HCS7 Signalized Intersection Results Summary

		1100	n olg	nunzo	a m			1001	uits Sui	iiiiai j	y				
General Inform	nation								Intersec	tion Inf	ormatio	on	J.	4 7 4 1	be la
Agency									Duration		0.25			N N 262	
Analyst				Analys	is Da	te 7/24/2	2016		Area Typ		Other		-*		**
Jurisdiction		South Dakota		Time F					PHF		0.89		- → * * *	w‡e	2
Urban Street		Elk Vale		Analys			ean		Analysis	Period	1> 7:0	0			-:
Intersection		Interchange I-90		File Na			pook El		e and I-90						C
	tion	Interchange 1-90		File Na	ame		реак Ег	k vai	e and 1-90	SPULE	xisting i	iming	· .	1149	20
Project Descrip	tion														
Demand Inform	nation				EE	3		V	VB		NB			SB	
Approach Move	ement			L	Т	R	L		T R	L	Т	R	L	Т	R
Demand (v), v	/eh/h			83		0	378		0	365	160		42	200	
Signal Informa	ation	v	¥								l				_
Cycle, s	84.0	Reference Phase	2									>		-	\prec
Offset, s	0	Reference Point	End	Green	0.0	0.0	0.0	0.	0 0.0	0.0				5	<u>з</u> ~
Uncoordinated	No	Simult. Gap E/W	On	Yellow		0.0	0.0	0.		0.0					
Force Mode	Fixed	Simult. Gap N/S	On	Red	0.0	0.0	0.0	0.	0.0	0.0	5		6	7	8
Timer Results				EBL	-	EBT	WB		WBT	NBI	-	NBT	SBI		SBT
Assigned Phas	e				\rightarrow	4			8	5		2	1		6
Case Number					5.0				5.0	2.0		4.0	2.0		4.0
	Phase Duration, s				19.0				19.0	21.8		49.8	15.2		43.2
	Change Period,(Y+ <i>R</i> _c), s				\rightarrow	8.5			8.5	8.5		8.5	8.5		8.5
Max Allow Hea		· ·			0.0				0.0	0.0		0.0	0.0		0.0
Queue Clearan					\rightarrow	0.0			0.0	0.0		0.0	0.0		0.0
Green Extensio		(ge), s			\rightarrow	0.0			0.0	0.0		0.0	0.0		0.0
Phase Call Pro						0.00			0.00	0.00		0.00	0.00		0.00
Max Out Proba	bility					0.00			0.00	0.00)	0.00	0.00)	0.00
Movement Gro	oup Res	sults			EB			W	B		NB			SB	
Approach Move	-				T	R	L	Т		L	T	R	L	T	R
Assigned Move				7		14	3		18	5	2		1	6	1
Adjusted Flow), veh/h		0		0	0		0	0	0		0	0	<u> </u>
		ow Rate (s), veh/h/l	In	0		0	0		0	0	0		0	0	<u> </u>
Queue Service				0.0		0.0	0.0		0.0	0.0	0.0		0.0	0.0	1
		e Time (<i>g</i> _c), s		0.0		0.0	0.0		0.0	0.0	0.0		0.0	0.0	
Green Ratio (g		(3-7,5		0.12		0.12	0.12		0.12	0.16	0.49		0.08	0.41	<u> </u>
Capacity (c), v				545		175	575		175	508	1430		186	1171	
Volume-to-Cap		tio (X)		0.171		0.000	0.739		0.000	0.808	0.126		0.253	0.192	<u> </u>
· · ·	•	/In (50 th percentile))	23.1		0.000	118		0.000	103.2	24.1		14.6	38.1	
		eh/In (50 th percent		0.8		0.0	4.6		0.0	4.0	0.9		0.4	1.4	<u> </u>
		RQ) (50 th percent	-	0.06		0.00	0.29		0.00	0.34	0.00		0.05	0.00	
Uniform Delay				33.2		0.0	36.9	-	0.0	34.1	11.6		36.3	15.7	
Incremental De	, ,,			0.1		0.0	4.4		0.0	1.2	0.2		0.3	0.4	
Initial Queue D				0.0		0.0	0.0	-	0.0	0.0	0.0		0.0	0.0	
Control Delay (•		33.2		0.0	41.3		0.0	35.3	11.7		36.6	16.1	
Level of Service				C		0.0	D		0.0	D	B		D	B	
Approach Dela				33.2	,	С	41.3	3	D	28.1		С	19.7	1	B
Intersection De	-			00.2).9			20.			C		5
	.ay, 3/vC												J		
Multimodal Re	sults				EB			W	В		NB			SB	
Pedestrian LOS		/ LOS		3.0	1	С	3.0		C	2.8		С	2.8	1	С
						F			F	1.0		A	0.7		A
	cycle LOS Score / LOS														

Copyright © 2017 University of Florida, All Rights Reserved.

HCS7 Signalized Intersection Results Summary

	537 SIY	nanze		101300		.63(um	mary	y					
General Information							Inters	octic	on Infe	ormatio	n		l et state t	the Le	
Agency							Duratio			0.25	///		0.000	2	
Analyst		Analyz		e 7/24/2	016		Area T			Other				×.	
Jurisdiction South Dakota		Time F		PM P			PHF	ype		0.89			W.FE	2	
Urban Street Elk Vale				_	зак				oriod	1> 7:0	0				
	`	Analys					Analys					- FL		ć	
Intersection Interchange I-90)	File Na	ame	[1.PM	реак Еп	< vai	e and I-	90 5	PULE	xisting t	iming	-	14141	20 6	
Project Description													<u> </u>	r	
Demand Information			EB			V	VB			NB			SB		
Approach Movement		L	Т	R	L	T	T F	र	L	Т	R	L	Т	R	
Demand (v), veh/h		227		0	459		(C	461	349		25	200		
												ر میں اور	in a state		
Signal Information			5		1		~							_	
Cycle, s 80.0 Reference Phas	se 2		8	54	1		` E''				Y	T_		- C .	
Offset, s 0 Reference Poin	t End	Green	4.6	2.0	24.4	1	5.0 0.	0	0.0		1		3	<u> </u>	
Uncoordinated No Simult. Gap E/V	V On	Yellow		6.5	6.5	6.			0.0					\sim	
Force Mode Fixed Simult. Gap N/S	S On	Red	2.0	2.0	2.0	2.	0 0.	0	0.0		5	6	7	8	
Timer Results		EBL	-	EBT	WBL		WBT		NBL	-	NBT	SBL		SBT	
Assigned Phase				4			8		5		2	1		6	
Case Number				5.0			5.0		2.0		4.0	2.0		4.0	
Phase Duration, s			23.5	$ \rightarrow $		23.5				43.4	13.1		32.9		
Change Period, ($Y+Rc$), s				8.5			8.5	8.5			8.5	8.5		8.5	
Max Allow Headway (MAH), s				3.0			3.0		3.1		0.0 3.		3.1		
Queue Clearance Time (g s), s				7.7			13.7		14.3			2.7			
Green Extension Time (g_{e}), s				1.6			1.2		0.9		0.0	0.0		0.0	
Phase Call Probability				1.00			1.00		1.00			0.46	3		
Max Out Probability				0.01			0.15		0.05			0.00)		
Movement Group Results			EB			W	R			NB			SB		
Approach Movement		L	Т	R	L	Т	11		L	T	R	L	Т	R	
Assigned Movement		7		14	3	<u> </u>	18	_	5	2		1	6		
Adjusted Flow Rate (v), veh/h		255		0	516	<u> </u>	0	_	518	392		28	225	-	
Adjusted Saturation Flow Rate (s), veh	ı/h/ln	1548		1403	1639		140		1626	1608		1639	1595	-	
Queue Service Time (g_s) , s		5.7		0.0	11.7	<u> </u>	0.0		12.3	6.3		0.7	4.2		
Cycle Queue Clearance Time (g_c) , s		5.7		0.0	11.7		0.0		12.3	6.3		0.7	4.2		
Green Ratio (g/C)		0.19		0.19	0.19		0.1	_	0.19	0.44		0.06	0.30		
Capacity (<i>c</i>), veh/h		759		262	793		262		617	1403		190	971		
Volume-to-Capacity Ratio (<i>X</i>)		0.336		0.000	0.651		0.00		0.840	0.279		0.148	0.231		
Back of Queue (Q), ft/ln (50 th percen	tile)	55.8		0.000	116.7		0.00		124.7	55.9		6.5	39.8		
Back of Queue (Q), veh/ln (50 th perc	,	2.1		0.0	4.6		0.0		4.9	2.2		0.3	1.6		
Queue Storage Ratio (RQ) (50 th perc	,	0.14		0.00	0.29		0.0		0.42	0.00		0.02	0.00		
Uniform Delay (d_1), s/veh		28.7		0.0	31.2		0.0		31.2	14.5		35.8	20.8		
Incremental Delay (d_2), s/veh		0.1		0.0	0.4		0.0	_	3.3	0.5		0.1	0.6		
Initial Queue Delay (d_3), s/veh		0.0		0.0	0.0		0.0		0.0	0.0		0.0	0.0		
Control Delay (<i>d</i>), s/veh		28.8		0.0	31.6		0.0	_	34.5	15.0		35.9	21.4		
Level of Service (LOS)		20.0 C		0.0	C		0.0	-	C	B		D	C		
Approach Delay, s/veh / LOS		28.8	3	С	31.6	;	С	╈	26.1		С	23.0	L	С	
Intersection Delay, s/veh / LOS		20.0			7.5				20.1			C		<u> </u>	
				21	.0							С			
Multimodal Results			ED			W	R			NB			SB		
Multimodal Results			EB				D	- 10 March 10		110			00		
Multimodal Results Pedestrian LOS Score / LOS		3.0	1	С	3.0		C		2.8		С	2.8		С	

Copyright © 2017 University of Florida, All Rights Reserved.

	HCS7 Two-Way Sto	p-Control Report	
General Information		Site Information	
Analyst	TSF	Intersection	EB Off Right Turn / Elk V
Agency/Co.		Jurisdiction	
Date Performed	7/24/2016	East/West Street	EB I-90 Off Ramp Right
Analysis Year	2016	North/South Street	Elk Vale
Time Analyzed	AM Peak	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	I-90 Corridor Study		
Lanes			
	P 4 + 7 4	<u>ل يا ج</u>	



Venicie Volunies and Adj	astine															
Approach		Eastb	ound			West	oound			North	bound			South	bound	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Priority		10	11	12		7	8	9	10	1	2	3	4U	4	5	6
Number of Lanes		0	0	1		0	0	0	0	0	0	0	0	0	2	0
Configuration				R											Т	
Volume, V (veh/h)				480											576	
Percent Heavy Vehicles (%)				3												
Proportion Time Blocked				0.330											0.000	
Percent Grade (%)			D													
Right Turn Channelized		Y	es			Ν	lo			Ν	lo			١	٩o	
Median Type/Storage				Undi	vided											
Critical and Follow-up He	eadwa	ys														
Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																
Delay, Queue Length, and	d Leve	l of S	ervice	;												
Flow Rate, v (veh/h)				522												
Capacity, c (veh/h)				724												
v/c Ratio				0.72												
95% Queue Length, Q_{95} (veh)				6.2												
Control Delay (s/veh)				21.7												
Level of Service, LOS				С												
Approach Delay (s/veh)		23	L.7													
Approach LOS		(2													

	HCS7 Two-Wa	ay Stop-Control Report	
General Information		Site Information	
Analyst	TSF	Intersection	EB Off Right Turn / Elk V
Agency/Co.		Jurisdiction	
Date Performed	7/24/2016	East/West Street	EB I-90 Off Ramp Right
Analysis Year	2016	North/South Street	Elk Vale
Time Analyzed	PM Peak	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	I-90 Corridor Study		
Lanes			
		1 1 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	



venicie volumes and Au	Justine	1115															
Approach		Eastb	ound			West	oound			North	bound			South	bound		
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	0	1		0	0	0	0	0	0	0	0	0	2	0	
Configuration				R											Т		
Volume, V (veh/h)				549											659		
Percent Heavy Vehicles (%)				3													
Proportion Time Blocked				0.330											0.000		
Percent Grade (%)			0	°													
Right Turn Channelized		Y	es			Ν	lo			Ν	lo			١	١o		
Median Type/Storage				Undi	vided												
Critical and Follow-up H	eadwa	ys															
Base Critical Headway (sec)																	
Critical Headway (sec)																	
Base Follow-Up Headway (sec)																	
Follow-Up Headway (sec)																	
Delay, Queue Length, an	d Leve	l of S	ervice	;													
Flow Rate, v (veh/h)				597													
Capacity, c (veh/h)				724													
v/c Ratio				0.82													
95% Queue Length, Q ₉₅ (veh)				9.0													
Control Delay (s/veh)				28.8													
Level of Service, LOS				D													
Approach Delay (s/veh)		28.8									-						
Approach LOS	D																

	HCS7 Two-W	ay Stop-Control Report	
General Information		Site Information	
Analyst	TSF	Intersection	WB Off Right Turn / Elk V
Agency/Co.		Jurisdiction	
Date Performed	7/24/2016	East/West Street	WB I-90 Off Ramp Right
Analysis Year	2016	North/South Street	Elk Vale
Time Analyzed	AM Peak	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	I-90 Corridor Study		
Lanes			



venicle volumes and Ad					1	14/				NL	la a sal		1	C	1		
Approach		1	ound				oound				bound			1	bound		
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R	
Priority		10	11	12		7	8	9	10	1	2	3	4U	4	5	6	
Number of Lanes		0	0	0		0	0	1	0	0	2	0	0	0	0	0	
Configuration								R			Т						
Volume, V (veh/h)								111			243						
Percent Heavy Vehicles (%)								3									
Proportion Time Blocked																	
Percent Grade (%)						(0										
Right Turn Channelized		Ν	lo			Y	es			Ν	lo			Ν	10		
Median Type/Storage				Undi	vided												
Critical and Follow-up H	eadwa	ys															
Base Critical Headway (sec)																	
Critical Headway (sec)																	
Base Follow-Up Headway (sec)																	
Follow-Up Headway (sec)																	
Delay, Queue Length, an	d Leve	l of S	ervice	•													
Flow Rate, v (veh/h)								121									
Capacity, c (veh/h)								890									
v/c Ratio								0.14									
95% Queue Length, Q ₉₅ (veh)								0.5									
Control Delay (s/veh)								9.7									
Level of Service, LOS																	
Approach Delay (s/veh)	9.7																
Approach LOS	A																

Copyright © 2017 University of Florida. All Rights Reserved.

	HCS7 Two-	Way Stop-Control Report	
General Information		Site Information	
Analyst	TSF	Intersection	WB Off Right Turn / Elk V
Agency/Co.		Jurisdiction	
Date Performed	7/24/2016	East/West Street	WB I-90 Off Ramp Right
Analysis Year	2016	North/South Street	Elk Vale
Time Analyzed	PM Peak	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	I-90 Corridor Study		
Lanes			



Venicle Volumes and Ad	ustine	ints															
Approach		Eastb	ound			West	bound			North	bound			South	bound		
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	0	0		0	0	1	0	0	2	0	0	0	0	0	
Configuration								R			Т						
Volume, V (veh/h)								140			576						
Percent Heavy Vehicles (%)								3									
Proportion Time Blocked								0.120			0.000						
Percent Grade (%)						(0										
Right Turn Channelized		Ν	lo			Y	es			Ν	10			Ν	lo		
Median Type/Storage				Undi	vided												
Critical and Follow-up H	eadwa	ys															
Base Critical Headway (sec)																	
Critical Headway (sec)																	
Base Follow-Up Headway (sec)																	
Follow-Up Headway (sec)																	
Delay, Queue Length, an	d Leve	l of S	ervice														
Flow Rate, v (veh/h)								152									
Capacity, c (veh/h)								951									
v/c Ratio								0.16									
95% Queue Length, Q ₉₅ (veh)								0.6									
Control Delay (s/veh)								9.5									
Level of Service, LOS		A															
Approach Delay (s/veh)		-		9.5							-						
Approach LOS		А															

Copyright $\ensuremath{\mathbb{C}}$ 2017 University of Florida. All Rights Reserved.

	HCS7 Two-Way	Stop-Control Report	
General Information		Site Information	
Analyst		Intersection	Elk Vale Rd & Mall Dr
Agency/Co.		Jurisdiction	
Date Performed	6/24/2016	East/West Street	Mall Dr
Analysis Year	2016	North/South Street	Elk Vale Rd
Time Analyzed	AM Peak	Peak Hour Factor	0.84
Intersection Orientation	North-South	Analysis Time Period (hrs)	1.00
Project Description	I-90 Corridor Study		·
lanac			



Major Street

					-) -											
Vehicle Volumes and Ad	justme	ents														
Approach		Eastb	ound			West	oound			North	bound			South	bound	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		1	1	0		1	1	0	0	1	2	0	0	1	1	0
Configuration		L		TR		L		TR		L	Т	TR		L		TR
Volume, V (veh/h)		8	1	74		6	2	1		119	121	18		2	202	11
Percent Heavy Vehicles (%)		0	0	12		100	100	0		4				0		
Proportion Time Blocked																
Percent Grade (%)			0				0									
Right Turn Channelized		Ν	10			Ν	lo			Ν	lo		No			
Median Type/Storage		Undivided														
Critical and Follow-up H	eadwa	ys														
Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																
Delay, Queue Length, an	d Leve	l of S	ervice	•												
Flow Rate, v (veh/h)		10		89		7		3		142				2		
Capacity, c (veh/h)		348		749		142		263		1295				1426		
v/c Ratio		0.03		0.12		0.05		0.01		0.11				0.00		
95% Queue Length, Q ₉₅ (veh)		0.1		0.4		0.2		0.0		0.4				0.0		
Control Delay (s/veh)		15.6		10.5		31.6		18.8		8.1				7.5		
Level of Service, LOS		С		В	3 D C			A				A				
Approach Delay (s/veh)	11.0 27.8								3.8 0.1							
Approach LOS	B D					C										

Copyright $\ensuremath{\mathbb{C}}$ 2017 University of Florida. All Rights Reserved.

HCS7™ TWSC Version 7.3

2.Elk Vale and Mall AM Peak.xtw

	HCS7 Two-Way	/ Stop-Control Report	
General Information		Site Information	
Analyst		Intersection	Elk Vale Rd & Mall Dr
Agency/Co.		Jurisdiction	
Date Performed	6/24/2016	East/West Street	Mall Dr
Analysis Year	2016	North/South Street	Elk Vale Rd
Time Analyzed	PM Peak	Peak Hour Factor	0.71
Intersection Orientation	North-South	Analysis Time Period (hrs)	1.00
Project Description	I-90 Corridor Study		
Lanas	· · · ·		



Major Street: North-South

		inajor street north south														
Vehicle Volumes and Ad	justme	ents														
Approach		Eastb	ound			West	bound			North	bound			South	bound	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		1	1	0		1	1	0	0	1	2	0	0	1	1	0
Configuration		L		TR		L		TR		L	Т	TR		L		TR
Volume, V (veh/h)		50	1	224		4	2	4		159	422	18		2	225	31
Percent Heavy Vehicles (%)		2	0	2		11	0	100		5				0		
Proportion Time Blocked																
Percent Grade (%)		(0			(C									
Right Turn Channelized		No No								Ν	lo			Ν	10	
Median Type/Storage		Undivided														
Critical and Follow-up H	eadwa	ys														
Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																
Delay, Queue Length, an	d Leve	l of S	ervice													
Flow Rate, v (veh/h)	Τ	70		316		6		9		224				3		
Capacity, c (veh/h)		139		690		33		225		1173				971		
v/c Ratio		0.50		0.46		0.18		0.04		0.19				0.00		
95% Queue Length, Q ₉₅ (veh)		2.8		2.5		0.6		0.1		0.7				0.0		
Control Delay (s/veh)		56.3		14.6		140.3		21.6		8.8				8.7		
Level of Service, LOS	F B					F C			A					A		
Approach Delay (s/veh)	22.2 69.1						2.3				0.1					
Approach LOS	С					I	F									

Copyright $\ensuremath{\mathbb{C}}$ 2017 University of Florida. All Rights Reserved.

	HCS7 Two-Way	Stop-Control Report	
General Information		Site Information	
Analyst		Intersection	I-90 Service Rd & W Gate
Agency/Co.		Jurisdiction	
Date Performed	6/24/2016	East/West Street	I-90 Service Rd
Analysis Year	2016	North/South Street	W Gate Rd
Time Analyzed	AM Peak	Peak Hour Factor	0.84
Intersection Orientation	North-South	Analysis Time Period (hrs)	1.00
Project Description	I-90 Corridor Study		
Lanas	· · ·		



Major Street: North-South

Vehicle Volumes and Ad	justme	nts																
Approach		Eastb	ound			West	oound			North	bound			South	bound			
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R		
Priority		10	11	12		7	8	9	10	1	2	3	4U	4	5	6		
Number of Lanes		0	1	0		0	0	0	0	1	1	0	0	0	1	0		
Configuration			LR							L	Т					TR		
Volume, V (veh/h)		4		4						20	59				298	23		
Percent Heavy Vehicles (%)		0		0						0								
Proportion Time Blocked																		
Percent Grade (%)		0																
Right Turn Channelized		No No									No No							
Median Type/Storage				Undi	vided													
Critical and Follow-up H	eadwa	ys																
Base Critical Headway (sec)																		
Critical Headway (sec)																		
Base Follow-Up Headway (sec)																		
Follow-Up Headway (sec)																		
Delay, Queue Length, an	d Leve	l of S	ervice															
Flow Rate, v (veh/h)			10							24								
Capacity, c (veh/h)			598							1188								
v/c Ratio			0.02							0.02								
95% Queue Length, Q ₉₅ (veh)			0.1							0.1								
Control Delay (s/veh)			11.1							8.1								
Level of Service, LOS			В						A									
Approach Delay (s/veh)	11.1						-		2	.1	-							
Approach LOS		В																

	Site Information	
	Intersection	
	Intersection	I-90 Service Rd & W Gate
	Jurisdiction	
)16	East/West Street	I-90 Service Rd
	North/South Street	W Gate Rd
k	Peak Hour Factor	0.83
South	Analysis Time Period (hrs)	1.00
rridor Study		
5	outh	k Peak Hour Factor outh Analysis Time Period (hrs)



Vehicle Volumes and Ad	justme	nts																
Approach	Τ	Eastk	ound			West	oound			North	bound			South	bound			
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R		
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6		
Number of Lanes		0	1	0		0	0	0	0	1	1	0	0	0	1	0		
Configuration			LR							L	Т					TR		
Volume, V (veh/h)		7		3						7	235				112	8		
Percent Heavy Vehicles (%)		0		0						0								
Proportion Time Blocked																		
Percent Grade (%)			0															
Right Turn Channelized		No No									lo			١	١o			
Median Type/Storage		Undivided																
Critical and Follow-up H	eadwa	ys																
Base Critical Headway (sec)																		
Critical Headway (sec)																		
Base Follow-Up Headway (sec)																		
Follow-Up Headway (sec)																		
Delay, Queue Length, an	d Leve	l of S	ervice															
Flow Rate, v (veh/h)			12							8								
Capacity, c (veh/h)			657							1450								
v/c Ratio			0.02							0.01								
95% Queue Length, Q ₉₅ (veh)			0.1							0.0								
Control Delay (s/veh)			10.6							7.5								
Level of Service, LOS			В							A								
Approach Delay (s/veh)		10.6								0.2								
Approach LOS			В															

	HCS7 Two-Way S	top-Control Report	
General Information		Site Information	
Analyst		Intersection	West Gate & Bluebird
Agency/Co.		Jurisdiction	
Date Performed	6/24/2016	East/West Street	Bluebird Dr
Analysis Year	2016	North/South Street	West Gate
Time Analyzed	AM Peak	Peak Hour Factor	0.79
Intersection Orientation	North-South	Analysis Time Period (hrs)	1.00
Project Description	I-90 Corridor Study		
Lanas			



Major Street: North-South

Vehicle Volumes and Adj	ustme	nts															
Approach		Eastb	ound			West	oound			North	bound			South	bound		
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		1	0	1		0	1	0	0	0	1	0	0	0	1	0	
Configuration		L		R			LTR				LTR				LTR		
Volume, V (veh/h)		1		32		160	1	0		6	27	20		4	112	1	
Percent Heavy Vehicles (%)		0		6		3	100	3		0				25			
Proportion Time Blocked																	
Percent Grade (%)		0 0															
Right Turn Channelized		No No								Ν	lo			Ν	lo		
Median Type/Storage		Undivided															
Critical and Follow-up He	eadwa	ys															
Base Critical Headway (sec)																	
Critical Headway (sec)																	
Base Follow-Up Headway (sec)																	
Follow-Up Headway (sec)																	
Delay, Queue Length, and	d Leve	l of S	ervice														
Flow Rate, v (veh/h)		1		41			204			8				5			
Capacity, c (veh/h)		738		896			677			1452				1407			
v/c Ratio		0.00		0.05			0.30			0.01				0.00			
95% Queue Length, Q ₉₅ (veh)		0.0		0.1			1.3			0.0				0.0			
Control Delay (s/veh)		9.9		9.2			12.6			7.5				7.6			
Level of Service, LOS		Α		А			В		A					A			
Approach Delay (s/veh)	9.2				12.6			0.9				0.3					
Approach LOS		A				В											

Copyright $\ensuremath{\mathbb{C}}$ 2017 University of Florida. All Rights Reserved.

	HCS7 Two-Wa	ay Stop-Control Report	
General Information		Site Information	
Analyst		Intersection	West Gate & Bluebird
Agency/Co.		Jurisdiction	
Date Performed	6/24/2016	East/West Street	Bluebird Dr
Analysis Year	2016	North/South Street	West Gate
Time Analyzed	PM Peak	Peak Hour Factor	0.86
Intersection Orientation	North-South	Analysis Time Period (hrs)	1.00
Project Description	I-90 Corridor Study	·	•



Vehicle Volumes and Adjustments

venicie volumes and Au	ustine	iiis														
Approach		Eastb	ound			West	oound			North	bound			South	bound	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		1	0	1		0	1	0	0	0	1	0	0	0	1	0
Configuration		L		R			LTR				LTR				LTR	
Volume, V (veh/h)		3		10		58	0	1		22	100	125		3	59	0
Percent Heavy Vehicles (%)		0		0		2	0	0		0				0		
Proportion Time Blocked																
Percent Grade (%)		()	°			0									
Right Turn Channelized		No No									lo			Ν	lo	
Median Type/Storage		Undivided														
Critical and Follow-up H	eadwa	ys														
Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																
Delay, Queue Length, an	d Leve	l of S	ervice	•												
Flow Rate, v (veh/h)		3		12			68			26				3		
Capacity, c (veh/h)		629		1000			615			1545				1315		
v/c Ratio		0.00		0.01			0.11			0.02				0.00		
95% Queue Length, Q ₉₅ (veh)		0.0		0.0			0.4			0.1				0.0		
Control Delay (s/veh)		10.8		8.6			11.6			7.4				7.7		
Level of Service, LOS	B A						В			А				A		
Approach Delay (s/veh)		9	9.1 11.6					0.8				0.3				
Approach LOS		1	4				В									

Copyright $\ensuremath{\mathbb{C}}$ 2017 University of Florida. All Rights Reserved.

HCS7 Two-Way	Stop-Control Report	
	Site Information	
	Intersection	Liberty and I-90 N Ramp
	Jurisdiction	
6/27/2016	East/West Street	I-90 Ramp
2016	North/South Street	Liberty
AM Peak	Peak Hour Factor	0.84
North-South	Analysis Time Period (hrs)	1.00
I-90 Corridor Study		
	6/27/2016 2016 AM Peak North-South	Intersection Intersection Jurisdiction 6/27/2016 East/West Street 2016 AM Peak Peak Hour Factor North-South Analysis Time Period (hrs)



Major Street: North-South

Vehicle Volumes and Ad	justme	ents															
Approach		Eastb	ound			West	bound			North	bound			South	bound		
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	0	0		1	0	1	0	1	2	0	0	0	1	1	
Configuration						L		R		L	Т				Т	R	
Volume, V (veh/h)						3		29		114	444				57	306	
Percent Heavy Vehicles (%)						0		31		4							
Proportion Time Blocked																	
Percent Grade (%)							0										
Right Turn Channelized		No No								Ν	lo			1	10		
Median Type/Storage		Undivided															
Critical and Follow-up H	eadwa	ys															
Base Critical Headway (sec)																	
Critical Headway (sec)																	
Base Follow-Up Headway (sec)																	
Follow-Up Headway (sec)																	
Delay, Queue Length, an	d Leve	l of S	ervice	•													
Flow Rate, v (veh/h)						4		35		136							
Capacity, c (veh/h)						226		654		1110							
v/c Ratio						0.02		0.05		0.12							
95% Queue Length, Q ₉₅ (veh)						0.1		0.2		0.4							
Control Delay (s/veh)						21.2		10.8		8.7							
Level of Service, LOS					C B				A								
Approach Delay (s/veh)					11.9			1.8									
Approach LOS						В											

Copyright $\ensuremath{\mathbb{C}}$ 2017 University of Florida. All Rights Reserved.

	HCS7 Two-Way	Stop-Control Report	
General Information		Site Information	
Analyst		Intersection	Liberty and I-90 N Ramp
Agency/Co.		Jurisdiction	
Date Performed	6/27/2016	East/West Street	I-90 Ramp
Analysis Year	2016	North/South Street	Liberty
Time Analyzed	PM Peak	Peak Hour Factor	0.95
Intersection Orientation	North-South	Analysis Time Period (hrs)	1.00
Project Description	I-90 Corridor Study		
Lamaa			



Major Street: North-South

Vehicle Volumes and Ad	justme	ents														
Approach		Eastb	ound			West	bound			North	bound			South	bound	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		1	0	1	0	1	2	0	0	0	1	1
Configuration						L		R		L	Т				Т	R
Volume, V (veh/h)						8		39		44	242				55	370
Percent Heavy Vehicles (%)						38		46		7						
Proportion Time Blocked																
Percent Grade (%)				°		()									
Right Turn Channelized		Ν	10			N	lo			Ν	lo			٩	10	
Median Type/Storage				Undi	vided											
Critical and Follow-up H	eadwa	ys														
Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																
Delay, Queue Length, an	d Leve	l of S	ervice	•												
Flow Rate, v (veh/h)						8		41		46						
Capacity, c (veh/h)						357		775		1075						
v/c Ratio						0.02		0.05		0.04						
95% Queue Length, Q ₉₅ (veh)						0.1		0.2		0.1						
Control Delay (s/veh)						15.3		9.9		8.5						
Level of Service, LOS						С		A		A						
Approach Delay (s/veh)						10.8			1.3							
Approach LOS						I	3									

Copyright © 2017 University of Florida. All Rights Reserved.

	HCS7 Two-Wa	y Stop-Control Report	
General Information		Site Information	
Analyst		Intersection	Liberty & I90 EB On Ramp
Agency/Co.		Jurisdiction	
Date Performed	6/27/2016	East/West Street	I90 EB On Ramp
Analysis Year	2016	North/South Street	Liberty
Time Analyzed	AM Peak	Peak Hour Factor	0.74
Intersection Orientation	North-South	Analysis Time Period (hrs)	1.00
Project Description	I-90 Corridor Study	·	



Major Street: North-South

Vehicle Volumes and Ad	justme	ents														
Approach		Eastb	ound			West	bound			North	bound			South	bound	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Priority		10	11	12		7	8	9	10	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	0	0	0	0	1	0	0	1	2	0
Configuration												TR		L	Т	
Volume, V (veh/h)											248	6		36	35	
Percent Heavy Vehicles (%)														42		
Proportion Time Blocked																
Percent Grade (%)																
Right Turn Channelized		Ν	10			Ν	lo			Ν	10			Ν	lo	
Median Type/Storage				Undi	vided											
Critical and Follow-up H	eadwa	ys														
Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																
Delay, Queue Length, an	d Leve	l of S	ervice	•												
Flow Rate, v (veh/h)														49		
Capacity, c (veh/h)														970		
v/c Ratio														0.05		
95% Queue Length, Q ₉₅ (veh)														0.2		
Control Delay (s/veh)														8.9		
Level of Service, LOS														A		
Approach Delay (s/veh)														4	.5	
Approach LOS																

	HCS7 Two-Wa	y Stop-Control Report	
General Information		Site Information	
Analyst		Intersection	Liberty & I90 EB On Ramp
Agency/Co.		Jurisdiction	
Date Performed	6/27/2016	East/West Street	I90 EB On Ramp
Analysis Year	2016	North/South Street	Liberty
Time Analyzed	PM Peak	Peak Hour Factor	0.87
Intersection Orientation	North-South	Analysis Time Period (hrs)	1.00
Project Description	I-90 Corridor Study	· · · · · · · · · · · · · · · · · · ·	



Major Street: North-South

Approach	T	Facth	ound			W/octl	oound			North	bound			South	bound		
	-	1															
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R	
Priority		10	11	12		7	8	9	10	1	2	3	4U	4	5	6	
Number of Lanes		0	0	0		0	0	0	0	0	1	0	0	1	2	0	
Configuration												TR		L	Т		
Volume, V (veh/h)											85	5		19	100		
Percent Heavy Vehicles (%)														26			
Proportion Time Blocked																	
Percent Grade (%)																	
Right Turn Channelized		Ν	10			Ν	lo			Ν	lo			Ν	10		
Median Type/Storage				Undi	vided												
Critical and Follow-up H	eadwa	ys															
Base Critical Headway (sec)																	
Critical Headway (sec)																	
Base Follow-Up Headway (sec)																	
Follow-Up Headway (sec)																	
Delay, Queue Length, an	d Leve	l of S	ervice														
Flow Rate, v (veh/h)														22			
Capacity, c (veh/h)														1327			
v/c Ratio														0.02			
95% Queue Length, Q ₉₅ (veh)														0.1			
Control Delay (s/veh)														7.8			
Level of Service, LOS														A			
Approach Delay (s/veh)													1.2				
Approach LOS	1																

	HCS7 Two-Wa	y Stop-Control Report	
General Information		Site Information	
Analyst		Intersection	Liberty & I90 EB On Ramp
Agency/Co.		Jurisdiction	
Date Performed	6/27/2016	East/West Street	I90 EB On Ramp
Analysis Year	2016	North/South Street	Liberty
Time Analyzed	AM Peak	Peak Hour Factor	0.74
Intersection Orientation	North-South	Analysis Time Period (hrs)	1.00
Project Description	I-90 Corridor Study	·	



Major Street: North-South

Vehicle Volumes and Ad	justme	ents														
Approach		Eastb	ound			West	bound			North	bound			South	bound	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Priority		10	11	12		7	8	9	10	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	0	0	0	0	1	0	0	1	2	0
Configuration												TR		L	Т	
Volume, V (veh/h)											248	6		36	35	
Percent Heavy Vehicles (%)														42		
Proportion Time Blocked																
Percent Grade (%)																
Right Turn Channelized		Ν	10			Ν	lo			Ν	10			Ν	lo	
Median Type/Storage				Undi	vided											
Critical and Follow-up H	eadwa	ys														
Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																
Delay, Queue Length, an	d Leve	l of S	ervice	•												
Flow Rate, v (veh/h)														49		
Capacity, c (veh/h)														970		
v/c Ratio														0.05		
95% Queue Length, Q ₉₅ (veh)														0.2		
Control Delay (s/veh)														8.9		
Level of Service, LOS														A		
Approach Delay (s/veh)														4	.5	
Approach LOS																

	HCS7 Two-W	ay Stop-Control Report	
General Information		Site Information	
Analyst		Intersection	Ellsworth and W 1416
Agency/Co.		Jurisdiction	
Date Performed	6/27/2016	East/West Street	1416 W
Analysis Year	2016	North/South Street	Ellsworth
Time Analyzed	AM Peak	Peak Hour Factor	0.87
Intersection Orientation	North-South	Analysis Time Period (hrs)	1.00
Project Description	I-90 Corridor Study		



Major Street: North-South

Vehicle Volumes and Ad	justme	ents														
Approach		Eastb	ound			West	bound			North	bound			South	bound	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	2	0	0	0	0	0	0	0	1	0
Configuration		LT				LT		TR								TR
Volume, V (veh/h)		582	82			0	32	10							28	144
Percent Heavy Vehicles (%)		2	1			3	6	50								
Proportion Time Blocked																
Percent Grade (%)		(0			(C									
Right Turn Channelized		Ν	lo			Ν	lo			Ν	lo			١	lo	
Median Type/Storage				Undi	vided											
Critical and Follow-up H	eadwa	ys														
Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																
Delay, Queue Length, an	d Leve	l of S	ervice													
Flow Rate, v (veh/h)		763				19		30								
Capacity, c (veh/h)		984				691		772								
v/c Ratio		0.78				0.03		0.04								
95% Queue Length, Q ₉₅ (veh)		9.5				0.1		0.1								
Control Delay (s/veh)		20.9				10.4		9.8								
Level of Service, LOS		С				В		A								
Approach Delay (s/veh)		20).9			1().3									
Approach LOS		(C			I	3									

Copyright $\ensuremath{\mathbb{C}}$ 2017 University of Florida. All Rights Reserved.

HCS7[™] TWSC Version 7.3 8.1416W and Ellsworth AM Peak.xtw

	HCS7 Two-W	ay Stop-Control Report	
General Information		Site Information	
Analyst		Intersection	Ellsworth and W 1416
Agency/Co.		Jurisdiction	
Date Performed	6/27/2016	East/West Street	1416 W
Analysis Year	2016	North/South Street	Ellsworth
Time Analyzed	PM Peak	Peak Hour Factor	0.98
Intersection Orientation	North-South	Analysis Time Period (hrs)	1.00
Project Description	I-90 Corridor Study		



Major Street: North-South

Vehicle Volumes and Ad	justme	ents														
Approach		Eastb	ound			West	bound			North	bound			South	bound	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	2	0	0	0	0	0	0	0	1	0
Configuration		LT				LT		TR								TR
Volume, V (veh/h)		256	65			2	40	7							86	259
Percent Heavy Vehicles (%)		3	0			0	10	14								
Proportion Time Blocked																
Percent Grade (%)		())									
Right Turn Channelized		Ν	lo			Ν	lo			Ν	10			٩	10	
Median Type/Storage				Undi	vided											
Critical and Follow-up H	eadwa	ys														
Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																
Delay, Queue Length, an	d Leve	l of S	ervice	•												
Flow Rate, v (veh/h)		327				23		28								
Capacity, c (veh/h)		927				571		636								
v/c Ratio		0.35				0.04		0.04								
95% Queue Length, Q ₉₅ (veh)		1.6				0.1		0.1								
Control Delay (s/veh)		11.0				11.6		10.9								
Level of Service, LOS		В				В		В								
Approach Delay (s/veh)		11	L.O			11	L.5									
Approach LOS			3				3									

Copyright © 2017 University of Florida. All Rights Reserved.

HCS7[™] TWSC Version 7.3 8.1416W and Ellsworth PM Peak.xtw

HCS7 Two-V	Vay Stop-Control Report	
	Site Information	
	Intersection	Ellsworth and 1416 E
	Jurisdiction	
6/27/2016	East/West Street	1416 E
2016	North/South Street	Ellsworth
AM Peak	Peak Hour Factor	0.87
East-West	Analysis Time Period (hrs)	1.00
I-90 Corridor Study		
	 6/27/2016 2016 AM Peak East-West 	Intersection Intersection Jurisdiction 6/27/2016 East/West Street 2016 AM Peak Peak Hour Factor East-West Analysis Time Period (hrs)



Vehicle Volumes and Adjustments

Vehicle Volumes and Ad	justme	ents															
Approach		Eastb	ound			West	oound			North	bound		Southbound				
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R	
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12	
Number of Lanes	0	0	2	0	0	0	0	0		0	1	0		0	1	0	
Configuration		LT		TR								TR		LT			
Volume, V (veh/h)		493 95 15									171	12		2	26		
Percent Heavy Vehicles (%)		2									2	0		50	0		
Proportion Time Blocked																	
Percent Grade (%)											0				0		
Right Turn Channelized		Ν	lo			Ν	lo			Ν	lo			Ν	lo		
Median Type/Storage				Undi	vided												
Critical and Follow-up H	eadwa	ys															
Base Critical Headway (sec)																	
Critical Headway (sec)																	
Base Follow-Up Headway (sec)																	
Follow-Up Headway (sec)																	
Delay, Queue Length, an	d Leve	l of S	ervice	•													
Flow Rate, v (veh/h)		567										211		32			
Capacity, c (veh/h)		1622										113		101			
v/c Ratio		0.35										1.86		0.32			
95% Queue Length, Q ₉₅ (veh)		1.6										54.6		1.3			
Control Delay (s/veh)		8.4										1653.6		57.2			
Level of Service, LOS	A										F		F				
Approach Delay (s/veh)		6	.9	-						1653.6				57.2			
Approach LOS										F		F					

	HCS7 Two-Way	Stop-Control Report	
General Information		Site Information	
Analyst		Intersection	Ellsworth and 1416 E
Agency/Co.		Jurisdiction	
Date Performed	6/27/2016	East/West Street	1416 E
Analysis Year	2016	North/South Street	Ellsworth
Time Analyzed	PM Peak	Peak Hour Factor	0.98
Intersection Orientation	East-West	Analysis Time Period (hrs)	1.00
Project Description	I-90 Corridor Study		-
Lanes			



Venicle Volumes and Ad	Justine	1115															
Approach		Eastb	ound			West	oound			North	bound		Southbound				
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R	
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12	
Number of Lanes	0	0	2	0	0	0	0	0		0	1	0		0	1	0	
Configuration		LT		TR								TR		LT			
Volume, V (veh/h)		221	87	124							100	10		10	78		
Percent Heavy Vehicles (%)		3									2	0		0	1		
Proportion Time Blocked																	
Percent Grade (%)											0			(D		
Right Turn Channelized		N	lo			Ν	lo			Ν	lo			Ν	lo		
Median Type/Storage				Undi	vided												
Critical and Follow-up H	eadwa	ys															
Base Critical Headway (sec)																	
Critical Headway (sec)																	
Base Follow-Up Headway (sec)																	
Follow-Up Headway (sec)																	
Delay, Queue Length, an	d Leve	l of S	ervice	•													
Flow Rate, v (veh/h)		226										112		90			
Capacity, c (veh/h)		1614										365		323			
v/c Ratio		0.14										0.31		0.28			
95% Queue Length, Q ₉₅ (veh)		0.5										1.3		1.1			
Control Delay (s/veh)		7.6										19.2		20.4			
Level of Service, LOS		A									С		С				
Approach Delay (s/veh)		3	.9						19.2				20.4				
Approach LOS									С				С				

Copyright $\ensuremath{\mathbb{C}}$ 2017 University of Florida. All Rights Reserved.

HCS7[™] TWSC Version 7.3 8.Ellsworth and 1416 E PM Peak.xtw

	HCS7 Two-	Way Stop-Control Report	
General Information		Site Information	
Analyst		Intersection	Commercial Gate & 1416 W
Agency/Co.		Jurisdiction	
Date Performed	6/27/2016	East/West Street	1416 W
Analysis Year	2016	North/South Street	Commercial Gate
Time Analyzed	AM Peak	Peak Hour Factor	0.91
Intersection Orientation	North-South	Analysis Time Period (hrs)	1.00
Project Description	I-90 Corridor Study		
Lanes			



Venicle Volumes and Ad	Justine	1113															
Approach		Eastb	ound			West	bound			North	bound		Southbound				
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		1	1	0		0	2	0	0	0	1	0	0	0	0	0	
Configuration		L	Т			LT		TR		LT							
Volume, V (veh/h)		12	101			1	253	3		0	248						
Percent Heavy Vehicles (%)		17	5			0	4	67		0							
Proportion Time Blocked																	
Percent Grade (%)		(D				0										
Right Turn Channelized		Ν	lo			Ν	lo			Ν	lo			١	١o		
Median Type/Storage				Undi	vided												
Critical and Follow-up H	eadwa	ys															
Base Critical Headway (sec)																	
Critical Headway (sec)																	
Base Follow-Up Headway (sec)																	
Follow-Up Headway (sec)																	
Delay, Queue Length, an	d Leve	l of S	ervice	ı													
Flow Rate, v (veh/h)		13	111			140		142		0							
Capacity, c (veh/h)		524	630			632		630		1636							
v/c Ratio		0.02	0.18			0.22		0.23		0.00							
95% Queue Length, Q ₉₅ (veh)		0.1	0.6			0.9		0.9		0.0							
Control Delay (s/veh)		12.1	11.9			12.3		12.4		7.2							
Level of Service, LOS		В	В			В		В		A							
Approach Delay (s/veh)		. 12	2.0		12.4				0.0								
Approach LOS		i	В			I	В										

Copyright $\ensuremath{\mathbb{C}}$ 2017 University of Florida. All Rights Reserved.

HCS7™ TWSC Version 7.3

	HCS7 Two-Way Sto	p-Control Report	
General Information		Site Information	
Analyst		Intersection	Commercial Gate & 1416 W
Agency/Co.		Jurisdiction	
Date Performed	6/27/2016	East/West Street	1416 W
Analysis Year	2016	North/South Street	Commercial Gate
Time Analyzed	PM Peak	Peak Hour Factor	0.90
Intersection Orientation	North-South	Analysis Time Period (hrs)	1.00
Project Description	I-90 Corridor Study		
Lanes			



Venicie Volumes una Aaj	astine																	
Approach		Eastb	ound			West	oound			North	bound		Southbound					
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R		
Priority		10	11	12		7	8	9	10	1	2	3	4U	4	5	6		
Number of Lanes		1	1	0		0	2	0	0	0	1	0	0	0	0	0		
Configuration		L	Т			LT		TR		LT								
Volume, V (veh/h)		0	343			0	352	4		0	80							
Percent Heavy Vehicles (%)		17	0			0	2	0		0								
Proportion Time Blocked																		
Percent Grade (%)		(D			(C											
Right Turn Channelized		Ν	lo			N	lo			Ν	lo			1	١o			
Median Type/Storage				Undi	vided													
Critical and Follow-up He	eadwa	ys																
Base Critical Headway (sec)																		
Critical Headway (sec)																		
Base Follow-Up Headway (sec)																		
Follow-Up Headway (sec)																		
Delay, Queue Length, an	d Leve	l of S	ervice															
Flow Rate, v (veh/h)		0	381			196		200		0								
Capacity, c (veh/h)		638	805			801		804		1636								
v/c Ratio		0.00	0.47			0.24		0.25		0.00								
95% Queue Length, Q ₉₅ (veh)		0.0	2.7			1.0		1.0		0.0								
Control Delay (s/veh)		10.6	13.5			10.9		11.0		7.2								
Level of Service, LOS		В	В			В		В		A								
Approach Delay (s/veh)		13	3.5		11.0				0.0									
Approach LOS			В				3											

Copyright $\ensuremath{\mathbb{C}}$ 2017 University of Florida. All Rights Reserved.

	HCS7 Two-V	Way Stop-Control Report	
General Information		Site Information	
Analyst		Intersection	Radar Hill & 1416 E
Agency/Co.		Jurisdiction	
Date Performed	6/27/2016	East/West Street	1416 East
Analysis Year	2016	North/South Street	Radar Hill Rd
Time Analyzed	AM Peak	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	1.00
Project Description	I-90 Corridor Study		
Lanes			



Venicie Volumes and Ad	Jastine																
Approach		Eastb	ound			West	oound			North	bound		Southbound				
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R	
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12	
Number of Lanes	0	0	2	0	0	0	0	0		0	1	0		0	1	0	
Configuration		LT		TR								TR		LT			
Volume, V (veh/h)		4	638	33							151	268		4	60		
Percent Heavy Vehicles (%)		0									2	4		0	7		
Proportion Time Blocked																	
Percent Grade (%)											D			(D		
Right Turn Channelized		Ν	lo			Ν	lo			Ν	lo			Ν	lo		
Median Type/Storage				Undi	vided												
Critical and Follow-up H	eadwa	ys															
Base Critical Headway (sec)																	
Critical Headway (sec)																	
Base Follow-Up Headway (sec)																	
Follow-Up Headway (sec)																	
Delay, Queue Length, an	d Leve	l of S	ervice														
Flow Rate, v (veh/h)		4										455		69			
Capacity, c (veh/h)		1636										489		340			
v/c Ratio		0.00										0.93		0.20			
95% Queue Length, Q ₉₅ (veh)		0.0										19.0		0.8			
Control Delay (s/veh)		7.2										77.3		18.3			
Level of Service, LOS		A								F		С					
Approach Delay (s/veh)		0	.1						77.3				18.3				
Approach LOS									F					(С		

Copyright $\ensuremath{\mathbb{C}}$ 2017 University of Florida. All Rights Reserved.

	HCS7 Two-V	Vay Stop-Control Report	
General Information		Site Information	
Analyst		Intersection	Radar Hill & 1416 E
Agency/Co.		Jurisdiction	
Date Performed	6/27/2016	East/West Street	1416 East
Analysis Year	2016	North/South Street	Radar Hill Rd
Time Analyzed	PM Peak	Peak Hour Factor	0.94
Intersection Orientation	East-West	Analysis Time Period (hrs)	1.00
Project Description	I-90 Corridor Study		
Lanes			



Venicle Volumes and Ad	Justine	1113															
Approach		Eastb	ound			West	bound			North	bound		Southbound				
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R	
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12	
Number of Lanes	0	0	2	0	0	0	0	0		0	1	0		0	1	0	
Configuration		LT		TR								TR		LT			
Volume, V (veh/h)		25	436	176							113	71		2	170		
Percent Heavy Vehicles (%)		0									3	1		0	1		
Proportion Time Blocked																	
Percent Grade (%)											D				0		
Right Turn Channelized		Ν	lo			Ν	lo			Ν	lo			Ν	10		
Median Type/Storage				Undi	vided												
Critical and Follow-up H	eadwa	ys															
Base Critical Headway (sec)																	
Critical Headway (sec)																	
Base Follow-Up Headway (sec)																	
Follow-Up Headway (sec)																	
Delay, Queue Length, an	d Leve	l of S	ervice														
Flow Rate, v (veh/h)		27										196		183			
Capacity, c (veh/h)		1636										469		353			
v/c Ratio		0.02										0.42		0.52			
95% Queue Length, Q ₉₅ (veh)		0.1										2.1		3.1			
Control Delay (s/veh)		7.2										18.1		26.0			
Level of Service, LOS		A										С		D			
Approach Delay (s/veh)		0	.3						18.1				26.0				
Approach LOS									С				D				

HCS7 Two-Way Stop-Control Report										
General Information		Site Information								
Analyst		Intersection	Radar Hill and 1416 W							
Agency/Co.		Jurisdiction								
Date Performed	6/27/2016	East/West Street	1416 W							
Analysis Year	2016	North/South Street	Radar Hill							
Time Analyzed	AM Peak	Peak Hour Factor	0.92							
Intersection Orientation	East-West	Analysis Time Period (hrs)	1.00							
Project Description	I-90 Corridor Study									
Lanes										

anes



Major Street: East-West

Vehicle Volumes and Ad	justine	ints														
Approach		Eastb	ound			West	bound			North	bound			South	bound	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	0	0	0	0	2	0		0	1	0		0	1	0
Configuration						LT		TR		LT						TR
Volume, V (veh/h)						54	295	4		153	2				10	36
Percent Heavy Vehicles (%)						7				2	0				0	0
Proportion Time Blocked																
Percent Grade (%)										()			(0	
Right Turn Channelized		No				Ν	10			N	0			Ν	lo	
Median Type/Storage		Undivided														
Critical and Follow-up H	eadwa	ys														
Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																
Delay, Queue Length, an	d Leve	l of S	ervice	•												
Flow Rate, v (veh/h)						59				168						50
Capacity, c (veh/h)						1586				620						738
v/c Ratio						0.04				0.27						0.07
95% Queue Length, Q ₉₅ (veh)						0.1				1.1						0.2
Control Delay (s/veh)						7.4				13.0						10.2
Level of Service, LOS						A				В						В
Approach Delay (s/veh)		-	-	-		1	.2	-		13	3.0			1().2	-
Approach LOS										I	3				В	

Copyright $\ensuremath{\mathbb{C}}$ 2017 University of Florida. All Rights Reserved.

HCS7 Two-Way Stop-Control Report										
General Information		Site Information								
Analyst		Intersection	Radar Hill and 1416 W							
Agency/Co.		Jurisdiction								
Date Performed	6/27/2016	East/West Street	1416 W							
Analysis Year	2016	North/South Street	Radar Hill							
Time Analyzed	PM Peak	Peak Hour Factor	0.94							
Intersection Orientation	East-West	Analysis Time Period (hrs)	1.00							
Project Description	I-90 Corridor Study									
Lanes										



and Adjust

Vehicle Volumes and Ad	justme	ents														
Approach		Eastb	ound			West	oound			North	bound			South	bound	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	0	0	0	0	2	0		0	1	0		0	1	0
Configuration						LT		TR		LT						TR
Volume, V (veh/h)						160	505	7		110	28				12	7
Percent Heavy Vehicles (%)						1				3	0				0	0
Proportion Time Blocked																
Percent Grade (%)						°				(0		0			
Right Turn Channelized		No				Ν	lo		No				No			
Median Type/Storage		Undivided														
Critical and Follow-up H	eadwa	ys														
Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																
Delay, Queue Length, an	d Leve	l of S	ervice	;												
Flow Rate, v (veh/h)	Τ					170				147						20
Capacity, c (veh/h)						1629				311						319
v/c Ratio						0.10				0.47						0.06
95% Queue Length, Q ₉₅ (veh)						0.3				2.6						0.2
Control Delay (s/veh)						7.5				26.9						17.0
Level of Service, LOS						A				D						С
Approach Delay (s/veh)					2.0			26.9			17.0					
Approach LOS										[2		С			

Copyright $\ensuremath{\mathbb{C}}$ 2017 University of Florida. All Rights Reserved.

HCS7[™] TWSC Version 7.3

Generated: 10/27/2017 2:58:06 PM

10.Radar Hill and 1416 W PM Peak.xtw

Phone: E-Mail: Fax:

_____ALL-WAY STOP CONTROL(AWSC) ANALYSIS______

Analyst: Agency/Co.:	
Date Performed:	6/27/2016
Analysis Time Period:	AM Peak
Intersection:	W Gate & 1416 W
Jurisdiction:	
Units: U. S. Customar	У
Analysis Year:	
Project ID:	
East/West Street:	1416 W
North/South Street:	W Gate
Worksheet 2	- Volume Adjustments and Site Characteristics

	Ea	stbou	nd	Westbound			No	orthbo	ound	Sc	Southbound		
	L	Т	R	L	Т	R	L	т	R	L	Т	R	
							_						
Volume	0	0	0	4	441	48	2	24	0	0	120	172	İ
% Thrus Lef	t Lan	е					•			•			·

	Eastb	ound	West!	oound	Northk	oound	South	oound
	L1	L2	L1	L2	L1	L2	L1	L2
				_				
Configuration			LT	R	$_{ m LT}$		TR	
PHF			0.95	0.95	0.95		0.95	
Flow Rate			468	50	27		307	
% Heavy Veh			3	8	0		0	
No. Lanes				2	1	L	-	1
Opposing-Lanes			(0	1	L	-	1
Conflicting-lanes			-	1	2	2		2
Geometry group			-	1	2	2		2
Duration, T 1.00	hrs.							

______Worksheet 3 - Saturation Headway Adjustment Worksheet______

	Eastbo			bound	Northbound			nbound
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rates:								
Total in Lane			468	50	27		307	
Left-Turn			4	0	2		0	
Right-Turn			0	50	0		181	
Prop. Left-Turns			0.0	0.0	0.1		0.0	
Prop. Right-Turns			0.0	1.0	0.0		0.6	
Prop. Heavy Vehicle			0.0	0.1	0.0		0.0	
Geometry Group				1	2	2		2
Adjustments Exhibit	17-33	:						
hLT-adj				0.2	(0.2		0.2

hRT-adj hHV-adj hadj, computed		0.1	1.7	-0.6 1.7 0.0	-0.6 1.7 -0.4
Wor	ksheet 4	- Departure	Headway	and Service Tim	ne
Flow rate hd, initial value x, initial hd, final value		L2 L1 468 3.20 3.20 0.42		0.02	Southbound L1 L2 307 3.20 3.20 0.27 4.83
Md, final value x, final value Move-up time, m Service Time			6 0.060 2.0	0.042 2.0	4.85 0.412 2.0 2.8
Wor	ksheet 5	- Capacity	and Level	of Service	
	Eastbou L1		tbound L2	Northbound L1 L2	Southbound L1 L2
Flow Rate Service Time Utilization, x Dep. headway, hd Capacity 95% Queue Length		2.8 0.62 4.81 743		0.042 5.62 675	307 2.8 0.412 4.83 749
Delay LOS Approach: Delay LOS Intersection Delay	13.4	15.8 C In	7.6 A 15.0- B tersectio	8.9 A 8.9 A n LOS B	11.2 B 11.2 B

Phone: E-Mail: Fax:

_____ALL-WAY STOP CONTROL(AWSC) ANALYSIS_____

Analyst: Agency/Co.:	
Date Performed:	6/27/2016
Analysis Time Period:	AM Peak
Intersection:	W Gate & 1416 W
Jurisdiction:	
Units: U. S. Customar	У
Analysis Year:	
Project ID: I-90 Cor	ridor Study
East/West Street:	1416 W
North/South Street:	W Gate
Worksheet 2	- Volume Adjustments and Site Characteristics

	Ea	stbou	nd	Westbound			Northbound			Southbound			
	L	Т	R	L	Т	R	L	Т	R	L	Т	R	
													_
Volume	0	0	0	2	513	90	2	24	0	0	52	82	Í
% Thrus Lef	t Lan	е		•			•			•			•

	Eastb	ound	West	oound	Northbound		Southbou	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration			τm	R	LT		TR	
Configuration			LT					
PHF			0.94	0.87	0.95		0.76	
Flow Rate			547	103	27		175	
% Heavy Veh			0	0	0		2	
No. Lanes			4	2	1		1	1
Opposing-Lanes			(C	1		1	1
Conflicting-lanes			-	1	2	2		2
Geometry group			-	1	2	2		2
Duration, T 1.00	hrs.							

______Worksheet 3 - Saturation Headway Adjustment Worksheet______

	Eastbo	ound	West	bound	Northk	oound	Sout	hbound
	L1	L2	L1	L2	L1	L2	L1	L2
Flow Rates:								
Total in Lane			547	103	27		175	
Left-Turn			2	0	2		0	
Right-Turn			0	103	0		107	
Prop. Left-Turns			0.0	0.0	0.1		0.0	
Prop. Right-Turns			0.0	1.0	0.0		0.6	
Prop. Heavy Vehicle			0.0	0.0	0.0		0.0	
Geometry Group				1	2	2		2
Adjustments Exhibit	17-33:	:						
hLT-adj				0.2	(0.2		0.2

hRT-adj hHV-adj hadj, computed		-0.6 1.7 0.0 -0.6	-0.6 1.7 0.0	-0.6 1.7 -0.3
Wor	ksheet 4 - De	parture Headway	and Service Tim	e
Flow rate hd, initial value x, initial hd, final value x, final value	Eastbound L1 L2 3.20 3.20	Westbound L1 L2 547 103 3.20 3.20 0.49 0.09 4.44 3.84 0.674 0.110	0.02 5.55 0.042	Southbound L1 L2 175 3.20 3.20 0.16 4.97 0.241
Move-up time, m Service Time		2.0 2.4 1.8		2.0 3.0
Wor	ksheet 5 - Ca	pacity and Level	of Service	
	Eastbound L1 L2	Westbound L1 L2	Northbound L1 L2	Southbound L1 L2
Flow Rate Service Time Utilization, x Dep. headway, hd Capacity 95% Queue Length Delay LOS Approach:		547 103 2.4 1.8 0.674 0.110 4.44 3.84 816 936 16.5 7.3 C A	0.042 5.55 675 8.8 A	175 3.0 0.241 4.97 729 9.5 A
Delay LOS Intersection Delay	13.7	15.0+ C Intersectio	8.8 A n LOS B	9.5 A

HCS7 Two-Way Stop-Control Report										
	Site Information									
	Intersection	S. Service and Elk Vale								
	Jurisdiction									
6/27/2016	East/West Street	Edward St/S. Service Road								
2016	North/South Street	Elk Vale								
AM Peak	Peak Hour Factor	0.88								
North-South	Analysis Time Period (hrs)	1.00								
I-90 Corridor Study										
	6/27/2016 2016 AM Peak North-South	Site Information Intersection Jurisdiction 6/27/2016 East/West Street 2016 AM Peak Peak Hour Factor North-South Analysis Time Period (hrs)								



Vehicle Volumes and Adjustments

venicle volumes and Ad	ustine	ints															
Approach		Eastb	ound			West	bound			North	bound		Southbound				
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	1	0		0	1	0	0	1	2	0	0	1	2	0	
Configuration			LTR				LTR			L	Т	TR		L	Т	TR	
Volume, V (veh/h)		9	4	10		46	4	43	1	15	936	14		19	897	25	
Percent Heavy Vehicles (%)		0	0	11		2	0	11	0	0				4			
Proportion Time Blocked																	
Percent Grade (%)		0 0															
Right Turn Channelized	No					Ν	10		No				No				
Median Type/Storage		Undivided															
Critical and Follow-up H	eadwa	ys															
Base Critical Headway (sec)																	
Critical Headway (sec)																	
Base Follow-Up Headway (sec)																	
Follow-Up Headway (sec)																	
Delay, Queue Length, an	d Leve	l of S	ervice														
Flow Rate, v (veh/h)			26				106			18				22			
Capacity, c (veh/h)			78				89			631				630			
v/c Ratio			0.33				1.19			0.03				0.03			
95% Queue Length, Q ₉₅ (veh)			1.4				17.5			0.1				0.1			
Control Delay (s/veh)			73.7				554.4			10.9				10.9			
Level of Service, LOS			F				F			В				В			
Approach Delay (s/veh)		73.7			554.4			0.2				0.2					
Approach LOS			F		F												

HCS7 Two-Way Stop-Control Report										
	Site Information									
	Intersection	S. Service and Elk Vale								
	Jurisdiction									
6/27/2016	East/West Street	Edward St/S. Service Road								
2016	North/South Street	Elk Vale								
PM Peak	Peak Hour Factor	0.94								
North-South	Analysis Time Period (hrs)	1.00								
I-90 Corridor Study										
	6/27/2016 6/27/2016 2016 PM Peak North-South	Site Information Intersection Jurisdiction 6/27/2016 East/West Street 2016 North/South Street PM Peak Peak Hour Factor North-South Analysis Time Period (hrs)								



Major Street: North-South

					,												
Vehicle Volumes and Ad	justme	ents															
Approach		Eastbound			Westbound			Northbound				Southbound					
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	Т	R	
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6	
Number of Lanes		0	1	0		0	1	0	0	1	2	0	0	1	2	0	
Configuration			LTR				LTR			L	Т	TR		L	Т	TR	
Volume, V (veh/h)		11	2	18		42	3	66		11	1119	64	2	53	1090	27	
Percent Heavy Vehicles (%)		9	0	0		2	0	0		0			0	2			
Proportion Time Blocked																	
Percent Grade (%)		0 0															
Right Turn Channelized		No				Ν	10		No				No				
Median Type/Storage		Undivided															
Critical and Follow-up H	eadwa	ys															
Base Critical Headway (sec)																	
Critical Headway (sec)																	
Base Follow-Up Headway (sec)																	
Follow-Up Headway (sec)																	
Delay, Queue Length, an	d Leve	l of S	ervice				<u>.</u>										
Flow Rate, v (veh/h)	T		33				118			12				58			
Capacity, c (veh/h)			56				68			594				516			
v/c Ratio			0.59				1.73			0.02				0.11			
95% Queue Length, Q ₉₅ (veh)			3.4				30.6			0.1				0.4			
Control Delay (s/veh)			153.6				1478.3			11.2				12.9			
Level of Service, LOS			F				F			В				В			
Approach Delay (s/veh)		153.6			1478.3			0.1				0.6					
Approach LOS		F				F											

Phone: E-mail: Fax:

_____Operational Analysis______ Analyst: DCJ Agency or Company: Date Performed: FHU 7/20/2016 Analysis Time Period: AM Peak Hour Freeway/Direction: EB I-90 From/To: Exit 60 to Exit 61 Jurisdiction: SDDOT Analysis Year: 2016 Description: I-90 Exit 61 to 67 Corridor Study _____Flow Inputs and Adjustments_____ veh/h Volume, V 1150 Peak-hour factor, PHF 0.81 355 Peak 15-min volume, v15 v Trucks and buses 11 % Recreational vehicles 0 Ŷ Terrain type: Level % Grade _ Segment length mi Trucks and buses PCE, ET 1.5 Recreational vehicle PCE, ER 1.2 Heavy vehicle adjustment, fHV 0.948 Driver population factor, fp 1.00 749 Flow rate, vp pc/h/ln _____Speed Inputs and Adjustments_____ Lane width ft Right-side lateral clearance ft _ _ Total ramp density, TRD ramps/mi Number of lanes, N 2 Free-flow speed: Measured FFS or BFFS 65.0 mi/h Lane width adjustment, fLW mi/h Lateral clearance adjustment, fLC _ mi/h TRD adjustment _ mi/h 65.0 Free-flow speed, FFS mi/h _____LOS and Performance Measures____ Flow rate, vp 749 pc/h/ln Free-flow speed, FFS 65.0 mi/h Average passenger-car speed, S 65.0 mi/h Number of lanes, N 2 Density, D 11.5 pc/mi/ln Level of service, LOS В

Phone: E-mail: Fax:

_____Operational Analysis______ Analyst: DCJ Agency or Company: Date Performed: FHU 7/20/2016 Analysis Time Period: PM Peak Hour Freeway/Direction: EB I-90 From/To: Exit 60 to Exit 61 Jurisdiction: SDDOT Analysis Year: 2016 Description: I-90 Exit 61 to 67 Corridor Study _____Flow Inputs and Adjustments_____ veh/h Volume, V 1610 Peak-hour factor, PHF 0.92 437 Peak 15-min volume, v15 v Trucks and buses 11 % Recreational vehicles Ŷ 0 Terrain type: Level % Grade _ Segment length mi Trucks and buses PCE, ET 1.5 Recreational vehicle PCE, ER 1.2 Heavy vehicle adjustment, fHV 0.948 Driver population factor, fp 1.00 923 Flow rate, vp pc/h/ln _____Speed Inputs and Adjustments_____ Lane width ft Right-side lateral clearance _ ft _ Total ramp density, TRD ramps/mi Number of lanes, N 2 Free-flow speed: Measured FFS or BFFS 65.0 mi/h Lane width adjustment, fLW mi/h Lateral clearance adjustment, fLC _ mi/h TRD adjustment _ mi/h 65.0 Free-flow speed, FFS mi/h _____LOS and Performance Measures_____ Flow rate, vp 923 pc/h/ln Free-flow speed, FFS 65.0 mi/h Average passenger-car speed, S 65.0 mi/h Number of lanes, N 2 14.2 Density, D pc/mi/ln Level of service, LOS В

Phone: Fax: E-mail: _____Diverge Analysis______ DCJ Analyst: Agency/Co.: Felsburg Holt & Ullevig Date performed: 7/21/2016 Analysis time period: AM Peak Hour Freeway/Dir of Travel: I-90 EB Junction: Exit 61 Jurisdiction: SDDOT Analysis Year: 2016 Description: I-90 Exit 61 to 67 Corridor Study _____Freeway Data______ Type of analysis Diverge Number of lanes in freeway 2 Free-flow speed on freeway 65.0 mph Volume on freeway 1150 vph _____Off Ramp Data_____ Side of freeway Right Number of lanes in ramp 1 Free-Flow speed on ramp 35.0 mph Volume on ramp 83 vph Length of first accel/decel lane 660 ft Length of second accel/decel lane ft _____Adjacent Ramp Data (if one exists)_____ Does adjacent ramp exist? No Volume on adjacent ramp vph Position of adjacent ramp Type of adjacent ramp Distance to adjacent ramp ft _____Conversion to pc/h Under Base Conditions______ Freeway Adjacent Junction Components Ramp Ramp Volume, V (vph) 83 1150 vph Peak-hour factor, PHF 0.81 0.81 Peak 15-min volume, v15 26 355 v Trucks and buses 11 11 % Recreational vehicles 0 0 Ŷ Level Level Terrain type: 0.00 % 0.00 % 8 Grade 0.00 mi 0.00 Length mi mi Trucks and buses PCE, ET 1.5 1.5 Recreational vehicle PCE, ER 1.2 1.2
Heavy vehicle adjust Driver population fac Flow rate, vp			0.948 1.00 108		pcph
	Estimation of	of V12 Diverge	e Areas_		
L E(= (Ec	quation 13-12	or 13-1	3)	
-	= 1.000 Usi	ing Equation	0		
v 12	= v + (v - v) 2 R F R		pc/h		
	Capaci	ity Checks			
v = v Fi F	Actual 1498	Maximum 4700		LOS F? No	
V = V - V FO F R	1390	4700	:	No	
V	108	2000		No	
R V or V	0 pc/h	(Equation	n 13-14	or 13-17)	
$\begin{array}{c} 3 & av34 \\ Is & v & or & v & z \end{array}$	2700 pc/h?	No			
3 av34 Is v or v > 1		No			
3 av34 If yes, v = 1498 12A	12	(Equation 13	8-15, 13	-16, 13-18,	or 13-19)
	Flow Entering I				
V	Actual M 1498 4	Max Desirable 4400		Violation? No	
12 Leve	el of Service Det	cermination (i	f not F)	
Density,	D = 4.252 + 0.			= 11.2	pc/mi/ln
Level of service for	R ramp-freeway jur	12 nction areas o	D of influ	ence B	
	Speed Es	stimation			
Intermediate speed va	ariable,		0.438		
Space mean speed in 1	ramp influence ar		54.9	mph	
Space mean speed in o	outer lanes,		N/A	mph	
Space mean speed for	all vehicles,	0 S =	54.9	mph	

Phone: Fax: E-mail: _____Diverge Analysis______ DCJ Analyst: Agency/Co.: Felsburg Holt & Ullevig Date performed: 7/21/2016 Analysis time period: PM Peak Hour Freeway/Dir of Travel: I-90 EB Junction: Exit 61 Jurisdiction: SDDOT Analysis Year: 2016 Description: I-90 Exit 61 to 67 Corridor Study _____Freeway Data______ Type of analysis Diverge Number of lanes in freeway 2 Free-flow speed on freeway 65.0 mph Volume on freeway 1610 vph _____Off Ramp Data_____ Side of freeway Right Number of lanes in ramp 1 Free-Flow speed on ramp 35.0 mph 275 Volume on ramp vph Length of first accel/decel lane 660 ft Length of second accel/decel lane ft _____Adjacent Ramp Data (if one exists)_____ Does adjacent ramp exist? No Volume on adjacent ramp vph Position of adjacent ramp Type of adjacent ramp Distance to adjacent ramp ft _____Conversion to pc/h Under Base Conditions______ Freeway Adjacent Junction Components Ramp Ramp Volume, V (vph) 275 1610 vph Peak-hour factor, PHF 0.92 0.92 Peak 15-min volume, v15 437 75 v Trucks and buses 11 11 % Recreational vehicles 0 0 Ŷ Level Level Terrain type: 0.00 % 0.00 % 8 Grade 0.00 mi 0.00 Length mi mi Trucks and buses PCE, ET 1.5 1.5 Recreational vehicle PCE, ER 1.2 1.2

Heavy vehicle adjust Driver population fa Flow rate, vp					pcph
	Estimation	of V12 Diverge	e Areas_		
L	= (E	quation 13-12	or 13-1	3)	
	= 1.000 Us	ing Equation	0		
	= v + (v - v) 2 R F R		pc/h		
	Capac	ity Checks			
v = v Fi F	Actual 1846	Maximum 4700		LOS F? No	
v = v - v FO F R	1531	4700		No	
V	315	2000		No	
R V or V	0 pc/h	(Equation	n 13-14	or 13-17)	
3 av34 Is v or v >	2700 pc/h?	No			
3 av34 Is v or v >		No			
3 av34 If yes, v = 1846 12A	12	(Equation 13	8-15, 13	-16, 13-18,	or 13-19)
	Flow Entering				
V	Actual 1846	Max Desirable 4400		Violation? No	
12 Lev	el of Service De	termination (i	lf not F)	
Density,		.0086 v - 0.0		= 14.2	pc/mi/ln
Level of service for	R ramp-freeway ju	12 nction areas c	D of influ	ence B	
	Speed E	stimation			
Intermediate speed v	ariable,		0.456		
Space mean speed in	ramp influence a		54.5	mph	
Space mean speed in	outer lanes,		N/A	mph	
Space mean speed for	all vehicles,	0 S =	54.5	mph	

Phone: Fax: E-mail: _____Merge Analysis_____ DCJ Analyst: Agency/Co.: Felsburg Holt & Ullevig Agency/Co..Feisburg notDate performed:7/21/2016Analysis time period:AM Peak Hour Freeway/Dir of Travel: I-90 EB Junction: Exit 61 Jurisdiction: SDDOT Analysis Year: 2016 Description: I-90 Exit 61 to 67 Corridor Study _____Freeway Data______ Type of analysis Merge Number of lanes in freeway 2 Free-flow speed on freeway 65.0 mph Volume on freeway 1067 vph _____On Ramp Data_____ Side of freeway Right Number of lanes in ramp 1 Free-flow speed on ramp 35.0 mph Volume on ramp 21 vph 1100 Length of first accel/decel lane ft Length of second accel/decel lane ft _____Adjacent Ramp Data (if one exists)_____ Does adjacent ramp exist? No Volume on adjacent Ramp vph Position of adjacent Ramp Type of adjacent Ramp Distance to adjacent Ramp ft _____Conversion to pc/h Under Base Conditions______ Freeway Adjacent Junction Components Ramp Ramp Volume, V (vph) 1067 21 vph Peak-hour factor, PHF 0.81 0.81 Peak 15-min volume, v15 329 6 v Trucks and buses 11 11 % Recreational vehicles 0 0 Ŷ Level Level Terrain type: % % 8 Grade Length mi mi mi Trucks and buses PCE, ET 1.5 1.5 Recreational vehicle PCE, ER 1.2 1.2

Heavy vehicle adjustment, Driver population factor, Flow rate, vp		0.948 1.00 1390	1.00		pcph
Е	stimation of	V12 Merge A	Areas		
	(Equa	ation 13-6 d	or 13-7))	
	1.000 Using	g Equation	0		
FM v = v 12 F	(P) = 1390 FM	0 pc/h			
	Capacity	y Checks			
v	Actual 1417			LOS F? No	
	0 pc/h	(Equation	n 13-14	or 13-17)	
3 av34 Is v or v > 2700 p	oc/h?	No			
3 av34 Is v or v > 1.5 v		No			
3 av34 1 If yes, v = 1390 12A		(Equation 13	3-15, 13	3-16, 13-18,	or 13-19)
Actu v 1417 R12	ow Entering Man al Man 460 Service Deter	x Desirable 00		Violation? No	
Density, D = $5.475 + 0.007$ R Level of service for ramp-	R	12	I	ł	pc/mi/ln
	Speed Est:	imation			
Intermediate speed variabl	е,		0.260		
Space mean speed in ramp i	nfluence area		59.0	mph	
Space mean speed in outer	lanes,		N/A	mph	
Space mean speed for all w	ehicles,	0 S =	59.0	mph	

Phone: Fax: E-mail: _____Merge Analysis_____ DCJ Analyst: Agency/Co.: Felsburg Holt & Ullevig Date performed: 7/21/2016 Analysis time period: PM Peak Hour Freeway/Dir of Travel: I-90 EB Junction: Exit 61 Jurisdiction: SDDOT Analysis Year: 2016 Description: I-90 Exit 61 to 67 Corridor Study _____Freeway Data______ Type of analysis Merge Number of lanes in freeway 2 Free-flow speed on freeway 65.0 mph Volume on freeway 1335 vph _____On Ramp Data_____ Side of freeway Right Number of lanes in ramp 1 Free-flow speed on ramp 35.0 mph Volume on ramp 21 vph 1100 Length of first accel/decel lane ft Length of second accel/decel lane ft _____Adjacent Ramp Data (if one exists)_____ Does adjacent ramp exist? No Volume on adjacent Ramp vph Position of adjacent Ramp Type of adjacent Ramp Distance to adjacent Ramp ft _____Conversion to pc/h Under Base Conditions______ Freeway Adjacent Junction Components Ramp Ramp Volume, V (vph) 21 1335 vph Peak-hour factor, PHF 0.92 0.92 Peak 15-min volume, v15 363 б v Trucks and buses 11 11 % Recreational vehicles 0 0 Ŷ Level Level Terrain type: % % 8 Grade Length mi mi mi Trucks and buses PCE, ET 1.5 1.5 Recreational vehicle PCE, ER 1.2 1.2

Heavy vehicle adjustment, fHV Driver population factor, fP Flow rate, vp			pcph
Estimati	on of V12 Merge	Areas	
EQ	(Equation 13-6 Using Equation = 1531 pc/h		
	apacity Checks		
	pacity checkb		
v 1555	Maximum 4700		F?
FO vorv O g 3 av34	oc/h (Equati	on 13-14 or 1	3-17)
Is v or v > 2700 pc/h? 3 av34	No		
Is v or v > $1.5 v / 2$ 3 av 34 12	No		
If yes, $v = 1531$ 12A	(Equation	13-15, 13-16,	13-18, or 13-19)
		.e Vic No	olation?
Density, D = $5.475 + 0.00734 v + R R$ Level of service for ramp-freeway	12	A	
Spee	ed Estimation		
Intermediate speed variable,	M	= 0.262	
Space mean speed in ramp influence		= 59.0 mph	L
Space mean speed in outer lanes,		= N/A mph	L
Space mean speed for all vehicles	-	= 59.0 mph	L

Fax:

_____Operational Analysis______ Analyst: DCJ Agency or Company: Date Performed: FHU 7/20/2016 Analysis Time Period: AM Peak Hour Freeway/Direction: EB I-90 From/To: Exit 61 to Exit 63 Jurisdiction: SDDOT Analysis Year: 2016 Description: I-90 Exit 61 to 67 Corridor Study _____Flow Inputs and Adjustments_____ veh/h Volume, V 1190 Peak-hour factor, PHF 0.81 367 Peak 15-min volume, v15 v Trucks and buses 11 % Recreational vehicles 0 Ŷ Terrain type: Level % Grade _ Segment length mi Trucks and buses PCE, ET 1.5 Recreational vehicle PCE, ER 1.2 Heavy vehicle adjustment, fHV 0.948 Driver population factor, fp 1.00 775 Flow rate, vp pc/h/ln _____Speed Inputs and Adjustments_____ Lane width ft Right-side lateral clearance ft _ _ Total ramp density, TRD ramps/mi Number of lanes, N 2 Free-flow speed: Measured FFS or BFFS 65.0 mi/h Lane width adjustment, fLW mi/h Lateral clearance adjustment, fLC _ mi/h TRD adjustment _ mi/h 65.0 Free-flow speed, FFS mi/h _____LOS and Performance Measures_____ Flow rate, vp 775 pc/h/ln Free-flow speed, FFS 65.0 mi/h Average passenger-car speed, S 65.0 mi/h Number of lanes, N 2 Density, D 11.9 pc/mi/ln Level of service, LOS В

Fax:

_____Operational Analysis______ Analyst: DCJ Agency or Company: Date Performed: FHU 7/20/2016 Analysis Time Period: PM Peak Hour Freeway/Direction: EB I-90 From/To: Exit 61 to Exit 63 Jurisdiction: SDDOT Analysis Year: 2016 Description: I-90 Exit 61 to 67 Corridor Study _____Flow Inputs and Adjustments_____ veh/h Volume, V 1330 Peak-hour factor, PHF 0.92 Peak 15-min volume, v15 361 v Trucks and buses 11 % Recreational vehicles 0 Ŷ Terrain type: Level % Grade _ Segment length mi Trucks and buses PCE, ET 1.5 Recreational vehicle PCE, ER 1.2 Heavy vehicle adjustment, fHV 0.948 Driver population factor, fp 1.00 763 Flow rate, vp pc/h/ln _____Speed Inputs and Adjustments_____ Lane width ft Right-side lateral clearance _ ft _ Total ramp density, TRD ramps/mi Number of lanes, N 2 Free-flow speed: Measured FFS or BFFS 65.0 mi/h Lane width adjustment, fLW mi/h Lateral clearance adjustment, fLC _ mi/h TRD adjustment _ mi/h Free-flow speed, FFS 65.0 mi/h _____LOS and Performance Measures_____ Flow rate, vp 763 pc/h/ln Free-flow speed, FFS 65.0 mi/h Average passenger-car speed, S 65.0 mi/h Number of lanes, N 2 11.7 Density, D pc/mi/ln Level of service, LOS В

Phone: Fax: E-mail: _____Diverge Analysis______ DCJ Analyst: Agency/Co.: Felsburg Holt & Ullevig Date performed: 7/21/2016 Analysis time period: AM Peak Hour Freeway/Dir of Travel: I-90 EB Junction: Exit 63 Jurisdiction: SDDOT Analysis Year: 2016 Description: I-90 Exit 61 to 67 Corridor Study _____Freeway Data______ Type of analysis Diverge Number of lanes in freeway 2 Free-flow speed on freeway 65.0 mph Volume on freeway 1190 vph _____Off Ramp Data_____ Side of freeway Right Number of lanes in ramp 1 Free-Flow speed on ramp 35.0 mph 565 Volume on ramp vph Length of first accel/decel lane 275 ft Length of second accel/decel lane ft _____Adjacent Ramp Data (if one exists)_____ Does adjacent ramp exist? No Volume on adjacent ramp vph Position of adjacent ramp Type of adjacent ramp Distance to adjacent ramp ft _____Conversion to pc/h Under Base Conditions______ Freeway Adjacent Junction Components Ramp Ramp Volume, V (vph) 565 1190 vph Peak-hour factor, PHF 0.81 0.81 Peak 15-min volume, v15 174 367 v Trucks and buses 11 11 % Recreational vehicles 0 0 Ŷ Level Level Terrain type: 0.00 % 0.00 % 8 Grade 0.00 mi 0.00 Length mi mi Trucks and buses PCE, ET 1.5 1.5 Recreational vehicle PCE, ER 1.2 1.2

Heavy vehicle adjustment, Driver population factor, Flow rate, vp	fP	0.948 1.00 1550			pcph
E	stimation of	V12 Diverge	e Areas_		
L = EQ	(Equa	tion 13-12	or 13-1	.3)	
~	1.000 Using	Equation	0		
v = v	+ (v - v) P F R F		pc/h		
	Capacity	Checks			
v = v Fi F	Actual 1550			LOS F? No	
v = v - v FO F R	814	4700		No	
v	736	2000		No	
R v or v	0 pc/h	(Equation	n 13-14	or 13-17)	
3 av34 Is v or v > 2700 p	c/h?	No			
3 av34 Is v or v > 1.5 v		No			
3 av34 1 If yes, v = 1550 12A		Equation 13	8-15, 13	-16, 13-18,	or 13-19)
	Entering Div				
v 1550	al Max 440			Violation? No	
12 Level of	Service Deter	mination (i	f not F	')	
_	4.252 + 0.00			= 15.1	pc/mi/ln
R Level of service for ramp-	freeway junct	12 ion areas c	D of influ	lence B	
	Speed Esti	mation			
Intermediate speed variabl	е,		0.494		
Space mean speed in ramp i	nfluence area	-	53.6	mph	
Space mean speed in outer	lanes,		N/A	mph	
Space mean speed for all v	ehicles,	0 S =	53.6	mph	

Phone: Fax: E-mail: _____Diverge Analysis______ DCJ Analyst: Agency/Co.: Felsburg Holt & Ullevig Date performed: 7/21/2016 Analysis time period: PM Peak Hour Freeway/Dir of Travel: I-90 EB Junction: Exit 63 Jurisdiction: SDDOT Analysis Year: 2016 Description: I-90 Exit 61 to 67 Corridor Study _____Freeway Data______ Type of analysis Diverge Number of lanes in freeway 2. Free-flow speed on freeway 65.0 mph Volume on freeway 1330 vph _____Off Ramp Data_____ Side of freeway Right Number of lanes in ramp 1 Free-Flow speed on ramp 35.0 mph Volume on ramp 617 vph Length of first accel/decel lane 275 ft Length of second accel/decel lane ft _____Adjacent Ramp Data (if one exists)_____ Does adjacent ramp exist? No Volume on adjacent ramp vph Position of adjacent ramp Type of adjacent ramp Distance to adjacent ramp ft _____Conversion to pc/h Under Base Conditions______ Freeway Adjacent Junction Components Ramp Ramp Volume, V (vph) 617 1330 vph Peak-hour factor, PHF 0.92 0.92 Peak 15-min volume, v15 168 361 v Trucks and buses 11 11 % Recreational vehicles 0 0 Ŷ Level Level Terrain type: 0.00 % 0.00 % 8 Grade 0.00 mi 0.00 Length mi mi Trucks and buses PCE, ET 1.5 1.5 Recreational vehicle PCE, ER 1.2 1.2

Heavy vehicle adjustmer Driver population facto Flow rate, vp		0.948 1.00 1525	0.948 1.00 708		pcph
	Estimation of	of V12 Diverge	e Areas_		
	(Ec	quation 13-12	or 13-1	.3)	
EQ P = FD	1.000 Usi	ing Equation	0		
	v + (v - v) R F R		pc/h		
	Capaci	ity Checks			
v = v Fi F	Actual 1525	Maximum 4700		LOS F? No	
v = v - v	817	4700		No	
FO F R V	708	2000		No	
R v or v	0 pc/h	(Equation	n 13-14	or 13-17)	
$\begin{array}{ccc} 3 & av34 \\ Is & v & or & v & > 270 \\ 2 & av24 \end{array}$	0 pc/h?	No			
3 av34 Is v or v > 1.5		No			
3 av34 If yes, v = 1525 12A	12	(Equation 13	3-15, 13	-16, 13-18,	or 13-19)
	low Entering I				
v 1	ctual N 525 4			Violation? No	
12 Level	of Service Det	cermination (i	if not F	')	
Density,	D = 4.252 + 0	.0086 v - 0.0 12)09 L D	= 14.9	pc/mi/ln
Level of service for ra	mp-freeway jur		_	lence B	
	Speed Es	stimation			
Intermediate speed vari	able,	D = S	0.492		
Space mean speed in ram	p influence a	rea, S =	53.7	mph	
Space mean speed in out	er lanes,		N/A	mph	
Space mean speed for al	l vehicles,	0 S =	53.7	mph	

Fax:

_____Operational Analysis______ Analyst: DCJ Agency or Company: Date Performed: FHU 7/20/2016 Analysis Time Period: AM Peak Hour Freeway/Direction: EB I-90 From/To: Exit 63 to Exit 67 Jurisdiction: SDDOT Analysis Year: 2016 Description: I-90 Exit 61 to 67 Corridor Study _____Flow Inputs and Adjustments_____ 600 veh/h Volume, V Peak-hour factor, PHF 0.81 185 Peak 15-min volume, v15 v Trucks and buses 11 % Recreational vehicles 0 Ŷ Terrain type: Level % Grade _ Segment length mi Trucks and buses PCE, ET 1.5 Recreational vehicle PCE, ER 1.2 Heavy vehicle adjustment, fHV 0.948 Driver population factor, fp 1.00 Flow rate, vp 391 pc/h/ln _____Speed Inputs and Adjustments_____ Lane width ft Right-side lateral clearance ft _ _ Total ramp density, TRD ramps/mi Number of lanes, N 2 Free-flow speed: Measured FFS or BFFS 65.0 mi/h Lane width adjustment, fLW mi/h Lateral clearance adjustment, fLC _ mi/h TRD adjustment _ mi/h 65.0 Free-flow speed, FFS mi/h _____LOS and Performance Measures_____ Flow rate, vp 391 pc/h/ln Free-flow speed, FFS 65.0 mi/h Average passenger-car speed, S 65.0 mi/h Number of lanes, N 2 Density, D 6.0 pc/mi/ln Level of service, LOS А

Fax:

_____Operational Analysis______Operational Analysis_____ Analyst: DCJ Agency or Company: Date Performed: FHU 7/20/2016 Analysis Time Period: PM Peak Hour Freeway/Direction: EB I-90 From/To: Exit 63 to Exit 67 Jurisdiction: SDDOT Analysis Year: 2016 Description: I-90 Exit 61 to 67 Corridor Study _____Flow Inputs and Adjustments_____ veh/h Volume, V 560 Peak-hour factor, PHF 0.92 152 Peak 15-min volume, v15 v Trucks and buses 11 % Recreational vehicles 0 Ŷ Terrain type: Level % Grade _ Segment length mi Trucks and buses PCE, ET 1.5 Recreational vehicle PCE, ER 1.2 Heavy vehicle adjustment, fHV 0.948 Driver population factor, fp 1.00 321 Flow rate, vp pc/h/ln _____Speed Inputs and Adjustments_____ Lane width ft Right-side lateral clearance ft _ _ Total ramp density, TRD ramps/mi Number of lanes, N 2 Free-flow speed: Measured FFS or BFFS 65.0 mi/h Lane width adjustment, fLW mi/h Lateral clearance adjustment, fLC _ mi/h TRD adjustment _ mi/h 65.0 Free-flow speed, FFS mi/h _____LOS and Performance Measures_____ Flow rate, vp 321 pc/h/ln Free-flow speed, FFS 65.0 mi/h Average passenger-car speed, S 65.0 mi/h Number of lanes, N 2 Density, D 4.9 pc/mi/ln Level of service, LOS А

Phone: Fax: E-mail: _____Diverge Analysis______ DCJ Analyst: Agency/Co.: Felsburg Holt & Ullevig Date performed: 7/21/2016 Analysis time period: AM Peak Hour Freeway/Dir of Travel: I-90 EB Junction: Exit 67A Jurisdiction: SDDOT Analysis Year: 2016 Description: I-90 Exit 61 to 67 Corridor Study _____Freeway Data______ Type of analysis Diverge Number of lanes in freeway 2. Free-flow speed on freeway 65.0 mph Volume on freeway 600 vph _____Off Ramp Data_____ Side of freeway Right Number of lanes in ramp 1 Free-Flow speed on ramp 35.0 mph 7 Volume on ramp vph Length of first accel/decel lane 325 ft Length of second accel/decel lane ft _____Adjacent Ramp Data (if one exists)_____ Does adjacent ramp exist? No Volume on adjacent ramp vph Position of adjacent ramp Type of adjacent ramp Distance to adjacent ramp ft _____Conversion to pc/h Under Base Conditions______ Freeway Adjacent Junction Components Ramp Ramp 7 Volume, V (vph) 600 vph Peak-hour factor, PHF 0.81 0.81 Peak 15-min volume, v15 185 2 v Trucks and buses 11 11 % Recreational vehicles 0 0 Ŷ Level Level Terrain type: 0.00 % 0.00 % 8 Grade 0.00 mi 0.00 Length mi mi Trucks and buses PCE, ET 1.5 1.5 Recreational vehicle PCE, ER 1.2 1.2

Heavy vehicle adjustment, Driver population factor, Flow rate, vp		0.948 1.00 781			pcph
Е	Stimation of	V12 Diverge	e Areas_		
L = EQ	(Equa	ation 13-12	or 13-1	.3)	
	1.000 Using	g Equation	0		
	+ (v - v) P F R]		pc/h		
	Capacity	y Checks			
v = v Fi F	Actual 781			LOS F? No	
v = v - v FO F R	772	4700		No	
v	9	2000		No	
R v or v	0 pc/h	(Equation	n 13-14	or 13-17)	
3 av34 Is v or v > 2700 p	oc/h?	No			
3 av34 Is v or v > 1.5 v		No			
3 av34 1 If yes, v = 781 12A		(Equation 13	3-15, 13	8-16, 13-18,	or 13-19)
	/ Entering Div				
v 781	al Maz 440			Violation? No	
12 Level of	Service Deter	rmination (:	if not F	')	
Density, D =	4.252 + 0.00	086 v - 0.(009 L	= 8.0	pc/mi/ln
R Level of service for ramp-	freeway junct	12 tion areas o	D of influ	lence A	
	Speed Est:	imation			
Intermediate speed variabl	е,		0.429		
Space mean speed in ramp i	nfluence area		55.1	mph	
Space mean speed in outer	lanes,		N/A	mph	
Space mean speed for all w	vehicles,	0 S =	55.1	mph	

Phone: Fax: E-mail: _____Diverge Analysis______ DCJ Analyst: Agency/Co.: Felsburg Holt & Ullevig Date performed: 7/21/2016 Analysis time period: PM Peak Hour Freeway/Dir of Travel: I-90 EB Junction: Exit 67A Jurisdiction: SDDOT Analysis Year: 2016 Description: I-90 Exit 61 to 67 Corridor Study _____Freeway Data______ Type of analysis Diverge Number of lanes in freeway 2. Free-flow speed on freeway 65.0 mph Volume on freeway 560 vph _____Off Ramp Data_____ Side of freeway Right Number of lanes in ramp 1 Free-Flow speed on ramp 35.0 mph 58 Volume on ramp vph Length of first accel/decel lane 325 ft Length of second accel/decel lane ft _____Adjacent Ramp Data (if one exists)_____ Does adjacent ramp exist? No Volume on adjacent ramp vph Position of adjacent ramp Type of adjacent ramp Distance to adjacent ramp ft _____Conversion to pc/h Under Base Conditions______ Freeway Adjacent Junction Components Ramp Ramp Volume, V (vph) 560 58 vph Peak-hour factor, PHF 0.92 0.92 Peak 15-min volume, v15 152 16 v Trucks and buses 11 11 % Recreational vehicles 0 0 % Level Level Terrain type: 0.00 % 0.00 00 8 Grade 0.00 mi 0.00 Length mi mi Trucks and buses PCE, ET 1.5 1.5 Recreational vehicle PCE, ER 1.2 1.2

Heavy vehicle adjustment, fHV Driver population factor, fP Flow rate, vp			pcph
Estimat	ion of V12 Diver	ge Areas	
L = EQ	(Equation 13-12	2 or 13-13)	
~ ~ ~	Using Equation	0	
v = v + (v - 12 R F	v) P = 642 R FD	pc/h	
C	apacity Checks		
	l Maximum 4700	LOS F? No	
v = v - v 575 FO F R	4700	No	
v 67	2000	No	
	pc/h (Equatio	on 13-14 or 13-	17)
3 av34 Is v or v > 2700 pc/h?	No		
3 av34 Is v or v > 1.5 v /2	No		
3 av34 12 If yes, v = 642 12A	(Equation]	13-15, 13-16, 1	3-18, or 13-19)
	ing Diverge Influ		
v 642	Max Desirable 4400	e Viola No	tion?
12 Level of Service	e Determination ((if not F)	
Density, $D = 4.252$	+ 0.0086 v - 0.		.8 pc/mi/ln
R Level of service for ramp-freeway	12 y junction areas	D of influence A	
Spe	ed Estimation		
Intermediate speed variable,		= 0.434	
Space mean speed in ramp influen		= 55.0 mph	
Space mean speed in outer lanes,		= N/A mph	
Space mean speed for all vehicles	0 s, S =	= 55.0 mph	

Phone: Fax: E-mail: _____Diverge Analysis______ DCJ Analyst: Agency/Co.: Felsburg Holt & Ullevig Date performed: 7/21/2016 Analysis time period: AM Peak Hour Freeway/Dir of Travel: I-90 EB Junction: Exit 67B Jurisdiction: SDDOT Analysis Year: 2016 Description: I-90 Exit 61 to 67 Corridor Study _____Freeway Data______ Type of analysis Diverge Number of lanes in freeway 2. Free-flow speed on freeway 65.0 mph Volume on freeway 593 vph _____Off Ramp Data_____ Side of freeway Right Number of lanes in ramp 1 Free-Flow speed on ramp 35.0 mph 324 Volume on ramp vph Length of first accel/decel lane 675 ft Length of second accel/decel lane ft _____Adjacent Ramp Data (if one exists)_____ Does adjacent ramp exist? No Volume on adjacent ramp vph Position of adjacent ramp Type of adjacent ramp Distance to adjacent ramp ft _____Conversion to pc/h Under Base Conditions______ Freeway Adjacent Junction Components Ramp Ramp Volume, V (vph) 593 324 vph Peak-hour factor, PHF 0.81 0.81 Peak 15-min volume, v15 100 183 v Trucks and buses 11 11 % Recreational vehicles 0 0 Ŷ Level Level Terrain type: 0.00 % 0.00 % 8 Grade 0.00 mi 0.00 Length mi mi Trucks and buses PCE, ET 1.5 1.5 Recreational vehicle PCE, ER 1.2 1.2

Heavy vehicle adjustment, Driver population factor, Flow rate, vp	fP	0.948 1.00 772	0.948 1.00 422		pcph
E	stimation of	V12 Diverge	Areas_		
	(Equa	tion 13-12	or 13-1	.3)	
EQ P = FD	1.000 Using	Equation	0		
v = v	+ (v - v) P F R F		pc/h		
	Capacity	Checks			
v = v Fi F	Actual 772			LOS F? No	
v = v - v	350	4700		No	
FO F R V	422	2000		No	
R v or v	0 pc/h	(Equation	13-14	or 13-17)	
3 av34 Is v or v > 2700 p	oc/h?	No			
3 av34 Is v or v > 1.5 v		No			
3 av34 1 If yes, v = 772 12A		Equation 13	5-15, 13	8-16, 13-18,	or 13-19)
	Entering Div				
Actu v 772	al Max 440			Violation? No	
12 Level of	Service Deter	mination (i	.f not F	')	
Density, D =	4.252 + 0.00	86 v - 0.0	09 L	= 4.8	pc/mi/ln
R Level of service for ramp-		12	D		-
	Speed Esti	mation			
Intermediate speed variabl	е,		0.466		
Space mean speed in ramp i	nfluence area		54.3	mph	
Space mean speed in outer	lanes,		N/A	mph	
Space mean speed for all v	ehicles,	0 S =	54.3	mph	

Phone: Fax: E-mail: _____Diverge Analysis______ DCJ Analyst: Agency/Co.: Felsburg Holt & Ullevig Date performed: 7/21/2016 Analysis time period: PM Peak Hour Freeway/Dir of Travel: I-90 EB Junction: Exit 67B Jurisdiction: SDDOT Analysis Year: 2016 Description: I-90 Exit 61 to 67 Corridor Study _____Freeway Data______ Type of analysis Diverge Number of lanes in freeway 2. Free-flow speed on freeway 65.0 mph Volume on freeway 502 vph _____Off Ramp Data_____ Side of freeway Right Number of lanes in ramp 1 Free-Flow speed on ramp 35.0 mph 206 Volume on ramp vph Length of first accel/decel lane 675 ft Length of second accel/decel lane ft _____Adjacent Ramp Data (if one exists)_____ Does adjacent ramp exist? No Volume on adjacent ramp vph Position of adjacent ramp Type of adjacent ramp Distance to adjacent ramp ft _____Conversion to pc/h Under Base Conditions______ Freeway Adjacent Junction Components Ramp Ramp Volume, V (vph) 502 206 vph Peak-hour factor, PHF 0.92 0.92 Peak 15-min volume, v15 136 56 v Trucks and buses 11 11 % Recreational vehicles 0 0 Ŷ Level Level Terrain type: 0.00 % 0.00 % 8 Grade 0.00 mi 0.00 Length mi mi Trucks and buses PCE, ET 1.5 1.5 Recreational vehicle PCE, ER 1.2 1.2

Heavy vehicle adjust Driver population fa Flow rate, vp					pcph
	Estimation of	of V12 Diverg	e Areas_		
	= (E0	quation 13-12	or 13-1	3)	
P	= 1.000 Us: FD	ing Equation	0		
	= v + (v - v) 12 R F R		pc/h		
	Capac:	ity Checks			
v = v Fi F	Actual 576	Maximum 4700		LOS F? No	
v = v - v FO F R	340	4700		No	
v	236	2000		No	
R v or v	0 pc/h	(Equatio	n 13-14	or 13-17)	
3 av34 Is v or v >	2700 pc/h?	No			
3 av34 Is v or v >	1.5 v /2	No			
3 av34 If yes, v = 576 12A	12	(Equation 1	3-15, 13	-16, 13-18,	or 13-19)
	Flow Entering I				
V	Actual M 576 4	Max Desirable 4400		Violation? No	
12 Lev	vel of Service Det	cermination (if not F	')	
Density,	D = 4.252 + 0	.0086 v - 0.	009 L D	= 3.1	pc/mi/ln
Level of service for	R r ramp-freeway jur			ence A	
	Speed Es	stimation			
Intermediate speed v	variable,	D = S	0.449		
Space mean speed in	ramp influence as	rea, S =	54.7	mph	
Space mean speed in	outer lanes,		N/A	mph	
Space mean speed for	c all vehicles,	0 S =	54.7	mph	

Phone: Fax: E-mail: _____Merge Analysis_____ DCJ Analyst: Agency/Co.: Felsburg Holt & Ullevig Date performed: 7/21/2016 Analysis time period: AM Peak Hour Freeway/Dir of Travel: I-90 EB Junction: Exit 67 Jurisdiction: SDDOT Analysis Year: 2016 Description: I-90 Exit 61 to 67 Corridor Study _____Freeway Data______ Type of analysis Merge Number of lanes in freeway 2. Free-flow speed on freeway 65.0 mph Volume on freeway 269 vph _____On Ramp Data_____ Side of freeway Right Number of lanes in ramp 1 Free-flow speed on ramp 35.0 mph Volume on ramp 42 vph Length of first accel/decel lane 800 ft Length of second accel/decel lane ft _____Adjacent Ramp Data (if one exists)_____ Does adjacent ramp exist? No Volume on adjacent Ramp vph Position of adjacent Ramp Type of adjacent Ramp Distance to adjacent Ramp ft _____Conversion to pc/h Under Base Conditions______ Freeway Adjacent Junction Components Ramp Ramp Volume, V (vph) 269 42 vph Peak-hour factor, PHF 0.81 0.81 Peak 15-min volume, v15 83 13 v Trucks and buses 11 11 % Recreational vehicles 0 0 % Level Level Terrain type: % % 8 Grade Length mi mi mi Trucks and buses PCE, ET 1.5 1.5 Recreational vehicle PCE, ER 1.2 1.2

Heavy vehicle adjustment, Driver population factor, Flow rate, vp			1.00	pcph
	_Estimation of	E V12 Merge	Areas	
EQ	(Equ 1.000 Usir)
FM v = v	(P) = 350 F FM		0	
	Capacit	cy Checks		
V FO		Maximum 4700		LOS F? No
v or v	0 pc/h	(Equatio	n 13-14	or 13-17)
3 av34 Is v or v > 2700	pc/h?	No		
$\begin{array}{ccc} 3 & av34 \\ Is & v & or & v & > 1.5 \\ \end{array}$		No		
3 av34 If yes, v = 350 12A	12	(Equation 1	3-15, 13	3-16, 13-18, or 13-19)
Act v 405 R12	ual Ma	ax Desirable 500		No
Density, D = $5.475 + 0.00$ R Level of service for ramp	R	12	1	J
	Speed Est	cimation		
Intermediate speed variab	ole,		0.271	
Space mean speed in ramp	influence are		58.8	mph
Space mean speed in outer	lanes,		N/A	mph
Space mean speed for all	vehicles,	0 S =	58.8	mph

Phone: Fax: E-mail: _____Merge Analysis_____ DCJ Analyst: Agency/Co.: Felsburg Holt & Ullevig Date performed: 7/21/2016 Analysis time period: PM Peak Hour Freeway/Dir of Travel: I-90 EB Junction: Exit 67 Jurisdiction: SDDOT Analysis Year: 2016 Description: I-90 Exit 61 to 67 Corridor Study _____Freeway Data______ Type of analysis Merge Number of lanes in freeway 2. Free-flow speed on freeway 65.0 mph Volume on freeway 296 vph _____On Ramp Data_____ Side of freeway Right Number of lanes in ramp 1 Free-flow speed on ramp 35.0 mph Volume on ramp 24 vph Length of first accel/decel lane 800 ft Length of second accel/decel lane ft _____Adjacent Ramp Data (if one exists)_____ Does adjacent ramp exist? No Volume on adjacent Ramp vph Position of adjacent Ramp Type of adjacent Ramp Distance to adjacent Ramp ft _____Conversion to pc/h Under Base Conditions______ Freeway Adjacent Junction Components Ramp Ramp Volume, V (vph) 296 24 vph Peak-hour factor, PHF 0.92 0.92 Peak 15-min volume, v15 80 7 v Trucks and buses 11 11 % Recreational vehicles 0 0 Ŷ Level Level Terrain type: % % 8 Grade Length mi mi mi Trucks and buses PCE, ET 1.5 1.5 Recreational vehicle PCE, ER 1.2 1.2

Heavy vehicle adjustment, Driver population factor, Flow rate, vp				I	ocph
	Estimation of	V12 Merge	Areas		
EQ	(Equ				
FM	1.000 Usin		0		
	(P) = 339 FM	pc/h			
	Capacit	y Checks			
V FO		Maximum 4700		LOS F? No	
v or v	0 pc/h	(Equatio	n 13-14	or 13-17)	
3 av34 Is v or v > 2700	pc/h?	No			
3 av34 Is v or v > 1.5 v		No			
3 av34 If yes, v = 339 12A		(Equation 1	3-15, 13	8-16, 13-18, or 13	8-19)
Act v 367 R12	low Entering ual Ma 46 Service Dete	x Desirable 00		No	
Density, D = $5.475 + 0.00$ R Level of service for ramp	R	12	Ī	A	′mi/ln
	Speed Est	imation			
Intermediate speed variab	le,		0.271		
Space mean speed in ramp	influence are		58.8	mph	
Space mean speed in outer	lanes,		N/A	mph	
Space mean speed for all	vehicles,	0 S =	58.8	mph	

Fax:

_____Operational Analysis______ Analyst: DCJ Agency or Company: Date Performed: FHU 7/20/2016 Analysis Time Period: AM Peak Hour Freeway/Direction: EB I-90 From/To: Exit 67 to Pull Off Jurisdiction: SDDOT Analysis Year: 2016 Description: I-90 Exit 61 to 67 Corridor Study _____Flow Inputs and Adjustments_____ veh/h Volume, V 310 Peak-hour factor, PHF 0.81 Peak 15-min volume, v15 96 v Trucks and buses 11 % Recreational vehicles Ŷ 0 Terrain type: Level % Grade _ Segment length mi Trucks and buses PCE, ET 1.5 Recreational vehicle PCE, ER 1.2 Heavy vehicle adjustment, fHV 0.948 Driver population factor, fp 1.00 202 Flow rate, vp pc/h/ln _____Speed Inputs and Adjustments_____ Lane width ft Right-side lateral clearance _ ft _ Total ramp density, TRD ramps/mi Number of lanes, N 2 Free-flow speed: Measured FFS or BFFS 65.0 mi/h Lane width adjustment, fLW mi/h Lateral clearance adjustment, fLC _ mi/h TRD adjustment _ mi/h Free-flow speed, FFS 65.0 mi/h _____LOS and Performance Measures_____ Flow rate, vp 202 pc/h/ln Free-flow speed, FFS 65.0 mi/h Average passenger-car speed, S 65.0 mi/h Number of lanes, N 2 Density, D 3.1 pc/mi/ln Level of service, LOS Α

Fax:

_____Operational Analysis______Operational Analysis_____ Analyst: DCJ Agency or Company: Date Performed: FHU 7/20/2016 Analysis Time Period: PM Peak Hour Freeway/Direction: EB I-90 From/To: East of Exit 67 Jurisdiction: SDDOT Analysis Year: 2016 Description: I-90 Exit 61 to 67 Corridor Study _____Flow Inputs and Adjustments_____ veh/h Volume, V 325 Peak-hour factor, PHF 0.92 Peak 15-min volume, v15 88 v Trucks and buses 11 % Recreational vehicles Ŷ 0 Terrain type: Level % Grade _ Segment length mi Trucks and buses PCE, ET 1.5 Recreational vehicle PCE, ER 1.2 Heavy vehicle adjustment, fHV 0.948 Driver population factor, fp 1.00 186 Flow rate, vp pc/h/ln _____Speed Inputs and Adjustments_____ Lane width ft Right-side lateral clearance ft _ _ Total ramp density, TRD ramps/mi Number of lanes, N 2 Free-flow speed: Measured FFS or BFFS 65.0 mi/h Lane width adjustment, fLW mi/h Lateral clearance adjustment, fLC _ mi/h TRD adjustment _ mi/h Free-flow speed, FFS 65.0 mi/h _____LOS and Performance Measures_____ Flow rate, vp 186 pc/h/ln Free-flow speed, FFS 65.0 mi/h Average passenger-car speed, S 65.0 mi/h Number of lanes, N 2 Density, D 2.9 pc/mi/ln Level of service, LOS А

Fax:

_____Operational Analysis______ Analyst: DCJ Agency or Company: Date Performed: FHU 7/20/2016 Analysis Time Period: AM Peak Hour Freeway/Direction: WB I-90 From/To: East of Exit 67 Jurisdiction: SDDOT Analysis Year: 2016 Description: I-90 Exit 61 to 67 Corridor Study _____Flow Inputs and Adjustments_____ veh/h Volume, V 260 Peak-hour factor, PHF 0.84 77 Peak 15-min volume, v15 v Trucks and buses 11 % Recreational vehicles Ŷ 0 Terrain type: Level % Grade _ Segment length mi Trucks and buses PCE, ET 1.5 Recreational vehicle PCE, ER 1.2 Heavy vehicle adjustment, fHV 0.948 Driver population factor, fp 1.00 Flow rate, vp 163 pc/h/ln _____Speed Inputs and Adjustments_____ Lane width ft Right-side lateral clearance ft _ _ Total ramp density, TRD ramps/mi Number of lanes, N 2 Free-flow speed: Measured FFS or BFFS 65.0 mi/h Lane width adjustment, fLW mi/h Lateral clearance adjustment, fLC _ mi/h TRD adjustment _ mi/h Free-flow speed, FFS 65.0 mi/h _____LOS and Performance Measures_____ Flow rate, vp 163 pc/h/ln Free-flow speed, FFS 65.0 mi/h Average passenger-car speed, S 65.0 mi/h Number of lanes, N 2 Density, D 2.5 pc/mi/ln Level of service, LOS А

Fax:

_____Operational Analysis______ Analyst: DCJ Agency or Company: Date Performed: FHU 7/20/2016 Analysis Time Period: PM Peak Hour Freeway/Direction: WB I-90 From/To: East of Exit 67 Jurisdiction: SDDOT Analysis Year: 2016 Description: I-90 Exit 61 to 67 Corridor Study _____Flow Inputs and Adjustments_____ veh/h Volume, V 410 Peak-hour factor, PHF 0.89 115 Peak 15-min volume, v15 v Trucks and buses 11 % Recreational vehicles 0 Ŷ Terrain type: Level % Grade _ Segment length mi Trucks and buses PCE, ET 1.5 Recreational vehicle PCE, ER 1.2 Heavy vehicle adjustment, fHV 0.948 Driver population factor, fp 1.00 243 Flow rate, vp pc/h/ln _____Speed Inputs and Adjustments_____ Lane width ft Right-side lateral clearance ft _ _ Total ramp density, TRD ramps/mi Number of lanes, N 2 Free-flow speed: Measured FFS or BFFS 65.0 mi/h Lane width adjustment, fLW mi/h Lateral clearance adjustment, fLC _ mi/h TRD adjustment _ mi/h Free-flow speed, FFS 65.0 mi/h _____LOS and Performance Measures_____ Flow rate, vp 243 pc/h/ln Free-flow speed, FFS 65.0 mi/h Average passenger-car speed, S 65.0 mi/h Number of lanes, N 2 3.7 Density, D pc/mi/ln Level of service, LOS А

Phone: Fax: E-mail: _____Diverge Analysis______ DCJ Analyst: Agency/Co.: Felsburg Holt & Ullevig Date performed: 7/21/2016 Analysis time period: AM Peak Hour Freeway/Dir of Travel: I-90 WB Junction: Exit 67 Jurisdiction: SDDOT Analysis Year: 2016 Description: I-90 Exit 61 to 67 Corridor Study _____Freeway Data______ Type of analysis Diverge Number of lanes in freeway 2. Free-flow speed on freeway 65.0 mph Volume on freeway 260 vph _____Off Ramp Data_____ Side of freeway Right Number of lanes in ramp 1 Free-Flow speed on ramp 35.0 mph Volume on ramp 32 vph 350 Length of first accel/decel lane ft Length of second accel/decel lane ft _____Adjacent Ramp Data (if one exists)_____ Does adjacent ramp exist? No Volume on adjacent ramp vph Position of adjacent ramp Type of adjacent ramp Distance to adjacent ramp ft _____Conversion to pc/h Under Base Conditions______ Freeway Adjacent Junction Components Ramp Ramp Volume, V (vph) 260 32 vph Peak-hour factor, PHF 0.84 0.84 Peak 15-min volume, v15 77 10 v Trucks and buses 11 11 % Recreational vehicles 0 0 Ŷ Level Level Terrain type: 0.00 % 0.00 8 8 Grade 0.00 mi 0.00 Length mi mi Trucks and buses PCE, ET 1.5 1.5 Recreational vehicle PCE, ER 1.2 1.2

Heavy vehicle adjustment, fHV Driver population factor, fP Flow rate, vp			0.948 1.00 40		pcph			
Estimation of V12 Diverge Areas								
	= (Equ EQ	ation 13-12	or 13-1	.3)				
P	= 1.000 Usin FD	g Equation	0					
v = v + (v - v) P = 327 pc/h 12 R F R FD								
Capacity Checks								
v = v Fi F	Actual 327	Maximum 4700		LOS F? No				
	287	4700		No				
V	40	2000		No				
R V or V	0 pc/h	(Equation	(Equation 13-14 or 13-17)					
3 av34 Is v or v >	2700 pc/h?	No						
3 av34 Is v or v >	1.5 v /2	No						
3 av34 If yes, v = 327 12A	12	(Equation 13	-15, 13	-16, 13-18,	or 13-19)			
	Flow Entering Di							
v 327		ax Desirable 100		Violation? No				
12 Level of Service Determination (if not F)								
Density, D = 4.252 + 0.0086 v - 0.009 L = 3.9 pc/mi/ln								
R 12 D Level of service for ramp-freeway junction areas of influence A								
	Speed Est	imation						
Intermediate speed	variable,	D = S	0.432					
Space mean speed in	ramp influence are	a, S =	55.1	mph				
Space mean speed in	outer lanes,		N/A	mph				
Space mean speed fo	r all vehicles,	0 S =	55.1	mph				

Phone: Fax: E-mail: _____Diverge Analysis______ DCJ Analyst: Agency/Co.: Felsburg Holt & Ullevig Date performed: 7/21/2016 Analysis time period: PM Peak Hour Freeway/Dir of Travel: I-90 WB Junction: Exit 67 Jurisdiction: SDDOT Analysis Year: 2016 Description: I-90 Exit 61 to 67 Corridor Study _____Freeway Data______ Type of analysis Diverge Number of lanes in freeway 2 Free-flow speed on freeway 65.0 mph Volume on freeway 410 vph _____Off Ramp Data_____ Side of freeway Right Number of lanes in ramp 1 Free-Flow speed on ramp 35.0 mph 47 Volume on ramp vph 350 Length of first accel/decel lane ft Length of second accel/decel lane ft _____Adjacent Ramp Data (if one exists)_____ Does adjacent ramp exist? No Volume on adjacent ramp vph Position of adjacent ramp Type of adjacent ramp Distance to adjacent ramp ft _____Conversion to pc/h Under Base Conditions______ Adjacent Junction Components Freeway Ramp Ramp Volume, V (vph) 47 410 vph Peak-hour factor, PHF 0.89 0.89 Peak 15-min volume, v15 13 115 v Trucks and buses 11 11 % Recreational vehicles 0 0 % Level Level Terrain type: 0.00 % 0.00 00 8 Grade 0.00 mi 0.00 Length mi mi Trucks and buses PCE, ET 1.5 1.5 Recreational vehicle PCE, ER 1.2 1.2

	ustment, fHV factor, fP				pcph	
	Estimation	of V12 Diverg	e Areas			
	L = (Equation 13-12 or 13-13) EQ					
	P = 1.000 U FD	sing Equation	0			
	v = v + (v - v) 12 R F R		pc/h			
	Capa	city Checks				
v = v Fi F		Maximum 4700		LOS F? No		
v = v - v FO F R	430	4700	1	No		
v R	56	2000	1	No		
v or v 3 av34	0 pc/h (Equation 13-14 or 13-17)					
	> 2700 pc/h?	No				
Is v or v 3 av34		No				
If yes, v = 48 12A		(Equation 1	3-15, 13-	-16, 13-18,	or 13-19)	
		Diverge Influ				
		Max Desirable 4400		Violation? No		
12	Level of Service D	etermination (if not F)		
Density,		0.0086 v - 0.	009 L D	= 5.3	pc/mi/ln	
Level of service	R for ramp-freeway j			ence A		
	Speed	Estimation				
Intermediate speed	d variable,		0.433			
Space mean speed	in ramp influence		55.0	mph		
Space mean speed	in outer lanes,	R S = 0	N/A	mph		
Space mean speed	for all vehicles,	-	55.0	mph		

Phone: Fax: E-mail: _____Merge Analysis_____ DCJ Analyst: Agency/Co.: Felsburg Holt & Ullevig Date performed: 7/21/2016 Analysis time period: AM Peak Hour Freeway/Dir of Travel: I-90 WB Junction: Exit 67 Jurisdiction: SDDOT Analysis Year: 2016 Description: I-90 Exit 61 to 67 Corridor Study _____Freeway Data______ Type of analysis Merge Number of lanes in freeway 2. Free-flow speed on freeway 65.0 mph Volume on freeway 228 vph _____On Ramp Data_____ Side of freeway Right Number of lanes in ramp 1 Free-flow speed on ramp 35.0 mph 420 Volume on ramp vph Length of first accel/decel lane 875 ft Length of second accel/decel lane ft _____Adjacent Ramp Data (if one exists)_____ Does adjacent ramp exist? No Volume on adjacent Ramp vph Position of adjacent Ramp Type of adjacent Ramp Distance to adjacent Ramp ft _____Conversion to pc/h Under Base Conditions______ Freeway Adjacent Junction Components Ramp Ramp Volume, V (vph) 228 420 vph Peak-hour factor, PHF 0.84 0.84 Peak 15-min volume, v15 125 68 v Trucks and buses 11 11 % Recreational vehicles 0 0 % Level Level Terrain type: % % 8 Grade Length mi mi mi Trucks and buses PCE, ET 1.5 1.5 Recreational vehicle PCE, ER 1.2 1.2
Heavy vehicle adjustment, Driver population factor, Flow rate, vp		0.948 1.00 286	1.00		pcph
	_Estimation of	V12 Merge	Areas		
L =	(Equ	ation 13-6	or 13-7)	
EQ P = FM	1.000 Usir	ng Equation	0		
	(P) = 286 F FM	5 pc/h			
	Capacit	cy Checks			
V		Maximum 4700		LOS F? No	
FO vorv	0 pc/h	(Equatio	n 13-14	or 13-17)	
3 av34 Is v or v > 2700	pc/h?	No			
$\begin{array}{ccc} 3 & av34 \\ \text{Is } v & \text{or } v & > 1.5 \\ \end{array}$		No			
3 av34 If yes, v = 286 12A	12	(Equation 1	3-15, 13	3-16, 13-18, o:	r 13-19)
Act v 814 R12	ual Ma 4 46	ax Desirable 500		No	
	Service Dete				
Density, D = 5.475 + 0.00 R Level of service for ramp	R	12	2	A	pc/mi/ln
	Speed Est	imation			
Intermediate speed variab	ole,		0.269		
Space mean speed in ramp	influence are		58.8	mph	
Space mean speed in outer	lanes,		N/A	mph	
Space mean speed for all	vehicles,	0 S =	58.8	mph	

Phone: Fax: E-mail: _____Merge Analysis_____ DCJ Analyst: Agency/Co.: Felsburg Holt & Ullevig Date performed: 7/21/2016 Analysis time period: PM Peak Hour Freeway/Dir of Travel: I-90 WB Junction: Exit 67 Jurisdiction: SDDOT Analysis Year: 2016 Description: I-90 Exit 61 to 67 Corridor Study _____Freeway Data______ Type of analysis Merge Number of lanes in freeway 2. Free-flow speed on freeway 65.0 mph Volume on freeway 363 vph _____On Ramp Data_____ Side of freeway Right Number of lanes in ramp 1 Free-flow speed on ramp 35.0 mph 414 Volume on ramp vph Length of first accel/decel lane 875 ft Length of second accel/decel lane ft _____Adjacent Ramp Data (if one exists)_____ Does adjacent ramp exist? No Volume on adjacent Ramp vph Position of adjacent Ramp Type of adjacent Ramp Distance to adjacent Ramp ft _____Conversion to pc/h Under Base Conditions______ Freeway Adjacent Junction Components Ramp Ramp Volume, V (vph) 363 414 vph Peak-hour factor, PHF 0.89 0.89 Peak 15-min volume, v15 102 116 v Trucks and buses 11 11 % Recreational vehicles 0 0 % Level Level Terrain type: % % 8 Grade Length mi mi mi Trucks and buses PCE, ET 1.5 1.5 Recreational vehicle PCE, ER 1.2 1.2

Heavy vehicle adjustment, Driver population factor, Flow rate, vp					pcph
]	Estimation of	V12 Merge	Areas		
L = EQ	(Equ	ation 13-6	or 13-7))	
	1.000 Usin	g Equation	0		
v = v	(P) = 430 FM	pc/h			
	Capacit	y Checks			
V FO	Actual 921			LOS F? No	
v or v 3 av34	0 pc/h	(Equatio	n 13-14	or 13-17)	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	pc/h?	No			
Is v or v > 1.5 v 3 av34		No			
If yes, v = 430 12A		(Equation 1	3-15, 13	3-16, 13-18, o	r 13-19)
Actu v 921 R12	low Entering al Ma 46 Service Dete	x Desirable 00		No	
Density, D = $5.475 + 0.00^{\circ}$ R Level of service for ramp	R	12	I	ł	pc/mi/ln
	Speed Est	imation			
Intermediate speed variab	le,		0.270		
Space mean speed in ramp :	influence are		58.8	mph	
Space mean speed in outer	lanes,	R S =	N/A	mph	
Space mean speed for all	vehicles,	0 S =	58.8	mph	

Fax:

_____Operational Analysis______ Analyst: DCJ Agency or Company: Date Performed: FHU 7/20/2016 Analysis Time Period: AM Peak Hour Freeway/Direction: WB I-90 From/To: Exit 67 to Exit 63 Jurisdiction: SDDOT Analysis Year: 2016 Description: I-90 Exit 61 to 67 Corridor Study _____Flow Inputs and Adjustments_____ veh/h Volume, V 680 Peak-hour factor, PHF 0.84 202 Peak 15-min volume, v15 v Trucks and buses 11 % Recreational vehicles Ŷ 0 Terrain type: Level % Grade _ Segment length mi Trucks and buses PCE, ET 1.5 Recreational vehicle PCE, ER 1.2 Heavy vehicle adjustment, fHV 0.948 Driver population factor, fp 1.00 427 Flow rate, vp pc/h/ln _____Speed Inputs and Adjustments_____ Lane width ft Right-side lateral clearance _ ft _ Total ramp density, TRD ramps/mi Number of lanes, N 2 Free-flow speed: Measured FFS or BFFS 65.0 mi/h Lane width adjustment, fLW mi/h Lateral clearance adjustment, fLC _ mi/h TRD adjustment _ mi/h 65.0 Free-flow speed, FFS mi/h _____LOS and Performance Measures____ Flow rate, vp 427 pc/h/ln Free-flow speed, FFS 65.0 mi/h Average passenger-car speed, S 65.0 mi/h Number of lanes, N 2 Density, D 6.6 pc/mi/ln Level of service, LOS А

Fax:

_____Operational Analysis______Operational Analysis_____ Analyst: DCJ Agency or Company: Date Performed: FHU 7/20/2016 Analysis Time Period: PM Peak Hour Freeway/Direction: WB I-90 From/To: Exit 67 to Exit 63 Jurisdiction: SDDOT Analysis Year: 2016 Description: I-90 Exit 61 to 67 Corridor Study _____Flow Inputs and Adjustments_____ veh/h Volume, V 980 Peak-hour factor, PHF 0.89 275 Peak 15-min volume, v15 v Trucks and buses 11 % Recreational vehicles 0 Ŷ Terrain type: Level % Grade _ Segment length mi Trucks and buses PCE, ET 1.5 Recreational vehicle PCE, ER 1.2 Heavy vehicle adjustment, fHV 0.948 Driver population factor, fp 1.00 581 Flow rate, vp pc/h/ln _____Speed Inputs and Adjustments_____ Lane width ft Right-side lateral clearance ft _ _ Total ramp density, TRD ramps/mi Number of lanes, N 2 Free-flow speed: Measured FFS or BFFS 65.0 mi/h Lane width adjustment, fLW mi/h Lateral clearance adjustment, fLC _ mi/h TRD adjustment _ mi/h 65.0 Free-flow speed, FFS mi/h _____LOS and Performance Measures_____ Flow rate, vp 581 pc/h/ln Free-flow speed, FFS 65.0 mi/h Average passenger-car speed, S 65.0 mi/h Number of lanes, N 2 Density, D 8.9 pc/mi/ln Level of service, LOS А

Phone: Fax: E-mail: _____Merge Analysis_____ DCJ Analyst: Agency/Co.: Felsburg Holt & Ullevig Agency/Co..Feisburg notDate performed:7/21/2016Analysis time period:AM Peak Hour Freeway/Dir of Travel: I-90 WB Junction: Exit 63 Jurisdiction: SDDOT Analysis Year: 2016 Description: I-90 Exit 61 to 67 Corridor Study _____Freeway Data______ Type of analysis Merge Number of lanes in freeway 2 Free-flow speed on freeway 65.0 mph Volume on freeway 680 vph _____On Ramp Data_____ Side of freeway Right Number of lanes in ramp 1 Free-flow speed on ramp 35.0 mph Volume on ramp 615 vph Length of first accel/decel lane 1050 ft Length of second accel/decel lane ft _____Adjacent Ramp Data (if one exists)_____ Does adjacent ramp exist? No Volume on adjacent Ramp vph Position of adjacent Ramp Type of adjacent Ramp Distance to adjacent Ramp ft _____Conversion to pc/h Under Base Conditions______ Freeway Adjacent Junction Components Ramp Ramp Volume, V (vph) 680 615 vph Peak-hour factor, PHF 0.84 0.84 Peak 15-min volume, v15 202 183 v Trucks and buses 11 11 % Recreational vehicles 0 0 % Level Level Terrain type: % % 8 Grade Length mi mi mi Trucks and buses PCE, ET 1.5 1.5 Recreational vehicle PCE, ER 1.2 1.2

Heavy vehicle adjustment, fHV Driver population factor, fP Flow rate, vp			pcph
Estima	tion of V12 Merg	e Areas	
L = EQ	(Equation 13-	6 or 13-7)	
	Using Equatio	n 0	
	= 854 pc/h		
	Capacity Checks_		
v 1626	al Maximu 4700		DS F? D
	pc/h (Equat	ion 13-14 or	r 13-17)
3 av34 Is v or v > 2700 pc/h?	No		
3 av34 Is v or v > 1.5 v /2	No		
3 av34 12 If yes, v = 854 12A	(Equation	13-15, 13-1	16, 13-18, or 13-19)
Actual v 1626 R12	tering Merge Inf Max Desirab 4600 ce Determination	le V M	Violation? No
Density, D = $5.475 + 0.00734 v$ R R Level of service for ramp-freew	12	A	
Sp	eed Estimation		
Intermediate speed variable,	М	= 0.267	
Space mean speed in ramp influe		= 58.9 m	nph
Space mean speed in outer lanes			nph
Space mean speed for all vehicl	0 es, S 	= 58.9 m	nph

Phone: Fax: E-mail: _____Merge Analysis_____ DCJ Analyst: Agency/Co.: Felsburg Holt & Ullevig Date performed: 7/21/2016 Analysis time period: PM Peak Hour Freeway/Dir of Travel: I-90 WB Junction: Exit 63 Jurisdiction: SDDOT Analysis Year: 2016 Description: I-90 Exit 61 to 67 Corridor Study _____Freeway Data______ Type of analysis Merge Number of lanes in freeway 2 Free-flow speed on freeway 65.0 mph Volume on freeway 980 vph _____On Ramp Data_____ Side of freeway Right Number of lanes in ramp 1 Free-flow speed on ramp 35.0 mph Volume on ramp 595 vph Length of first accel/decel lane 1050 ft Length of second accel/decel lane ft _____Adjacent Ramp Data (if one exists)_____ Does adjacent ramp exist? No Volume on adjacent Ramp vph Position of adjacent Ramp Type of adjacent Ramp Distance to adjacent Ramp ft _____Conversion to pc/h Under Base Conditions______ Freeway Adjacent Junction Components Ramp Ramp Volume, V (vph) 980 595 vph Peak-hour factor, PHF 0.89 0.89 Peak 15-min volume, v15 275 167 v Trucks and buses 11 11 % Recreational vehicles 0 0 % Level Level Terrain type: % % 8 Grade Length mi mi mi Trucks and buses PCE, ET 1.5 1.5 Recreational vehicle PCE, ER 1.2 1.2

1 5 ,	1.00 1.	.948 .00 05 pcph
Estimation of	V12 Merge Area	as
L = (Equa EQ P = 1.000 Using FM v = v (P) = 1162	g Equation 0	13-7)
12 F FM		
Capacity	/ Checks	
v 1867	Maximum 4700	LOS F? No
	(Equation 13	3-14 or 13-17)
3 av34 Is v or v > 2700 pc/h? 3 av34	No	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	No	
	Equation 13-15	5, 13-16, 13-18, or 13-19)
Flow Entering M Actual Max v 1867 460 R12 Level of Service Deter	c Desirable)0	No
Density, D = $5.475 + 0.00734 v + 0.007$ R R Level of service for ramp-freeway junct	12	А
Speed Esti	imation	
Intermediate speed variable,	M = 0.2	273
Space mean speed in ramp influence area	S a, S = 58 R	.7 mph
Space mean speed in outer lanes,	S = N	A mph
Space mean speed for all vehicles,	S = 58	.7 mph

Fax:

_____Operational Analysis______ Analyst: DCJ Agency or Company: Date Performed: FHU 7/20/2016 Analysis Time Period: AM Peak Hour Freeway/Direction: WB I-90 From/To: Exit 63 to Exit 61 Jurisdiction: SDDOT Analysis Year: 2016 Description: I-90 Exit 61 to 67 Corridor Study _____Flow Inputs and Adjustments_____ veh/h Volume, V 1270 Peak-hour factor, PHF 0.84 378 Peak 15-min volume, v15 v Trucks and buses 11 % Recreational vehicles 0 Ŷ Terrain type: Level % Grade _ Segment length mi Trucks and buses PCE, ET 1.5 Recreational vehicle PCE, ER 1.2 Heavy vehicle adjustment, fHV 0.948 Driver population factor, fp 1.00 798 Flow rate, vp pc/h/ln _____Speed Inputs and Adjustments_____ Lane width ft Right-side lateral clearance ft _ _ Total ramp density, TRD ramps/mi Number of lanes, N 2 Free-flow speed: Measured FFS or BFFS 65.0 mi/h Lane width adjustment, fLW mi/h Lateral clearance adjustment, fLC _ mi/h TRD adjustment _ mi/h 65.0 Free-flow speed, FFS mi/h _____LOS and Performance Measures_____ Flow rate, vp 798 pc/h/ln Free-flow speed, FFS 65.0 mi/h Average passenger-car speed, S 65.0 mi/h Number of lanes, N 2 12.3 Density, D pc/mi/ln Level of service, LOS В

Fax:

_____Operational Analysis______ Analyst: DCJ Agency or Company: Date Performed: FHU 7/20/2016 Analysis Time Period: PM Peak Hour Freeway/Direction: WB I-90 From/To: Exit 63 to Exit 61 Jurisdiction: SDDOT Analysis Year: 2016 Description: I-90 Exit 61 to 67 Corridor Study _____Flow Inputs and Adjustments_____ veh/h Volume, V 1580 Peak-hour factor, PHF 0.89 444 Peak 15-min volume, v15 v Trucks and buses 11 % Recreational vehicles 0 Ŷ Terrain type: Level % Grade _ Segment length mi Trucks and buses PCE, ET 1.5 Recreational vehicle PCE, ER 1.2 Heavy vehicle adjustment, fHV 0.948 Driver population factor, fp 1.00 936 Flow rate, vp pc/h/ln _____Speed Inputs and Adjustments_____ Lane width ft Right-side lateral clearance _ ft _ Total ramp density, TRD ramps/mi Number of lanes, N 2 Free-flow speed: Measured FFS or BFFS 65.0 mi/h Lane width adjustment, fLW mi/h Lateral clearance adjustment, fLC _ mi/h TRD adjustment _ mi/h 65.0 Free-flow speed, FFS mi/h _____LOS and Performance Measures_____ Flow rate, vp 936 pc/h/ln Free-flow speed, FFS 65.0 mi/h Average passenger-car speed, S 65.0 mi/h Number of lanes, N 2 Density, D 14.4 pc/mi/ln Level of service, LOS В

Phone: Fax: E-mail: _____Diverge Analysis______ DCJ Analyst: Agency/Co.: Felsburg Holt & Ullevig Date performed: 7/21/2016 Analysis time period: AM Peak Hour Freeway/Dir of Travel: I-90 WB Junction: Exit 61 Jurisdiction: SDDOT Analysis Year: 2016 Description: I-90 Exit 61 to 67 Corridor Study _____Freeway Data_____ Type of analysis Diverge Number of lanes in freeway 2 Free-flow speed on freeway 65.0 mph Volume on freeway 1270 vph _____Off Ramp Data_____ Side of freeway Right Number of lanes in ramp 1 Free-Flow speed on ramp 35.0 mph Volume on ramp vph 9 Length of first accel/decel lane 710 ft Length of second accel/decel lane ft _____Adjacent Ramp Data (if one exists)_____ Does adjacent ramp exist? No Volume on adjacent ramp vph Position of adjacent ramp Type of adjacent ramp Distance to adjacent ramp ft _____Conversion to pc/h Under Base Conditions______ Freeway Adjacent Junction Components Ramp Ramp 9 Volume, V (vph) 1270 vph Peak-hour factor, PHF 0.84 0.84 Peak 15-min volume, v15 378 3 v Trucks and buses 11 11 % Recreational vehicles 0 0 Ŷ Level Level Terrain type: 0.00 % 0.00 8 8 Grade 0.00 mi 0.00 Length mi mi Trucks and buses PCE, ET 1.5 1.5 Recreational vehicle PCE, ER 1.2 1.2

Heavy vehicle adjustment, Driver population factor, Flow rate, vp		0.948 1.00 1595			pcph
E	stimation of	V12 Diverge	e Areas_		
	(Equa	ation 13-12	or 13-1	.3)	
EQ P = FD	1.000 Using	g Equation	0		
	+ (v - v) P F R F		pc/h		
	Capacity	Checks			
v = v Fi F	Actual 1595			LOS F? No	
v = v - v	1584	4700		No	
FOFR V	11	2000		No	
R v or v	0 pc/h	(Equatior	n 13-14	or 13-17)	
3 av34 Is v or v > 2700 p	c/h?	No			
3 av34 Is v or v > 1.5 v		No			
3 av34 1 If yes, v = 1595 12A		Equation 13	3-15, 13	8-16, 13-18,	or 13-19)
	Entering Div				
v 1595	al Max 440			Violation? No	
12 Level of	Service Deter	mination (i	if not F	י)	
Density, D =	4.252 + 0.00)86 v - 0.0 12	09 L D	= 11.6	pc/mi/ln
Level of service for ramp-	freeway junct		-	lence B	
	Speed Esti	mation			
Intermediate speed variabl	е,		0.429		
Space mean speed in ramp i	nfluence area		55.1	mph	
Space mean speed in outer	lanes,		N/A	mph	
Space mean speed for all v	ehicles,	0 S =	55.1	mph	

Phone: Fax: E-mail: _____Diverge Analysis______ DCJ Analyst: Agency/Co.: Felsburg Holt & Ullevig Date performed: 7/21/2016 Analysis time period: PM Peak Hour Freeway/Dir of Travel: I-90 WB Junction: Exit 61 Jurisdiction: SDDOT Analysis Year: 2016 Description: I-90 Exit 61 to 67 Corridor Study _____Freeway Data______ Type of analysis Diverge Number of lanes in freeway 2. Free-flow speed on freeway 65.0 mph Volume on freeway 1580 vph _____Off Ramp Data_____ Side of freeway Right Number of lanes in ramp 1 Free-Flow speed on ramp 35.0 mph Volume on ramp 10 vph 710 Length of first accel/decel lane ft Length of second accel/decel lane ft _____Adjacent Ramp Data (if one exists)_____ Does adjacent ramp exist? No Volume on adjacent ramp vph Position of adjacent ramp Type of adjacent ramp Distance to adjacent ramp ft _____Conversion to pc/h Under Base Conditions______ Freeway Adjacent Junction Components Ramp Ramp Volume, V (vph) 1580 10 vph Peak-hour factor, PHF 0.89 0.89 Peak 15-min volume, v15 4443 v Trucks and buses 11 11 % Recreational vehicles 0 0 Ŷ Level Level Terrain type: 0.00 % 0.00 8 8 Grade 0.00 mi 0.00 Length mi mi Trucks and buses PCE, ET 1.5 1.5 Recreational vehicle PCE, ER 1.2 1.2

Heavy vehicle adjustment, Driver population factor, Flow rate, vp		0.948 1.00 1873	0.948 1.00 12		pcph
Е	stimation of	V12 Diverge	e Areas_		
	(Equa	ation 13-12	or 13-2	13)	
EQ P = FD	1.000 Using	g Equation	0		
v = v	+ (v - v) P F R F		pc/h		
	Capacity	Z Checks			
v = v Fi F	Actual 1873			LOS F? No	
v = v - v	1861	4700		No	
FO F R V	12	2000		No	
R v or v	0 pc/h	(Equation	n 13-14	or 13-17)	
3 av34 Is v or v > 2700 p	oc/h?	No			
3 av34 Is v or v > 1.5 v		No			
3 av34 1 If yes, v = 1873 12A		(Equation 13	3-15, 13	3-16, 13-18,	or 13-19)
	Entering Div				
v 1873	Max Max 440			Violation? No	
12 Level of	Service Deter	mination (if not B	F)	
Density, D =	4.252 + 0.00			= 14.0	pc/mi/ln
R Level of service for ramp-	freeway junct	12 tion areas o	D of influ	lence B	
	Speed Esti	imation			
Intermediate speed variabl	е,	D = S	0.429		
Space mean speed in ramp i	nfluence area	a, S =	55.1	mph	
Space mean speed in outer	lanes,		N/A	mph	
Space mean speed for all w	ehicles,	0 S =	55.1	mph	

Phone: Fax: E-mail: _____Merge Analysis_____ DCJ Analyst: Agency/Co.: Felsburg Holt & Ullevig Agency/Co..Feisburg notDate performed:7/21/2016Analysis time period:AM Peak Hour Freeway/Dir of Travel: I-90 WB Junction: Exit 61 Jurisdiction: SDDOT Analysis Year: 2016 Description: I-90 Exit 61 to 67 Corridor Study _____Freeway Data______ Type of analysis Merge Number of lanes in freeway 2 Free-flow speed on freeway 65.0 mph Volume on freeway 1261 vph _____On Ramp Data_____ Side of freeway Right Number of lanes in ramp 1 Free-flow speed on ramp 35.0 mph Volume on ramp 132 vph Length of first accel/decel lane 1150 ft Length of second accel/decel lane ft Adjacent Ramp Data (if one exists)_____ Does adjacent ramp exist? No Volume on adjacent Ramp vph Position of adjacent Ramp Type of adjacent Ramp Distance to adjacent Ramp ft _____Conversion to pc/h Under Base Conditions______ Freeway Adjacent Junction Components Ramp Ramp Volume, V (vph) 132 1261 vph Peak-hour factor, PHF 0.84 0.84 Peak 15-min volume, v15 375 39 v Trucks and buses 11 11 % Recreational vehicles 0 0 Ŷ Level Level Terrain type: % % 8 Grade Length mi mi mi Trucks and buses PCE, ET 1.5 1.5 Recreational vehicle PCE, ER 1.2 1.2

Heavy vehicle adjustment, Driver population factor, Flow rate, vp		0.948 1.00 1584	1.00		pcph
	Estimation of	V12 Merge A	Areas		
L = EQ P = FM	(Equ 1.000 Usin				
	(P) = 158 FM	4 pc/h			
	Capacit	y Checks			
V FO		Maximum 4700		LOS F? No	
v or v 3 av34	0 pc/h	(Equation	n 13-14	or 13-17)	
Is v or v > 2700 ; 3 av34	pc/h?	No			
Is v or v > 1.5 v 3 av34	/2	No			
If yes, v = 1584 12A		(Equation 13	3-15, 13	-16, 13-18, c	or 13-19)
Act v 175 R12	low Entering ual Ma 0 46 Service Dete	x Desirable 00		Violation? No	
Density, D = 5.475 + 0.00 R Level of service for ramp	R	12	A		pc/mi/ln
	Speed Est	imation			
Intermediate speed variab	le,	M = S	0.263		
Space mean speed in ramp	influence are		59.0	mph	
Space mean speed in outer	lanes,		N/A	mph	
Space mean speed for all	vehicles,	-	59.0	mph	

Phone: Fax: E-mail: _____Merge Analysis_____ DCJ Analyst: Agency/Co.: Felsburg Holt & Ullevig Date performed: 7/21/2016 Analysis time period: PM Peak Hour Freeway/Dir of Travel: I-90 WB Junction: Exit 61 Jurisdiction: SDDOT Analysis Year: 2016 Description: I-90 Exit 61 to 67 Corridor Study _____Freeway Data______ Type of analysis Merge Number of lanes in freeway 2 Free-flow speed on freeway 65.0 mph Volume on freeway 1570 vph _____On Ramp Data_____ Side of freeway Right Number of lanes in ramp 1 Free-flow speed on ramp 35.0 mph Volume on ramp 192 vph Length of first accel/decel lane 1150 ft Length of second accel/decel lane ft Adjacent Ramp Data (if one exists)_____ Does adjacent ramp exist? No Volume on adjacent Ramp vph Position of adjacent Ramp Type of adjacent Ramp Distance to adjacent Ramp ft _____Conversion to pc/h Under Base Conditions______ Freeway Adjacent Junction Components Ramp Ramp Volume, V (vph) 1570 192 vph Peak-hour factor, PHF 0.89 0.89 Peak 15-min volume, v15 441 54 v Trucks and buses 11 11 % Recreational vehicles 0 0 Ŷ Level Level Terrain type: % % 8 Grade Length mi mi mi Trucks and buses PCE, ET 1.5 1.5 Recreational vehicle PCE, ER 1.2 1.2

Heavy vehicle adjustment, Driver population factor, Flow rate, vp		0.948 1.00 1861			pcph
I	Estimation of	V12 Merge	Areas		
EQ	(Equa)	
FM v = v	(P) = 1861 FM		0		
	Capacity	/ Checks			
v	Actual 2089			LOS F? No	
FO v or v 3 av34	0 pc/h	(Equatio	n 13-14	or 13-17)	
Is v or v > 2700 g 3 av34	oc/h?	No			
Is v or v > 1.5 v 3 av34		No			
If yes, v = 1861 12A		(Equation 1	3-15, 13	3-16, 13-18, 0	or 13-19)
Actu v 2089 R12	low Entering Maz Mal Maz 9 460 Service Deter	c Desirable)0		No	
Density, D = 5.475 + 0.007 R Level of service for ramp-	R	12	1	ł	pc/mi/ln
	Speed Est	imation			
Intermediate speed variabl	le,	M = S	0.272		
Space mean speed in ramp	influence area		58.7	mph	
Space mean speed in outer	lanes,	S =	N/A	mph	
Space mean speed for all v	vehicles,	-	58.7	mph	

Fax:

_____Operational Analysis______ Analyst: DCJ Agency or Company: Date Performed: FHU 7/20/2016 Analysis Time Period: AM Peak Hour Freeway/Direction: WB I-90 From/To: Exit 61 to Exit 60 Jurisdiction: SDDOT Analysis Year: 2016 Description: I-90 Exit 61 to 67 Corridor Study _____Flow Inputs and Adjustments_____ veh/h Volume, V 1350 Peak-hour factor, PHF 0.84 402 Peak 15-min volume, v15 v Trucks and buses 11 % Recreational vehicles 0 Ŷ Terrain type: Level % Grade _ Segment length mi Trucks and buses PCE, ET 1.5 Recreational vehicle PCE, ER 1.2 Heavy vehicle adjustment, fHV 0.948 Driver population factor, fp 1.00 848 Flow rate, vp pc/h/ln _____Speed Inputs and Adjustments_____ Lane width ft Right-side lateral clearance _ ft _ Total ramp density, TRD ramps/mi Number of lanes, N 2 Free-flow speed: Measured FFS or BFFS 65.0 mi/h Lane width adjustment, fLW mi/h Lateral clearance adjustment, fLC _ mi/h TRD adjustment _ mi/h Free-flow speed, FFS 65.0 mi/h _____LOS and Performance Measures_____ Flow rate, vp 848 pc/h/ln Free-flow speed, FFS 65.0 mi/h Average passenger-car speed, S 65.0 mi/h Number of lanes, N 2 Density, D 13.0 pc/mi/ln Level of service, LOS В

Fax:

_____Operational Analysis______ Analyst: DCJ Agency or Company: Date Performed: FHU 7/20/2016 Analysis Time Period: PM Peak Hour Freeway/Direction: WB I-90 From/To: Exit 61 to Exit 60 Jurisdiction: SDDOT Analysis Year: 2016 Description: I-90 Exit 61 to 67 Corridor Study _____Flow Inputs and Adjustments_____ veh/h Volume, V 1640 Peak-hour factor, PHF 0.89 461 Peak 15-min volume, v15 v Trucks and buses 11 % Recreational vehicles 0 Ŷ Terrain type: Level % Grade _ Segment length mi Trucks and buses PCE, ET 1.5 Recreational vehicle PCE, ER 1.2 Heavy vehicle adjustment, fHV 0.948 Driver population factor, fp 1.00 972 Flow rate, vp pc/h/ln _____Speed Inputs and Adjustments_____ Lane width ft Right-side lateral clearance _ ft _ Total ramp density, TRD ramps/mi Number of lanes, N 2 Free-flow speed: Measured FFS or BFFS 65.0 mi/h Lane width adjustment, fLW mi/h Lateral clearance adjustment, fLC _ mi/h TRD adjustment _ mi/h Free-flow speed, FFS 65.0 mi/h _____LOS and Performance Measures_____ Flow rate, vp 972 pc/h/ln Free-flow speed, FFS 65.0 mi/h Average passenger-car speed, S 65.0 mi/h Number of lanes, N 2 Density, D 15.0 pc/mi/ln Level of service, LOS В