

# APPENDIX D

## HCS Capacity Analysis



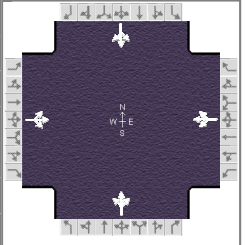
# APPENDIX D

HCS Capacity Analysis - Existing & No-Build Conditions



# HCS7 Signalized Intersection Results Summary

General Information				Intersection Information			
Agency	Arcadis US Inc			Duration, h	0.250		
Analyst	QAI	Analysis Date	5/26/2022	Area Type	Other		
Jurisdiction	District 12	Time Period	AM Peak	PHF	0.92		
Urban Street	US 422	Analysis Year	2022	Analysis Period	1> 6:15		
Intersection	US422 at Rapids Road	File Name	US 422 at Rapids Road - 2022 AM.xus				
Project Description	2022 Existing Conditions						



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand ( $v$ ), veh/h	20	375	10	5	915	10	30	10	5	5	5	55

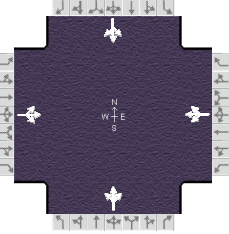
Signal Information				Signal Phases											
Cycle, s	90.0	Reference Phase	2	Green				1		2		3		4	
Offset, s	0	Reference Point	End	Yellow				5		6		7		8	
Uncoordinated	No	Simult. Gap E/W	Off	Red				5		6		7		8	
Force Mode	Fixed	Simult. Gap N/S	Off												

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		8.0		8.0		8.0		8.0
Phase Duration, s		78.3		78.3		11.7		11.7
Change Period, ( $Y+R_c$ ), s		6.8		6.8		5.1		5.1
Max Allow Headway ( $MAH$ ), s		0.0		0.0		3.1		3.2
Queue Clearance Time ( $g_s$ ), s						4.8		6.3
Green Extension Time ( $g_e$ ), s		0.0		0.0		0.0		0.0
Phase Call Probability						0.95		0.95
Max Out Probability						0.90		1.00

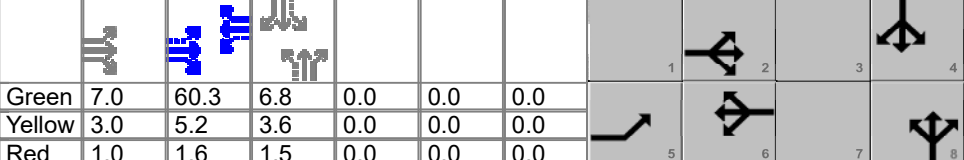
Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate ( $v$ ), veh/h	440			1011			49			71		
Adjusted Saturation Flow Rate ( $s$ ), veh/h/ln	1525			1582			1460			1448		
Queue Service Time ( $g_s$ ), s	0.0			0.0			0.0			1.1		
Cycle Queue Clearance Time ( $g_c$ ), s	7.0			32.8			2.8			4.3		
Green Ratio ( $g/C$ )	0.79			0.79			0.07			0.07		
Capacity ( $c$ ), veh/h	1252			1296			175			150		
Volume-to-Capacity Ratio ( $X$ )	0.351			0.780			0.280			0.471		
Back of Queue ( $Q$ ), ft/ln ( 95 th percentile)	60.1			281.3			46.4			69.7		
Back of Queue ( $Q$ ), veh/ln ( 95 th percentile)	2.2			10.3			1.8			2.7		
Queue Storage Ratio ( $RQ$ ) ( 95 th percentile)	0.00			0.00			0.00			0.00		
Uniform Delay ( $d_1$ ), s/veh	2.6			5.3			39.8			40.6		
Incremental Delay ( $d_2$ ), s/veh	0.8			4.7			0.3			0.9		
Initial Queue Delay ( $d_3$ ), s/veh	0.0			0.0			0.0			0.0		
Control Delay ( $d$ ), s/veh	3.4			10.0			40.2			41.4		
Level of Service ( LOS )	A			A			D			D		
Approach Delay, s/veh / LOS	3.4	A		10.0	A		40.2	D		41.4	D	
Intersection Delay, s/veh / LOS	10.5						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.60	B	1.60	B	1.72	B	1.72	B
Bicycle LOS Score / LOS	1.21	A	2.16	B	0.57	A	0.60	A

## HCS7 Signalized Intersection Results Summary

General Information				Intersection Information		
Agency	Arcadis US Inc			Duration, h	0.250	
Analyst	QAI	Analysis Date	5/26/2022	Area Type	Other	
Jurisdiction	District12	Time Period	PM Peak	PHF	0.92	
Urban Street	US 422	Analysis Year	2022	Analysis Period	1 > 4:45	
Intersection	US422 at Rapids Road	File Name	US 422 at Rapids Road - 2022 PM.xus			
Project Description	2022 Existing Conditions					

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	60	855	30	5	465	15	10	10	10	20	20	40

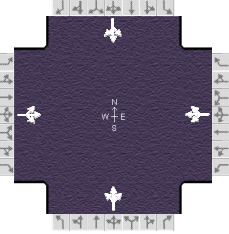
Signal Information														
Cycle, s	90.0	Reference Phase	2	Green	7.0	60.3	6.8	0.0	0.0	0.0	1	2	3	4
Offset, s	0	Reference Point	End	Yellow	3.0	5.2	3.6	0.0	0.0	0.0	5	6	7	8
Uncoordinated	No	Simult. Gap E/W	Off	Red	1.0	1.6	1.5	0.0	0.0	0.0				
Force Mode	Fixed	Simult. Gap N/S	Off											

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6		8		4
Case Number	0.0	14.2		8.3		8.0		8.0
Phase Duration, s	11.0	78.1		67.1		11.9		11.9
Change Period, ( Y+R <sub>c</sub> ), s	4.0	6.8		6.8		5.1		5.1
Max Allow Headway ( MAH ), s	0.0	0.0		0.0		3.1		3.1
Queue Clearance Time ( g <sub>s</sub> ), s						3.7		7.2
Green Extension Time ( g <sub>e</sub> ), s	0.0	0.0		0.0		0.0		0.0
Phase Call Probability						0.95		0.95
Max Out Probability						0.13		1.00

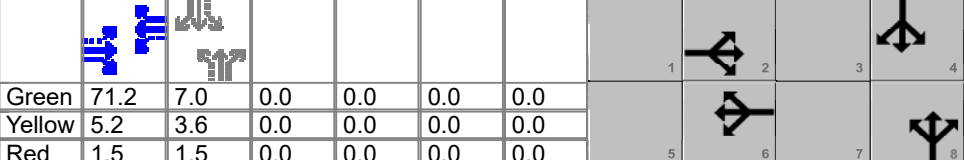
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate ( v ), veh/h	1027			527			33			87		
Adjusted Saturation Flow Rate ( s ), veh/h/ln	1545			1570			1560			1484		
Queue Service Time ( g <sub>s</sub> ), s	7.0			0.0			0.0			3.4		
Cycle Queue Clearance Time ( g <sub>c</sub> ), s	34.8			14.9			1.7			5.2		
Green Ratio ( g/C )	0.79			0.67			0.08			0.08		
Capacity ( c ), veh/h	1269			1092			171			162		
Volume-to-Capacity Ratio ( X )	0.810			0.483			0.190			0.536		
Back of Queue ( Q ), ft/ln ( 95 th percentile)	293.6			207			30.4			86.6		
Back of Queue ( Q ), veh/ln ( 95 th percentile)	10.9			7.6			1.2			3.3		
Queue Storage Ratio ( RQ ) ( 95 th percentile)	0.00			0.00			0.00			0.00		
Uniform Delay ( d <sub>1</sub> ), s/veh	5.4			7.4			39.2			40.8		
Incremental Delay ( d <sub>2</sub> ), s/veh	5.7			1.5			0.2			1.0		
Initial Queue Delay ( d <sub>3</sub> ), s/veh	0.0			0.0			0.0			0.0		
Control Delay ( d ), s/veh	11.1			8.9			39.4			41.8		
Level of Service ( LOS )	B			A			D			D		
Approach Delay, s/veh / LOS	11.1	B		8.9	A		39.4	D		41.8	D	
Intersection Delay, s/veh / LOS	12.6						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.60	B	1.64	B	1.72	B	1.72	B
Bicycle LOS Score / LOS	2.18	B	1.36	A	0.54	A	0.63	A

# HCS7 Signalized Intersection Results Summary

General Information				Intersection Information		
Agency	Arcadis US Inc			Duration, h	0.250	
Analyst	QAI	Analysis Date	5/26/2022	Area Type	Other	
Jurisdiction	District 12	Time Period	AM Peak	PHF	0.92	
Urban Street	US 422	Analysis Year	2027	Analysis Period	1> 6:15	
Intersection	US422 at Rapids Road	File Name	US 422 at Rapids Road - 2027 AM.xus			
Project Description	2027 Existing Conditions					

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	25	385	15	10	930	15	35	15	10	10	10	60

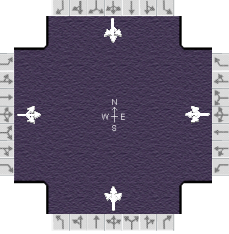
Signal Information													
Cycle, s	90.0	Reference Phase	2	Green	71.2	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Offset, s	0	Reference Point	End	Yellow	5.2	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Uncoordinated	No	Simult. Gap E/W	Off	Red	1.5	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Force Mode	Fixed	Simult. Gap N/S	Off										

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		8.0		8.0		8.0		8.0
Phase Duration, s		77.9		77.9		12.1		12.1
Change Period, ( Y+R <sub>c</sub> ), s		6.8		6.8		5.1		5.1
Max Allow Headway ( MAH ), s		0.0		0.0		3.1		3.2
Queue Clearance Time ( g <sub>s</sub> ), s						5.7		7.1
Green Extension Time ( g <sub>e</sub> ), s		0.0		0.0		0.0		0.0
Phase Call Probability						0.98		0.98
Max Out Probability						1.00		1.00

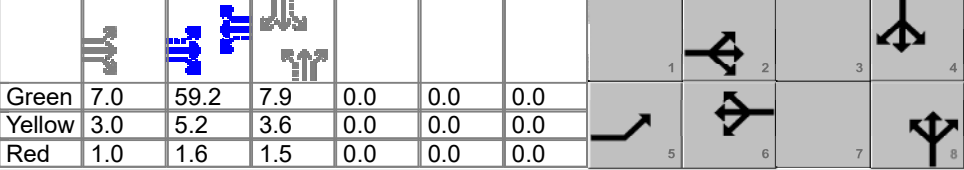
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate ( v ), veh/h	462			1038			65			87		
Adjusted Saturation Flow Rate ( s ), veh/h/ln	1497			1577			1474			1485		
Queue Service Time ( g <sub>s</sub> ), s	0.0			0.0			0.0			1.4		
Cycle Queue Clearance Time ( g <sub>c</sub> ), s	7.6			36.0			3.7			5.1		
Green Ratio ( g/C )	0.79			0.79			0.08			0.08		
Capacity ( c ), veh/h	1226			1287			177			160		
Volume-to-Capacity Ratio ( X )	0.377			0.806			0.368			0.544		
Back of Queue ( Q ), ft/ln ( 95 th percentile)	67.7			313			62.3			86.4		
Back of Queue ( Q ), veh/ln ( 95 th percentile)	2.5			11.4			2.4			3.3		
Queue Storage Ratio ( RQ ) ( 95 th percentile)	0.00			0.00			0.00			0.00		
Uniform Delay ( d <sub>1</sub> ), s/veh	2.8			5.7			40.0			40.7		
Incremental Delay ( d <sub>2</sub> ), s/veh	0.9			5.5			0.5			1.1		
Initial Queue Delay ( d <sub>3</sub> ), s/veh	0.0			0.0			0.0			0.0		
Control Delay ( d ), s/veh	3.7			11.2			40.5			41.7		
Level of Service ( LOS )	A			B			D			D		
Approach Delay, s/veh / LOS	3.7	A		11.2	B		40.5	D		41.7	D	
Intersection Delay, s/veh / LOS	11.9						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.60	B	1.60	B	1.72	B	1.72	B
Bicycle LOS Score / LOS	1.25	A	2.20	B	0.60	A	0.63	A

## HCS7 Signalized Intersection Results Summary

General Information				Intersection Information		
Agency	Arcadis US Inc			Duration, h	0.250	
Analyst	QAI	Analysis Date	5/26/2022	Area Type	Other	
Jurisdiction	District12	Time Period	PM Peak	PHF	0.92	
Urban Street	US 422	Analysis Year	2027	Analysis Period	1 > 4:45	
Intersection	US422 at Rapids Road	File Name	US 422 at Rapids Road - 2027 PM.xus			
Project Description	2027 Existing Conditions					

Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand ( $v$ ), veh/h	65	870	35	10	475	20	15	15	15	25	25	45

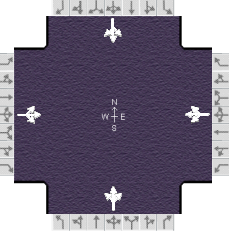
Signal Information														
Cycle, s	90.0	Reference Phase	2	Green	7.0	59.2	7.9	0.0	0.0	0.0	1	2	3	4
Offset, s	0	Reference Point	End	Yellow	3.0	5.2	3.6	0.0	0.0	0.0	5	6	7	8
Uncoordinated	No	Simult. Gap E/W	Off	Red	1.0	1.6	1.5	0.0	0.0	0.0				
Force Mode	Fixed	Simult. Gap N/S	Off											

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6		8		4
Case Number	0.0	14.2		8.3		8.0		8.0
Phase Duration, s	11.0	77.0		66.0		13.0		13.0
Change Period, ( $Y+R_c$ ), s	4.0	6.8		6.8		5.1		5.1
Max Allow Headway ( $MAH$ ), s	0.0	0.0		0.0		3.1		3.1
Queue Clearance Time ( $g_s$ ), s						4.6		8.1
Green Extension Time ( $g_e$ ), s	0.0	0.0		0.0		0.0		0.0
Phase Call Probability						0.98		0.98
Max Out Probability						0.68		1.00

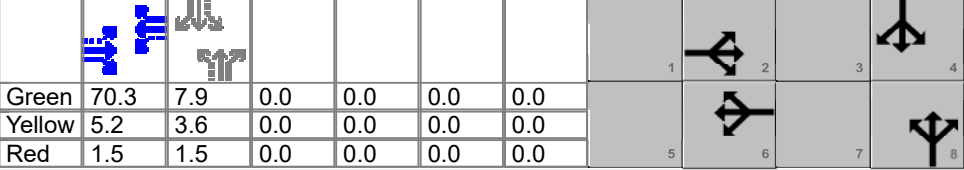
Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate ( $v$ ), veh/h	1054			549			49			103		
Adjusted Saturation Flow Rate ( $s$ ), veh/h/ln	1538			1554			1556			1491		
Queue Service Time ( $g_s$ ), s	7.0			0.0			0.0			3.5		
Cycle Queue Clearance Time ( $g_c$ ), s	41.1			16.5			2.6			6.1		
Green Ratio ( $g/C$ )	0.78			0.66			0.09			0.09		
Capacity ( $c$ ), veh/h	1245			1063			190			181		
Volume-to-Capacity Ratio ( $X$ )	0.847			0.516			0.258			0.570		
Back of Queue ( $Q$ ), ft/ln ( 95 th percentile)	121.7			227.6			45.4			106.2		
Back of Queue ( $Q$ ), veh/ln ( 95 th percentile)	4.5			8.3			1.8			4.1		
Queue Storage Ratio ( $RQ$ ) ( 95 th percentile)	0.00			0.00			0.00			0.00		
Uniform Delay ( $d_1$ ), s/veh	6.5			8.1			38.6			40.2		
Incremental Delay ( $d_2$ ), s/veh	7.2			1.8			0.3			2.7		
Initial Queue Delay ( $d_3$ ), s/veh	0.0			0.0			0.0			0.0		
Control Delay ( $d$ ), s/veh	13.7			9.9			38.9			42.9		
Level of Service (LOS)	B			A			D			D		
Approach Delay, s/veh / LOS	13.7	B		9.9	A		38.9	D		42.9	D	
Intersection Delay, s/veh / LOS	14.9						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.60	B	1.64	B	1.72	B	1.72	B
Bicycle LOS Score / LOS	2.23	B	1.39	A	0.57	A	0.66	A

# HCS7 Signalized Intersection Results Summary

General Information				Intersection Information		
Agency	Arcadis US Inc			Duration, h	0.250	
Analyst	QAI	Analysis Date	5/26/2022	Area Type	Other	
Jurisdiction	District 12	Time Period	AM Peak	PHF	0.92	
Urban Street	US 422	Analysis Year	2047	Analysis Period	1> 6:15	
Intersection	US422 at Rapids Road	File Name	US 422 at Rapids Road - 2047 AM.xus			
Project Description	2047 Existing Conditions					

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	30	415	20	15	1000	20	40	20	15	15	15	65

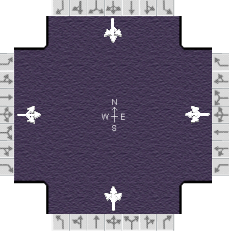
Signal Information														
Cycle, s	90.0	Reference Phase	2	Green	70.3	7.9	0.0	0.0	0.0	0.0	1	2	3	4
Offset, s	0	Reference Point	End	Yellow	5.2	3.6	0.0	0.0	0.0	0.0	5	6	7	8
Uncoordinated	No	Simult. Gap E/W	Off	Red	1.5	1.5	0.0	0.0	0.0	0.0				
Force Mode	Fixed	Simult. Gap N/S	Off											

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		8.0		8.0		8.0		8.0
Phase Duration, s		77.0		77.0		13.0		13.0
Change Period, ( Y+R <sub>c</sub> ), s		6.8		6.8		5.1		5.1
Max Allow Headway ( MAH ), s		0.0		0.0		3.1		3.2
Queue Clearance Time ( g <sub>s</sub> ), s						6.7		8.0
Green Extension Time ( g <sub>e</sub> ), s		0.0		0.0		0.0		0.0
Phase Call Probability						0.99		0.99
Max Out Probability						1.00		1.00

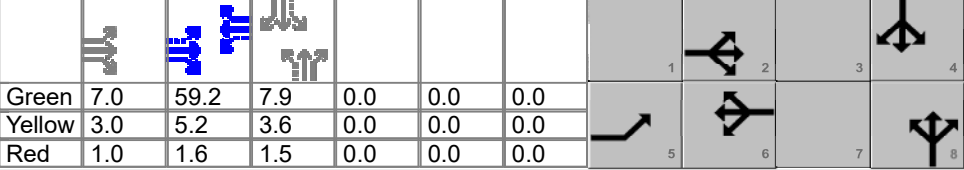
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate ( v ), veh/h	505			1125			82			103		
Adjusted Saturation Flow Rate ( s ), veh/h/ln	1410			1573			1481			1504		
Queue Service Time ( g <sub>s</sub> ), s	0.0			8.2			0.0			1.3		
Cycle Queue Clearance Time ( g <sub>c</sub> ), s	9.1			49.2			4.7			6.0		
Green Ratio ( g/C )	0.78			0.78			0.09			0.09		
Capacity ( c ), veh/h	1142			1267			191			178		
Volume-to-Capacity Ratio ( X )	0.442			0.888			0.426			0.579		
Back of Queue ( Q ), ft/ln ( 95 th percentile)	88.8			446.8			77.9			106.9		
Back of Queue ( Q ), veh/ln ( 95 th percentile)	3.3			16.3			3.0			4.1		
Queue Storage Ratio ( RQ ) ( 95 th percentile)	0.00			0.00			0.00			0.00		
Uniform Delay ( d <sub>1</sub> ), s/veh	3.2			7.6			39.5			40.2		
Incremental Delay ( d <sub>2</sub> ), s/veh	1.2			9.5			0.6			3.1		
Initial Queue Delay ( d <sub>3</sub> ), s/veh	0.0			0.0			0.0			0.0		
Control Delay ( d ), s/veh	4.4			17.0			40.1			43.3		
Level of Service ( LOS )	A			B			D			D		
Approach Delay, s/veh / LOS	4.4	A		17.0	B		40.1	D		43.3	D	
Intersection Delay, s/veh / LOS	16.0						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.60	B	1.60	B	1.72	B	1.72	B
Bicycle LOS Score / LOS	1.32	A	2.34	B	0.62	A	0.66	A

## HCS7 Signalized Intersection Results Summary

General Information				Intersection Information		
Agency	Arcadis US Inc			Duration, h	0.250	
Analyst	QAI	Analysis Date	5/26/2022	Area Type	Other	
Jurisdiction	District12	Time Period	PM Peak	PHF	0.92	
Urban Street	US 422	Analysis Year	2047	Analysis Period	1 > 4:45	
Intersection	US422 at Rapids Road	File Name	US 422 at Rapids Road - 2047 PM.xus			
Project Description	2047 Existing Conditions					

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand ( v ), veh/h	70	940	40	15	515	25	20	20	20	30	30	50

Signal Information														
Cycle, s	90.0	Reference Phase	2	Green	7.0	59.2	7.9	0.0	0.0	0.0	1	2	3	4
Offset, s	0	Reference Point	End	Yellow	3.0	5.2	3.6	0.0	0.0	0.0	5	6	7	8
Uncoordinated	No	Simult. Gap E/W	Off	Red	1.0	1.6	1.5	0.0	0.0	0.0				
Force Mode	Fixed	Simult. Gap N/S	Off											

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6		8		4
Case Number	0.0	14.2		8.3		8.0		8.0
Phase Duration, s	11.0	77.0		66.0		13.0		13.0
Change Period, ( Y+R <sub>c</sub> ), s	4.0	6.8		6.8		5.1		5.1
Max Allow Headway ( MAH ), s	0.0	0.0		0.0		3.1		3.1
Queue Clearance Time ( g <sub>s</sub> ), s						5.5		9.1
Green Extension Time ( g <sub>e</sub> ), s	0.0	0.0		0.0		0.0		0.0
Phase Call Probability						0.99		0.99
Max Out Probability						1.00		1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate ( v ), veh/h	1141			603			65			120		
Adjusted Saturation Flow Rate ( s ), veh/h/ln	1532			1538			1558			1504		
Queue Service Time ( g <sub>s</sub> ), s	7.0			0.0			0.0			3.6		
Cycle Queue Clearance Time ( g <sub>c</sub> ), s	56.7			19.2			3.5			7.1		
Green Ratio ( g/C )	0.78			0.66			0.09			0.09		
Capacity ( c ), veh/h	1239			1053			190			183		
Volume-to-Capacity Ratio ( X )	0.921			0.573			0.343			0.654		
Back of Queue ( Q ), ft/ln ( 95 th percentile)	373.7			258.8			61.3			132.3		
Back of Queue ( Q ), veh/ln ( 95 th percentile)	13.8			9.4			2.4			5.1		
Queue Storage Ratio ( RQ ) ( 95 th percentile)	0.00			0.00			0.00			0.00		
Uniform Delay ( d <sub>1</sub> ), s/veh	8.0			8.5			39.0			40.6		
Incremental Delay ( d <sub>2</sub> ), s/veh	12.5			2.3			0.4			6.5		
Initial Queue Delay ( d <sub>3</sub> ), s/veh	0.0			0.0			0.0			0.0		
Control Delay ( d ), s/veh	20.5			10.8			39.4			47.1		
Level of Service ( LOS )	C			B			D			D		
Approach Delay, s/veh / LOS	20.5	C		10.8	B		39.4	D		47.1	D	
Intersection Delay, s/veh / LOS	19.8						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.60	B	1.64	B	1.72	B	1.72	B
Bicycle LOS Score / LOS	2.37	B	1.48	A	0.60	A	0.68	A



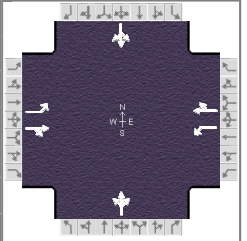
# APPENDIX D

## HCS Capacity Analysis - Build Conditions



# HCS7 Signalized Intersection Results Summary

General Information				Intersection Information			
Agency	Arcadis US Inc			Duration, h	0.250		
Analyst	QAI	Analysis Date	5/26/2022	Area Type	Other		
Jurisdiction	District 12	Time Period	AM Peak	PHF	0.92		
Urban Street	US 422	Analysis Year	2027	Analysis Period	1 > 6:15		
Intersection	US422 at Rapids Road	File Name	US 422 at Rapids Road - 2027 AM - LT.xus				
Project Description	2027 Build Conditions						



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand ( v ), veh/h	25	385	15	10	930	15	35	15	10	10	10	60

Signal Information				Signal Phases											
Cycle, s	90.0	Reference Phase	2	Green				1		2		3		4	
Offset, s	0	Reference Point	End	Yellow				5		6		7		8	
Uncoordinated	No	Simult. Gap E/W	Off	Red				5		6		7		8	
Force Mode	Fixed	Simult. Gap N/S	Off												

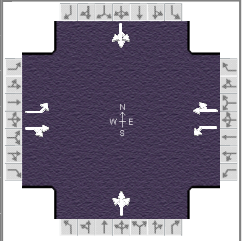
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		6.0		6.0		8.0		8.0
Phase Duration, s		77.9		77.9		12.1		12.1
Change Period, ( Y+R <sub>c</sub> ), s		6.8		6.8		5.1		5.1
Max Allow Headway ( MAH ), s		0.0		0.0		3.1		3.2
Queue Clearance Time ( g <sub>s</sub> ), s						5.8		7.1
Green Extension Time ( g <sub>e</sub> ), s		0.0		0.0		0.0		0.0
Phase Call Probability						0.98		0.98
Max Out Probability						1.00		1.00

Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate ( v ), veh/h	27	435		11	1027		65			87		
Adjusted Saturation Flow Rate ( s ), veh/h/ln	558	1603		969	1582		1474			1485		
Queue Service Time ( g <sub>s</sub> ), s	2.8	7.0		0.3	34.9		0.0			1.4		
Cycle Queue Clearance Time ( g <sub>c</sub> ), s	37.7	7.0		7.3	34.9		3.8			5.1		
Green Ratio ( g/C )	0.79	0.79		0.79	0.79		0.08			0.08		
Capacity ( c ), veh/h	304	1267		770	1250		177			160		
Volume-to-Capacity Ratio ( X )	0.089	0.343		0.014	0.821		0.368			0.544		
Back of Queue ( Q ), ft/ln ( 95 th percentile)	16.8	61.4		2.1	314.3		62.3			88.6		
Back of Queue ( Q ), veh/ln ( 95 th percentile)	0.7	2.3		0.1	11.5		2.4			3.4		
Queue Storage Ratio ( RQ ) ( 95 th percentile)	0.00	0.00		0.00	0.00		0.00			0.00		
Uniform Delay ( d <sub>1</sub> ), s/veh	16.9	2.7		3.8	5.6		40.0			40.7		
Incremental Delay ( d <sub>2</sub> ), s/veh	0.6	0.7		0.0	6.2		0.5			2.1		
Initial Queue Delay ( d <sub>3</sub> ), s/veh	0.0	0.0		0.0	0.0		0.0			0.0		
Control Delay ( d ), s/veh	17.5	3.4		3.8	11.8		40.5			42.8		
Level of Service ( LOS)	B	A		A	B		D			D		
Approach Delay, s/veh / LOS	4.3	A		11.7	B		40.5	D		42.8	D	
Intersection Delay, s/veh / LOS	12.4						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.60	B	1.60	B	1.94	B	1.94	B
Bicycle LOS Score / LOS	1.25	A	2.20	B	0.60	A	0.63	A

## HCS7 Signalized Intersection Results Summary

General Information				Intersection Information			
Agency	Arcadis US Inc			Duration, h	0.250		
Analyst	QAI	Analysis Date	5/26/2022	Area Type	Other		
Jurisdiction	District12	Time Period	PM Peak	PHF	0.92		
Urban Street	US 422	Analysis Year	2027	Analysis Period	1 > 4:45		
Intersection	US422 at Rapids Road		File Name	US 422 at Rapids Road - 2027 PM - LT.xus			
Project Description	2027 Build Conditions						



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand ( $v$ ), veh/h	65	870	35	10	475	20	15	15	15	25	25	45

Signal Information				Signal Phases									
Cycle, s	90.0	Reference Phase	2										
Offset, s	0	Reference Point	End	Green	5.8	61.3	7.0	0.0	0.0	0.0			
Uncoordinated	No	Simult. Gap E/W	Off	Yellow	3.0	5.2	3.6	0.0	0.0	0.0			
Force Mode	Fixed	Simult. Gap N/S	Off	Red	1.0	1.6	1.5	0.0	0.0	0.0			

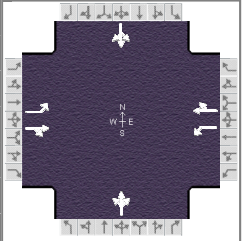
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6		8		4
Case Number	1.0	4.0		6.3		8.0		8.0
Phase Duration, s	9.8	77.9		68.1		12.1		12.1
Change Period, ( $Y+R_c$ ), s	4.0	6.8		6.8		5.1		5.1
Max Allow Headway ( $MAH$ ), s	3.0	0.0		0.0		3.1		3.1
Queue Clearance Time ( $g_s$ ), s	2.9					4.6		8.1
Green Extension Time ( $g_e$ ), s	0.0	0.0		0.0		0.0		0.0
Phase Call Probability	0.83					0.98		0.98
Max Out Probability	0.05					0.73		1.00

Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate ( $v$ ), veh/h	71	984		11	538		49			103		
Adjusted Saturation Flow Rate ( $s$ ), veh/h/ln	1667	1602		581	1575		1562			1498		
Queue Service Time ( $g_s$ ), s	0.9	30.1		0.9	14.9		0.0			3.5		
Cycle Queue Clearance Time ( $g_c$ ), s	0.9	30.1		21.2	14.9		2.6			6.1		
Green Ratio ( $g/C$ )	0.77	0.79		0.68	0.68		0.08			0.08		
Capacity ( $c$ ), veh/h	642	1266		345	1073		175			167		
Volume-to-Capacity Ratio ( $X$ )	0.110	0.777		0.032	0.502		0.280			0.618		
Back of Queue ( $Q$ ), ft/ln ( 95 th percentile)	7.6	271.8		5.7	203.8		46			112		
Back of Queue ( $Q$ ), veh/ln ( 95 th percentile)	0.3	10.1		0.2	7.4		1.8			4.3		
Queue Storage Ratio ( $RQ$ ) ( 95 th percentile)	0.00	0.00		0.00	0.00		0.00			0.00		
Uniform Delay ( $d_1$ ), s/veh	4.3	5.1		13.6	7.0		39.5			41.0		
Incremental Delay ( $d_2$ ), s/veh	0.0	4.7		0.2	1.7		0.3			5.0		
Initial Queue Delay ( $d_3$ ), s/veh	0.0	0.0		0.0	0.0		0.0			0.0		
Control Delay ( $d$ ), s/veh	4.3	9.9		13.7	8.6		39.8			46.1		
Level of Service (LOS)	A	A		B	A		D			D		
Approach Delay, s/veh / LOS	9.5	A		8.7	A		39.8	D		46.1	D	
Intersection Delay, s/veh / LOS	12.3						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.60	B	1.63	B	1.94	B	1.94	B
Bicycle LOS Score / LOS	2.23	B	1.39	A	0.57	A	0.66	A

## HCS7 Signalized Intersection Results Summary

General Information				Intersection Information			
Agency	Arcadis US Inc			Duration, h	0.250		
Analyst	QAI	Analysis Date	5/26/2022	Area Type	Other		
Jurisdiction	District 12	Time Period	AM Peak	PHF	0.92		
Urban Street	US 422	Analysis Year	2047	Analysis Period	1 > 6:15		
Intersection	US422 at Rapids Road		File Name	US 422 at Rapids Road - 2047 AM - LT.xus			
Project Description	2047 Build Conditions						



Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand ( v ), veh/h	30	415	20	15	1000	20	40	20	15	15	15	65

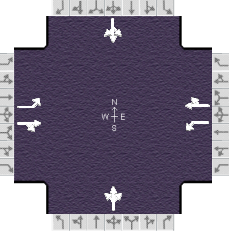
Signal Information				Signal Phases											
Cycle, s	90.0	Reference Phase	2	Green				1		2		3		4	
Offset, s	0	Reference Point	End	Yellow				5		6		7		8	
Uncoordinated	No	Simult. Gap E/W	Off	Red				5		6		7		8	
Force Mode	Fixed	Simult. Gap N/S	Off												

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		6.0		6.0		8.0		8.0
Phase Duration, s		77.9		77.9		12.1		12.1
Change Period, ( Y+R <sub>c</sub> ), s		6.8		6.8		5.1		5.1
Max Allow Headway ( MAH ), s		0.0		0.0		3.1		3.2
Queue Clearance Time ( g <sub>s</sub> ), s						6.9		8.0
Green Extension Time ( g <sub>e</sub> ), s		0.0		0.0		0.0		0.0
Phase Call Probability						0.99		0.99
Max Out Probability						1.00		1.00

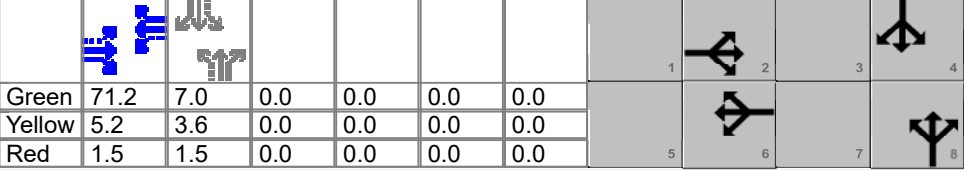
Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate ( v ), veh/h	33	473		16	1109		82			103		
Adjusted Saturation Flow Rate ( s ), veh/h/ln	516	1600		935	1581		1449			1526		
Queue Service Time ( g <sub>s</sub> ), s	4.3	7.9		0.5	44.4		0.0			1.1		
Cycle Queue Clearance Time ( g <sub>c</sub> ), s	48.7	7.9		8.4	44.4		4.9			6.0		
Green Ratio ( g/C )	0.79	0.79		0.79	0.79		0.08			0.08		
Capacity ( c ), veh/h	233	1264		737	1249		174			165		
Volume-to-Capacity Ratio ( X )	0.140	0.374		0.022	0.888		0.468			0.626		
Back of Queue ( Q ), ft/ln ( 95 th percentile)	25.6	70.6		3.4	405.8		79.2			112.6		
Back of Queue ( Q ), veh/ln ( 95 th percentile)	1.0	2.6		0.1	14.8		3.1			4.3		
Queue Storage Ratio ( RQ ) ( 95 th percentile)	0.00	0.00		0.00	0.00		0.00			0.00		
Uniform Delay ( d <sub>1</sub> ), s/veh	23.8	2.8		4.1	6.6		40.5			41.0		
Incremental Delay ( d <sub>2</sub> ), s/veh	1.3	0.8		0.1	9.6		0.7			5.5		
Initial Queue Delay ( d <sub>3</sub> ), s/veh	0.0	0.0		0.0	0.0		0.0			0.0		
Control Delay ( d ), s/veh	25.0	3.7		4.1	16.2		41.2			46.5		
Level of Service ( LOS )	C	A		A	B		D			D		
Approach Delay, s/veh / LOS	5.0	A		16.1	B		41.2	D		46.5	D	
Intersection Delay, s/veh / LOS	15.9						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.60	B	1.60	B	1.94	B	1.94	B
Bicycle LOS Score / LOS	1.32	A	2.34	B	0.62	A	0.66	A

## HCS7 Signalized Intersection Results Summary

General Information				Intersection Information		
Agency	Arcadis US Inc			Duration, h	0.250	
Analyst	QAi	Analysis Date	5/26/2022	Area Type	Other	
Jurisdiction	District 12	Time Period	AM Peak	PHF	0.92	
Urban Street	US 422	Analysis Year	2047	Analysis Period	1 > 6:15	
Intersection	US422 at Rapids Road	File Name	US 422 at Rapids Road - 2047 AM - LT.xus			
Project Description	2047 Build Conditions					

Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand ( $v$ ), veh/h	30	415	20	15	1000	20	40	20	15	15	15	65

Signal Information														
Cycle, s	90.0	Reference Phase	2	Green	71.2	7.0	0.0	0.0	0.0	0.0				
Offset, s	0	Reference Point	End	Yellow	5.2	3.6	0.0	0.0	0.0	0.0				
Uncoordinated	No	Simult. Gap E/W	Off	Red	1.5	1.5	0.0	0.0	0.0	0.0				
Force Mode	Fixed	Simult. Gap N/S	Off											

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		6.0		6.0		8.0		8.0
Phase Duration, s		77.9		77.9		12.1		12.1
Change Period, ( $Y+R_c$ ), s		6.8		6.8		5.1		5.1
Max Allow Headway ( $MAH$ ), s		0.0		0.0		3.1		3.2
Queue Clearance Time ( $g_s$ ), s						6.9		8.0
Green Extension Time ( $g_e$ ), s		0.0		0.0		0.0		0.0
Phase Call Probability						0.99		0.99
Max Out Probability						1.00		1.00

Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate ( $v$ ), veh/h	33	473		16	1109			82			103	
Adjusted Saturation Flow Rate ( $s$ ), veh/h/ln	516	1600		935	1581			1449			1526	
Queue Service Time ( $g_s$ ), s	4.3	7.9		0.5	44.4			0.0			1.1	
Cycle Queue Clearance Time ( $g_c$ ), s	48.7	7.9		8.4	44.4			4.9			6.0	
Green Ratio ( $g/C$ )	0.79	0.79		0.79	0.79			0.08			0.08	
Capacity ( $c$ ), veh/h	233	1264		737	1249			174			165	
Volume-to-Capacity Ratio ( $X$ )	0.140	0.374		0.022	0.888			0.468			0.626	
Back of Queue ( $Q$ ), ft/ln ( 95 th percentile)	25.6	70.6		3.4	405.8			79.2			112.6	
Back of Queue ( $Q$ ), veh/ln ( 95 th percentile)	1.0	2.6		0.1	14.8			3.1			4.3	
Queue Storage Ratio ( $RQ$ ) ( 95 th percentile)	0.00	0.00		0.00	0.00			0.00			0.00	
Uniform Delay ( $d_1$ ), s/veh	23.8	2.8		4.1	6.6			40.5			41.0	
Incremental Delay ( $d_2$ ), s/veh	1.3	0.8		0.1	9.6			0.7			5.5	
Initial Queue Delay ( $d_3$ ), s/veh	0.0	0.0		0.0	0.0			0.0			0.0	
Control Delay ( $d$ ), s/veh	25.0	3.7		4.1	16.2			41.2			46.5	
Level of Service (LOS)	C	A		A	B			D			D	
Approach Delay, s/veh / LOS	5.0		A	16.1		B	41.2		D	46.5		D
Intersection Delay, s/veh / LOS	15.9						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.60	B	1.60	B	1.94	B	1.94	B
Bicycle LOS Score / LOS	1.32	A	2.34	B	0.62	A	0.66	A