985</i>	
Speed Inputs			Calc Speed Adj and I	FFS	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f _{uw}		mph
Number of Lanes, N	3		fuc		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	70.0	mph	FFS	70.0	mph
Base free-flow Speed, BFFS		mph		70.0	трп
LOS and Performance Me	asures		Design (N)		
<u>Operational (LOS)</u> v _p = (V or DDHV) / (PHF x N x f _{H'} S D = v _p / S LOS	_V x f _p) 1463 69.2 21.1 C	pc/h/ln mph pc/mi/ln	<u>Design (N)</u> Design LOS v _p = (V or DDHV) / (PHF x S D = v _p / S Required Number of Lanes	N x f _{HV} x f _p) s, N	pc/h/ln mph pc/mi/ln
Glossary			Factor Location		
N - Number of lanes S V - Hourly volume D v _p - Flow rate Ff LOS - Level of service Bl DDHV - Directional design hour v	 Speed Density FS - Free-flow s FFS - Base free volume 	peed -flow speed	E _R - Exhibits 11-10, 11-12 E _T - Exhibits 11-10, 11-11, f _p - Page 11-18 LOS, S, FFS, v _p - Exhibits	11-13 11-2, 11-3	f _{LW} - Exhibit 11-8 f _{LC} - Exhibit 11-9 TRD - Page 11-11

HCS 2010TM Version 6.90

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RAMPS AND RAMP JUNCTIONS WORKSHEET										
General Infor	rmation			Site Infor	mation					
Analyst			Fr	eeway/Dir of Tr	avel	I-95 SB	}			
Agency or Company	AEC	ОМ	Ju	Inction		Seg 6-N	Merge from	Hillsboro EB		
Date Performed			Ju	irisdiction		•	·			
Analysis Time Perio	d AM		Ar	nalysis Year		EXISTI	NG 2015/2	016		
Project Description	SW 10th Stree	t SIMR								
Inputs										
Upstream Adi Ramp		Freeway Num	ber of Lanes, N	3					Downstrea	m Adi
opotrouin / taj r tamp		Ramp Numbe	r of Lanes, N	1					Ramp	in / taj
🗹 Yes 🛛 🗹 Oi	n	Acceleration I	ane Length L	600						
		Deceleration	ano Longth L	000					L Yes	⊡ On
	ff								🗹 No	Off
		Freeway Volu	me, V _F	4150					_	#
L _{up} = 2080	ft	Ramp Volume	e, V _R	700					└down [—]	п
V - 000	- I- <i>U</i> -	Freeway Free	-Flow Speed, S _{FF}	70.0					V_ =	veh/h
$v_u = 600 v$	en/n	Ramp Free-Fl	ow Speed, S _{FR}	50.0					*D	VCII/II
Conversion t	o pc/h Un	der Base	Conditions							
(nc/h)	V	PHF	Terrain	%Truck	%Rv		f	f	v = V/PHF	x f x f
(pc/ii)	(Veh/hr)		Terrain	70 TTUCK	70130	_	'HV	'p	v — v/i i ii	^ 'HV ^ 'p
Freeway	4150	0.96	Level	3	0	0.9	985	1.00	43	88
Ramp	700	0.83	Level	2	0	0.9	990	1.00	8	52
UpStream	600	0.88	Level	2	0	0.9	990	1.00	6	89
DownStream										
Merge Areas Diverge Areas										
Estimation of	t v ₁₂				Estimati	on o	t v ₁₂			
	V ₁₂ = V _F	(P _{FM})					V = V	/_ + (\/_ - \/_	\P	
L _{FO} =	(Equ	ation 13-6 of	r 13-7)		-		* 12	R^{-1} R^{-1}	/'FD	
	0 594	using Equat	tion (Exhibit 13-6)		EQ -		(<i>)</i>
	2608	nc/h			P _{FD} =		ι	ising Equatio	on (Exhibit 13-	•7)
12	1780	po/n nc/h (Equati	on 13-14 or 13-		V ₁₂ =		þ	oc/h		
V ₃ or V _{av34}	1700		01110-14-0110-		$V_3^{}$ or $V_{av34}^{}$		F	pc/h (Equation 1	3-14 or 13-17	<i>'</i>)
Is V_3 or $V_{av34} > 2,70$	00 pc/h?	s 🗸 No			Is V_3 or V_{av3}	₈₄ > 2,7	00 pc/h? 🗌	Yes 🗌 No		
$I_{\rm S} V_{2} \text{ or } V_{2,24} > 1.5$	* V ₁₀ /2 Ve	s 🗌 No			Is V_3 or V_{av3}	₈₄ > 1.5	* V ₁₂ /2	Yes 🗌 No		
5 av54	2608	oc/h (Equati	on 13-16 13-		If Yes V.o. =		p	oc/h (Equatio	n 13-16, 13	-18, or
if Yes,V _{12a} =	18, or	13-19)					13	8-19)		
Capacity Che	ecks				Capacity	y Che	ecks			
	Actual		Capacity	LOS F?			Actual	Ca	pacity	LOS F?
					V _F			Exhibit 13-	8	
V	5040			Na	$V_{ro} = V_r$	- V_		Exhibit 13-	8	
v FO	5240			INO	FU F	R		Exhibit 13	-	
					V _R			10		
Flow Enterin	g Merge In	fluence A	rea		Flow En	terin	g Diver	ge Influen	ce Area	
	Actual	Max	Desirable	Violation?		ŀ	Actual	Max Desi	irable	Violation?
V _{R12}	3460	Exhibit 13-8	4600:All	No	V ₁₂			Exhibit 13-8		
Level of Service Determination (if not F) Level of Service Determination (if not F)							F)			
D _p = 5.475 +	- 0.00734 v _D + (0.0078 V ₄₀ - 0.	00627 L		[D _D = 4	.252 + 0.	0086 V ₄₀ - 0	.009 Lp	/
$D_{-} = 28.3 (pc/n)$	ni/In)	12	A		$D_{-} = (n)$	K c/mi/lr	n)	12	D	
	42.0				Р _R (р	C/1111/11	1)			
LOS = D(Exhibit)	13-2)				LUS = (E	:xnidit	13-2)			
Speed Deteri	mination				Speed D	eteri	minatio	n		
M _S = 0.385 (Ex	ibit 13-11)				D _s = (E	xhibit 1	3-12)			
S _R = 59.2 mph	(Exhibit 13-11)				S _R = mp	oh (Exh	ibit 13-12)			
$S_0 = 65.4 \text{ mph}$	(Exhibit 13-11)				S ₀ = m	oh (Exh	ibit 13-12)			
S = 61.2 mph	(Exhibit 13-13)				S = mr	oh (Exh	ibit 13-13)			
···م					I	(

		RAMP	S AND RAM	P JUNCTI	ONS WC	RKS	HEET			
General Infor	rmation			Site Infor	mation					
Analyst			Fr	eeway/Dir of Tr	avel	I-95 SE	3			
Agency or Company	AEC	OM	Ju	nction		Seg 7-	Diverge to	SW 10th St		
Date Performed			Ju	risdiction						
Analysis Time Perio	d AM		Ar	alysis Year		EXIST	NG 2015/2	016		
Project Description	SW 10th Stree	et SIMR								
Inputs		1							r	
Upstream Adj F	Ramp	Freeway Nun	ber of Lanes, N	3					Downstrea	am Adj
		Ramp Numbe	er of Lanes, N	1					Ramp	
Yes L	On	Acceleration	Lane Length, L _A						✓ Yes	✓ On
No	Off	Deceleration	Lane Length L _n	180						
		Freeway Volu	ime, V _r	4810					I No	□ Off
	ft	Ramp Volum	e V_	910					L _{down} =	2210 ft
up		Freeway Free	-Flow Speed S	70.0						
V _u = v	eh/h	Dema Free F	-i low Speed, S _{FF}	70.0					V _D =	1180 veh/h
	Ramp Free-Flow Speed, S _{FR} 45.									
Conversion to pc/h Under Base Conditions										
(pc/h)	(Veh/hr)	PHF	Terrain	%Truck	%Rv		f _{H∨}	f _p	v = V/PHF	${ m x}~{ m f}_{ m HV}~{ m x}~{ m f}_{ m p}$
Freeway	4810	0.96	Level	3	0	0.	985	1.00	50	86
Ramp	910	0.90	Level	2	0	0.	990	1.00	10	21
UpStream										
DownStream	1180	0.98	Level	2	0	0.	990	1.00	12	16
		Diverge Areas								
Estimation of v ₁₂					Estimat	tion o	of v ₁₂			
	V ₁₂ = V _F	(P _{EM})					V ₁₂ =	V _P + (V _F - V	/p)Ped	
L _{FO} =	(Faua	ation 13-6 or	13-7)		L _{FO} =		12	Fouation 13-	12 or 13-13)
P =	usina	Fountion (Exhibit 13-6)		EQ P =		0	586 usina Ea	uation (Evhi	/ hit 13_7)
· FM V =	nc/b				'FD V -		0.	000 using ∟y		bit 15-7)
v_{12}^{-}	pc/n	Equation 40	44 40 47)		$v_{12} - v_{12} - v$		34			40.47
$v_3 \text{ or } v_{av34}$	рс/п (-14 01 13-17)		v ₃ 01 v _{av34}		۲۲ ۱۳	83 pc/n (Equ	Jation 13-14	+ or 13-17)
$15 v_3 \text{ or } v_{av34} > 2,70$		s 🗌 No			IS V ₃ Or V _{av}	_{/34} > 2,1		Yes ⊻No		
Is V_3 or $V_{av34} > 1.5$	* V ₁₂ /2 ∐Ye	s 🗌 No	40.40.40		Is v_3 or $v_{av34} > 1.5^{\circ} v_{12}/2$ Yes V No					
If Yes,V _{12a} =	pc/n (13_19)	Equation 13	-16, 13-18, or		If Yes,V _{12a} = pc/h (Equation 13-16, 13-18, or 13- 19)					
Capacity Che	ecks	/			Capacity Checks					
	Actual	(Capacity	LOS F?		<u>j en</u>	Actual	C	apacity	LOS F?
					V_		5086	Exhibit 13-	8 7200	No
V		Evhibit 12.9			F	- V	4065	Exhibit 12	e 7200	No
v FO		EXHIBIT 13-0			V _{FO} - V _F	= " R	4005		.0 7200	NO
					V _R		1021	Exhibit 13-	10 2100	No
Flow Entering	g Merge In	fluence A	Area	i	Flow Er	nterin	g Dive	rge Influer	nce Area	
	Actual	Max	Desirable	Violation?			Actual	Max Desira	ible	Violation?
V _{R12}		Exhibit 13-8			V ₁₂	;	3403	Exhibit 13-8	4400:All	No
Level of Service Determination (if not F)					Level of	f Ser	vice De	terminatio	on (if not	F)
$D_{R} = 5.475 + 0.000$			D _R = 4	1.252 + 0	.0086 V ₁₂ - 0	.009 L _D				
D _R = (pc/mi/lr	ı)				D _R = 3 ⁻	1.9 (pc	/mi/ln)			
LOS = (Exhibit	13-2)				LOS = D	(Exhil	bit 13-2)			
Speed Determination					Speed L	Deter	minatio	n		
$M_{-} = (Exibit 1)$	3_11)				D_= 0.	.390 (E	xhibit 13-	·12)		
S = mnh (Ev)	~ 11				S _p = 50	9.1 mnh	(Exhibit	, 13-12)		
	$\frac{101110-11}{1000000000000000000000000000$				$S_{0} = 74.1 \text{ mph} (Exhibit 13-12)$					
S_0 - mph (Ext	1101(13-11)				\sim_0 /4.1 IIIVII (EXTINUL IO-12) S = 62.2 mph (Extribut 42.42)					
		Noble D			<u>- 6</u>	o.o mpr	i (⊏xi iidii t	13-13)	0	
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2015 Existing Freeway_HCS Operational Analysis

	BASIC F	REEWAY SE	GMENTS WORKSHEET		
General Information			Site Information		
Analyst Agency or Company Date Performed Analysis Time Period	AECOM		Highway/Direction of Travel From/To Jurisdiction Analysis Year	I-95 SB Seg 8-B FXISTIN	et Off & On Ramp
Project Description SW 10th	h Street SIMR			L/(O/II	10 2010/2010
Oper.(LOS)			Des.(N)	Pla	anning Data
Flow Inputs					
Volume, V AADT Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D	3900	veh/h veh/day veh/h	Peak-Hour Factor, PHF %Trucks and Buses, P _T %RVs, P _R General Terrain: Grade % Length Up/Down %	0.96 3 0 Level mi	
Calculate Flow Adjustr	nents				
f _p E _T	1.00 1.5		E _R f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	1.2 0.985	
Speed Inputs			Calc Speed Adj and FFS	6	
Lane Width Rt-Side Lat. Clearance Number of Lanes, N Total Ramp Density, TRD FFS (measured) Base free-flow Speed, BFFS	3 70.0	ft ft ramps/mi mph mph	f _{LW} f _{LC} TRD Adjustment FFS	70.0	mph mph mph mph
LOS and Performance	Measures		Design (N)		
<u>Operational (LOS)</u> v _p = (V or DDHV) / (PHF x N : S D = v _p / S LOS	x f _{HV} x f _p) 1374 69.6 19.7 C	pc/h/ln mph pc/mi/ln	$\frac{\text{Design (N)}}{\text{Design LOS}}$ $v_p = (V \text{ or DDHV}) / (PHF x N x)$ S $D = v_p / S$ Required Number of Lanes, N	f _{HV} x f _p)	pc/h/ln mph pc/mi/ln
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v _p - Flow rate LOS - Level of service DDHV - Directional design ho	S - Speed D - Density FFS - Free-flow BFFS - Base free our volume	speed ee-flow speed	E _R - Exhibits 11-10, 11-12 E _T - Exhibits 11-10, 11-11, 11- f _p - Page 11-18 LOS, S, FFS, v _p - Exhibits 11-	-13 2, 11-3	f _{LW} - Exhibit 11-8 f _{LC} - Exhibit 11-9 TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET											
General	Infor	mation			Site Infor	mation					
Analyst				Fr	eeway/Dir of Tra	avel	I-95 SB	3			
Agency or Co	ompany	AECO	MC	Ju	nction	:	Seg 9-I	Merge from	10th St		
Date Perform	ned .			Ju	risdiction						
Analysis Tim	e Period	AM		Ar	halysis Year		EXISTI	NG 2015/2	016		
Project Desc	ription	SW 10th Stree	t SINK								
inputs				han af Lana a Ni							
Upstream Ad	lj Ramp		Freeway Num	iber of Lanes, N	3					Downstrea	m Adj
Vos			Ramp Numbe	r of Lanes, N	1					Ramp	
103			Acceleration L	ane Length, L _A	1500					🗌 Yes	On
🗌 No	✓ Off		Deceleration I	_ane Length L _D						V No	□ Off
			Freeway Volu	me, V _F	3900						
L _{up} =	2210 f	ť	Ramp Volume	e, V _R	1180					L _{down} =	ft
			Freeway Free	-Flow Speed, S _{FF}	70.0					V -	voh/h
V _u =	910 ve	h/h	Ramp Free-Fl	ow Speed, S _{FR}	50.0					v _D –	ven/n
Conversion to pc/h Under Base Conditions											
(pc/h)	V (Vah/hr)	PHF	Terrain	%Truck	%Rv		f _{HV}	f _n	v = V/PHF	x f _{HV} x f _p
Freeway		3000	0.96		3	0	0	985	1.00	/1	23
Ramn		1180	0.30	Level	2	0	0.	<u>aan</u>	1.00	4	16
UpStream		910	0.00	Level	2	0	0.	990	1.00	12	10
DownStream	n	010	0.00	20001	<u> </u>	, v	0.		1.00		21
	Merge Areas Diverge Areas										
Estimati	ion of	v ₁₂				Estimati	on o	of v ₁₂			
		$V_{12} = V_{F}$	(P _{FM})					\/ _\	$I \pm 0 I = 0$		
L _{E0} =		2021.55	6 (Equation	13-6 or 13-7)				v ₁₂ –	$v_R + (v_F - v_R)$) ^P FD	
		0.619	using Equat	ion (Exhibit 13-6)		EQ -		(Equation 13-	12 OF 13-13	5) ->
V ₄₀ =		2554	oc/h	()		FD -		ι	using Equatio	n (Exhibit 13-	-1)
12		1569	oc/h (Equati	on 13-14 or 13-		V ₁₂ =		k)C/h		
v ₃ or v _{av34}		17)				V ₃ or V _{av34}		ا • • • • •	pc/h (Equation 1	3-14 or 13-17)
Is V_3 or V_{av3}	₃₄ > 2,700) pc/h? 🗌 Ye	s 🗹 No			Is V ₃ or V _{av3}	₄ > 2,7	00 pc/h?	Yes No		
Is $V_3^{}$ or $V_{av3}^{}$	₃₄ > 1.5 *	V ₁₂ /2 Ve	s 🗌 No			Is V ₃ or V _{av3}	₄ > 1.5	* V ₁₂ /2	Yes No		
If Yes.V ₄₀₂ =		2554	pc/h (Equati	on 13-16, 13-		If Yes,V _{12a} =		۲ 1 ۲	oc/h (Equatio ₃₋19)	n 13-16, 13	-18, or
Conceit	Cha	18, or	13-19)			Conceit	· Ch		, 10)		
Capacity	y che	Actual		`anaoitu		Capacity		Actual	Cor	a oitu	
		Actual		apacity	LUGF?	V		Actual	Evhibit 12 (LUSF?
						V _F	<u></u>			2	
V _{FO})	5339	Exhibit 13-8		No	$v_{FO} = v_{F}$	- v _R		Exhibit 13-8	3	
						V _R			Exhibit 13-	•	
Flow En	tering	Merge In	fluence A	rea		Flow En	terin	g Diver	ge Influen	ce Area	<u> </u>
		Actual	Max	Desirable	Violation?		ŀ	Actual	Max Desi	rable	Violation?
V _{R12}	2	3770	Exhibit 13-8	4600:All	No	V ₁₂			Exhibit 13-8		
Level of Service Determination (if not F) Level of Service Determination (if not F)						5)					
D _R =	5.475 +	0.00734 v _R + (0.0078 V ₁₂ - 0.	00627 L _A		[[) _R = 4	1.252 + 0.	0086 V ₁₂ - 0.	.009 L _D	
D _R = 24	.9 (pc/mi	/ln)				D _R = (p	c/mi/lr	n)			
LOS = C	(Exhibit 1	13-2)				LOS = (E	xhibit	13-2)			
Speed D	Speed Determination Speed Determination										
$M_{e} = 0.3$	340 (Exih	oit 13-11)				D _s = (E)	xhibit 1	3-12)			
S_= 60	.5 mnh (Exhibit 13-11)				S _R = mp	oh (Exh	nibit 13-12)			
к 50 S ₀ = 66	2 mnh (Exhibit 13-11)				S ₀ = mr	oh (Exh	nibit 13-12)			
S = 62	.0 mnh (Exhibit 13-13)				S = mr	h (Fxh	nibit 13-13)			
<u>۲</u>						I					

	BASIC F	REEWAY SE	GMENTS WORKSHEET		
General Information			Site Information		
Analyst			Highway/Direction of Travel	I-95 SB Sea 10-F	Ret 10th St & Samnle
Agency or Company	AECOM		From/To	Rd	
Date Performed Analysis Time Period	AM		Jurisdiction Analysis Year	EXISTIN	G 2015/2016
Project Description SW 10th	Street SIMR				
✓ Oper.(LOS)			Des.(N)	Pla	nning Data
Flow Inputs					
Volume, V AADT Rock Hr Bron, of AADT, K	5020	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P _T %R\/s_P	0.95 3 0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length Up/Down %	Level mi	
Calculate Flow Adjustm	ients				
f	1.00		E	1.2	
E _T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.985	
Speed Inputs			Calc Speed Adj and FF	S	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f _{i w}		mph
Number of Lanes, N	3		f _{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	70.0	mph	FFS	70.0	mph
Base free-flow Speed, BFFS		mph		, 0.0	
LOS and Performance	leasures		Design (N)		
<u>Operational (LOS)</u> v _p = (V or DDHV) / (PHF x N x S D = v _p / S LOS	f _{HV} x f _p) 1788 66.0 27.1 D	pc/h/ln mph pc/mi/ln	$\frac{\text{Design (N)}}{\text{Design LOS}}$ $v_p = (V \text{ or DDHV}) / (PHF x N x)$ S $D = v_p / S$ Required Number of Lanes, N	k f _{HV} x f _p)	pc/h/ln mph pc/mi/ln
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v _p - Flow rate LOS - Level of service DDHV - Directional design hou	S - Speed D - Density FFS - Free-flow BFFS - Base fre ur volume	speed e-flow speed	E _R - Exhibits 11-10, 11-12 E _T - Exhibits 11-10, 11-11, 11 f _p - Page 11-18 LOS, S, FFS, v _p - Exhibits 11	-13 -2, 11-3	f _{LW} - Exhibit 11-8 f _{LC} - Exhibit 11-9 TRD - Page 11-11

HCS 2010TM Version 6.90

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		RAMP	S AND RAM	P JUNCTI	ONS WC	RKS	HEET			
General Info	rmation			Site Infor	mation					
Analyst			Fre	eeway/Dir of Tr	avel	I-95 SE	3			
Agency or Company	y AEC	OM	Ju	nction		Seg 11	- Diverge to	o Sample Rd		
Date Performed			Ju	risdiction				- / -		
Analysis Time Perio	d AM		An	alysis Year		EXISTI	NG 2015/2	016		
Project Description	SW 10th Stree	I SIMR								
mputs		En anna Nime	han af Lanca N	2						
Upstream Adj F	Ramp	Freeway Nurr	iber of Lanes, N	3					Downstrea	am Adj
		Ramp Numbe	er of Lanes, N	1					Ramp	
		Acceleration I	_ane Length, L _A						🗹 Yes	🗹 On
✓ No [Off	Deceleration	Lane Length L _D	250						Off
		Freeway Volu	me, V _F	5020						
L _{up} =	ft	Ramp Volume	790					L _{down} =	1660 ft	
		Freeway Free	-Flow Speed, S _{FF}	70.0					V -	005 voh/h
$V_u = v_u$	= veh/h Ramp Free-Flow Speed, S _{FR} 45.0								v _D -	825 ven/n
Conversion to pc/h Under Base Conditions									1	
(nc/h)	V V	DUE	Torrain	% Truck	%.Dv		f	f		vf vf
(pc/ll)	(Veh/hr)	ГПГ	Terrain	/0 ITUCK	/0Г\V	-	'HV	'p	v – v/i i ii	^ ' HV ^ ' p
Freeway	5020	0.96	Level	3	0	0.	985	1.00	53	308
Ramp	790	0.97	Level	2	0	0.	990	1.00	8	23
UpStream	005	0.04	1	0	0		000	4.00		00
DownStream	825	0.84 Morgo Arooo	Level	2	0	0.	990	1.00	9	92
Merge Areas					Fstimat	tion	fv.	nverge Areas		
	<u>* *12</u>	(LStiniat		<u>12</u>			
	V ₁₂ = V _F	(P _{FM})					V ₁₂ =	V _R + (V _F - V	(_R)P _{FD}	
L _{EQ} =	(Equa	ation 13-6 or	13-7)		L _{EQ} =		(Equation 13-	12 or 13-13	5)
P _{FM} =	using	Equation (Exhibit 13-6)		P _{FD} =		0.	589 using Eq	uation (Exh	ibit 13-7)
V ₁₂ =	pc/h				V ₁₂ =		34	67 pc/h		
V ₃ or V _{av34}	pc/h (Equation 13	-14 or 13-17)		V_3 or V_{av34}		18	841 pc/h (Equ	uation 13-1	4 or 13-17)
Is V_3 or $V_{av34} > 2,7$	00 pc/h? 🗌 Ye	s 🗌 No			Is V_3 or V_{av}	_{/34} > 2,7	00 pc/h?	Yes 🗹 No		
Is V ₃ or V _{av34} > 1.5	* V ₁₂ /2	s 🗌 No			Is V_3 or V_{av}	, ₃₄ > 1.5	* V ₁₂ /2	Yes 🗹 No		
If Yes.V ₁₀₀ =	pc/h (Equation 13	-16, 13-18, or		If Yes.V40.	=	р	c/h (Equation	า 13-16, 13	-18, or 13-
	13-19)					h. Ch	19)		
Capacity Cho	ecks				Capacit	y Ch	ecks			
	Actual		apacity	LUSF?	V		Actual			LUS F?
					V _F		5308	Exhibit 13-	8 7200	NO
V _{FO}		Exhibit 13-8			$V_{FO} = V_{FO}$	- V _R	4485	Exhibit 13-	8 7200	No
					V _R		823	Exhibit 13-	10 2100	No
Flow Enterin	g Merge In	fluence A	lrea		Flow Er	nterin	g Dive	rge Influer	ice Area	-
	Actual	Max	Desirable	Violation?		/	Actual	Max Desira	ble	Violation?
V _{R12}		Exhibit 13-8			V ₁₂	3	3467	Exhibit 13-8	4400:All	No
Level of Serv		Level of	f Serv	vice De	terminatio	on (if not	F)			
D _R = 5.475 + 0			D _R = 4	1.252 + 0	.0086 V ₁₂ - 0	.009 L _D				
D _R = (pc/mi/lı	n)				D _R = 3	1.8 (pc	/mi/ln)			
LOS = (Exhibit	13-2)				LOS = D	(Exhil	oit 13-2)			
Speed Determination					Speed L	Deter	minatic	on		
M _e = (Exibit 1	(3-11)				$D_s = 0$.372 (E	xhibit 13-	·12)		
$S_{p} = mnh (Fx)$, hibit 13-11)				S _R = 5	9.6 mph	(Exhibit	13-12)		
	hibit 13_11)				$S_0 = 73.5 \text{ mph} (Exhibit 13-12)$					
S = mnh (Fx)	hibit 13-13)				S = 63.8 mph (Exhibit 13-13)					
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2015 Existing Freeway_HCS Operational Analysis

	BASIC F	REEWAY SE	GMENTS WORKSHEET		
General Information			Site Information		
Analyst Agency or Company Date Performed	AECOM		Highway/Direction of Travel From/To Jurisdiction	l-95 SB Seg 12-i	Bet Off & On Ramps
Analysis Time Period	AM		Analysis Year	EXISTIN	NG 2015/2016
Project Description					nation Data
✓ Oper.(LOS)			Jes.(N)		anning Data
	4220	voh/h	Dook Hour Footor, DHE	0.06	
AADT	4230	veh/day	%Trucks and Buses, P _T	0.90 3	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	%RVs, P _R General Terrain: Grade % Length Up/Down %	0 Level mi	
Calculate Flow Adjustn	nents				
f _p	1.00		E _R	1.2	
E _T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.985	
Speed Inputs			Calc Speed Adj and FFS	6	
Lane Width		ft			
Rt-Side Lat. Clearance	_	ft	f _{LW}		mph
Number of Lanes, N	3	, .			mph
Total Ramp Density, TRD	70.0	ramps/mi	TRD Adjustment		mph
FFS (measured)	70.0	mpn	FFS	70.0	mph
		mpn			
LOS and Performance	Measures		Design (N)		
<u>Operational (LOS)</u> v _p = (V or DDHV) / (PHF x N > S D = v _p / S LOS	x f _{HV} x f _p) 1491 69.0 21.6 C	pc/h/ln mph pc/mi/ln	$\frac{\text{Design (N)}}{\text{Design LOS}}$ $v_p = (V \text{ or DDHV}) / (PHF x N x)$ S $D = v_p / S$ Required Number of Lanes, N	f _{HV} x f _p)	pc/h/ln mph pc/mi/ln
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v _p - Flow rate LOS - Level of service DDHV - Directional design ho	S - Speed D - Density FFS - Free-flow BFFS - Base fre ur volume	speed ee-flow speed	E _R - Exhibits 11-10, 11-12 E _T - Exhibits 11-10, 11-11, 11- f _p - Page 11-18 LOS, S, FFS, v _p - Exhibits 11-2	13 2, 11-3	f _{LW} - Exhibit 11-8 f _{LC} - Exhibit 11-9 TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET										
General Infor	mation			Site Infor	mation					
Analyst			Fre	eeway/Dir of Tra	avel	I-95 S	iΒ			
Agency or Company	AEC	ОМ	Ju	nction		Seg 1	3-Merge from S	Sample Rd W	/B	
Date Performed			Ju	risdiction						
Analysis Time Period	MA M		An	alysis Year		EXIST	FING 2015/201	6		
Project Description	SW 10th Stree	et SIMR								
inputs		I=							1	
Upstream Adj Ramp		Freeway Num	iber of Lanes, N	3					Downstrea Ramp	m Adj
Yes Or	ı	Acceleration I	Lane Length, L	990						V On
No □Of	f	Deceleration	Lane Length L _D							
		Freeway Volu	ıme, V _F	4230						
L _{up} = ft		Ramp Volum	e, V _R	825					L _{down} =	2400 ft
V _u = veh/h	1	Freeway Free	e-Flow Speed, S _{FF}	70.0					V _D =	835 veh/h
Conversion t	o no/h Un	Ramp Free-F	low Speed, S _{FR}	50.0						
Conversion l			Conditions		1	-			I	
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f _{HV}	f _p	v = V/PHF	x f _{HV} x f _p
Freeway	4230	0.96	Level	3	0	C).985	1.00	44	72
Ramp	825	0.84	Level	2	0	C).990	1.00	99	92
UpStream						_				-
DownStream	835	0.88	Level	2	0	C).990	1.00	9	58
Estimation of	fV12	werge Areas			Estimat	ion d	of v_{42}	erge Areas		
	$V_{10} = V_{r}$	(P.,.)					12		<u>`</u>	
L _{F0} =	(Fau	、 ⊧≝ ⁄ ation 13-6 o	r 13-7)				V ₁₂ = V _R	+ (V _F - V _R)P _{FD}	
P_,, =	0.605	using Faua	tion (Exhibit 13-6)		L _{EQ} =		(Ed	quation 13-	12 or 13-13)
V ₁₀ =	2707	nc/h			P _{FD} =		us	ng Equatio	n (Exhibit 13-	7)
12	1765	pc/h (Equati	on 13-14 or 13-		$V_{12} =$		pc	′h h (⊏auratian 1	2 44 42 47	\
$v_3 0 v_{av34}$	17)				ls V. or V	>2	/pc 700 nc/h2	n (Equation 1	3-14 Of 13-17)
Is V_3 or $V_{av34} > 2,70$	י∪ pc/n ? Ye * ע / מי	s ⊻No			Is V ₂ or V	34 [·] 2, > 1 :	5 * V/2			
$15 V_3 \text{ or } V_{av34} > 1.5$	° v ₁₂ /∠ ⊻ Ye	s 🛄 No	10 10 10			34	0 12'- DC	h (Equation	n 13-16. 13	-18. or
If Yes,V _{12a} =	2707 18, or	13-19)	on 13-16, 13-		if Yes,V _{12a} =	-	13-1	19)	, -	-,-
Capacity Che	ecks			u.	Capacit	y Ch	necks			
	Actual	(Capacity	LOS F?			Actual	Car	pacity	LOS F?
					V _F			Exhibit 13-8	8	
V _{FO}	5464	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V _R		Exhibit 13-8	8	
					V _R			Exhibit 13-	-	
Flow Entering	g Merge In	fluence A	Area	8	Flow En	terii	ng Diverg	e Influen	ce Area	
	Actual	Max	Desirable	Violation?			Actual	Max Desi	irable	Violation?
V _{R12} 3699 Exhibit 13-8 4600:All No V ₁₂ Exhibit 13-8										
Level of Serv	ice Deterr	nination (if not F)		Level of	⁻ Ser	vice Dete	rminatio	n (if not l	5)
D _R = 5.475 +	0.00734 v _R + (0.0078 V ₁₂ - 0.	00627 L _A			D _R =	4.252 + 0.00	086 V ₁₂ - 0.	.009 L _D	
D _R = 27.7 (pc/m	ni/ln)				D _R = (p	c/mi/	íln)			
LOS = C (Exhibit	13-2)				LOS = (E	Exhibi	it 13-2)			
Speed Detern	nination				Speed L)etei	rmination			
M _S = 0.380 (Exi	bit 13-11)				U _s = (E	xhibit	13-12)			
S _R = 59.4 mph	(Exhibit 13-11)				S _R = m	ph (Ex	(nidit 13-12)			
S ₀ = 65.4 mph	(Exhibit 13-11)				S ₀ = m	ph (Ex	(hibit 13-12)			
S = 61.2 mph	(Exhibit 13-13)				S= m	ph (Ex	(hibit 13-13)			

Appendix C

	BASIC F	REEWAY SE	GMENTS WORKSHEET		
General Information			Site Information		
Analyst			Highway/Direction of Travel	1-95 SB	Pot M/R & ER On
Agency or Company	AECOM		From/To	Ramps	
Date Performed Analysis Time Period	AM		Jurisdiction Analysis Year	EXISTIN	G 2015/2016
Project Description SW 10th	Street SIMR				
✓ Oper.(LOS)			Des.(N)	Pla	nning Data
Flow Inputs					
Volume, V AADT	5055	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P _T	0.96 3	
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	%RVs, P _R General Terrain: Grade % Length Up/Down %	0 Level mi	
Calculate Flow Adjustm	ents				
f_	1.00		En	1.2	
E _T	1.5		−R f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	0.985	
Speed Inputs			Calc Speed Adj and FF	S	
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f _{LW}		mph
Number of Lanes, N	3		f _{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	70.0	mph	, FFS	70.0	mph
Base free-flow Speed, BFFS		mph		10.0	mpn
LOS and Performance M	leasures		Design (N)		
Operational (LOS) v _p = (V or DDHV) / (PHF x N x S D = v _p / S LOS	f _{HV} x f _p) 1782 66.1 27.0 D	pc/h/ln mph pc/mi/ln	Design (N) Design LOS $v_p = (V \text{ or DDHV}) / (PHF x N x)$ S D = v_p / S Required Number of Lanes, N	(f _{HV} x f _p)	pc/h/ln mph pc/mi/ln
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v _p - Flow rate LOS - Level of service DDHV - Directional design hou	S - Speed D - Density FFS - Free-flow BFFS - Base free ir volume	speed e-flow speed	E _R - Exhibits 11-10, 11-12 E _T - Exhibits 11-10, 11-11, 11 f _p - Page 11-18 LOS, S, FFS, v _p - Exhibits 11-	-13 -2, 11-3	f _{LW} - Exhibit 11-8 f _{LC} - Exhibit 11-9 TRD - Page 11-11

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		F	REEWAY	WEAV	ING WOF	RKSHEE	Г		
Genera	Informatio	on			Site Info	rmation			
Analyst Agency/Con Date Perfori Analysis Tin	npany ned ne Period	AECON AM	1		Freeway/Dir of Travel I-95 SB Weaving Segment Location Seg 15- Bet Sample & Copans Analysis Year EXISTING 2015/2016				
Project Des	cription SW 10th	n Street SIMR							
Inputs					1				
Weaving configurationOne-SideWeaving number of lanes, NWeaving segment length, Ls1410Freeway free-flow speed, FFS70 mp					Segment typ Freeway min Freeway ma: Terrain type	Freeway 15 2400 Level			
Convers	sions to po	/h Under	Base Co	ondition	5				_
	V (veh/h)	PHF	Truck (%)	RV (%)	Ε _Τ	E _R	f _{HV}	fp	v (pc/h)
V _{FF}	4275	0.95	3	0	1.5	1.2	0.985	1.00	4568
V _{RF}	835	0.88	2	0	1.5	1.2	0.990	1.00	958
V _{FR}	590	0.88	2	0	1.5	1.2	0.990	1.00	677
V _{RR}	0	0.88	2	0	1.5	1.2	0.990	1.00	0
V _{NW}	4568							V =	6203
V _w	1635								
VR	0.264								
Configu	ration Cha	racterist	ics		•				
Minimum m	aneuver lanes, N	√ _{WL}		2 lc	Minimum we	aving lane ch	nanges, LC _{MIN}		1635 lc/h
Interchange	density, ID			0.8 int/mi	Weaving lan	e changes, L	C _w		1968 lc/h
Minimum R	F lane changes,	LC _{RF}		1 lc/pc	Non-weaving	g lane change	es, LC _{NW}		935 lc/h
Minimum Fl	R lane changes,	LC _{FR}		1 lc/pc	Total lane ch	nanges, LC _{ALI}	_		2903 lc/h
Minimum R	R lane changes,	LC _{RR}		lc/pc	Non-weaving	g vehicle inde	ex, I _{NW}		515
Weavin	g Segment	Speed,	Density, I	_evel of	Service,	and Cap	acity		
Weaving segment flow rate, v6120 veh/hWeaving intensity factor, W0.400Weaving segment capacity, cw8315 veh/hWeaving segment speed, S51.7 mpl								0.400 51.7 mph	
Weaving se	gment v/c ratio			0.736	Average wea	aving speed,	Sw		54.3 mph
Weaving se	gment density, [)	30).0 pc/mi/ln	Average nor	n-weaving spe	eed, S _{NW}		50.8 mph
Level of Se	vice, LOS			D	Maximum we	eaving length	, L _{MAX}		5197 ft
Notes									
a. Weaving s Chapter 13, ' b. For volume	egments longer th Freeway Merge a es that exceed the	an the calcula nd Diverge Se weaving segn	ted maximum le gments". nent capacity, th	ength should l	be treated as is rvice is "F".	olated merge	and diverge ar	eas using the	procedures of

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	BASIC F	REEWAY SE	GMENTS WORKSHEET		
Conoral Information			Site Information		
Analyst Agency or Company Date Performed	AECOM		Highway/Direction of Travel From/To	l-95 SB Seg 1-B	et Hillsboro & Palmetto
Analysis Time Period	PM		Analysis Year	EXISTIN	IG 2015/2016
Project Description SW 10t	h Street SIMR				
Oper.(LOS)			Des.(N)	Pla	anning Data
Flow Inputs					
Volume, V AADT	5750	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P _T	0.96 3	
Peak-Hr Prop. of AAD1, K Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length Up/Down %	0 Level mi	
Calculate Flow Adjustr	nents				
f _p	1.00		E _R	1.2	
E _T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.985	
Speed Inputs			Calc Speed Adj and FFS	6	
Lane Width Rt-Side Lat, Clearance		ft	f		mph
Number of Lanes, N Total Ramp Density, TRD	3	ramps/mi	f _{LC} TRD Adjustment		mph
FFS (measured) Base free-flow Speed, BFFS	70.0	mph mph	FFS	70.0	mph
LOS and Performance	Measures		Design (N)		
<u>Operational (LOS)</u> v _p = (V or DDHV) / (PHF x N) S D = v _p / S LOS	x f _{HV} x f _p) 2026 62.1 32.6 D	pc/h/ln mph pc/mi/ln	$\frac{\text{Design (N)}}{\text{Design LOS}}$ $v_p = (V \text{ or DDHV}) / (PHF x N x S)$ $D = v_p / S$ Required Number of Lanes, N	f _{HV} x f _p)	pc/h/ln mph pc/mi/ln
Glossary			Factor Location		
N - Number of lanes V - Hourly volume v _p - Flow rate LOS - Level of service DDHV - Directional design ho	S - Speed D - Density FFS - Free-flow BFFS - Base free our volume	speed ee-flow speed	E _R - Exhibits 11-10, 11-12 E _T - Exhibits 11-10, 11-11, 11- f _p - Page 11-18 LOS, S, FFS, v _p - Exhibits 11-2	13 2, 11-3	f _{LW} - Exhibit 11-8 f _{LC} - Exhibit 11-9 TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET											
General Infor	mation			Site Infor	mation						
Analyst			Fre	eeway/Dir of Tr	avel	I-95 SE	3				
Agency or Company	AEC	MO	Ju	nction		Seg 2-I	Diverge to	Hillsboro			
Date Performed			Ju	risdiction				- / -			
Analysis Time Period	d PM		An	alysis Year		EXISTI	NG 2015/2	016			
	SW 10th Stree	t SIMR									
mputs			han of Lanca N	2					1		
Upstream Adj F	lamp	Freeway Num	iber of Lanes, N	3					Downstrea	am Adj	
	On	Ramp Numbe	er of Lanes, N	1					Ramp		
		Acceleration I	Lane Length, L _A						🗹 Yes	On	
✓ No	Off	Deceleration	Lane Length L _D	1500						□ ∩ff	
		Freeway Volu	ıme, V _F	5750							
$L_{up} = f$	ť	Ramp Volume	e, V _R	1000					L _{down} =	2175 ft	
		Freeway Free	-Flow Speed, S	70.0						750 1 4	
$V_u = v$	eh/h	Ramp Free-F	low Speed. S	45.0					V _D =	750 veh/h	
Conversion t	o pc/h Un	der Base	Conditions								
(n c /h)	V		Terreire	0/ T au ala	0/ D		f	f		vf vf	
(pc/n)	(Veh/hr)	PHF	Terrain	% I ruck	%RV		ЧV	Р	v = v/PHF	х і _{НV} х і _р	
Freeway	5750	0.96	Level	3	0	0.	985	1.00	60	79	
Ramp	1000	0.97	Level	2	0	0.	990	1.00	10)41	
UpStream									ļ		
DownStream	750	0.89	Level	2	0	0.	990	1.00	8	51	
F otimation of	f	Merge Areas			Fatimat	ion o	L	liverge Areas			
Estimation of						Estimation of v_{12}					
$V_{12} = V_F (P_{FM})$							V ₁₂ =	V _R + (V _F - V	′ _R)P _{FD}		
L _{EQ} =	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.	560 using Ec	uation (Exhi	bit 13-7)	
V ₁₂ =	pc/h				V ₁₂ =		38	863 pc/h			
V_2 or $V_{0/24}$	pc/h (Equation 13	-14 or 13-17)		V_2 or V_{2}		22	, 16 pc/h (Fai	uation 13-14	4 or 13-17)	
$1 \text{ s } V_{2} \text{ or } V_{2} \text{ or } 2.70$)0 pc/h? □Ye	s 🗌 No	,		Is V ₂ or V ₂	₂₄ > 2.7	 00 pc/h? ∏	Yes Vo		,	
$1 \text{ s V}_{a} \text{ or V}_{a} > 15$	*V/2 □Vo				Is $V_3 \text{ or } V_{av34} > 1.5 * V_{12}/2$ Yes No						
	pc/h (Equation 13	-16. 13-18. or		IS v_3 or $v_{av34} > 1.5 v_{12}/2$ Yes V No pc/h (Equation 13-16, 13-18, or 13-						
If Yes,V _{12a} =	13-19)		,,,		If Yes,V _{12a} =	=	۲ 1	9)		,	
Capacity Che	ecks				Capacit	y Ch	ecks				
	Actual	(Capacity	LOS F?			Actual	C	apacity	LOS F?	
					V _F		6079	Exhibit 13-	-8 7200	No	
V _{FO}		Exhibit 13-8			$V_{FO} = V_{F}$	- V _R	5038	Exhibit 13-	-8 7200	No	
					V _R		1041	Exhibit 13-	10 2100	No	
Flow Entering	u a Merae In	fluence A	Area		Flow Er	nterin	a Dive	rae Influer	ice Area		
	Actual	Max	Desirable	Violation?			Actual	Max Desira	ible	Violation?	
V _{R12}		Exhibit 13-8			V ₁₂	3	3863	Exhibit 13-8	4400:All	No	
Level of Serv	ice Detern	nination (ïf not F)		Level of	fServ	vice De	terminatio	n (if not	F)	
D _R = 5.475 + 0.	$D_{p} = 5.475 + 0.00734 v_{p} + 0.0078 V_{12} - 0.00627 L_{A}$ $D_{p} = 4.252 + 0.0086 V_{12} - 0.009 L_{p}$										
D _P = (pc/mi/lr	1)	.=			$D_p = 24$	4.0 (pc	/mi/ln)		2		
LOS = (Exhibit	, 13-2)				LOS = C	(Exhil	, oit 13-2)				
Speed Deter	Speed Determination Speed Determination										
M = (Evilute 1)	2 11)				D = 0	392 (F	xhibit 13-	.12)			
	0-11)				$v_s = 0.392 (EXIIIDIL 13-12)$ S = 50.0 mph (Exhibit 12.42)						
S _R - mpn (Exr	101(13-11)				S = 72.0 mph (Exhibit 12.12)						
S_0 = mph (Exh	NDIT 13-11)				S_0^{-1} 72.0 mpH (Exhibit 13-12)						
p = mpn (Exr	iidit 13-13)				S= 6	3.2 mph	(Exhibit	13-13)			
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2015 Existing Freeway_HCS Operational Analysis

BASIC FREEWAY SEGMENTS WORKSHEET										
General Information			Site Information							
Analyst Agency or Company Date Performed Analysis Time Period	AECOM PM		Highway/Direction of Travel From/To Jurisdiction Analysis Year	I-95 SB Seg 3-B EXISTIN	et Off & On Ramps IG 2015/2016					
Project Description SW 10th	h Street SIMR									
Oper.(LOS)			Des.(N)	Pla	anning Data					
Flow Inputs										
Volume, V AADT Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D	4750	veh/h veh/day veh/h	Peak-Hour Factor, PHF %Trucks and Buses, P _T %RVs, P _R General Terrain: Grade % Length	0.96 3 0 Level mi						
Coloulato Flow Adjuste	nonto		Up/Down %							
				1.0						
^τ ρ Ε _Τ	1.00 1.5		E _R f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	1.2 0.985						
Speed Inputs			Calc Speed Adj and FFS	3						
Lane Width Rt-Side Lat. Clearance Number of Lanes, N Total Ramp Density, TRD FFS (measured) Base free-flow Speed, BFFS	3 70.0	ft ft ramps/mi mph mph	f _{∟w} f _{LC} TRD Adjustment FFS	70.0	mph mph mph mph					
LOS and Performance	Measures		Design (N)							
<u>Operational (LOS)</u> v _p = (V or DDHV) / (PHF x N x S D = v _p / S LOS	x f _{HV} x f _p) 1674 67.4 24.8 C	pc/h/ln mph pc/mi/ln	$\frac{\text{Design (N)}}{\text{Design LOS}}$ $v_p = (V \text{ or DDHV}) / (PHF x N x S)$ $D = v_p / S$ Required Number of Lanes, N	f _{HV} x f _p)	pc/h/ln mph pc/mi/ln					
Glossary			Factor Location							
N - Number of lanes V - Hourly volume v _p - Flow rate LOS - Level of service DDHV - Directional design ho	S - Speed D - Density FFS - Free-flow BFFS - Base free our volume	speed ee-flow speed	E _R - Exhibits 11-10, 11-12 E _T - Exhibits 11-10, 11-11, 11- f _p - Page 11-18 LOS, S, FFS, v _p - Exhibits 11-2	13 2, 11-3	f _{LW} - Exhibit 11-8 f _{LC} - Exhibit 11-9 TRD - Page 11-11					

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RAMPS AND RAMP JUNCTIONS WORKSHEET										
General Infor	mation			Site Infor	mation					
Analyst			Fre	eeway/Dir of Tra	avel	I-95 S	В			
Agency or Company	AEC	MC	Ju	nction		Seg 4	-Merge from	n Hillsboro WB		
Date Performed			Ju	risdiction						
Analysis Time Period	M9 M		An	alysis Year		EXIST	TING 2015/2	016		
Project Description	SW 10th Stree	t SIMR								
Inputs		1							ir	
Upstream Adi Ramp		Freeway Num	ber of Lanes, N	3					Downstrea	m Adi
		Ramp Numbe	r of Lanes, N	1					Ramp	
Yes Or	ı	Acceleration L	ane Length, L	945						
		Deceleration I	ane Length I	0.0					I res	l On
No Of	f			1750					🗌 No	Off
- a		Freeway volume, V _F 4/5							1. =	2080 ft
- _{up} - π		Ramp Volume	e, V _R	750					∽down	2000 11
Freeway Free-Flow Speed, S _{FF}				70.0					V., =	670 veh/h
		Ramp Free-Fl	ow Speed, S _{FR}	50.0					. D	
Conversion t	o pc/h Und	der Base	Conditions						8	
(pc/h)	%Truck	%Rv		funz	fn	v = V/PHF	x fuy x f			
(po,ri)	(Veh/hr) (Veh/hr)			7011401	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		HV	·p		нотр
Freeway	4750	0.96	Level	3	0	0).985	1.00	5)22
Ramp	750	0.89	Level	2	0	0).990	1.00	8	51
UpStream	070	0.04								
DownStream	670	0.94	Level	2	0	U).990 г	1.00	1	20
Estimation of	F 1/	werge Areas			Diverge Areas					
	v 12				Estimati		12			
$V_{12} = V_F (P_{FM})$							V ₁₀ = '	Vn + (Vr - Vn)P _{ED}	
L _{EQ} =	L _{EO} = (Equation 13-6 or 13-7)				- =		12	Equation 13	′ ⊦∪ 12 or 13_1'	3)
P _{FM} =	0.604	using Equat	tion (Exhibit 13-6)		EQ D –				n /Evhibit 12	7)
V ₁₂ =	3033	oc/h	· · ·		FD		,			-7)
	1989	oc/h (Fouati	on 13-14 or 13-		v ₁₂ =		I	oc/n		
v ₃ or v _{av34}	17)				V ₃ or V _{av34}			pc/h (Equation 1	3-14 or 13-1	7)
Is V ₃ or V _{av34} > 2,70	0 pc/h? 🗌 Ye	s 🗹 No			Is V ₃ or V _{av3}	₃₄ > 2,	700 pc/h?	Yes No		
Is V ₃ or V _{av34} > 1.5 '	* V ₁₂ /2	s 🗌 No			Is V ₃ or V _{av3}	₃₄ > 1.5	5 * V ₁₂ /2	Yes 🗌 No		
	3033	oc/h (Equati	on 13-16, 13-		If Yes,V ₁₂₂ =	:	l	oc/h (Equatio	n 13-16, 13	-18, or
11 1 es, v _{12a} –	18, or	13-19)			120		1.	3-19)		
Capacity Che	cks				Capacit	y Ch	necks			
	Actual	0	Capacity	LOS F?			Actual	Ca	pacity	LOS F?
					V _F			Exhibit 13-	8	
Vro	5873	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V _R		Exhibit 13-	8	
FO	0010							Exhibit 13	-	
					۷R			10		
Flow Entering	g Merge In	fluence A	rea		Flow En	terii	ng Dive	rge Influen	ce Area	
	Actual	Max	Desirable	Violation?			Actual	Max Des	irable	Violation?
V _{R12}	3884	Exhibit 13-8	4600:All	No	V ₁₂			Exhibit 13-8		
Level of Serv	ice Detern	nination (if not F)		Level of	⁻ Ser	vice De	terminatio	n (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	
$D_{p} = 29.5 (pc/m)$	ii/ln)				D _P = (p	oc/mi/	ln)			
IOS = D(Exhibit)	, 13-2)				10S = (F	- xhihi	it 13-2)			
	nination				Speed C		rminatio	<u></u>		
					D - /-		12 10	///		
M _S = 0.416 (Exi	bit 13-11)				υ _s - (Ε		13-12)			
S _R = 58.3 mph (Exhibit 13-11)				\aleph_R = mph (Exhibit 13-12)						
S ₀ = 64.6 mph ((Exhibit 13-11)				S ₀ = mph (Exhibit 13-12)					
S = 60.3 mph (Exhibit 13-13) S = mph (Exhibit 13-13)										

BASIC FREEWAY SEGMENTS WORKSHEET										
General Information			Site Information							
Analyst			Highway/Direction of Travel	1-95 SB	of M/R On & ER On					
Agency or Company	AECOM		From/To	Ramps						
Date Performed Analysis Time Period	PM		Jurisdiction Analysis Year	EXISTIN	IG 2015/2016					
Project Description SW 10t	th Street SIMR									
✓ Oper.(LOS))		Des.(N)	Pla	inning Data					
Flow Inputs										
Volume, V	5500	veh/h	Peak-Hour Factor, PHF %Trucks and Buses, P	0.96 3						
Pook Hr Prop. of AADT K		ven/day	% RV/s P	0						
Peak-Hr Direction Prop. D			General Terrain	u Level						
$DDHV = AADT \times K \times D$		veh/h	Grade % Length	mi						
			Up/Down %							
Calculate Flow Adjust	ments									
f _n	1.00		E _R	1.2						
E _T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.985						
Speed Inputs			Calc Speed Adj and FF	S						
Lane Width		ft								
Rt-Side Lat. Clearance		ft	f _{i w}		mph					
Number of Lanes, N	3		f		mph					
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph					
FFS (measured)	70.0	mph	FFS	70.0	mph					
Base free-flow Speed, BFFS		mph		1010						
LOS and Performance	Measures		Design (N)							
			Design (N)							
Operational (LOS)			Design LOS							
$v_p = (V \text{ or } DDHV) / (PHF X N)$	x f _{HV} x f _p) 1938	pc/h/ln	$v_{p} = (V \text{ or DDHV}) / (PHF x N x)$	(f _{HV} x f _n)	pc/h/ln					
S	63.7	mph	S	nv p	mph					
D = v _p / S	30.4	pc/mi/ln	$D = v_n / S$		pc/mi/ln					
LOS	D		Required Number of Lanes, N	I	F -					
Glossary			Factor Location							
N - Number of lanes	S - Speed									
V - Hourly volume	D - Densitv		E _R - Exhibits 11-10, 11-12		t _{LW} - Exhibit 11-8					
v - Flow rate	FFS - Free-flow	speed	E _T - Exhibits 11-10, 11-11, 11	-13	f _{LC} - Exhibit 11-9					
LOS - Level of service	BFFS - Base fre	e-flow speed	f _p - Page 11-18		TRD - Page 11-11					
DDHV - Directional design bo	our volume		LOS, S, FFS, v _p - Exhibits 11	-2, 11-3						

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RAMPS AND RAMP JUNCTIONS WORKSHEET											
General II	nforn	nation			Site Infor	mation					
Analyst Agency or Con Date Performe Analysis Time	npany d Period	AECC PM	ОМ	F Ji Ji A	reeway/Dir of Tr unction urisdiction nalysis Year	avel	I-95 S Seg 6 EXIST	B -Merge from FING 2015/2	n Hillsboro EB 2016		
Project Descrip	ption S	SW 10th Street	t SIMR								
Inputs											
Upstream Adj I	Ramp		Freeway Num Ramp Numbe	ber of Lanes, N r of Lanes, N	3 1					Downstrea Ramp	m Adj
✓ Yes 🛛	✓ On		Acceleration L	ane Length, L _A	600					🗌 Yes	On
No [Off		Freeway Volu	Freeway Volume, V _F 5500						Off	
L _{up} = 2	:080 ft		Ramp Volume, V _R 670 L _{down} = 1					π			
$V_u = 7$	'50 veł	n/h	Ramp Free-Fl	low Speed, S _{FR}	50.0					v _D =	veh/h
Conversi	Conversion to pc/h Under Base Conditions										
(pc/h)	(pc/h) V PHF Terrain %Truc (Veh/hr) 0.96 Level 3				%Truck	%Rv		f _{HV}	f _p	v = V/PHF	x f _{HV} x f _p
Freeway		5500	0.96	Level	3	0	0).985	1.00	58	315
Ramp		670	0.94	Level	2	0	0).990	1.00	7	20
UpStream		750	0.89	Level	2	0 0.990 1.00				8	51
DownStream			Merce Areas					[)iverge Areas		
Estimatio	Estimation of v ₁₂					Estimation of v ₁₂					
		V ₁₂ = V _F	(P _{FM})					V =	V + (V - V))P	
L _{EO} = (Equation 13-6 or 13-7)						-		* 12	^v R [·] (^v F ^v R) (Equation 12)	/'FD 12 or 12 13	2
P _{FM} =		0.594	using Equat	tion (Exhibit 13-6)	EQ D -			Lyualion 13-	·12 01 13-10	7) 7)
V ₁₂ =		3456 g	oc/h	,	,	FD			using Equalio		-1)
12 1/ or 1/		2359 p	oc/h (Equati	on 13-14 or 13	-	v ₁₂ –			pc/n		•
Is V ₃ or V _{av34}	> 2,700	17) pc/h? Yes	s 🔽 No			v_3 or v_{av34} Is V_3 or V_{av3}	, ₃₄ > 2,	700 pc/h? [Pc/n (Equation 1 ☐Yes □ No	13-14 or 13-17	()
Is V ₂ or V ₂₁₂₄	> 1.5 * \	V₁₀/2 √Yes				Is V ₃ or V _{av}	₃₄ > 1.	5 * V ₁₂ /2	Yes 🗌 No		
If Yes,V _{12a} =		3456 p	oc/h (Equati 13-19)	on 13-16, 13-		lf Yes,V _{12a} =	=	 1;	pc/h (Equatio 3-19)	n 13-16, 13	-18, or
Capacity	Chec	ks	10 10)			Capacit	v Ch	ecks			
		Actual		Capacity	LOS F?		<u>, , , , , , , , , , , , , , , , , , , </u>	Actual	Ca	oacity	LOS F?
						Vr			Exhibit 13-	8	
V _{FO}		6535	Exhibit 13-8		No	V _{FO} = V _F	- V _R		Exhibit 13-	8	
						V _R			Exhibit 13	-	
Flow Ente	ering	Merge In	fluence A	lrea		Flow En	<u>iterii</u>	ng Dive	rge Influen	ice Area	
		Actual	Max	Desirable	Violation?		_	Actual	Max Des	irable	Violation?
V _{R12}		41/6	Exhibit 13-8	4600:All	No	V ₁₂			Exhibit 13-8		
Level of S	Servie	ce Detern	nination (if not F)		Level of	f Ser	vice De	terminatio	n (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 = 34.0) (pc/mi/ xhibit 1;	ln) 3-2)				D _R = (p LOS = (F	oc/mi/ =xhibi	'ln) it 13-2)			
Speed Do	torm	ination				Speed r	Deta	rminatic	<u>n</u>		
Speed De							vhihit	13 10)	///		
M _S = 0.51	5 (Exibi	t 13-11)				ν _s – (Ε		10-12)			
S _R = 55.6	B _R = 55.6 mph (Exhibit 13-11)					S_R - mpn (Exhibit 13-12)					
$S_0 = 63.1 \text{ mph} (Exhibit 13-11)$ $S_0 = \text{mph} (Exhibit 13-12)$											
S = 58.1	= 58.1 mph (Exhibit 13-13) S = mph (Exhibit 13-13)										

RAMPS AND RAMP JUNCTIONS WORKSHEET												
General Infor	rmation			Site Infor	mation							
Analyst			Fr	eeway/Dir of Tr	avel	I-95 SE	3					
Agency or Company	AEC	OM	Ju	nction		Seg 7-	Diverge to	SW 10th St				
Date Performed			Ju	risdiction				- / -				
Analysis Time Perio	d PM		Ar	alysis Year		EXIST	NG 2015/2	016				
	SW 10th Stree	ET SIMR										
inputs		F N	han af Lanaa N	2					1			
Upstream Adj F	Ramp	Freeway Num	ider of Lanes, N	3					Downstrea	am Adj		
		Ramp Numbe	er of Lanes, N	1					Ramp			
		Acceleration I	Lane Length, L _A						🗹 Yes	🗹 On		
. ✓ No	Off	Deceleration	Lane Length L _D	180						Off		
		Freeway Volu	ıme, V _F	6110								
L _{up} =	ft	Ramp Volume	mp Volume, V _R 960 ^L _{down} =					L _{down} =	2210 ft			
		Freeway Free	-Flow Speed, S _{FF}	70.0					V -	1170 voh/h		
$V_u = v$	/eh/h	Ramp Free-F	low Speed, S _{FR}	45.0					v _D -	1170 ven/n		
Conversion t	to pc/h Un	der Base	Conditions									
(no/h)	V		Torroin	0/ Truck	0/ Dv		f	f		vf vf		
(pc/n)	(Veh/hr)	РПГ	Terrain	% ITUCK	70 FLV		'HV	ľр	v – v/FTH	^ ' HV ^ ' p		
Freeway	6110	0.96	Level	3	0	0.	985	1.00	64	160		
Ramp	960	0.86	Level	2	0	0.	990	1.00	1'	27		
UpStream		A = 4										
DownStream	1170	0.71	Level	2	0	0.	990	1.00	16	64		
Merge Areas					Estimat	tion	L fv	liverge Areas				
					LSumai		** 12	$= V_{R} + (V_{F} - V_{R})P_{FD}$				
$V_{12} = V_{F} (P_{FM})$							V ₁₂ =	V _R + (V _F - V	′ _R)P _{FD}			
L _{EQ} =	(Equa	ation 13-6 or	13-7)		L _{EQ} =		(Equation 13-	12 or 13-13	5)		
P _{FM} =	using	Equation (Exhibit 13-6)		P _{FD} =		0.	547 using Eq	uation (Exh	ibit 13-7)		
V ₁₂ =	pc/h				V ₁₂ =		40)42 pc/h				
V ₃ or V _{av34}	pc/h (Equation 13	-14 or 13-17)		V_3 or V_{av34}		24	18 pc/h (Equ	uation 13-1	4 or 13-17)		
Is V_3 or $V_{av34} > 2,70$	00 pc/h? 🗌 Ye	s 🗌 No			Is V ₃ or V _{av}	, ₃₄ > 2,7	'00 pc/h? [Yes Vo				
Is V_3 or $V_{3v34} > 1.5$	* V ₁₀ /2 Ye	s 🗌 No			Is $V_3 \text{ or } V_{av34} > 1.5 * V_{12}/2$ Yes V No							
	pc/h (Equation 13	-16, 13-18, or		$v_{3} = v_{av34} + 1.5 v_{12} + 1.5 v_{12}$							
11 1 es, v _{12a} –	13-19))			11 1 es, v _{12a} -	_	19	9)				
Capacity Che	ecks			¥	Capacit	y Ch	ecks					
	Actual		Capacity	LOS F?			Actual	C	apacity	LOS F?		
					V _F		6460	Exhibit 13-	8 7200	No		
V _{FO}		Exhibit 13-8			$V_{FO} = V_{F}$	- V _R	5333	Exhibit 13-	8 7200	No		
					V _R		1127	Exhibit 13-	10 2100	No		
Flow Enterin	g Merge In	fluence A	lrea		Flow Er	nterin	g Dive	rge Influer	ice Area			
	Actual	Max	Desirable	Violation?			Actual	Max Desira	ble	Violation?		
V _{R12}		Exhibit 13-8			V ₁₂	4	4042	Exhibit 13-8	4400:All	No		
Level of Serv	vice Detern	nination (ïf not F)		Level of	fSer	vice De	terminatio	n (if not	. F)		
D _R = 5.475 + 0	.00734 v _R +	0.0078 V ₁₂	- 0.00627 L ₄			D _R = 4	1.252 + 0	.0086 V ₁₂ - 0	.009 L _D	•		
$D_p = (pc/mi/lr$	1)	12	~		$D_{p} = -3$	7.4 (pc	/mi/ln)	12	D			
IOS = (Exhibit)	13-2)					(Evhil	nit 13_2)					
Speed Determination												
				D = 0		vhihit 12	12)					
	3-11) 111 (0 (1)				S = 5			13 10\				
S _R = mph (Ext	R ⁼ mph (Exhibit 13-11)				S_R^- 58.8 mpn (Exhibit 13-12)							
S ₀ = mph (Exh	= mph (Exhibit 13-11)				$S_0 = 71.3 \text{ mph} (\text{Exhibit } 13-12)$							
S = mph (Ext	nibit 13-13)				S = 62.9 mph (Exhibit 13-13)							
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2015 Existing Freeway_HCS Operational Analysis

BASIC FREEWAY SEGMENTS WORKSHEET										
General Information			Site Information							
Analyst Agency or Company Date Performed Analysis Time Period	AECOM PM		Highway/Direction of Travel From/To Jurisdiction Analysis Year	I-95 SB Seg 8-B EXISTIN	et Off & On Ramp IG 2015/2016					
Project Description SW 10th	h Street SIMR									
✓ Oper.(LOS)			Des.(N)	Pla	anning Data					
Flow Inputs										
Volume, V AADT Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D	5150	veh/h veh/day veh/h	Peak-Hour Factor, PHF %Trucks and Buses, P _T %RVs, P _R General Terrain: Grade % Length	0.96 3 0 Level mi						
		VOIMI	Up/Down %							
	nents									
E _T	1.00 1.5		E _R f _{HV} = 1/[1+P _T (E _T - 1) + P _R (E _R - 1)]	1.2 0.985						
Speed Inputs			Calc Speed Adj and FFS	6						
Lane Width Rt-Side Lat. Clearance Number of Lanes, N Total Ramp Density, TRD FFS (measured) Base free-flow Speed, BFFS	3 70.0	ft ft ramps/mi mph mph	f _{∟w} f _{LC} TRD Adjustment FFS	70.0	mph mph mph mph					
LOS and Performance	Measures		Design (N)							
<u>Operational (LOS)</u> v _p = (V or DDHV) / (PHF x N x S D = v _p / S LOS	x f _{HV} x f _p) 1815 65.6 27.7 D	pc/h/ln mph pc/mi/ln	Design (N) Design LOS $v_p = (V \text{ or DDHV}) / (PHF x N x)$ S D = v_p / S Required Number of Lanes, N	f _{HV} x f _p)	pc/h/ln mph pc/mi/ln					
Glossary			Factor Location							
N - Number of lanes V - Hourly volume v _p - Flow rate LOS - Level of service DDHV - Directional design ho	S - Speed D - Density FFS - Free-flow BFFS - Base freeur volume	speed e-flow speed	E _R - Exhibits 11-10, 11-12 E _T - Exhibits 11-10, 11-11, 11- f _p - Page 11-18 LOS, S, FFS, v _p - Exhibits 11-2	13 2, 11-3	f _{LW} - Exhibit 11-8 f _{LC} - Exhibit 11-9 TRD - Page 11-11					

HCS 2010TM Version 6.90

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RAMPS AND RAMP JUNCTIONS WORKSHEET											
General I	nforn	nation			Site Infor	mation					
Analyst Agency or Con Date Performe Analysis Time	mpany ed Period	AECO PM	ОМ	F J J A	reeway/Dir of Tr unction urisdiction alysis Year	avel	I-95 S Seg 9 EXIST	B -Merge from TING 2015/2	n 10th St 2016		
Project Descrip	ption S	SW 10th Stree	t SIMR								
Inputs											
Upstream Adj l	Ramp		Freeway Num Ramp Numbe	ber of Lanes, N r of Lanes, N	3 1					Downstrea Ramp	m Adj
I Yes [On		Acceleration I	ane Length, L _A	1500					Yes	On
No [✓ Off		Freeway Volu	me, V _F	5150					I No	Off
L _{up} = 2	2210 ft	t	Ramp Volume Freewav Free	e, V _R -Flow Speed. S _{FF}	1170 70.0					L _{down} =	π
$V_u = 9$	960 vel	h/h	Ramp Free-Fl	ow Speed, S _{FR}	50.0					v _D =	veh/h
Conversi	on to	pc/h Und	der Base	Conditions	1	.					
(pc/h)	v PHF Terrain %True av 5150 0.96 Level 3				%Truck	%Rv		f _{HV}	f _p	v = V/PHF	x f _{HV} x f _p
Freeway		5150	0.96	Level	3	0	0	.985	1.00	54	145
Ramp		1170	0.71	Level	2	0 0.990 1.00			1.00	16	64
UpStream		960	0.86	Level	2	0 0.990 1.00				11	27
DownStream			Morgo Aroas)iverge Areas	_	
Estimatio	Estimation of v ₁₂					Estimation of v ₁₂					
		$V_{12} = V_{F}$	(P _{FM})					V - Y			
L _{EO} = 2400.33 (Equation 13-6 or 13-7)						_		v ₁₂ –	VR ' (VF - VR	リ FD 10 on 10 11	2)
$P_{\rm rw} = 0.607$ using Equation (Exhibit 13-6)					5)	EQ -		(Equation 13-) _\
$V_{10} =$		3307 r	oc/h	(,	FD -		ı	using Equatio	n (Exnibit 13	-7)
12		2138 r	oc/h (Equati	on 13-14 or 13	-	v ₁₂ =		I	oc/h		
V_3 or V_{av34} Is V_2 or V_{av34}	> 2,700	17) pc/h? Yes	s 🔽 No			$V_3 \text{ or } V_{av34}$ pc/h (Equation 13-14 or 13-17) Is $V_3 \text{ or } V_{av34} > 2,700$ pc/h? Yes No					
Is V _o or V _o	> 1.5 * '					Is V_3 or V_{av}	₃₄ > 1.9	5 * V ₁₂ /2	Yes No		
If Yes,V _{12a} =		3307 µ	oc/h (Equati	on 13-16, 13-		If Yes,V _{12a} =	=	1 1	pc/h (Equatio 3-19)	n 13-16, 13	-18, or
Capacity	Chec	cks	10 10)			Capacit	v Ch	lecks			
		Actual		apacity	LOS F?	Capacity Checks					
						V _E			Exhibit 13-	8	
V _{FO}		7109	Exhibit 13-8		No	V _{FO} = V _F	- V _R		Exhibit 13-	8	
						V _R			Exhibit 13 10	-	
Flow Ente	ering	Merge In	fluence A	rea	<u> </u>	Flow En	<u>iterii</u>	ng Dive	rge Influen	ce Area	
		Actual	Max	Desirable	Violation?		_	Actual	Max Des	irable	Violation?
V _{R12}		4971	Exhibit 13-8	4600:All	Yes	V ₁₂			Exhibit 13-8		
Level of S	Servi	ce Detern	nination (if not F)		Level of	f Ser	vice De	terminatio	n (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 = 34.1	l (pc/mi/ -	'ln) 3-2)				D _R = (p	oc/mi/ =xhihi	ln) t 13-2)			
Speed Do	torm	ination				Spood r		rminatic	20		
						$D = /\Box$	vhihit	13_12)	///		
w _s = 0.73	33 (Exibi	t 13-11)				$\nu_{\rm S} = (\text{EXIII0I(10-12)})$					
⊳ _R = 49.5	_R = 49.5 mph (Exhibit 13-11)					S_{R} mph (Exhibit 13-12)					
S ₀ = 64.1	l mph (E	Exhibit 13-11)				P_0 mpn (Exhibit 13-12)					
S = 53.1	s = 53.1 mph (Exhibit 13-13) S = mph (Exhibit 13-13)										

BASIC FREEWAY SEGMENTS WORKSHEET										
General Information			Site Information							
Analyst			Highway/Direction of Travel	1-95 SB	Pot 10th St & Sample					
Agency or Company	AECOM		From/To	Rd						
Date Performed Analysis Time Period	PM		Jurisdiction Analysis Year	EXISTIN	G 2015/2016					
Project Description SW 10th	Street SIMR									
✓ Oper.(LOS)			Des.(N)	🗌 Pla	nning Data					
Flow Inputs										
Volume, V AADT Rock Hr Brop, of AADT, K	6280	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P _T %P\/s_P	0.95 3 0						
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length Up/Down %	Level mi						
Calculate Flow Adjustm	ents									
f	1.00		E	1.2						
E _T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.985						
Speed Inputs			Calc Speed Adj and FF	S						
Lane Width		ft								
Rt-Side Lat. Clearance		ft	f _{i w}		mph					
Number of Lanes, N	3		f _{LC}		mph					
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph					
FFS (measured)	70.0	mph	FFS	70.0	mph					
Base free-flow Speed, BFFS		mph		10.0						
LOS and Performance N	leasures		Design (N)							
<u>Operational (LOS)</u> $v_p = (V \text{ or DDHV}) / (PHF x N x S)D = v_p / SLOS$	f _{HV} x f _p) 2237 57.5 38.9 E	pc/h/ln mph pc/mi/ln	Design (N) Design LOS $v_p = (V \text{ or DDHV}) / (PHF x N x)$ S D = v_p / S Required Number of Lanes, N	x f _{HV} x f _p)	pc/h/ln mph pc/mi/ln					
Glossary			Factor Location							
N - Number of lanes V - Hourly volume v _p - Flow rate LOS - Level of service DDHV - Directional design hou	S - Speed D - Density FFS - Free-flow BFFS - Base fre rr volume	speed e-flow speed	E _R - Exhibits 11-10, 11-12 E _T - Exhibits 11-10, 11-11, 11 f _p - Page 11-18 LOS, S, FFS, v _p - Exhibits 11	-13 -2, 11-3	f _{LW} - Exhibit 11-8 f _{LC} - Exhibit 11-9 TRD - Page 11-11					

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	RAMPS AND RAMP JUNCTIONS WORKSHEET													
General Info	rmation			Site Infor	mation									
Analyst			Fre	eeway/Dir of Tr	avel	I-95 SE	3							
Agency or Company	y AEC	MO	Ju	nction		Seg 11	- Diverge to	o Sample Rd						
Date Performed			Ju	risdiction				- / -						
Analysis Time Perio	DM 4011 DI		An	alysis Year		EXISTI	NG 2015/2	016						
	SW 10th Stree	t SIMR												
mputs			han of Lanca N	2					1					
Upstream Adj F	Ramp	Freeway Nurr	iber of Lanes, N	3					Downstrea	am Adj				
		Ramp Numbe	er of Lanes, N	1					Ramp					
		Acceleration I	_ane Length, L _A						🗹 Yes	🗹 On				
✓ No [Off	Deceleration I	Lane Length L _D	250						Off				
		Freeway Volu	eway Volume, V _F 6280											
L _{up} =	ft	Ramp Volume	e, V _R	990					L _{down} =	1660 ft				
		Freeway Free	e-Flow Speed, S _{FF}	70.0					V -	750 voh/h				
$V_u = V_u$	Ven/n Ramp Free-Flow Speed, S _{EP} 45.0						v _D -	750 Ven/m						
Conversion	to pc/h Un	der Base	Conditions											
(nc/h)	V	DUE	Torrain	% Truck	%.Dv		f	f		vf vf				
(pc/ll)	(Veh/hr)		Terrain	/011UCK	/015.0	_	'HV	'p	v – v/i i ii	^ ' HV ^ ' p				
Freeway	6280	0.99	Level	3	0 0.985 1.00			64	139					
Ramp	990	0.91	Level	2	0	0.	990	1.00	10)99				
UpStream	750	0.00		0	0		000	4.00		F 4				
DownStream	750	U.89 Merge Areas	Levei	Ζ	0	0.	990 F	1.00 Diverge Areas	8	51				
Estimation o	Estimation of V ₄₂					tion o	f V.a	nverge Areas	reas / V_R)P_ED					
					$V_{12} = V_R + (V_F - V_R)P_{FD}$									
$V_{12} = V_F (P_{FM})$						v ₁₂ =	v _R + (v _F - v	R)P _{FD}						
L _{EQ} =	(Equa	ition 13-6 or	13-7)		L _{EQ} =		(1	Equation 13-	12 or 13-13	5)				
P _{FM} =	using	Equation (I	Exhibit 13-6)		P _{FD} =		0.	548 using Eq	uation (Exhi	ibit 13-7)				
V ₁₂ =	pc/h				V ₁₂ =		40)28 pc/h						
V ₃ or V _{av34}	pc/h (Equation 13	-14 or 13-17)		$V_3^{}$ or $V_{av34}^{}$		24	11 pc/h (Equ	uation 13-14	4 or 13-17)				
Is V_3 or $V_{av34} > 2,7$	00 pc/h? 🗌 Ye	s 🗌 No			Is V_3 or V_{av}	_{/34} > 2,7	00 pc/h?	Yes 🗹 No						
Is V ₃ or V _{av34} > 1.5	* V ₁₂ /2	s 🗌 No			Is V_3 or $V_{av34} > 1.5 * V_{12}/2$ Yes No									
If Yes,V _{12a} =	pc/h (Equation 13	-16, 13-18, or		If Yes,V ₁₂₂ :	=	p	c/h (Equation	n 13-16, 13	-18, or 13-				
Capacity Ch	13-19)				Capacit	w Ch		9)						
	Actual		apacity			y Ch	Actual		anacity					
	Actual	1	Japacity	LUGT	V		6420	Evhibit 12		No				
V					V - V	V	0439		0 7200					
V _{FO}		EXNIDIT 13-8			$v_{FO} = v_F$	- v _R	5340	Exhibit 13-	8 7200	NO				
					V _R		1099	Exhibit 13-	10 2100	No				
Flow Enterin	g Merge In	fluence A	lrea	h	Flow Er	nterin	g Dive	rge Influer	nce Area					
	Actual	Max	Desirable	Violation?			Actual	Max Desira	ible	Violation?				
V _{R12}		Exhibit 13-8			V ₁₂	4	1028	Exhibit 13-8	4400:All	No				
Level of Serv	vice Detern	nination (if not F)		Level of	f Serv	vice De	terminatio	on (if not	F)				
$D_{R} = 5.475 + 0$	0.00734 v _R +	0.0078 V ₁₂ -	- 0.00627 L _A			D _R = 4	1.252 + 0	.0086 V ₁₂ - 0	.009 L _D					
D _R = (pc/mi/lı	n)				D _R = 3	6.6 (pc	/mi/ln)							
LOS = (Exhibit	13-2)				LOS = E	(Exhil	oit 13-2)							
Speed Determination Speed Determination														
M _e = (Exibit 1	(3-11)				D _s = 0.	.397 (E	xhibit 13-	·12)						
$S_{n} = mnh (Fx)$, hibit 13-11)				S _R = 58.9 mph (Exhibit 13-12)									
	hibit 13_11)				$S_0 = 71.3 \text{ mph}$ (Exhibit 13-12)									
S = mph (Fx)	hibit 13-13)				S = 63.0 mph (Exhibit 13-13)									
vright © 2016 Universi	mph (EXhibit 13-13)					Versie	n 6 90		Generated 1	0/22/2018 3:37				

2015 Existing Freeway_HCS Operational Analysis

BASIC FREEWAY SEGMENTS WORKSHEET										
General Information			Site Information							
Analyst Agency or Company Date Performed Analysis Time Period	AECOM PM		Highway/Direction of Travel From/To Jurisdiction Analysis Year	I-95 SB Seg 12-I EXISTIN	Bet Off & On Ramps IG 2015/2016					
Project Description SW 10th	h Street SIMR		- ,	_						
✓ Oper.(LOS)			Des.(N)	Pla	anning Data					
Flow Inputs										
Volume, V AADT Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D	5290	veh/h veh/day veh/h	Peak-Hour Factor, PHF %Trucks and Buses, P _T %RVs, P _R General Terrain: Grade % Length	0.99 3 0 Level mi						
		Venin	Up/Down %	1111						
Calculate Flow Adjustn	nents									
f _p	1.00		E _R	1.2						
E _T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.985						
Speed Inputs			Calc Speed Adj and FFS	6						
Lane Width Rt-Side Lat. Clearance Number of Lanes, N Total Ramp Density, TRD FFS (measured) Base free-flow Speed, BFFS	3 70.0	ft ft ramps/mi mph mph	f _{∟w} f _{LC} TRD Adjustment FFS	70.0	mph mph mph mph					
LOS and Performance	Measures		Design (N)							
<u>Operational (LOS)</u> v _p = (V or DDHV) / (PHF x N x S D = v _p / S LOS	x f _{HV} x f _p) 1808 65.7 27.5 D	pc/h/ln mph pc/mi/ln	<u>Design (N)</u> Design LOS v _p = (V or DDHV) / (PHF x N x S D = v _p / S Required Number of Lanes, N	f _{HV} x f _p)	pc/h/ln mph pc/mi/ln					
Glossary			Factor Location							
N - Number of lanes V - Hourly volume v _p - Flow rate LOS - Level of service DDHV - Directional design ho	S - Speed D - Density FFS - Free-flow BFFS - Base free our volume	speed ee-flow speed	E _R - Exhibits 11-10, 11-12 E _T - Exhibits 11-10, 11-11, 11- f _p - Page 11-18 LOS, S, FFS, v _p - Exhibits 11-2	13 2, 11-3	f _{LW} - Exhibit 11-8 f _{LC} - Exhibit 11-9 TRD - Page 11-11					

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RAMPS AND RAMP JUNCTIONS WORKSHEET										
General Infor	mation			Site Infor	mation					
Analyst			Fre	eeway/Dir of Tr	avel	I-95 S	іВ			
Agency or Company	AEC	ОМ	Ju	nction		Seg 1	3-Merge fror	n Sample Rd W	В	
Date Performed			Ju	risdiction						
Analysis Time Period	PM		An	alysis Year		EXIST	FING 2015/2	016		
Project Description	SW 10th Stree	et SIMR								
mputs			her of Lense N	0						
Upstream Adj Ramp		Freeway Num	IDER OF LARES, N	3					Downstrea Ramp	am Adj
Yes On	l	Acceleration I	Lane Length, L	990						
No Off	F	Deceleration	Lane Length L _D							
		Freeway Volu	ıme, V _F	5290						
L _{up} = ft		Ramp Volume	e, V _R	750					L _{down} =	2400 ft
V., = veh/h		Freeway Free	e-Flow Speed, S _{FF}	70.0					V _D =	570 veh/h
u		Ramp Free-F	low Speed, S _{FR}	50.0						
Conversion to	o pc/h Un	der Base	Conditions				r			
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f _{HV}	f _p	v = V/PHF	${ m x}~{ m f}_{ m HV}~{ m x}~{ m f}_{ m p}$
Freeway	5290	0.99	Level	3	0	C).985	1.00	5	424
Ramp	750	0.89	Level	2	0	C).990	1.00	8	851
UpStream										
DownStream	570	0.91	Level	2	0	C).990	1.00	6	33
Estimation of		Merge Areas			Estimati	ion	D	iverge Areas		
Estimation of	v ₁₂				Esumau		01 V ₁₂			
	V ₁₂ = V _F	(P _{FM})					V ₁₂ = \	/ _R + (V _F - V _R)P _{ED}	
L _{EQ} = (Equation 13-6 or 13-7)					L _{EO} =		(Equation 13-	12 or 13-1	3)
P _{FM} =	0.605	using Equa	tion (Exhibit 13-6)				Ĺ	Ising Equatio	n (Exhibit 13	-7)
V ₁₂ =	3283	pc/h			V ₁₂ =		p	oc/h	(,
V ₃ or V _{av34}	2141	pc/h (Equati	on 13-14 or 13-		V_3 or V_{av34}		ŗ	oc/h (Equation 1	3-14 or 13-1	7)
Is V ₂ or V ₂₁₂₄ > 2,70	0 pc/h? 🗌 Ye	s 🔽 No			Is V ₃ or V _{av3}	₃₄ > 2,	700 pc/h? 🗌	Yes No		
$I_{3} = \frac{1}{1000} V_{3} = 1$	V ₁₂ /2 √Ye	s 🗌 No			Is V_3 or V_{av3}	₃₄ > 1.	5 * V ₁₂ /2	Yes No		
If Yes,V _{12a} =	3283 18. or	pc/h (Equati 13-19)	on 13-16, 13-		lf Yes,V _{12a} =		р 13	oc/h (Equation 8-19)	n 13-16, 13	3-18, or
Capacity Che	cks				Capacity	y Ch	necks			
	Actual		Capacity	LOS F?			Actual	Cap	pacity	LOS F?
					V _F			Exhibit 13-8	3	
V _{EO}	6275	Exhibit 13-8		No	$V_{FO} = V_{F}$	- V _R		Exhibit 13-8	3	
					V _R			Exhibit 13-	-	
Elow Entering	n Merge In	fluence A	Irea	<u> </u>	Flow En	terii	na Diver	ae Influen		
	Actual	Max	Desirable	Violation?			Actual	Max Desi	rable	Violation?
V _{R12}	4134	Exhibit 13-8	4600:All	No	V ₁₂			Exhibit 13-8		
Level of Serv	ice Detern	nination (if not F)		Level of	Ser	vice De	terminatio	n (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 = 31.1 (pc/m	i/ln)				D _R = (p	oc/mi/	'ln)			
LOS = D (Exhibit	13-2)				LOS = (E	Exhibi	it 13-2)			
Speed Detern	Speed Determination Speed Determination									
M _S = 0.465 (Exit	oit 13-11)				D _s = (E	xhibit	13-12)			
S _R = 57.0 mph (Exhibit 13-11)				S _R = m	ph (Ex	hibit 13-12)			
$S_0= 64.1 \text{ mph} (Exhibit 13-11)$			S ₀ = mph (Exhibit 13-12)							
S = 59.2 mph (Exhibit 13-13)				S= m	ph (Ex	(hibit 13-13)			
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Appendix C

BASIC FREEWAY SEGMENTS WORKSHEET												
General Information			Site Information									
Analyst			Highway/Direction of Travel	1-95 SB	Pot M/P & EP On							
Agency or Company	AECOM		From/To	Seg 14-E Ramps	Set WB & EB On							
Date Performed Analysis Time Period	AM		Jurisdiction Analysis Year	EXISTIN	IG 2015/2016							
Project Description SW 10th	Street SIMR											
✓ Oper.(LOS)		Des.(N)	Planning Data									
Flow Inputs												
Volume, V AADT Peak-Hr Prop. of AADT, K	6040	veh/h veh/day	Peak-Hour Factor, PHF %Trucks and Buses, P _T %RVs, P _R	0.99 3 0								
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terrain: Grade % Length Up/Down %	Level mi								
Calculate Flow Adjustm	nents											
f _p	1.00		E _R	1.2								
E _T	1.5		$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.985								
Speed Inputs		Calc Speed Adj and FFS										
Lane Width		ft										
Rt-Side Lat. Clearance		ft	f _{LW}		mph							
Number of Lanes, N	3		f _{LC}		mph							
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph							
FFS (measured)	70.0	mph	FFS	70.0	mph							
Base free-flow Speed, BFFS		mph										
LOS and Performance I		Design (N)										
<u>Operational (LOS)</u> v _p = (V or DDHV) / (PHF x N x S D = v _p / S LOS	a f _{HV} x f _p) 2064 61.3 33.6 D	pc/h/ln mph pc/mi/ln	$\frac{\text{Design (N)}}{\text{Design LOS}}$ $v_p = (V \text{ or DDHV}) / (PHF x N x S)$ $D = v_p / S$ Required Number of Lanes, N	f _{HV} x f _p)	pc/h/ln mph pc/mi/ln							
Glossary			Factor Location									
N - Number of lanesS - SpeedV - Hourly volumeD - Densityvp - Flow rateFFS - Free-flow speedLOS - Level of serviceBFFS - Base free-flow speedDDHV - Directional design hour volume			$ E_{\rm R} - {\rm Exhibits \ 11-10, \ 11-12} \qquad \qquad f_{\rm LW} - {\rm Exhibit \ 11} \\ E_{\rm T} - {\rm Exhibits \ 11-10, \ 11-11, \ 11-13} \qquad \qquad f_{\rm LC} - {\rm Exhibit \ 11-10, \ 11-11, \ 11-13} \\ f_{\rm p} - {\rm Page \ 11-18} \qquad \qquad {\rm TRD \ - \ Page \ 11} \\ LOS, \ S, \ {\rm FFS, \ v_{\rm p}} - {\rm Exhibits \ 11-2, \ 11-3} \\ $									

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FREEWAY WEAVING WORKSHEET											
General Information					Site Information						
Analyst Agency/Company AECOM Date Performed Analysis Time Period PM				Freeway/Dir of Travel I-95 SB Weaving Segment Location Seg 15- Bet Sample & Copans Analysis Year EXISTING 2015/2016				le & Copans)16			
Project De	scription SW 10t	h Street SIMF	{								
Inputs					1						
Weaving configurationOne-SidedWeaving number of lanes, N4Weaving segment length, Ls1410ftFreeway free-flow speed, FFS70 mph				Segment type Freev Freeway minimum speed, S _{MIN} Freeway maximum capacity, C _{IFL} 24 Terrain type Le				Freeway 15 2400 Leve			
Conve	rsions to po	c/h Unde	r Base Co	ondition	S						
	V (veh/h)	PHF	Truck (%)	RV (%)	Ε _Τ	E _R	f _{HV}	fp	v (pc/h)		
V _{FF}	5370	0.95	3	0	1.5	1.2	0.985	1.00	5737		
V _{RF}	570	0.91	2	0	1.5	1.2	0.990	1.00	633		
V _{FR}	620	0.87	2	0	1.5	1.2	0.990	1.00	720		
V _{RR}	0	0.91	2	0	1.5	1.2	0.990	1.00	0		
V _{NW}	5737		-	-			-	V =	7090		
V _w	1353										
VR	0.191										
Config	uration Cha	aracterist	tics								
Minimum maneuver lanes, N _{WI} 2 Ic				Minimum weaving lane changes, LC _{MIN}				1353 lc/h			
Interchange density, ID			0.8 int/mi	Weaving lane changes, LC_w				1686 lc/h			
Minimum RF lane changes, LC _{RF}			1 lc/pc	Non-weaving lane changes, LC _{NW}				1176 lc/h			
Minimum FR lane changes, LC _{FR} 1 lc/pc				Total lane changes, LC _{ALL}				2862 lc/h			
Minimum RR lane changes, LC _{RR} Ic/pc				Non-weaving vehicle index, I _{NW}				647			
Weavir	ng Segmen	t Speed,	Density, I	Level of	Service,	and Cap	pacity				
Weaving segment flow rate, v 6992 veh/h				Weaving intensity factor, W 0.2				0.395			
Weaving segment capacity, c _w			8544 veh/h	Weaving seg	gment speed		52.2 mph				
Weaving segment v/c ratio 0.			0.818	Average weaving speed, S_w				54.4 mph			
Weaving segment density, D 33.			3.9 pc/mi/ln	Average non-weaving speed, $S_{_{\sf NW}}$				51.8 mph			
Level of Service, LOS			D	Maximum weaving length, L _{MAX}			4443 fi				
Notes											
a. Weaving Chapter 13	segments longer t	han the calcula	ited maximum le	ength should l	be treated as is	solated merge	and diverge are	eas using the	procedures of		

Dnapter 13, "Freeway Merge and Diverge Segments". b. For volumes that exceed the weaving segment capacity, the level of service is "F".

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