Memo

August 30, 2012

TO: Rick Laux, P.E., WisDOT NE Region

FR: Pat Hawley, P.E., PTOE
Justin Schueler

FR: Jerry Shadewald, P.E., HNTB

RE: USH 41/WIS 441 Operation Needs Study
WisDOT ID 1130-31-00
Outagamie County, Wisconsin
Roundabout Analysis Software Comparison – RODEL vs. HCM 2010

Introduction

The Wisconsin Department of Transportation (WisDOT) is evaluating mainline and ramp intersection improvements at several interchanges along the USH 41/WIS 441 corridor in Outagamie County. HNTB has been retained by WisDOT to perform the corridor evaluation. R.A. Smith National was hired as a sub consultant to conduct roundabout operational analysis at the study interchanges. RODEL methodology and software has been historically preferred by WisDOT for roundabout analysis. Recently, WisDOT has been evaluating other roundabout capacity models available, including the Highway Capacity Manual (HCM) 2010. The study interchanges were reanalyzed using the HCM 2010 procedures for comparison. This report summarizes the analysis results and highlights the differences between the RODEL and HCM 2010 methodologies.

Analysis

Roundabout operational analysis was completed with the design year 2038 volumes at the following interchanges.

- USH 41 with WIS 47 (Richmond Street)
- USH 41 with County E (Ballard Street)
- WIS 441 with County OO (Northland Avenue)
- USH 41 with WIS 96 (Wisconsin Avenue)
- USH 41 with WIS 125 (College Avenue)
- WIS 441 with County CE (College Avenue)

The analysis was conducted using the following software packages: RODEL 1.9.9 (the most current DOS based version) and SIDRA 5.1 (utilizing HCM 2010 methodologies – US Mode). The six study interchanges were analyzed with a maximum of three entry lanes (plus bypass when applicable) on each approach.

HCM 2010 Parameters

A recent UW-Madison Traffic Operations and Safety (TOPS) laboratory study observed lower headways in Wisconsin than the HCM 2010 default headway values. Critical and follow-up headway values presented in the TOPS lab study and used in the SIDRA analysis are listed in Table 1.

Table 1
Wisconsin Headway Values
SIDRA (HCM 2010) Analysis

Number of Circulating (Conflicting) Lanes	Critical Headway (sec)	Follow-Up Headway (sec)
One	4.2	3.2
Two	4.0	2.8

RODEL Parameters

RODEL capacity equations are based on empirical data that focus on the capacity impacts of various geometric parameters. The Wisconsin Facilities Development Manual (FDM) provides default geometric parameters which are to be used in RODEL analysis. Recent studies at select roundabouts showed RODEL overestimates operational capacity for roundabouts in Wisconsin. Therefore, modified analysis parameters were provided by WisDOT and Ourston Roundabout Engineering, Inc. which better reflect capacity conditions at Wisconsin roundabouts. The new RODEL parameters are summarized in Table 2. It should be noted that these analysis parameters are user defined and are not connected with any specific release version of the software.

Table 2
RODEL Analysis Parameters

Geometric Parameters	Single-Lane Entry	Dual-Lane Entry	Triple-Lane Entry
Entry Width (m)	3.65	7.30	10.95
Effective Flare Length (m)	25	25	25
Maximum Half Width (m)	3.65	7.30	10.95
Radius (m)	20	20	20
Entry Angle (deg)	25	25	25
Inscribed Diameter (m)	45	50	60

Note: Based on evolving WisDOT roundabout guidance, the RODEL analysis parameters presented in Table 2 are more conservative than the parameters used in previous RODEL analyses related to this project. Sensitivity tests showed the current RODEL parameters resulted in capacity reductions of approximately 7 to 13%. In addition, the current RODEL LOS delay thresholds are now based on the HCM unsignalized intersection criteria, rather than the higher signalized criteria that were used previously at multilane roundabouts. This further reduced the reported performance of roundabouts based on the RODEL methodology.

Comparison

The following figures summarize the roundabout geometry based on each software package (maximum three circulating lanes). Primary differences between the two software programs are outlined below each set of figures. Red arrows indicate lanes that have unacceptable operations (LOS E or F). SIDRA and RODEL analysis outputs are provided in Appendix A and Appendix B, respectively.

USH 41 with WIS 47 (Richmond Street)

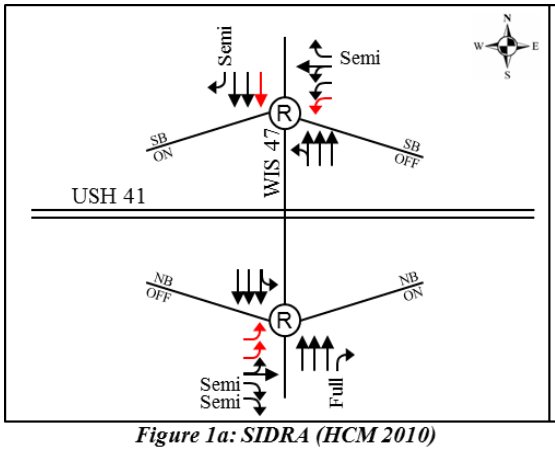


Figure 1a: SIDRA (HCM 2010)

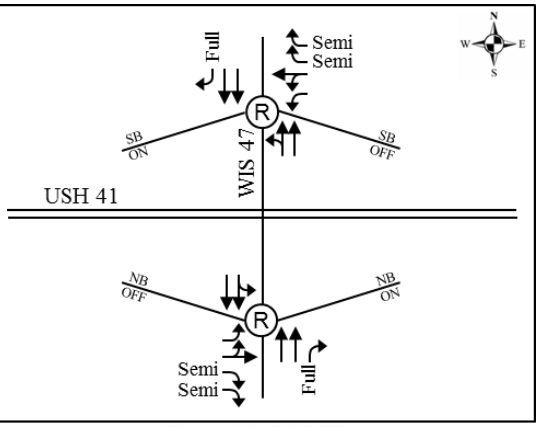


Figure 1b: RODEL

SIDRA (HCM 2010)

- Three-lane roundabouts have failing operations
- Six-lane facility along WIS 47

RODEL

- Two-lane roundabouts have acceptable operations
- Four-lane facility along WIS 47

USH 41 with County E (Ballard Street)

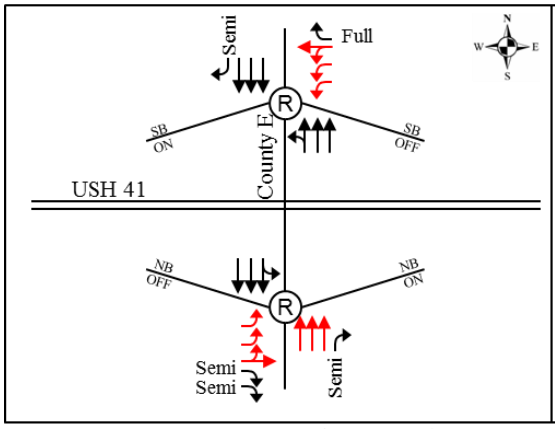


Figure 2a: SIDRA (HCM 2010)

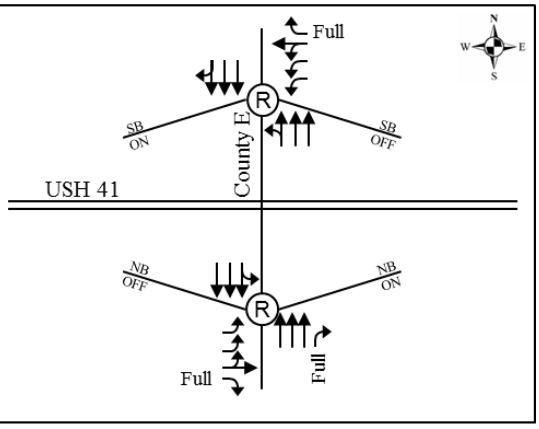


Figure 2b: RODEL

SIDRA (HCM 2010)

- Three-lane roundabouts have failing operations
- Six-lane facility along County E
- Full right-turn bypass lane requires additional downstream lane

RODEL

- Three-lane roundabouts have acceptable operations
- Six-lane facility along County E
- Full right-turn bypass lane requires additional downstream lane

WIS 441 with County OO (Northland Avenue)

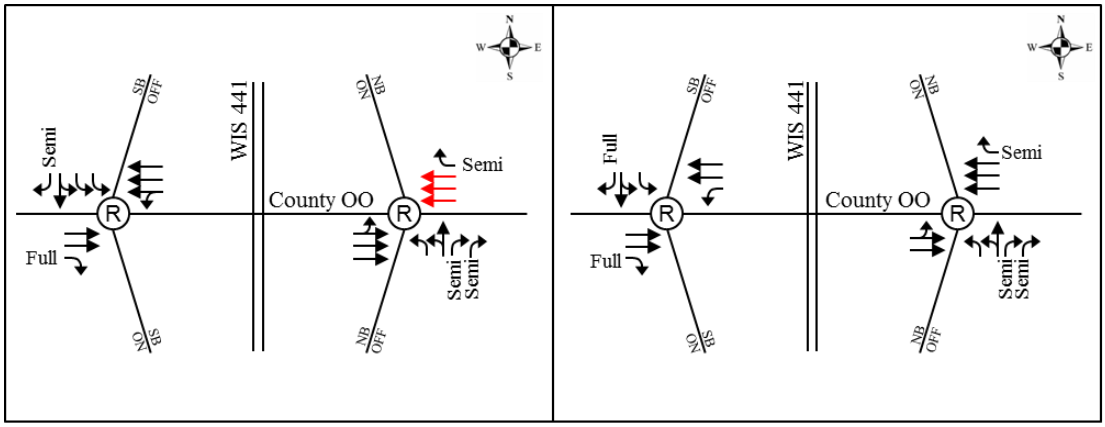


Figure 3a: SIDRA (HCM 2010) ***Figure 3b: RODEL***

SIDRA (HCM 2010)

- Three-lane roundabouts have failing operations
- Six-lane facility along County OO

RODEL

- Three-lane roundabouts have acceptable operations
- Five-lane facility along CTH OO
- Full right-turn bypass lane requires additional downstream lane

USH 41 with WIS 96 (Wisconsin Avenue)

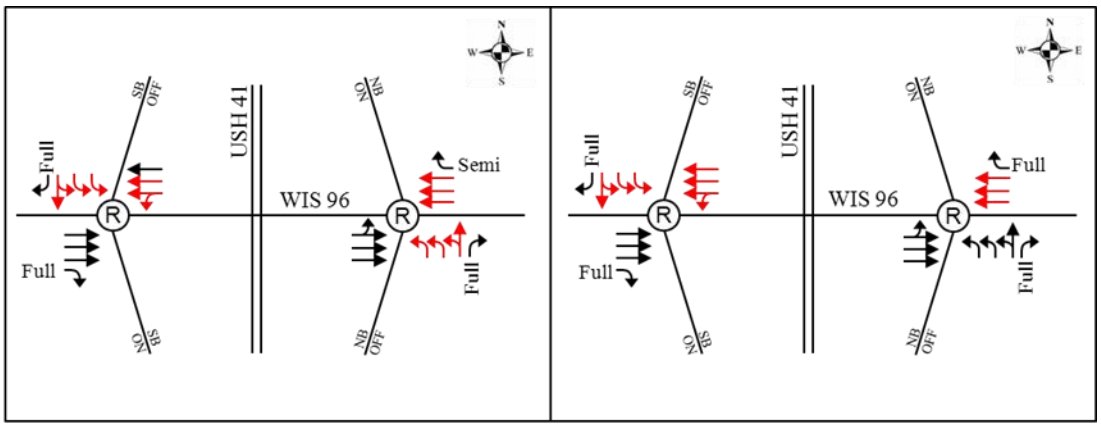


Figure 4a: SIDRA (HCM 2010) ***Figure 4b: RODEL***

SIDRA (HCM 2010)

- Three-lane roundabouts have failing operations
- Six-lane facility along WIS 96
- Full right-turn bypass lane requires additional downstream lane

RODEL

- Three-lane roundabouts have failing operations
- Six-lane facility along WIS 96
- Full right-turn bypass lane requires additional downstream lane

USH 41 with WIS 125 (College Avenue)

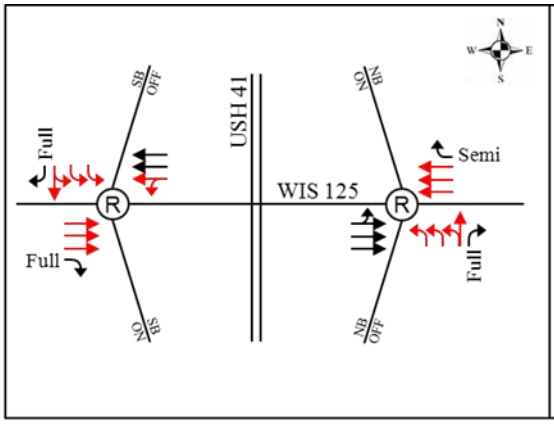


Figure 5a: SIDRA (HCM 2010)

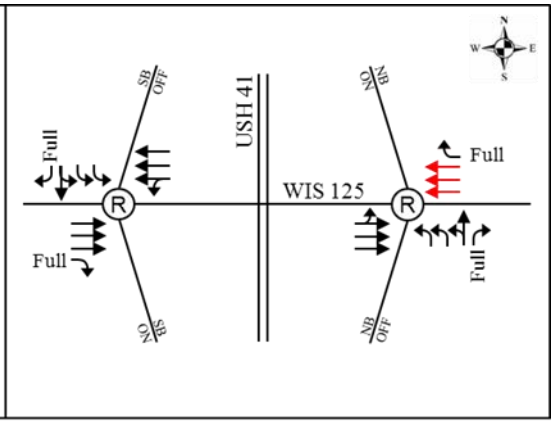


Figure 5b: RODEL

SIDRA (HCM 2010)

- Three-lane roundabouts have failing operations
- Six-lane facility along WIS 125
- Full right-turn bypass lane requires additional downstream lane

RODEL

- Three-lane roundabouts have failing operations
- Six-lane facility along WIS 125
- Full right-turn bypass lane requires additional downstream lane

WIS 441 with County CE (College Avenue)

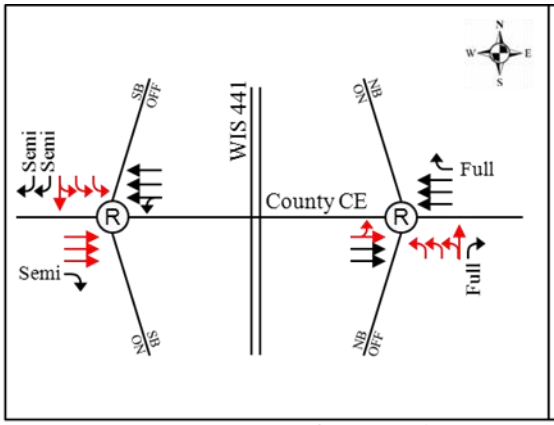


Figure 6a: SIDRA (HCM 2010)

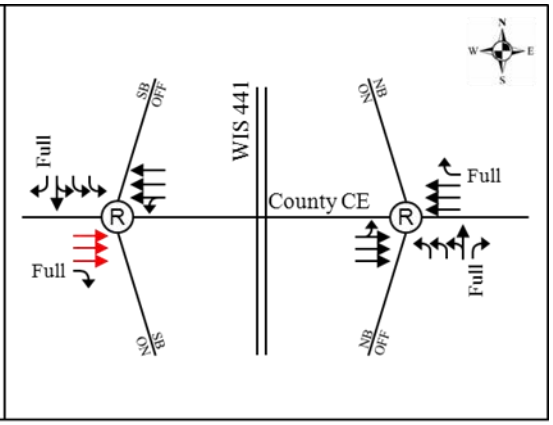


Figure 6b: RODEL

SIDRA (HCM 2010)

- Three-lane roundabouts have failing operations
- Six-lane facility along County CE
- Full right-turn bypass lane requires additional downstream lane

RODEL

- Three-lane roundabouts have failing operations
- Six-lane facility along County CE
- Full right-turn bypass lane requires additional downstream lane

Conclusion

The analysis comparison showed RODEL had higher overall capacities, while SIDRA had higher bypass capacities. Table 3 provides a feasibility summary of the roundabouts based on operations.

Table 3
USH 41/WIS 441
Roundabout Feasibility Based on Operations

Interchange	SIDRA	RODEL
USH 41 with WIS 47	Failing	OK
USH 41 with County E	Failing	OK
WIS 441 with County OO	Failing	OK
USH 41 with WIS 96	Failing	Failing
USH 41 with WIS 125	Failing	Failing
WIS 441 with County CE	Failing	Failing

As shown in Table 3, roundabouts would be feasible at three interchanges based on current RODEL methodologies, but they would not be feasible at any of the six interchanges based on HCM 2010 methodologies.

APPENDIX A

SIDRA Software Analysis Output

WIS 441 with County CE

INPUT REPORT

WIS 441 NB Ramps with CTH CE (College Ave)

Intersection Parameters	
Title	WIS 441 NB Ramps with CTH CE (College Ave)
Intersection ID	1
Unit Time (for volumes)	60 minutes
Peak Flow Period (for performance)	15 minutes

Geometry - Approach Data

Location	Name	Type	No. of App. Lanes	No. of Exit Lanes	Median Width ft	Extra Bunching %
South	WIS 441 NB Off Ramp	One-way Approach	4	0	–	0.0
East	CTH CE (College Ave)	Two-way	4	4	–	0.0
North	WIS 441 SB On Ramp	One-way Exit	0	2	–	0.0
West	CTH CE (College Ave)	Two-way	3	3	–	0.0

Geometry - Roundabout Data

Location	Name	Island Diameter ft	Circ. Width ft	Circ. Lanes	Entry Radius ft	Entry Angle degrees	Env. Factor	Entry/Circ. Flow Adjust.
South	WIS 441 NB Off Ramp	100.00	30.00	3	65.0	30.0	1.2000	None
East	CTH CE (College Ave)	100.00	30.00	3	65.0	30.0	1.2000	None
North	WIS 441 SB On Ramp	100.00	30.00	3	65.0	30.0	1.2000	None
West	CTH CE (College Ave)	100.00	30.00	1	65.0	30.0	1.2000	None

Geometry - Approach Lane Data

Lane Number	Lane Type	Lane Discip.	Basic Satn Flow tcu/h	Utilisation Ratio %	Saturation Speed mph	Capacity Adjustment %
South	WIS 441 NB Off Ramp					
App. Lane 1	Normal	L	1900	36.0	–	0.0
App. Lane 2	Normal	L	1900	33.0	–	0.0
App. Lane 3	Normal	LT	1900	30.0	–	0.0
App. Lane 4	Continuous	R	1900	–	–	0.0
East	CTH CE (College Ave)					
App. Lane 1	Normal	T	1900	36.0	–	0.0
App. Lane 2	Normal	T	1900	33.0	–	0.0
App. Lane 3	Normal	T	1900	30.0	–	0.0
App. Lane 4	Continuous	R	1900	47.0	–	0.0
West	CTH CE (College Ave)					
App. Lane 1	Normal	LT	1900	36.0	–	0.0
App. Lane 2	Normal	T	1900	33.0	–	0.0
App. Lane 3	Normal	T	1900	30.0	–	0.0

Geometry - Approach & Exit Lane Data

Lane Number	Lane Width ft	Lane Length ft	Grade %	SL Type
South	WIS 441 NB Off Ramp			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
East	CTH CE (College Ave)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–
Exit Lane 4	13.00	1600.0	0.00	–
North	WIS 441 SB On Ramp			
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
West	CTH CE (College Ave)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–

Lanes are numbered from left to right in the direction of travel.

Geometry - Movement Definitions

To Approach	Movement Banned	Turn Desig.
From: South	WIS 441 NB Off Ramp	
West	No	L
North	No	T
East	No	R
From: East	CTH CE (College Ave)	
East	No	T
West	No	T
North	No	R
From: West	CTH CE (College Ave)	
West	No	T
North	No	L
East	No	T

HCM 2010 Roundabout Model Calibration

Location	Name	HCM 2010 Single Lane		HCM 2010 Multi-Lane Dominant Lane		HCM 2010 Multi-Lane Subdominant Lane	
		Para. A	Para. B	Para. A	Para. B	Para. A	Para. B
South	WIS 441 NB Off Ramp	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
East	CTH CE (College Ave)	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
North	WIS 441 SB On Ramp	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
West	CTH CE (College Ave)	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722

Volumes

To Approach	Total veh	HV %	Peak Flow Factor %	Vehicle Occupancy pers/veh	Flow Scale %	Growth Rate %/year
From: South	WIS 441 NB Off Ramp					
West	145.0	1.00	89.0	1.20	100.00	2.00
North	1.0	1.00	89.0	1.20	100.00	2.00
East	465.0	1.00	89.0	1.20	100.00	2.00
From: East	CTH CE (College Ave)					
East	5.0	1.00	89.0	1.20	100.00	2.00
West	1520.0	1.00	89.0	1.20	100.00	2.00
North	935.0	1.00	89.0	1.20	100.00	2.00
From: West	CTH CE (College Ave)					
West	5.0	1.00	89.0	1.20	100.00	2.00
North	365.0	1.00	89.0	1.20	100.00	2.00
East	950.0	1.00	89.0	1.20	100.00	2.00

Path Data

To Approach	App. Cruise Speed mph	Exit Cruise Speed mph	App. Trav. Distance ft	Negn Speed mph	Negn Distance ft	Downst. Distance ft	Negn Radius ft
From: South	WIS 441 NB Off Ramp						
West	40.0	40.0	1600.0	–	–	–	–
North	40.0	40.0	1600.0	–	–	–	–
East	40.0	40.0	1600.0	–	–	–	–
From: East	CTH CE (College Ave)						
East	40.0	40.0	1600.0	–	–	–	–
West	40.0	40.0	1600.0	–	–	–	–
North	40.0	40.0	1600.0	–	–	–	–
From: West	CTH CE (College Ave)						
West	40.0	40.0	1600.0	–	–	–	–
North	40.0	40.0	1600.0	–	–	–	–
East	40.0	40.0	1600.0	–	–	–	–

Movement Data - General

Turn	Mov. ID	Queue Space LV ft	Queue Space HV ft	Vehicle Length LV ft	Vehicle Length HV ft	HVE	P.Deg. Satn	Movement Type	Movement Control
South	WIS 441 NB Off Ramp								
L	3	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	8	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	18	25.00	45.00	17.00	36.00	2.00	–	*Cont.*	–
East	CTH CE (College Ave)								
T	6	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	16	25.00	45.00	17.00	36.00	2.00	–	*Cont.*	–
West	CTH CE (College Ave)								
L	5	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	2	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–

Movement Type and Control parameters are set automaticly from Approach Control and Lane Type data in the Geometry dialog.

Gap Acceptance

Movement		Critical Gap sec	Follow-up Headway sec	Min. Departures veh/min	Exiting Flow Effect %
South	WIS 441 NB Off Ramp				
	L	4.000	2.800	2.50	0
	T	4.000	2.800	2.50	0
East	CTH CE (College Ave)				
	T	4.000	2.800	2.50	0
West	CTH CE (College Ave)				
	L	4.200	3.200	2.50	0
	T	4.200	3.200	2.50	0

Model Settings - Options	
General Options	
Level of Service Method	Delay & v/c (HCM 2010)
Level of Service Target	LOS D
Performance Measure	Delay
Percentile Queue	95 %
Hours per Year	480 h
Gap Acceptance	
HV Method for Gap-Acceptance	Include HV Effect for all percentages
Gap-Acceptance Capacity	Traditional M1
HCM Delay Formula	Yes
Downstream Short Lane Model	
Minimum Downstream Utilisation Ratio	20 %
Minimum Downstream Distance	100 ft
Distance for Full Lane Utilisation	660 ft
Calibration Parameter	1.2

Model Settings - Roundabouts	
Roundabout Model Options	
Capacity Model	US HCM 2010
LOS Method	Same as Sign Control
US HCM 2010 Roundabout Model	
Include Origin-Destination Pattern Effects	No
Factor for Parameter A	1.000
Factor for Parameter B	1.000
Other Roundabout Models	
FHWA 2000	No
Use Urban Compact Roundabout	–
HCM 2000	No
NAASRA 1986	No

Model Settings - Cost Parameters	
Vehicle Operating Cost	
Cost Unit	$
Pump Price of Fuel	3.000 $/gal
Fuel Resource Cost Factor	0.700
Ratio of Running Cost to Fuel Cost	3.00
Vehicle Mass	
Light Vehicle Mass	3100.0 lb
Heavy Vehicle Mass	24000.0 lb
Heavy Vehicle Maximum Power	130 kW
Time Cost	
Average Income	23.00 $/h
Time Value Factor	0.400

Demand & Sensitivity	
Analysis Method:	None

Site Properties	
Site (Intersection) Type	Roundabout

Model Name	US HCM (Customary)
Drive Rule	Right-hand side of the road
New Zealand Rule	No
HCM Version	Yes
Units	US Customary

INTERSECTION SUMMARY

WIS 441 NB Ramps with CTH CE (College Ave)
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	4934	veh/h	5920	pers/h
Percent Heavy Vehicles	1.0	%		
Degree of Saturation	0.747			
Practical Spare Capacity	-29.9	%		
Effective Intersection Capacity	3529	veh/h		
Control Delay (Total)	11.97	veh-h/h	14.36	pers-h/h
Control Delay (Average)	8.7	sec	8.7	sec
Control Delay (Worst Lane)	19.6	sec		
Control Delay (Worst Movement)	17.0	sec	17.0	sec
Geometric Delay (Average)	6.3	sec		
Stop-Line Delay (Average)	8.7	sec		
Intersection Level of Service (LOS)	LOS A			
95% Back of Queue - Vehicles (Worst Lane)	5.5	veh		
95% Back of Queue - Distance (Worst Lane)	139.1	ft		
Total Effective Stops	3308	veh/h	3970	pers/h
Effective Stop Rate	0.67	per veh	0.67	per pers
Proportion Queued	0.29		0.29	
Performance Index	85.8		85.8	
Travel Distance (Total)	1892.8	veh-mi/h	2271.3	pers-mi/h
Travel Distance (Average)	2026	ft	2026	ft
Travel Time (Total)	67.9	veh-h/h	81.5	pers-h/h
Travel Time (Average)	49.6	sec	49.6	sec
Travel Speed	27.9	mph	27.9	mph
Cost (Total)	1336.38	$/h	1336.38	$/h
Fuel Consumption (Total)	92.8	gal/h		
Carbon Dioxide (Total)	878.3	kg/h		
Hydrocarbons (Total)	1.460	kg/h		
Carbon Monoxide (Total)	66.63	kg/h		
NOx (Total)	2.112	kg/h		

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	2,368,180	veh/y	2,841,816	pers/y
Delay	5,746	veh-h/y	6,895	pers-h/y
Effective Stops	1,588,023	veh/y	1,905,627	pers/y
Travel Distance	908,538	veh-mi/y	1,090,246	pers-mi/y
Travel Time	32,597	veh-h/y	39,117	pers-h/y
Cost	641,460	$/y	641,460	$/y
Fuel Consumption	44,531	gal/y		
Carbon Dioxide	421,586	kg/y		
Hydrocarbons	701	kg/y		
Carbon Monoxide	31,984	kg/y		
NOx	1,014	kg/y		

MOVEMENT SUMMARY

Site: WIS 441 NB Ramps with CTH CE - AM 3LN

WIS 441 NB Ramps with CTH CE (College Ave)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: WIS 441 NB Off Ramp											
3	L	163	1.0	0.139	10.2	LOS B	0.4	9.7	0.69	0.91	24.9
8	T	1	1.0	0.116	10.0	LOS B	0.3	8.0	0.69	0.80	26.9
18	R	522	1.0	0.327	0.1	X	X	X	X	0.51	33.8
Approach		687	1.0	0.327	2.5	LOS A	0.4	9.7	0.17	0.61	31.0
East: CTH CE (College Ave)											
6	T	1713	1.0	0.747	17.0	LOS C	5.5	139.1	0.73	0.93	24.3
16	R	1051	1.0	1.398	0.2	X	X	X	X	0.51	33.7
Approach		2764	1.0	0.747	10.6	LOS B	5.5	139.1	0.45	0.77	27.2
West: CTH CE (College Ave)											
5	L	410	1.0	0.486	8.7	LOS A	2.2	56.5	0.05	0.75	25.6
2	T	1073	1.0	0.486	7.9	LOS A	2.2	56.5	0.05	0.42	29.0
Approach		1483	1.0	0.486	8.1	LOS A	2.2	56.5	0.05	0.51	27.9
All Vehicles		4934	1.0	0.747	8.7	LOS A	5.5	139.1	0.29	0.67	27.9

X: Not applicable for Continuous movement.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

LANE SUMMARY

WIS 441 NB Ramps with CTH CE (College Ave)
Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Lane Length ft	SL Type	Cap. Adj. %	Prob. Block. %
South: WIS 441 NB Off Ramp																
Lane 1	60	0	0	60	1.0	430	0.139	100	10.4	LOS B	0.4	9.7	1600	–	0.0	0.0
Lane 2	55	0	0	55	1.0	430	0.127	92[5]	10.2	LOS B	0.4	8.9	1600	–	0.0	0.0
Lane 3	49	1	0	50	1.0	430	0.116	83[5]	10.0	LOS B	0.3	8.0	1600	–	0.0	0.0
Lane 4	0	0	522	522	1.0	1599	0.327	100	0.1	X	X	X	1600	–	0.0	X
Approach	163	1	522	687	1.0		0.327		2.5	LOS A	0.4	9.7				
East: CTH CE (College Ave)																
Lane 1	0	623	0	623	1.0	834	0.747	100	19.6	LOS C	5.5	139.1	1600	–	0.0	0.0
Lane 2	0	571	0	571	1.0	834	0.685	92[5]	16.6	LOS C	4.4	111.2	1600	–	0.0	0.0
Lane 3	0	519	0	519	1.0	834	0.623	83[5]	14.3	LOS B	3.6	89.6	1600	–	0.0	0.0
Lane 4	0	0	1051	1051	1.0	1599	0.657	100	0.2	X	X	X	1600	–	0.0	X
Approach	0	1713	1051	2764	1.0		0.747		10.6	LOS B	5.5	139.1				
West: CTH CE (College Ave)																
Lane 1	410	129	0	539	1.0	1109	0.486	100	8.7	LOS A	2.2	56.5	1600	–	0.0	0.0
Lane 2	0	494	0	494	1.0	1109	0.446	92[5]	8.1	LOS A	1.9	48.1	1600	–	0.0	0.0
Lane 3	0	449	0	449	1.0	1109	0.405	83[5]	7.5	LOS A	1.6	40.8	1600	–	0.0	0.0
Approach	410	1073	0	1483	1.0		0.486		8.1	LOS A	2.2	56.5				
Intersection				4934	1.0		0.747		8.7	LOS A	5.5	139.1				

X: Not applicable for Continuous lane.

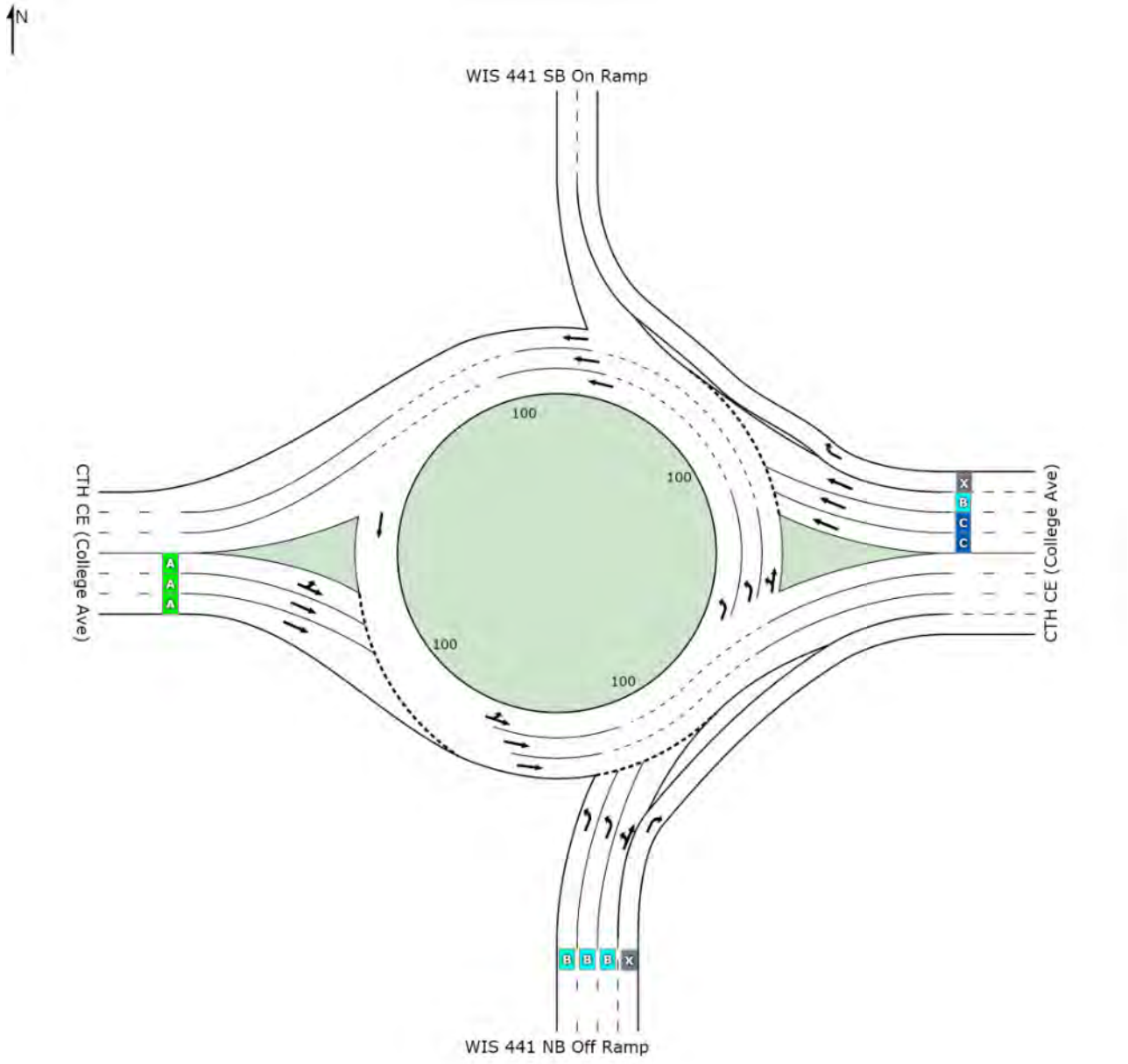
Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

5 Lane underutilisation determined by program

LEVEL OF SERVICE SUMMARY

Site: WIS 441 NB Ramps with CTH CE - AM 3LN

WIS 441 NB Ramps with CTH CE (College Ave)
Roundabout



	South	East	North	West	Intersection
LOS	A	B	NA	A	A

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Model used. Geometric Delay not included.

INPUT REPORT

WIS 441 NB Ramps with CTH CE (College Ave)

Intersection Parameters	
Title	WIS 441 NB Ramps with CTH CE (College Ave)
Intersection ID	1
Unit Time (for volumes)	60 minutes
Peak Flow Period (for performance)	15 minutes

Geometry - Approach Data

Location	Name	Type	No. of App. Lanes	No. of Exit Lanes	Median Width ft	Extra Bunching %
South	WIS 441 NB Off Ramp	One-way Approach	4	0	–	0.0
East	CTH CE (College Ave)	Two-way	4	4	–	0.0
North	WIS 441 SB On Ramp	One-way Exit	0	2	–	0.0
West	CTH CE (College Ave)	Two-way	3	3	–	0.0

Geometry - Roundabout Data

Location	Name	Island Diameter ft	Circ. Width ft	Circ. Lanes	Entry Radius ft	Entry Angle degrees	Env. Factor	Entry/Circ. Flow Adjust.
South	WIS 441 NB Off Ramp	100.00	30.00	3	65.0	30.0	1.2000	None
East	CTH CE (College Ave)	100.00	30.00	3	65.0	30.0	1.2000	None
North	WIS 441 SB On Ramp	100.00	30.00	3	65.0	30.0	1.2000	None
West	CTH CE (College Ave)	100.00	30.00	1	65.0	30.0	1.2000	None

Geometry - Approach Lane Data

Lane Number	Lane Type	Lane Discip.	Basic Satn Flow tcu/h	Utilisation Ratio %	Saturation Speed mph	Capacity Adjustment %
South	WIS 441 NB Off Ramp					
App. Lane 1	Normal	L	1900	36.0	–	0.0
App. Lane 2	Normal	L	1900	33.0	–	0.0
App. Lane 3	Normal	LT	1900	30.0	–	0.0
App. Lane 4	Continuous	R	1900	–	–	0.0
East	CTH CE (College Ave)					
App. Lane 1	Normal	T	1900	36.0	–	0.0
App. Lane 2	Normal	T	1900	33.0	–	0.0
App. Lane 3	Normal	T	1900	30.0	–	0.0
App. Lane 4	Continuous	R	1900	47.0	–	0.0
West	CTH CE (College Ave)					
App. Lane 1	Normal	LT	1900	36.0	–	0.0
App. Lane 2	Normal	T	1900	33.0	–	0.0
App. Lane 3	Normal	T	1900	30.0	–	0.0

Geometry - Approach & Exit Lane Data

Lane Number	Lane Width ft	Lane Length ft	Grade %	SL Type
South	WIS 441 NB Off Ramp			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
East	CTH CE (College Ave)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–
Exit Lane 4	13.00	1600.0	0.00	–
North	WIS 441 SB On Ramp			
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
West	CTH CE (College Ave)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–

Lanes are numbered from left to right in the direction of travel.

Geometry - Movement Definitions

To Approach	Movement Banned	Turn Desig.
From: South	WIS 441 NB Off Ramp	
West	No	L
North	No	T
East	No	R
From: East	CTH CE (College Ave)	
East	No	T
West	No	T
North	No	R
From: West	CTH CE (College Ave)	
West	No	T
North	No	L
East	No	T

HCM 2010 Roundabout Model Calibration

Location	Name	HCM 2010 Single Lane		HCM 2010 Multi-Lane Dominant Lane		HCM 2010 Multi-Lane Subdominant Lane	
		Para. A	Para. B	Para. A	Para. B	Para. A	Para. B
South	WIS 441 NB Off Ramp	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
East	CTH CE (College Ave)	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
North	WIS 441 SB On Ramp	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
West	CTH CE (College Ave)	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722

Volumes

To Approach	Total veh	HV %	Peak Flow Factor %	Vehicle Occupancy pers/veh	Flow Scale %	Growth Rate %/year
From: South	WIS 441 NB Off Ramp					
West	215.0	1.00	91.0	1.20	100.00	2.00
North	1.0	1.00	91.0	1.20	100.00	2.00
East	940.0	1.00	91.0	1.20	100.00	2.00
From: East	CTH CE (College Ave)					
East	5.0	1.00	91.0	1.20	100.00	2.00
West	1255.0	1.00	91.0	1.20	100.00	2.00
North	495.0	1.00	91.0	1.20	100.00	2.00
From: West	CTH CE (College Ave)					
West	5.0	1.00	91.0	1.20	100.00	2.00
North	360.0	1.00	91.0	1.20	100.00	2.00
East	2445.0	1.00	91.0	1.20	100.00	2.00

Path Data

To Approach	App. Cruise Speed mph	Exit Cruise Speed mph	App. Trav. Distance ft	Negn Speed mph	Negn Distance ft	Downst. Distance ft	Negn Radius ft
From: South	WIS 441 NB Off Ramp						
West	40.0	40.0	1600.0	–	–	–	–
North	40.0	40.0	1600.0	–	–	–	–
East	40.0	40.0	1600.0	–	–	–	–
From: East	CTH CE (College Ave)						
East	40.0	40.0	1600.0	–	–	–	–
West	40.0	40.0	1600.0	–	–	–	–
North	40.0	40.0	1600.0	–	–	–	–
From: West	CTH CE (College Ave)						
West	40.0	40.0	1600.0	–	–	–	–
North	40.0	40.0	1600.0	–	–	–	–
East	40.0	40.0	1600.0	–	–	–	–

Movement Data - General

Turn	Mov. ID	Queue Space LV ft	Queue Space HV ft	Vehicle Length LV ft	Vehicle Length HV ft	HVE	P.Deg. Satn	Movement Type	Movement Control
South	WIS 441 NB Off Ramp								
L	3	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	8	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	18	25.00	45.00	17.00	36.00	2.00	–	*Cont.*	–
East	CTH CE (College Ave)								
T	6	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	16	25.00	45.00	17.00	36.00	2.00	–	*Cont.*	–
West	CTH CE (College Ave)								
L	5	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	2	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–

Movement Type and Control parameters are set automaticly from Approach Control and Lane Type data in the Geometry dialog.

Gap Acceptance

Movement		Critical Gap sec	Follow-up Headway sec	Min. Departures veh/min	Exiting Flow Effect %
South	WIS 441 NB Off Ramp				
	L	4.000	2.800	2.50	0
	T	4.000	2.800	2.50	0
East	CTH CE (College Ave)				
	T	4.000	2.800	2.50	0
West	CTH CE (College Ave)				
	L	4.200	3.200	2.50	0
	T	4.200	3.200	2.50	0

Model Settings - Options	
General Options	
Level of Service Method	Delay & v/c (HCM 2010)
Level of Service Target	LOS D
Performance Measure	Delay
Percentile Queue	95 %
Hours per Year	480 h
Gap Acceptance	
HV Method for Gap-Acceptance	Include HV Effect for all percentages
Gap-Acceptance Capacity	Traditional M1
HCM Delay Formula	Yes
Downstream Short Lane Model	
Minimum Downstream Utilisation Ratio	20 %
Minimum Downstream Distance	100 ft
Distance for Full Lane Utilisation	660 ft
Calibration Parameter	1.2

Model Settings - Roundabouts	
Roundabout Model Options	
Capacity Model	US HCM 2010
LOS Method	Same as Sign Control
US HCM 2010 Roundabout Model	
Include Origin-Destination Pattern Effects	No
Factor for Parameter A	1.000
Factor for Parameter B	1.000
Other Roundabout Models	
FHWA 2000	No
Use Urban Compact Roundabout	–
HCM 2000	No
NAASRA 1986	No

Model Settings - Cost Parameters	
Vehicle Operating Cost	
Cost Unit	$
Pump Price of Fuel	3.000 $/gal
Fuel Resource Cost Factor	0.700
Ratio of Running Cost to Fuel Cost	3.00
Vehicle Mass	
Light Vehicle Mass	3100.0 lb
Heavy Vehicle Mass	24000.0 lb
Heavy Vehicle Maximum Power	130 kW
Time Cost	
Average Income	23.00 $/h
Time Value Factor	0.400

Demand & Sensitivity	
Analysis Method:	None

Site Properties	
Site (Intersection) Type	Roundabout

Model Name	US HCM (Customary)
Drive Rule	Right-hand side of the road
New Zealand Rule	No
HCM Version	Yes
Units	US Customary

INTERSECTION SUMMARY

WIS 441 NB Ramps with CTH CE (College Ave)
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	6287	veh/h	7544	pers/h
Percent Heavy Vehicles	1.0	%		
Degree of Saturation	1.012			
Practical Spare Capacity	-16.0	%		
Effective Intersection Capacity	6211	veh/h		
Control Delay (Total)	39.65	veh-h/h	47.58	pers-h/h
Control Delay (Average)	22.7	sec	22.7	sec
Control Delay (Worst Lane)	68.5	sec		
Control Delay (Worst Movement)	62.8	sec	62.8	sec
Geometric Delay (Average)	6.1	sec		
Stop-Line Delay (Average)	22.7	sec		
Intersection Level of Service (LOS)	LOS C			
95% Back of Queue - Vehicles (Worst Lane)	131.3	veh		
95% Back of Queue - Distance (Worst Lane)	3308.6	ft		
Total Effective Stops	3251	veh/h	3901	pers/h
Effective Stop Rate	0.52	per veh	0.52	per pers
Proportion Queued	0.43		0.43	
Performance Index	191.9		191.9	
Travel Distance (Total)	2410.3	veh-mi/h	2892.4	pers-mi/h
Travel Distance (Average)	2024	ft	2024	ft
Travel Time (Total)	110.6	veh-h/h	132.7	pers-h/h
Travel Time (Average)	63.3	sec	63.3	sec
Travel Speed	21.8	mph	21.8	mph
Cost (Total)	2033.75	$/h	2033.75	$/h
Fuel Consumption (Total)	128.0	gal/h		
Carbon Dioxide (Total)	1211.8	kg/h		
Hydrocarbons (Total)	2.075	kg/h		
Carbon Monoxide (Total)	87.88	kg/h		
NOx (Total)	2.778	kg/h		

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	3,017,671	veh/y	3,621,205	pers/y
Delay	19,033	veh-h/y	22,839	pers-h/y
Effective Stops	1,560,563	veh/y	1,872,676	pers/y
Travel Distance	1,156,944	veh-mi/y	1,388,333	pers-mi/y
Travel Time	53,079	veh-h/y	63,695	pers-h/y
Cost	976,202	$/y	976,202	$/y
Fuel Consumption	61,441	gal/y		
Carbon Dioxide	581,680	kg/y		
Hydrocarbons	996	kg/y		
Carbon Monoxide	42,180	kg/y		
NOx	1,334	kg/y		

MOVEMENT SUMMARY

Site: WIS 441 NB Ramps with CTH CE - PM 3LN

WIS 441 NB Ramps with CTH CE (College Ave)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: WIS 441 NB Off Ramp											
3	L	236	1.0	0.641	62.8	LOS F	1.9	48.6	0.95	1.09	13.2
8	T	1	1.0	0.534	56.6	LOS F	1.5	38.2	0.95	1.05	14.0
18	R	1033	1.0	0.646	0.2	X	X	X	X	0.51	33.7
Approach		1270	1.0	0.646	11.9	LOS B	1.9	48.6	0.18	0.62	25.7
East: CTH CE (College Ave)											
6	T	1385	1.0	0.628	13.5	LOS B	3.5	89.2	0.65	0.86	25.9
16	R	544	1.0	0.724	0.1	X	X	X	X	0.51	33.8
Approach		1929	1.0	0.628	9.7	LOS A	3.5	89.2	0.47	0.76	27.7
West: CTH CE (College Ave)											
5	L	396	1.0	1.012	49.5	LOS F	131.3	3308.6	1.00	0.22	15.2
2	T	2692	1.0	1.012	33.2	LOS F	131.3	3308.6	0.44	0.34	18.8
Approach		3088	1.0	1.012	35.3	LOS E	131.3	3308.6	0.51	0.32	18.2
All Vehicles		6287	1.0	1.012	22.7	LOS C	131.3	3308.6	0.43	0.52	21.8

X: Not applicable for Continuous movement.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

LANE SUMMARY

Site: WIS 441 NB Ramps with CTH CE - PM 3LN

WIS 441 NB Ramps with CTH CE (College Ave)
Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Lane Length ft	SL Type	Cap. Adj. %	Prob. Block. %
South: WIS 441 NB Off Ramp																
Lane 1	86	0	0	86	1.0	135	0.641	100	68.5	LOS F	1.9	48.6	1600	–	0.0	0.0
Lane 2	79	0	0	79	1.0	135	0.588	92[5]	62.1	LOS F	1.7	43.2	1600	–	0.0	0.0
Lane 3	71	1	0	72	1.0	135	0.534	83[5]	56.6	LOS F	1.5	38.2	1600	–	0.0	0.0
Lane 4	0	0	1033	1033	1.0	1599	0.646	100	0.2	X	X	X	1600	–	0.0	X
Approach	236	1	1033	1270	1.0		0.646		11.9	LOS B	1.9	48.6				
East: CTH CE (College Ave)																
Lane 1	0	503	0	503	1.0	802	0.628	100	14.9	LOS B	3.5	89.2	1600	–	0.0	0.0
Lane 2	0	462	0	462	1.0	802	0.576	92[5]	13.3	LOS B	3.0	74.7	1600	–	0.0	0.0
Lane 3	0	420	0	420	1.0	802	0.523	83[5]	11.9	LOS B	2.5	62.4	1600	–	0.0	0.0
Lane 4	0	0	544	544	1.0	1599	0.340	100	0.1	X	X	X	1600	–	0.0	X
Approach	0	1385	544	1929	1.0		0.628		9.7	LOS A	3.5	89.2				
West: CTH CE (College Ave)																
Lane 1	396	727	0	1123	1.0	1109	1.012	100	49.5	LOS F	131.3	3308.6	1600	–	0.0	34.4
Lane 2	0	1029	0	1029	1.0	1109	0.928	92[5]	31.9	LOS D	26.2	659.8	1600	–	0.0	0.0
Lane 3	0	936	0	936	1.0	1109	0.843	83[5]	22.0	LOS C	12.0	303.3	1600	–	0.0	0.0
Approach	396	2692	0	3088	1.0		1.012		35.3	LOS E	131.3	3308.6				
Intersection				6287	1.0		1.012		22.7	LOS C	131.3	3308.6				

X: Not applicable for Continuous lane.

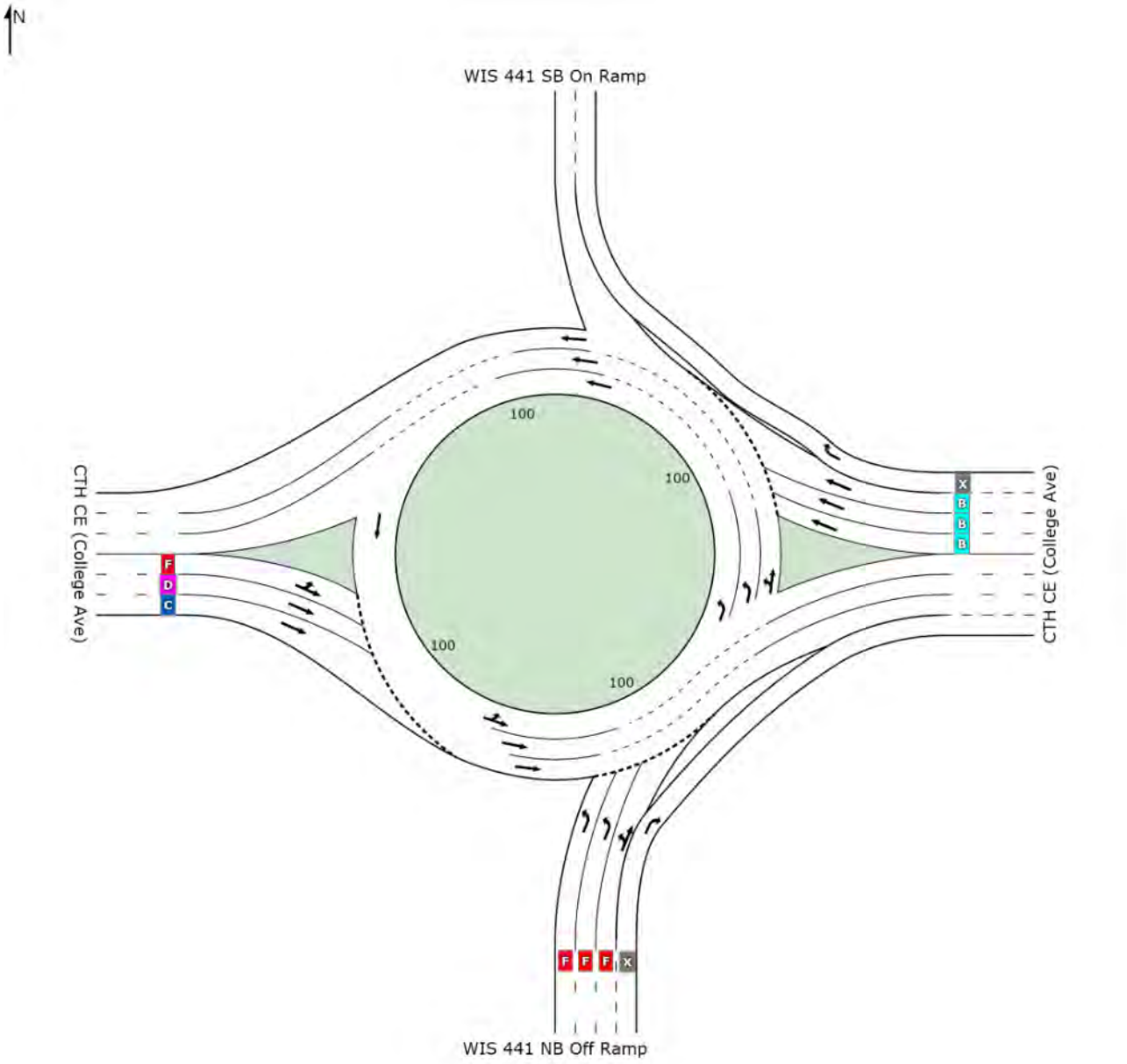
Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

5 Lane underutilisation determined by program

LEVEL OF SERVICE SUMMARY

Site: WIS 441 NB Ramps with CTH CE - PM 3LN

WIS 441 NB Ramps with CTH CE (College Ave)
Roundabout



	South	East	North	West	Intersection
LOS	B	A	NA	E	C

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Model used. Geometric Delay not included.

INPUT REPORT

WIS 441 SB Ramps with CTH CE (College Ave)

Intersection Parameters	
Title	WIS 441 SB Ramps with CTH CE (College Ave)
Intersection ID	1
Unit Time (for volumes)	60 minutes
Peak Flow Period (for performance)	15 minutes

Geometry - Approach Data

Location	Name	Type	No. of App. Lanes	No. of Exit Lanes	Median Width ft	Extra Bunching %
South	WIS 441 SB On Ramp	One-way Exit	0	1	–	0.0
East	CTH CE (College Ave)	Two-way	3	3	–	0.0
North	WIS 441 SB Off Ramp	One-way Approach	5	0	–	0.0
West	CTH CE (College Ave)	Two-way	4	3	–	0.0

Geometry - Roundabout Data

Location	Name	Island Diameter ft	Circ. Width ft	Circ. Lanes	Entry Radius ft	Entry Angle degrees	Env. Factor	Entry/Circ. Flow Adjust.
South	WIS 441 SB On Ramp	100.00	30.00	3	65.0	30.0	1.2000	None
East	CTH CE (College Ave)	100.00	30.00	1	65.0	30.0	1.2000	None
North	WIS 441 SB Off Ramp	100.00	30.00	3	65.0	30.0	1.2000	None
West	CTH CE (College Ave)	100.00	30.00	3	65.0	30.0	1.2000	None

Geometry - Approach Lane Data

Lane Number	Lane Type	Lane Discip.	Basic Satn Flow tcu/h	Utilisation Ratio %	Saturation Speed mph	Capacity Adjustment %
East	CTH CE (College Ave)					
App. Lane 1	Normal	LT	1900	47.0	–	0.0
App. Lane 2	Normal	T	1900	53.0	–	0.0
App. Lane 3	Normal	T	1900	53.0	–	0.0
North	WIS 441 SB Off Ramp					
App. Lane 1	Normal	L	1900	36.0	–	0.0
App. Lane 2	Normal	L	1900	33.0	–	0.0
App. Lane 3	Normal	LT	1900	30.0	–	0.0
App. Lane 4	Slip (Giveway/Yield)	R	1900	47.0	–	0.0
App. Lane 5	Slip (Giveway/Yield)	R	1900	53.0	–	0.0
West	CTH CE (College Ave)					
App. Lane 1	Normal	T	1900	36.0	–	0.0
App. Lane 2	Normal	T	1900	33.0	–	0.0
App. Lane 3	Normal	T	1900	30.0	–	0.0
App. Lane 4	Slip (Giveway/Yield)	R	1900	–	–	0.0

Geometry - Approach & Exit Lane Data

Lane Number	Lane Width ft	Lane Length ft	Grade %	SL Type
South	WIS 441 SB On Ramp			
Exit Lane 1	13.00	1600.0	0.00	–
East	CTH CE (College Ave)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–
North	WIS 441 SB Off Ramp			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
App. Lane 5	13.00	1600.0	0.00	–
West	CTH CE (College Ave)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–

Lanes are numbered from left to right in the direction of travel.

Geometry - Movement Definitions

To Approach	Movement Banned	Turn Desig.
From: East	CTH CE (College Ave)	
East	No	L
South	No	L
West	No	T
From: North	WIS 441 SB Off Ramp	
East	No	L
South	No	T
West	No	R
From: West	CTH CE (College Ave)	
West	No	T
East	No	T
South	No	R

HCM 2010 Roundabout Model Calibration

Location	Name	HCM 2010 Single Lane		HCM 2010 Multi-Lane Dominant Lane		HCM 2010 Multi-Lane Subdominant Lane	
		Para. A	Para. B	Para. A	Para. B	Para. A	Para. B
South	WIS 441 SB On Ramp	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
East	CTH CE (College Ave)	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
North	WIS 441 SB Off Ramp	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
West	CTH CE (College Ave)	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722

Volumes

To Approach	Total veh	HV %	Peak Flow Factor %	Vehicle Occupancy pers/veh	Flow Scale %	Growth Rate %/year
From: East	CTH CE (College Ave)					
East	5.0	1.00	92.0	1.20	100.00	2.00
South	845.0	1.00	92.0	1.20	100.00	2.00
West	825.0	1.00	92.0	1.20	100.00	2.00
From: North	WIS 441 SB Off Ramp					
East	485.0	1.00	92.0	1.20	100.00	2.00
South	1.0	1.00	92.0	1.20	100.00	2.00
West	495.0	1.00	92.0	1.20	100.00	2.00
From: West	CTH CE (College Ave)					
West	5.0	1.00	92.0	1.20	100.00	2.00
East	825.0	1.00	92.0	1.20	100.00	2.00
South	230.0	1.00	92.0	1.20	100.00	2.00

Path Data

To Approach	App. Cruise Speed mph	Exit Cruise Speed mph	App. Trav. Distance ft	Negn Speed mph	Negn Distance ft	Downst. Distance ft	Negn Radius ft
From: East	CTH CE (College Ave)						
East	40.0	40.0	1600.0	–	–	–	–
South	40.0	40.0	1600.0	–	–	–	–
West	40.0	40.0	1600.0	–	–	–	–
From: North	WIS 441 SB Off Ramp						
East	40.0	40.0	1600.0	–	–	–	–
South	40.0	40.0	1600.0	–	–	–	–
West	40.0	40.0	1600.0	–	–	–	–
From: West	CTH CE (College Ave)						
West	40.0	40.0	1600.0	–	–	–	–
East	40.0	40.0	1600.0	–	–	–	–
South	40.0	40.0	1600.0	–	–	–	–

Movement Data - General

Turn	Mov. ID	Queue Space LV ft	Queue Space HV ft	Vehicle Length LV ft	Vehicle Length HV ft	HVE	P.Deg. Satn	Movement Type	Movement Control
East	CTH CE (College Ave)								
L	1	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	6	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
North	WIS 441 SB Off Ramp								
L	7	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	4	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	14	25.00	45.00	17.00	36.00	2.00	–	*Slip*	*Yield*
West	CTH CE (College Ave)								
T	2	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	12	25.00	45.00	17.00	36.00	2.00	–	*Slip*	*Yield*

Movement Type and Control parameters are set automaticly from Approach Control and Lane Type data in the Geometry dialog.

Gap Acceptance

Movement		Critical Gap sec	Follow-up Headway sec	Min. Departures veh/min	Exiting Flow Effect %
East	CTH CE (College Ave)				
	L	4.200	3.200	2.50	0
	T	4.200	3.200	2.50	0
North	WIS 441 SB Off Ramp				
	L	4.000	2.800	2.50	0
	T	4.000	2.800	2.50	0
	R	–	–	2.50	0
West	CTH CE (College Ave)				
	T	4.000	2.800	2.50	0
	R	4.000	2.800	2.50	0

Model Settings - Options	
General Options	
Level of Service Method	Delay & v/c (HCM 2010)
Level of Service Target	LOS D
Performance Measure	Delay
Percentile Queue	95 %
Hours per Year	480 h
Gap Acceptance	
HV Method for Gap-Acceptance	Include HV Effect for all percentages
Gap-Acceptance Capacity	Traditional M1
HCM Delay Formula	Yes
Downstream Short Lane Model	
Minimum Downstream Utilisation Ratio	20 %
Minimum Downstream Distance	100 ft
Distance for Full Lane Utilisation	660 ft
Calibration Parameter	1.2

Model Settings - Roundabouts	
Roundabout Model Options	
Capacity Model	US HCM 2010
LOS Method	Same as Sign Control
US HCM 2010 Roundabout Model	
Include Origin-Destination Pattern Effects	No
Factor for Parameter A	1.000
Factor for Parameter B	1.000
Other Roundabout Models	
FHWA 2000	No
Use Urban Compact Roundabout	–
HCM 2000	No
NAASRA 1986	No

Model Settings - Cost Parameters	
Vehicle Operating Cost	
Cost Unit	$
Pump Price of Fuel	3.000 $/gal
Fuel Resource Cost Factor	0.700
Ratio of Running Cost to Fuel Cost	3.00
Vehicle Mass	
Light Vehicle Mass	3100.0 lb
Heavy Vehicle Mass	24000.0 lb
Heavy Vehicle Maximum Power	130 kW
Time Cost	
Average Income	23.00 $/h
Time Value Factor	0.400

Demand & Sensitivity	
Analysis Method:	None

Site Properties	
Site (Intersection) Type	Roundabout

Model Name	US HCM (Customary)
Drive Rule	Right-hand side of the road
New Zealand Rule	No
HCM Version	Yes
Units	US Customary

INTERSECTION SUMMARY

WIS 441 SB Ramps with CTH CE (College Ave)
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	4039	veh/h	4847	pers/h
Percent Heavy Vehicles	1.0	%		
Degree of Saturation	0.833			
Practical Spare Capacity	2.1	%		
Effective Intersection Capacity	4850	veh/h		
Control Delay (Total)	20.33	veh-h/h	24.39	pers-h/h
Control Delay (Average)	18.1	sec	18.1	sec
Control Delay (Worst Lane)	32.0	sec		
Control Delay (Worst Movement)	27.9	sec	27.9	sec
Geometric Delay (Average)	8.0	sec		
Stop-Line Delay (Average)	18.1	sec		
Intersection Level of Service (LOS)	LOS C			
95% Back of Queue - Vehicles (Worst Lane)	11.2	veh		
95% Back of Queue - Distance (Worst Lane)	281.8	ft		
Total Effective Stops	3140	veh/h	3768	pers/h
Effective Stop Rate	0.78	per veh	0.78	per pers
Proportion Queued	0.47		0.47	
Performance Index	90.8		90.8	
Travel Distance (Total)	1579.7	veh-mi/h	1895.7	pers-mi/h
Travel Distance (Average)	2065	ft	2065	ft
Travel Time (Total)	68.7	veh-h/h	82.5	pers-h/h
Travel Time (Average)	61.2	sec	61.2	sec
Travel Speed	23.0	mph	23.0	mph
Cost (Total)	1288.01	$/h	1288.01	$/h
Fuel Consumption (Total)	83.7	gal/h		
Carbon Dioxide (Total)	792.9	kg/h		
Hydrocarbons (Total)	1.362	kg/h		
Carbon Monoxide (Total)	60.16	kg/h		
NOx (Total)	1.858	kg/h		

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	1,938,783	veh/y	2,326,539	pers/y
Delay	9,758	veh-h/y	11,709	pers-h/y
Effective Stops	1,507,086	veh/y	1,808,503	pers/y
Travel Distance	758,274	veh-mi/y	909,929	pers-mi/y
Travel Time	32,981	veh-h/y	39,577	pers-h/y
Cost	618,242	$/y	618,242	$/y
Fuel Consumption	40,198	gal/y		
Carbon Dioxide	380,568	kg/y		
Hydrocarbons	654	kg/y		
Carbon Monoxide	28,879	kg/y		
NOx	892	kg/y		

MOVEMENT SUMMARY

Site: WIS 441 SB Ramps with CTH CE - AM 3LN

WIS 441 SB Ramps with CTH CE (College Ave)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
East: CTH CE (College Ave)											
1	L	924	1.0	0.833	21.1	LOS C	11.2	281.8	0.15	0.64	21.0
6	T	897	1.0	0.404	7.4	LOS A	1.6	40.6	0.04	0.42	29.3
Approach		1821	1.0	0.833	14.4	LOS B	11.2	281.8	0.10	0.53	24.3
North: WIS 441 SB Off Ramp											
7	L	527	1.0	0.572	24.8	LOS C	2.1	52.2	0.85	1.04	20.0
4	T	1	1.0	0.476	22.5	LOS C	1.6	40.3	0.84	0.97	21.5
14	R	538	1.0	0.432	11.3	LOS B	1.7	42.4	0.62	0.85	26.3
Approach		1066	1.0	0.572	18.0	LOS C	2.1	52.2	0.73	0.95	22.6
West: CTH CE (College Ave)											
2	T	902	1.0	0.743	27.9	LOS D	3.7	92.6	0.85	1.05	20.4
12	R	250	1.0	0.384	10.9	LOS B	1.4	35.4	0.61	0.84	26.6
Approach		1152	1.0	0.743	24.2	LOS C	3.7	92.6	0.80	1.01	21.5
All Vehicles		4039	1.0	0.833	18.1	LOS C	11.2	281.8	0.47	0.78	23.0

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

LANE SUMMARY

WIS 441 SB Ramps with CTH CE (College Ave)
Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Lane Length ft	SL Type	Cap. Adj. %	Prob. Block. %
East: CTH CE (College Ave)																
Lane 1	924	0	0	924	1.0	1109	0.833	100	21.1	LOS C	11.2	281.8	1600	–	0.0	0.0
Lane 2	0	448	0	448	1.0	1109	0.404	49[5]	7.4	LOS A	1.6	40.6	1600	–	0.0	0.0
Lane 3	0	448	0	448	1.0	1109	0.404	49[5]	7.4	LOS A	1.6	40.6	1600	–	0.0	0.0
Approach	924	897	0	1821	1.0		0.833		14.4	LOS B	11.2	281.8				
North: WIS 441 SB Off Ramp																
Lane 1	192	0	0	192	1.0	336	0.572	100	26.9	LOS D	2.1	52.2	1600	–	0.0	0.0
Lane 2	176	0	0	176	1.0	336	0.524	92[5]	24.5	LOS C	1.8	46.0	1600	–	0.0	0.0
Lane 3	159	1	0	160	1.0	336	0.476	83[5]	22.5	LOS C	1.6	40.3	1600	–	0.0	0.0
Lane 4	0	0	253	253	1.0	659	0.383	89[5]	10.7	LOS B	1.4	35.4	1600	–	0.0	0.0
Lane 5	0	0	285	285	1.0	659	0.432	100	11.7	LOS B	1.7	42.4	1600	–	0.0	0.0
Approach	527	1	538	1066	1.0		0.572		18.0	LOS C	2.1	52.2				
West: CTH CE (College Ave)																
Lane 1	0	328	0	328	1.0	441	0.743	100	32.0	LOS D	3.7	92.6	1600	–	0.0	0.0
Lane 2	0	301	0	301	1.0	441	0.681	92[5]	27.3	LOS D	3.1	77.4	1600	–	0.0	0.0
Lane 3	0	273	0	273	1.0	441	0.619	83[5]	23.6	LOS C	2.6	65.2	1600	–	0.0	0.0
Lane 4	0	0	250	250	1.0	651	0.384	100	10.9	LOS B	1.4	35.4	1600	–	0.0	0.0
Approach	0	902	250	1152	1.0		0.743		24.2	LOS C	3.7	92.6				
Intersection				4039	1.0		0.833		18.1	LOS C	11.2	281.8				

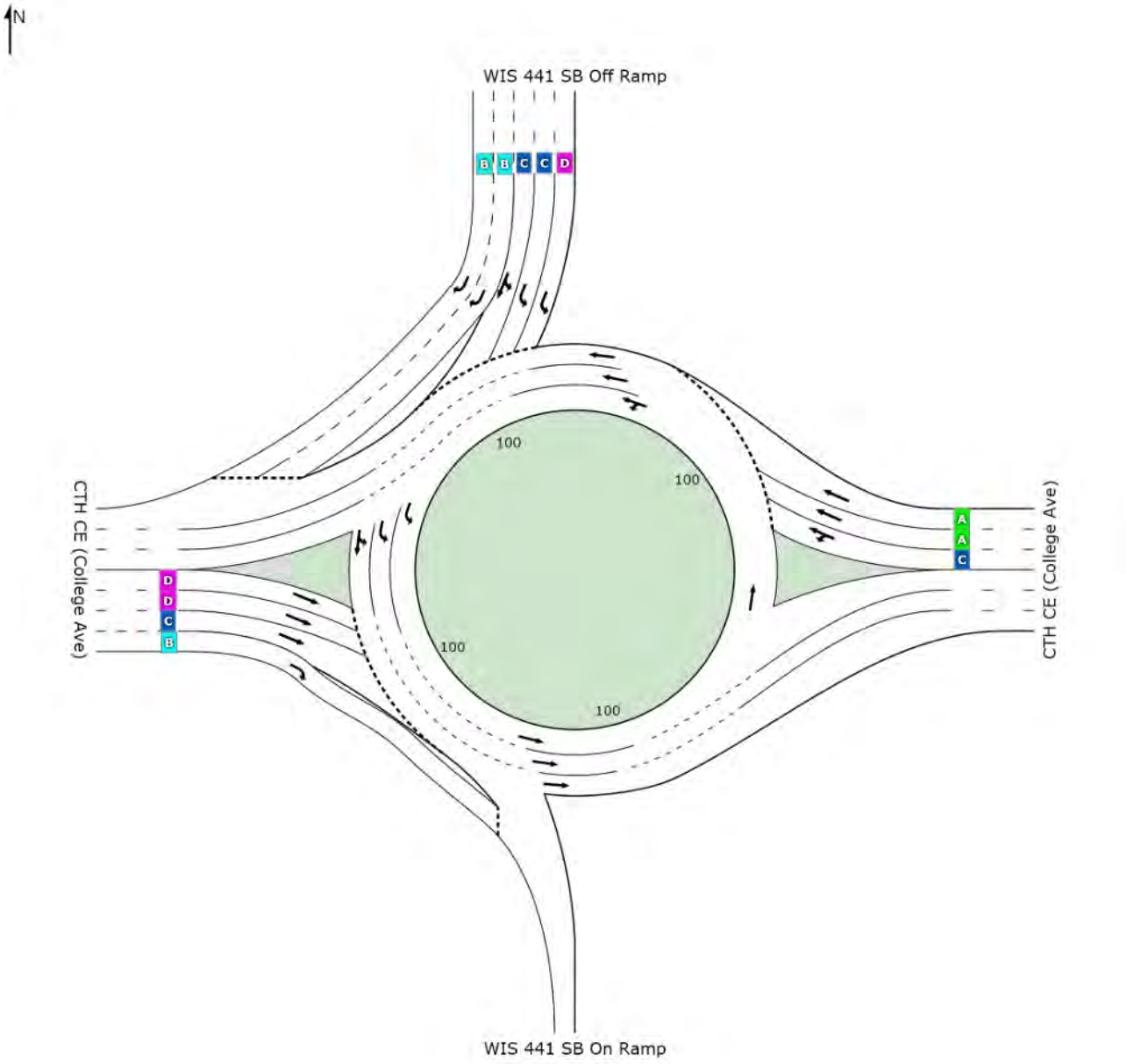
Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

5 Lane underutilisation determined by program

LEVEL OF SERVICE SUMMARY

Site: WIS 441 SB Ramps with CTH CE - AM 3LN

WIS 441 SB Ramps with CTH CE (College Ave)
Roundabout



	South	East	North	West	Intersection
LOS	NA	B	C	C	C

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Model used. Geometric Delay not included.

INPUT REPORT

WIS 441 SB Ramps with CTH CE (College Ave)

Intersection Parameters	
Title	WIS 441 SB Ramps with CTH CE (College Ave)
Intersection ID	1
Unit Time (for volumes)	60 minutes
Peak Flow Period (for performance)	15 minutes

Geometry - Approach Data

Location	Name	Type	No. of App. Lanes	No. of Exit Lanes	Median Width ft	Extra Bunching %
South	WIS 441 SB On Ramp	One-way Exit	0	1	–	0.0
East	CTH CE (College Ave)	Two-way	3	3	–	0.0
North	WIS 441 SB Off Ramp	One-way Approach	5	0	–	0.0
West	CTH CE (College Ave)	Two-way	4	3	–	0.0

Geometry - Roundabout Data

Location	Name	Island Diameter ft	Circ. Width ft	Circ. Lanes	Entry Radius ft	Entry Angle degrees	Env. Factor	Entry/Circ. Flow Adjust.
South	WIS 441 SB On Ramp	100.00	30.00	3	65.0	30.0	1.2000	None
East	CTH CE (College Ave)	100.00	30.00	1	65.0	30.0	1.2000	None
North	WIS 441 SB Off Ramp	100.00	30.00	3	65.0	30.0	1.2000	None
West	CTH CE (College Ave)	100.00	30.00	3	65.0	30.0	1.2000	None

Geometry - Approach Lane Data

Lane Number	Lane Type	Lane Discip.	Basic Satn Flow tcu/h	Utilisation Ratio %	Saturation Speed mph	Capacity Adjustment %
East	CTH CE (College Ave)					
App. Lane 1	Normal	LT	1900	47.0	–	0.0
App. Lane 2	Normal	T	1900	53.0	–	0.0
App. Lane 3	Normal	T	1900	53.0	–	0.0
North	WIS 441 SB Off Ramp					
App. Lane 1	Normal	L	1900	36.0	–	0.0
App. Lane 2	Normal	L	1900	33.0	–	0.0
App. Lane 3	Normal	LT	1900	30.0	–	0.0
App. Lane 4	Slip (Giveway/Yield)	R	1900	47.0	–	0.0
App. Lane 5	Slip (Giveway/Yield)	R	1900	53.0	–	0.0
West	CTH CE (College Ave)					
App. Lane 1	Normal	T	1900	36.0	–	0.0
App. Lane 2	Normal	T	1900	33.0	–	0.0
App. Lane 3	Normal	T	1900	30.0	–	0.0
App. Lane 4	Slip (Giveway/Yield)	R	1900	–	–	0.0

Geometry - Approach & Exit Lane Data

Lane Number	Lane Width ft	Lane Length ft	Grade %	SL Type
South	WIS 441 SB On Ramp			
Exit Lane 1	13.00	1600.0	0.00	–
East	CTH CE (College Ave)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–
North	WIS 441 SB Off Ramp			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
App. Lane 5	13.00	1600.0	0.00	–
West	CTH CE (College Ave)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–

Lanes are numbered from left to right in the direction of travel.

Geometry - Movement Definitions

To Approach	Movement Banned	Turn Desig.
From: East	CTH CE (College Ave)	
East	No	L
South	No	L
West	No	T
From: North	WIS 441 SB Off Ramp	
East	No	L
South	No	T
West	No	R
From: West	CTH CE (College Ave)	
West	No	T
East	No	T
South	No	R

HCM 2010 Roundabout Model Calibration

Location	Name	HCM 2010 Single Lane		HCM 2010 Multi-Lane Dominant Lane		HCM 2010 Multi-Lane Subdominant Lane	
		Para. A	Para. B	Para. A	Para. B	Para. A	Para. B
South	WIS 441 SB On Ramp	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
East	CTH CE (College Ave)	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
North	WIS 441 SB Off Ramp	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
West	CTH CE (College Ave)	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722

Volumes

To Approach	Total veh	HV %	Peak Flow Factor %	Vehicle Occupancy pers/veh	Flow Scale %	Growth Rate %/year
From: East	CTH CE (College Ave)					
East	5.0	2.00	95.0	1.20	100.00	2.00
South	560.0	2.00	95.0	1.20	100.00	2.00
West	910.0	2.00	95.0	1.20	100.00	2.00
From: North	WIS 441 SB Off Ramp					
East	1350.0	1.00	95.0	1.20	100.00	2.00
South	1.0	1.00	95.0	1.20	100.00	2.00
West	520.0	1.00	95.0	1.20	100.00	2.00
From: West	CTH CE (College Ave)					
West	5.0	1.00	95.0	1.20	100.00	2.00
East	1455.0	1.00	95.0	1.20	100.00	2.00
South	140.0	1.00	95.0	1.20	100.00	2.00

Path Data

To Approach	App. Cruise Speed mph	Exit Cruise Speed mph	App. Trav. Distance ft	Negn Speed mph	Negn Distance ft	Downst. Distance ft	Negn Radius ft
From: East	CTH CE (College Ave)						
East	40.0	40.0	1600.0	–	–	–	–
South	40.0	40.0	1600.0	–	–	–	–
West	40.0	40.0	1600.0	–	–	–	–
From: North	WIS 441 SB Off Ramp						
East	40.0	40.0	1600.0	–	–	–	–
South	40.0	40.0	1600.0	–	–	–	–
West	40.0	40.0	1600.0	–	–	–	–
From: West	CTH CE (College Ave)						
West	40.0	40.0	1600.0	–	–	–	–
East	40.0	40.0	1600.0	–	–	–	–
South	40.0	40.0	1600.0	–	–	–	–

Movement Data - General

Turn	Mov. ID	Queue Space LV ft	Queue Space HV ft	Vehicle Length LV ft	Vehicle Length HV ft	HVE	P.Deg. Satn	Movement Type	Movement Control
East	CTH CE (College Ave)								
L	1	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	6	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
North	WIS 441 SB Off Ramp								
L	7	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	4	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	14	25.00	45.00	17.00	36.00	2.00	–	*Slip*	*Yield*
West	CTH CE (College Ave)								
T	2	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	12	25.00	45.00	17.00	36.00	2.00	–	*Slip*	*Yield*

Movement Type and Control parameters are set automaticly from Approach Control and Lane Type data in the Geometry dialog.

Gap Acceptance

Movement		Critical Gap sec	Follow-up Headway sec	Min. Departures veh/min	Exiting Flow Effect %
East	CTH CE (College Ave)				
	L	4.200	3.200	2.50	0
	T	4.200	3.200	2.50	0
North	WIS 441 SB Off Ramp				
	L	4.000	2.800	2.50	0
	T	4.000	2.800	2.50	0
	R	–	–	2.50	0
West	CTH CE (College Ave)				
	T	4.000	2.800	2.50	0
	R	4.000	2.800	2.50	0

Model Settings - Options	
General Options	
Level of Service Method	Delay & v/c (HCM 2010)
Level of Service Target	LOS D
Performance Measure	Delay
Percentile Queue	95 %
Hours per Year	480 h
Gap Acceptance	
HV Method for Gap-Acceptance	Include HV Effect for all percentages
Gap-Acceptance Capacity	Traditional M1
HCM Delay Formula	Yes
Downstream Short Lane Model	
Minimum Downstream Utilisation Ratio	20 %
Minimum Downstream Distance	100 ft
Distance for Full Lane Utilisation	660 ft
Calibration Parameter	1.2

Model Settings - Roundabouts	
Roundabout Model Options	
Capacity Model	US HCM 2010
LOS Method	Same as Sign Control
US HCM 2010 Roundabout Model	
Include Origin-Destination Pattern Effects	No
Factor for Parameter A	1.000
Factor for Parameter B	1.000
Other Roundabout Models	
FHWA 2000	No
Use Urban Compact Roundabout	–
HCM 2000	No
NAASRA 1986	No

Model Settings - Cost Parameters	
Vehicle Operating Cost	
Cost Unit	$
Pump Price of Fuel	3.000 $/gal
Fuel Resource Cost Factor	0.700
Ratio of Running Cost to Fuel Cost	3.00
Vehicle Mass	
Light Vehicle Mass	3100.0 lb
Heavy Vehicle Mass	24000.0 lb
Heavy Vehicle Maximum Power	130 kW
Time Cost	
Average Income	23.00 $/h
Time Value Factor	0.400

Demand & Sensitivity	
Analysis Method:	None

Site Properties	
Site (Intersection) Type	Roundabout

Model Name	US HCM (Customary)
Drive Rule	Right-hand side of the road
New Zealand Rule	No
HCM Version	Yes
Units	US Customary

INTERSECTION SUMMARY

WIS 441 SB Ramps with CTH CE (College Ave)
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	5206	veh/h	6248	pers/h
Percent Heavy Vehicles	1.3	%		
Degree of Saturation	1.650			
Practical Spare Capacity	-48.5	%		
Effective Intersection Capacity	3156	veh/h		
Control Delay (Total)	177.93	veh-h/h	213.52	pers-h/h
Control Delay (Average)	123.0	sec	123.0	sec
Control Delay (Worst Lane)	332.8	sec		
Control Delay (Worst Movement)	278.1	sec	278.1	sec
Geometric Delay (Average)	8.1	sec		
Stop-Line Delay (Average)	123.0	sec		
Intersection Level of Service (LOS)	LOS F			
95% Back of Queue - Vehicles (Worst Lane)	75.5	veh		
95% Back of Queue - Distance (Worst Lane)	1902.3	ft		
Total Effective Stops	11468	veh/h	13761	pers/h
Effective Stop Rate	2.20	per veh	2.20	per pers
Proportion Queued	0.66		0.66	
Performance Index	405.5		405.5	
Travel Distance (Total)	2041.2	veh-mi/h	2449.4	pers-mi/h
Travel Distance (Average)	2070	ft	2070	ft
Travel Time (Total)	240.6	veh-h/h	288.7	pers-h/h
Travel Time (Average)	166.4	sec	166.4	sec
Travel Speed	8.5	mph	8.5	mph
Cost (Total)	3766.83	$/h	3766.83	$/h
Fuel Consumption (Total)	172.5	gal/h		
Carbon Dioxide (Total)	1633.0	kg/h		
Hydrocarbons (Total)	3.163	kg/h		
Carbon Monoxide (Total)	101.90	kg/h		
NOx (Total)	3.031	kg/h		

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	2,499,032	veh/y	2,998,838	pers/y
Delay	85,406	veh-h/y	102,487	pers-h/y
Effective Stops	5,504,552	veh/y	6,605,463	pers/y
Travel Distance	979,770	veh-mi/y	1,175,724	pers-mi/y
Travel Time	115,481	veh-h/y	138,578	pers-h/y
Cost	1,808,079	$/y	1,808,079	$/y
Fuel Consumption	82,791	gal/y		
Carbon Dioxide	783,861	kg/y		
Hydrocarbons	1,518	kg/y		
Carbon Monoxide	48,913	kg/y		
NOx	1,455	kg/y		

MOVEMENT SUMMARY

Site: WIS 441 SB Ramps with CTH CE - PM 3LN

WIS 441 SB Ramps with CTH CE (College Ave)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
East: CTH CE (College Ave)											
1	L	595	2.0	0.541	9.8	LOS A	2.7	69.2	0.04	0.69	25.1
6	T	958	2.0	0.435	7.9	LOS A	1.8	45.8	0.03	0.43	29.0
Approach		1553	2.0	0.541	8.6	LOS A	2.7	69.2	0.04	0.53	27.3
North: WIS 441 SB Off Ramp											
7	L	1421	1.0	1.278	135.1	LOS F	42.1	1060.2	1.00	2.72	8.0
4	T	1	1.0	1.065	95.5	LOS F	17.0	427.3	1.00	2.04	10.0
14	R	547	1.0	0.462	12.3	LOS B	1.8	46.4	0.65	0.88	25.8
Approach		1969	1.0	1.278	100.9	LOS F	42.1	1060.2	0.90	2.21	9.8
West: CTH CE (College Ave)											
2	T	1537	1.0	1.650	278.1	LOS F	75.5	1902.3	1.00	4.03	4.3
12	R	147	1.0	0.179	6.2	LOS A	0.6	14.0	0.46	0.73	29.3
Approach		1684	1.0	1.650	254.3	LOS F	75.5	1902.3	0.95	3.74	4.7
All Vehicles		5206	1.3	1.650	123.0	LOS F	75.5	1902.3	0.66	2.20	8.5

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

LANE SUMMARY

WIS 441 SB Ramps with CTH CE (College Ave)
Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Lane Length ft	SL Type	Cap. Adj. %	Prob. Block. %
East: CTH CE (College Ave)																
Lane 1	595	0	0	595	2.0	1100	0.541	100	9.8	LOS A	2.7	69.2	1600	–	0.0	0.0
Lane 2	0	479	0	479	2.0	1100	0.435	81[5]	7.9	LOS A	1.8	45.8	1600	–	0.0	0.0
Lane 3	0	479	0	479	2.0	1100	0.435	81[5]	7.9	LOS A	1.8	45.8	1600	–	0.0	0.0
Approach	595	958	0	1553	2.0		0.541		8.6	LOS A	2.7	69.2				
North: WIS 441 SB Off Ramp																
Lane 1	517	0	0	517	1.0	405	1.278	100	171.6	LOS F	42.1	1060.2	1600	–	0.0	0.0
Lane 2	474	0	0	474	1.0	405	1.172	92[5]	131.2	LOS F	29.0	729.9	1600	–	0.0	0.0
Lane 3	430	1	0	431	1.0	405	1.065	83[5]	95.5	LOS F	17.0	427.3	1600	–	0.0	0.0
Lane 4	0	0	257	257	1.0	627	0.410	89[5]	11.7	LOS B	1.5	38.6	1600	–	0.0	0.0
Lane 5	0	0	290	290	1.0	627	0.462	100	12.9	LOS B	1.8	46.4	1600	–	0.0	0.0
Approach	1421	1	547	1969	1.0		1.278		100.9	LOS F	42.1	1060.2				
West: CTH CE (College Ave)																
Lane 1	0	559	0	559	1.0	339	1.650	100	332.8	LOS F	75.5	1902.3	1600	–	0.0	10.4
Lane 2	0	512	0	512	1.0	339	1.512	92[5]	274.1	LOS F	60.7	1528.6	1600	–	0.0	3.7
Lane 3	0	466	0	466	1.0	339	1.375	83[5]	216.9	LOS F	45.9	1157.4	1600	–	0.0	0.0
Lane 4	0	0	147	147	1.0	824	0.179	100	6.2	LOS A	0.6	14.0	1600	–	0.0	0.0
Approach	0	1537	147	1684	1.0		1.650		254.3	LOS F	75.5	1902.3				
Intersection				5206	1.3		1.650		123.0	LOS F	75.5	1902.3				

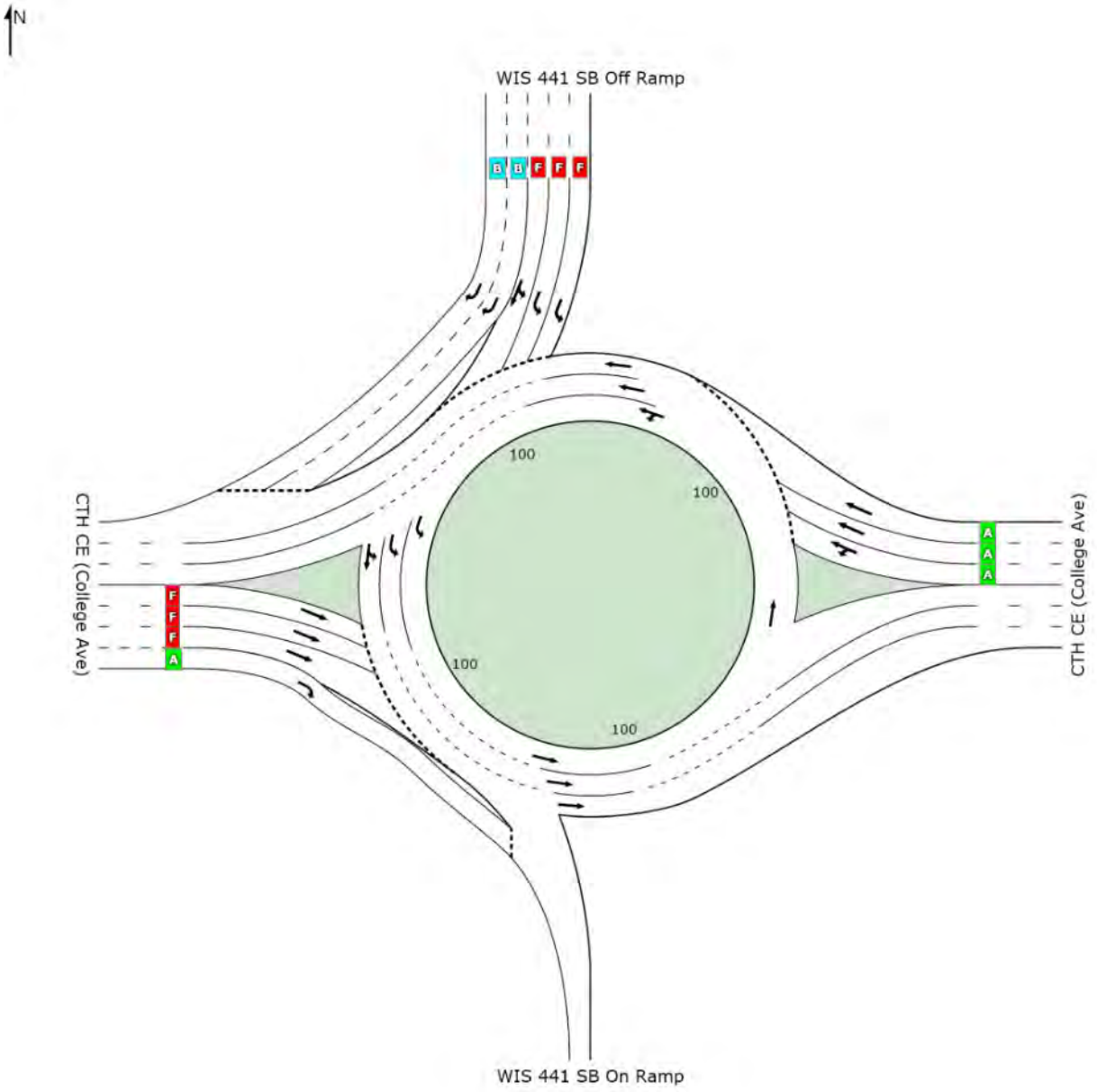
Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

5 Lane underutilisation determined by program

LEVEL OF SERVICE SUMMARY

Site: WIS 441 SB Ramps with CTH CE - PM 3LN

WIS 441 SB Ramps with CTH CE (College Ave)
Roundabout



	South	East	North	West	Intersection
LOS	NA	A	F	F	F

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Model used. Geometric Delay not included.

US 41 with County E

INPUT REPORT

US 41 NB Ramps with CTH E (Ballard Road)

Intersection Parameters	
Title	US 41 NB Ramps with CTH E (Ballard Road)
Intersection ID	1
Unit Time (for volumes)	60 minutes
Peak Flow Period (for performance)	15 minutes

Geometry - Approach Data

Location	Name	Type	No. of App. Lanes	No. of Exit Lanes	Median Width ft	Extra Bunching %
South	CTH E (Ballard Road)	Two-way	4	3	–	0.0
East	US 41 NB Off Ramp	One-way Exit	0	1	–	0.0
North	CTH E (Ballard Road)	Two-way	3	3	–	0.0
West	US 41 NB Off Ramp	One-way Approach	5	0	–	0.0

Geometry - Roundabout Data

Location	Name	Island Diameter ft	Circ. Width ft	Circ. Lanes	Entry Radius ft	Entry Angle degrees	Env. Factor	Entry/Circ. Flow Adjust.
South	CTH E (Ballard Road)	100.00	30.00	3	65.0	30.0	1.2000	None
East	US 41 NB Off Ramp	100.00	30.00	3	65.0	30.0	1.2000	None
North	CTH E (Ballard Road)	100.00	30.00	1	65.0	30.0	1.2000	None
West	US 41 NB Off Ramp	100.00	30.00	3	65.0	30.0	1.2000	None

Geometry - Approach Lane Data

Lane Number	Lane Type	Lane Discip.	Basic Satn Flow tcu/h	Utilisation Ratio %	Saturation Speed mph	Capacity Adjustment %
South	CTH E (Ballard Road)					
App. Lane 1	Normal	T	1900	36.0	–	0.0
App. Lane 2	Normal	T	1900	33.0	–	0.0
App. Lane 3	Normal	T	1900	30.0	–	0.0
App. Lane 4	Slip (Giveway/Yield)	R	1900	–	–	0.0
North	CTH E (Ballard Road)					
App. Lane 1	Normal	LT	1900	47.0	–	0.0
App. Lane 2	Normal	T	1900	47.0	–	0.0
App. Lane 3	Normal	T	1900	53.0	–	0.0
West	US 41 NB Off Ramp					
App. Lane 1	Normal	L	1900	36.0	–	0.0
App. Lane 2	Normal	L	1900	33.0	–	0.0
App. Lane 3	Normal	LT	1900	30.0	–	0.0
App. Lane 4	Slip (Giveway/Yield)	R	1900	47.0	–	0.0
App. Lane 5	Slip (Giveway/Yield)	R	1900	53.0	–	0.0

Geometry - Approach & Exit Lane Data

Lane Number	Lane Width ft	Lane Length ft	Grade %	SL Type
South	CTH E (Ballard Road)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–
East	US 41 NB Off Ramp			
Exit Lane 1	13.00	1600.0	0.00	–
North	CTH E (Ballard Road)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–
West	US 41 NB Off Ramp			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
App. Lane 5	13.00	1600.0	0.00	–

Lanes are numbered from left to right in the direction of travel.

Geometry - Movement Definitions

To Approach	Movement Banned	Turn Desig.
From: South	CTH E (Ballard Road)	
South	No	T
North	No	T
East	No	R
From: North	CTH E (Ballard Road)	
North	No	T
East	No	L
South	No	T
From: West	US 41 NB Off Ramp	
North	No	L
East	No	T
South	No	R

HCM 2010 Roundabout Model Calibration

Location	Name	HCM 2010 Single Lane		HCM 2010 Multi-Lane Dominant Lane		HCM 2010 Multi-Lane Subdominant Lane	
		Para. A	Para. B	Para. A	Para. B	Para. A	Para. B
South	CTH E (Ballard Road)	1130.0	0.001000	1285.7	0.000722	1285.7	0.000722
East	US 41 NB Off Ramp	1130.0	0.001000	1285.7	0.000722	1285.7	0.000722
North	CTH E (Ballard Road)	1130.0	0.001000	1285.7	0.000722	1285.7	0.000722
West	US 41 NB Off Ramp	1130.0	0.001000	1285.7	0.000722	1285.7	0.000722

Volumes

To Approach	Total veh	HV %	Peak Flow Factor %	Vehicle Occupancy pers/veh	Flow Scale %	Growth Rate %/year
From: South	CTH E (Ballard Road)					
South	5.0	1.00	88.0	1.20	100.00	2.00
North	975.0	1.00	88.0	1.20	100.00	2.00
East	610.0	1.00	88.0	1.20	100.00	2.00
From: North	CTH E (Ballard Road)					
North	5.0	1.00	88.0	1.20	100.00	2.00
East	355.0	1.00	88.0	1.20	100.00	2.00
South	1395.0	1.00	88.0	1.20	100.00	2.00
From: West	US 41 NB Off Ramp					
North	615.0	2.00	88.0	1.20	100.00	2.00
East	1.0	2.00	88.0	1.20	100.00	2.00
South	475.0	2.00	88.0	1.20	100.00	2.00

Path Data

To Approach	App. Cruise Speed mph	Exit Cruise Speed mph	App. Trav. Distance ft	Negn Speed mph	Negn Distance ft	Downst. Distance ft	Negn Radius ft
From: South	CTH E (Ballard Road)						
South	40.0	40.0	1600.0	–	–	–	–
North	40.0	40.0	1600.0	–	–	–	–
East	40.0	40.0	1600.0	–	–	–	–
From: North	CTH E (Ballard Road)						
North	40.0	40.0	1600.0	–	–	–	–
East	40.0	40.0	1600.0	–	–	–	–
South	40.0	40.0	1600.0	–	–	–	–
From: West	US 41 NB Off Ramp						
North	40.0	40.0	1600.0	–	–	–	–
East	40.0	40.0	1600.0	–	–	–	–
South	40.0	40.0	1600.0	–	–	–	–

Movement Data - General

Turn	Mov. ID	Queue Space LV ft	Queue Space HV ft	Vehicle Length LV ft	Vehicle Length HV ft	HVE	P.Deg. Satn	Movement Type	Movement Control
South	CTH E (Ballard Road)								
T	8	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	18	25.00	45.00	17.00	36.00	2.00	–	*Slip*	*Yield*
North	CTH E (Ballard Road)								
L	7	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	4	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
West	US 41 NB Off Ramp								
L	5	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	2	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	12	25.00	45.00	17.00	36.00	2.00	–	*Slip*	*Yield*

Movement Type and Control parameters are set automaticly from Approach Control and Lane Type data in the Geometry dialog.

Gap Acceptance

Movement	Critical Gap sec	Follow-up Headway sec	Min. Departures veh/min	Exiting Flow Effect %
South	CTH E (Ballard Road)			
T	4.000	2.800	2.50	0
R	–	–	2.50	0
North	CTH E (Ballard Road)			
L	4.200	3.200	2.50	0
T	4.200	3.200	2.50	0
West	US 41 NB Off Ramp			
L	4.000	2.800	2.50	0
T	4.000	2.800	2.50	0
R	–	–	2.50	0

Model Settings - Options	
General Options	
Level of Service Method	Delay & v/c (HCM 2010)
Level of Service Target	LOS D
Performance Measure	Delay
Percentile Queue	95 %
Hours per Year	480 h
Gap Acceptance	
HV Method for Gap-Acceptance	Include HV Effect for all percentages
Gap-Acceptance Capacity	Traditional M1
HCM Delay Formula	Yes
Downstream Short Lane Model	
Minimum Downstream Utilisation Ratio	20 %
Minimum Downstream Distance	100 ft
Distance for Full Lane Utilisation	660 ft
Calibration Parameter	1.2

Model Settings - Roundabouts	
Roundabout Model Options	
Capacity Model	US HCM 2010
LOS Method	Same as Sign Control
US HCM 2010 Roundabout Model	
Include Origin-Destination Pattern Effects	No
Factor for Parameter A	1.000
Factor for Parameter B	1.000
Other Roundabout Models	
FHWA 2000	No
Use Urban Compact Roundabout	–
HCM 2000	No
NAASRA 1986	No

Model Settings - Cost Parameters	
Vehicle Operating Cost	
Cost Unit	$
Pump Price of Fuel	3.000 $/gal
Fuel Resource Cost Factor	0.700
Ratio of Running Cost to Fuel Cost	3.00
Vehicle Mass	
Light Vehicle Mass	3100.0 lb
Heavy Vehicle Mass	24000.0 lb
Heavy Vehicle Maximum Power	130 kW
Time Cost	
Average Income	23.00 $/h
Time Value Factor	0.400

Demand & Sensitivity	
Analysis Method:	None

Site Properties	
Site (Intersection) Type	Roundabout

Model Name	US HCM (Customary)
Drive Rule	Right-hand side of the road
New Zealand Rule	No
HCM Version	Yes
Units	US Customary

INTERSECTION SUMMARY

US 41 NB Ramps with CTH E (Ballard Road)
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	5041	veh/h	6049	pers/h
Percent Heavy Vehicles	1.2	%		
Degree of Saturation	0.869			
Practical Spare Capacity	-2.1	%		
Effective Intersection Capacity	5804	veh/h		
Control Delay (Total)	30.87	veh-h/h	37.04	pers-h/h
Control Delay (Average)	22.0	sec	22.0	sec
Control Delay (Worst Lane)	62.4	sec		
Control Delay (Worst Movement)	52.6	sec	52.6	sec
Geometric Delay (Average)	7.0	sec		
Stop-Line Delay (Average)	22.0	sec		
Intersection Level of Service (LOS)	LOS C			
95% Back of Queue - Vehicles (Worst Lane)	5.8	veh		
95% Back of Queue - Distance (Worst Lane)	145.5	ft		
Total Effective Stops	4154	veh/h	4985	pers/h
Effective Stop Rate	0.82	per veh	0.82	per pers
Proportion Queued	0.52		0.52	
Performance Index	120.1		120.1	
Travel Distance (Total)	1950.6	veh-mi/h	2340.7	pers-mi/h
Travel Distance (Average)	2043	ft	2043	ft
Travel Time (Total)	89.4	veh-h/h	107.3	pers-h/h
Travel Time (Average)	63.8	sec	63.8	sec
Travel Speed	21.8	mph	21.8	mph
Cost (Total)	1657.27	$/h	1657.27	$/h
Fuel Consumption (Total)	105.8	gal/h		
Carbon Dioxide (Total)	1002.1	kg/h		
Hydrocarbons (Total)	1.721	kg/h		
Carbon Monoxide (Total)	74.83	kg/h		
NOx (Total)	2.327	kg/h		

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	2,419,637	veh/y	2,903,564	pers/y
Delay	14,817	veh-h/y	17,780	pers-h/y
Effective Stops	1,994,130	veh/y	2,392,956	pers/y
Travel Distance	936,296	veh-mi/y	1,123,556	pers-mi/y
Travel Time	42,915	veh-h/y	51,498	pers-h/y
Cost	795,487	$/y	795,487	$/y
Fuel Consumption	50,800	gal/y		
Carbon Dioxide	480,993	kg/y		
Hydrocarbons	826	kg/y		
Carbon Monoxide	35,917	kg/y		
NOx	1,117	kg/y		

MOVEMENT SUMMARY

Site: US 41 NB Ramps with CTH E - AM 3LN

US 41 NB Ramps with CTH E (Ballard Road)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: CTH E (Ballard Road)											
8	T	1114	1.0	0.718	21.6	LOS C	3.9	97.2	0.79	0.99	22.5
18	R	693	1.0	0.731	17.0	LOS C	5.8	145.5	0.73	0.94	23.8
Approach		1807	1.0	0.731	19.8	LOS C	5.8	145.5	0.76	0.97	23.0
North: CTH E (Ballard Road)											
7	L	403	1.0	0.575	10.4	LOS B	3.2	80.3	0.06	0.77	24.8
4	T	1591	1.0	0.648	11.2	LOS B	4.3	108.7	0.07	0.41	27.1
Approach		1994	1.0	0.648	11.1	LOS B	4.3	108.7	0.07	0.49	26.6
West: US 41 NB Off Ramp											
5	L	699	2.0	0.869	52.6	LOS F	4.5	115.5	0.94	1.21	14.5
2	T	1	2.0	0.724	42.4	LOS E	2.9	73.8	0.92	1.11	16.3
12	R	540	2.0	0.724	30.4	LOS D	3.3	83.1	0.87	1.08	19.2
Approach		1240	2.0	0.869	42.9	LOS E	4.5	115.5	0.91	1.15	16.2
All Vehicles		5041	1.2	0.869	22.0	LOS C	5.8	145.5	0.52	0.82	21.8

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

LANE SUMMARY

Site: US 41 NB Ramps with CTH E - AM 3LN

US 41 NB Ramps with CTH E (Ballard Road)
Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Lane Length ft	SL Type	Cap. Adj. %	Prob. Block. %
South: CTH E (Ballard Road)																
Lane 1	0	405	0	405	1.0	564	0.718	100	24.6	LOS C	3.9	97.2	1600	–	0.0	0.0
Lane 2	0	371	0	371	1.0	564	0.658	92[5]	21.1	LOS C	3.2	81.1	1600	–	0.0	0.0
Lane 3	0	337	0	337	1.0	564	0.598	83[5]	18.4	LOS C	2.7	68.0	1600	–	0.0	0.0
Lane 4	0	0	693	693	1.0	948	0.731	100	17.0	LOS C	5.8	145.5	1600	–	0.0	0.0
Approach	0	1114	693	1807	1.0		0.731		19.8	LOS C	5.8	145.5				
North: CTH E (Ballard Road)																
Lane 1	403	234	0	638	1.0	1109	0.575	89[5]	10.4	LOS B	3.2	80.3	1600	–	0.0	0.0
Lane 2	0	638	0	638	1.0	1109	0.575	89[5]	10.4	LOS B	3.2	80.3	1600	–	0.0	0.0
Lane 3	0	719	0	719	1.0	1109	0.648	100	12.3	LOS B	4.3	108.7	1600	–	0.0	0.0
Approach	403	1591	0	1994	1.0		0.648		11.1	LOS B	4.3	108.7				
West: US 41 NB Off Ramp																
Lane 1	255	0	0	255	2.0	293	0.869	100	62.4	LOS F	4.5	115.5	1600	–	0.0	0.0
Lane 2	233	0	0	233	2.0	293	0.796	92[5]	51.1	LOS F	3.6	90.4	1600	–	0.0	0.0
Lane 3	211	1	0	212	2.0	293	0.724	83[5]	42.4	LOS E	2.9	73.8	1600	–	0.0	0.0
Lane 4	0	0	254	254	2.0	395	0.642	89[5]	27.3	LOS D	2.6	66.4	1600	–	0.0	0.0
Lane 5	0	0	286	286	2.0	395	0.724	100	33.3	LOS D	3.3	83.1	1600	–	0.0	0.0
Approach	699	1	540	1240	2.0		0.869		42.9	LOS E	4.5	115.5				
Intersection				5041	1.2		0.869		22.0	LOS C	5.8	145.5				

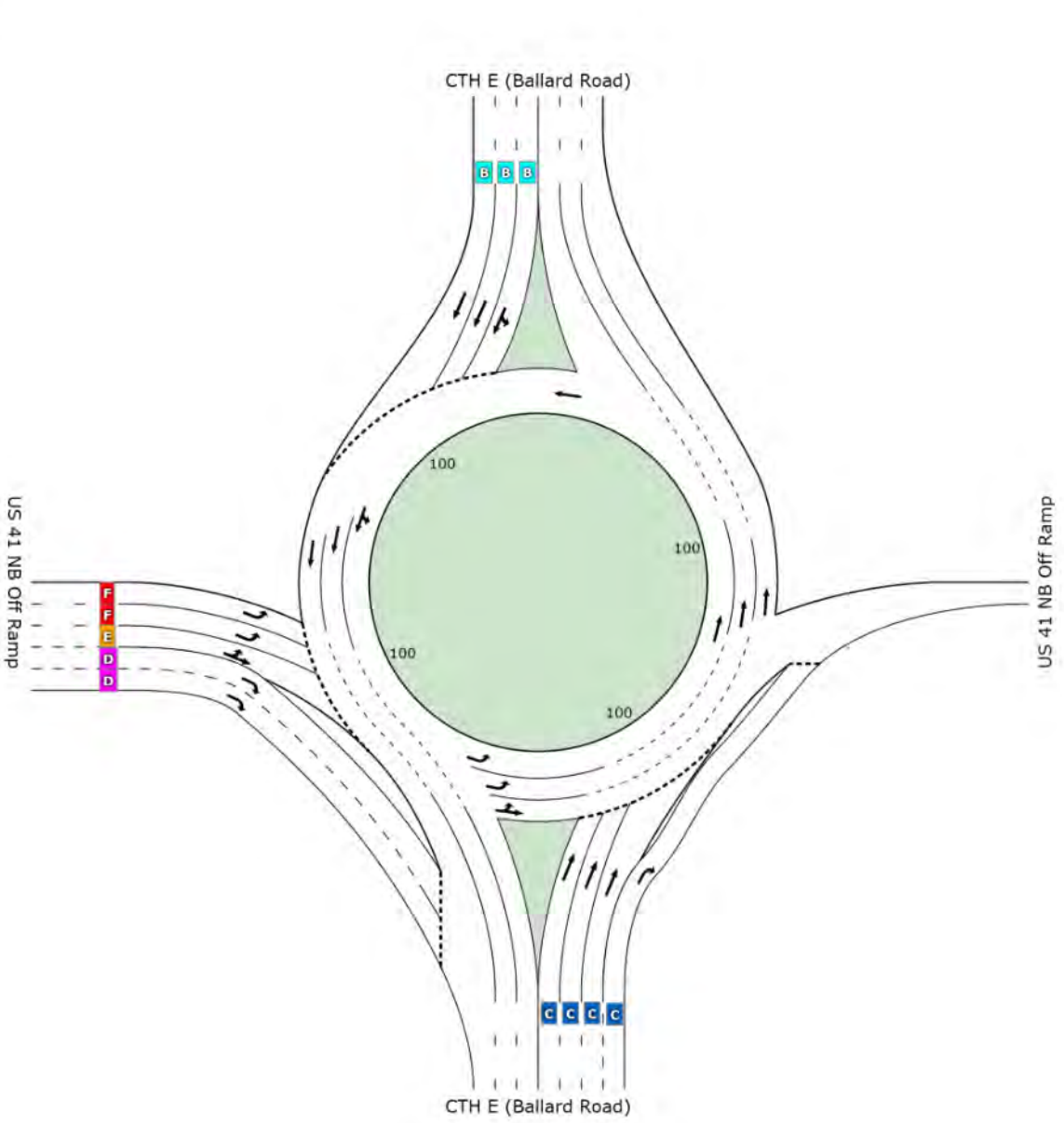
Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

5 Lane underutilisation determined by program

LEVEL OF SERVICE SUMMARY

Site: US 41 NB Ramps with CTH E - AM 3LN

US 41 NB Ramps with CTH E (Ballard Road)
Roundabout



	South	East	North	West	Intersection
LOS	C	NA	B	E	C

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Model used. Geometric Delay not included.

INPUT REPORT

US 41 NB Ramps with CTH E (Ballard Road)

Intersection Parameters	
Title	US 41 NB Ramps with CTH E (Ballard Road)
Intersection ID	1
Unit Time (for volumes)	60 minutes
Peak Flow Period (for performance)	15 minutes

Geometry - Approach Data

Location	Name	Type	No. of App. Lanes	No. of Exit Lanes	Median Width ft	Extra Bunching %
South	CTH E (Ballard Road)	Two-way	4	3	–	0.0
East	US 41 NB Off Ramp	One-way Exit	0	1	–	0.0
North	CTH E (Ballard Road)	Two-way	3	3	–	0.0
West	US 41 NB Off Ramp	One-way Approach	5	0	–	0.0

Geometry - Roundabout Data

Location	Name	Island Diameter ft	Circ. Width ft	Circ. Lanes	Entry Radius ft	Entry Angle degrees	Env. Factor	Entry/Circ. Flow Adjust.
South	CTH E (Ballard Road)	100.00	30.00	3	65.0	30.0	1.2000	None
East	US 41 NB Off Ramp	100.00	30.00	3	65.0	30.0	1.2000	None
North	CTH E (Ballard Road)	100.00	30.00	1	65.0	30.0	1.2000	None
West	US 41 NB Off Ramp	100.00	30.00	3	65.0	30.0	1.2000	None

Geometry - Approach Lane Data

Lane Number	Lane Type	Lane Discip.	Basic Satn Flow tcu/h	Utilisation Ratio %	Saturation Speed mph	Capacity Adjustment %
South	CTH E (Ballard Road)					
App. Lane 1	Normal	T	1900	36.0	–	0.0
App. Lane 2	Normal	T	1900	33.0	–	0.0
App. Lane 3	Normal	T	1900	30.0	–	0.0
App. Lane 4	Slip (Giveway/Yield)	R	1900	–	–	0.0
North	CTH E (Ballard Road)					
App. Lane 1	Normal	LT	1900	47.0	–	0.0
App. Lane 2	Normal	T	1900	47.0	–	0.0
App. Lane 3	Normal	T	1900	53.0	–	0.0
West	US 41 NB Off Ramp					
App. Lane 1	Normal	L	1900	36.0	–	0.0
App. Lane 2	Normal	L	1900	33.0	–	0.0
App. Lane 3	Normal	LT	1900	30.0	–	0.0
App. Lane 4	Slip (Giveway/Yield)	R	1900	47.0	–	0.0
App. Lane 5	Slip (Giveway/Yield)	R	1900	53.0	–	0.0

Geometry - Approach & Exit Lane Data

Lane Number	Lane Width ft	Lane Length ft	Grade %	SL Type
South	CTH E (Ballard Road)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–
East	US 41 NB Off Ramp			
Exit Lane 1	13.00	1600.0	0.00	–
North	CTH E (Ballard Road)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–
West	US 41 NB Off Ramp			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
App. Lane 5	13.00	1600.0	0.00	–

Lanes are numbered from left to right in the direction of travel.

Geometry - Movement Definitions

To Approach	Movement Banned	Turn Desig.
From: South	CTH E (Ballard Road)	
South	No	T
North	No	T
East	No	R
From: North	CTH E (Ballard Road)	
North	No	T
East	No	L
South	No	T
From: West	US 41 NB Off Ramp	
North	No	L
East	No	T
South	No	R

HCM 2010 Roundabout Model Calibration

Location	Name	HCM 2010 Single Lane		HCM 2010 Multi-Lane Dominant Lane		HCM 2010 Multi-Lane Subdominant Lane	
		Para. A	Para. B	Para. A	Para. B	Para. A	Para. B
South	CTH E (Ballard Road)	1130.0	0.001000	1285.7	0.000722	1285.7	0.000722
East	US 41 NB Off Ramp	1130.0	0.001000	1285.7	0.000722	1285.7	0.000722
North	CTH E (Ballard Road)	1130.0	0.001000	1285.7	0.000722	1285.7	0.000722
West	US 41 NB Off Ramp	1130.0	0.001000	1285.7	0.000722	1285.7	0.000722

Volumes

To Approach	Total veh	HV %	Peak Flow Factor %	Vehicle Occupancy pers/veh	Flow Scale %	Growth Rate %/year
From: South	CTH E (Ballard Road)					
South	5.0	1.00	94.0	1.20	100.00	2.00
North	1620.0	1.00	94.0	1.20	100.00	2.00
East	535.0	1.00	94.0	1.20	100.00	2.00
From: North	CTH E (Ballard Road)					
North	5.0	1.00	94.0	1.20	100.00	2.00
East	615.0	1.00	94.0	1.20	100.00	2.00
South	1220.0	1.00	94.0	1.20	100.00	2.00
From: West	US 41 NB Off Ramp					
North	805.0	1.00	94.0	1.20	100.00	2.00
East	1.0	1.00	94.0	1.20	100.00	2.00
South	345.0	1.00	94.0	1.20	100.00	2.00

Path Data

To Approach	App. Cruise Speed mph	Exit Cruise Speed mph	App. Trav. Distance ft	Negn Speed mph	Negn Distance ft	Downst. Distance ft	Negn Radius ft
From: South	CTH E (Ballard Road)						
South	40.0	40.0	1600.0	–	–	–	–
North	40.0	40.0	1600.0	–	–	–	–
East	40.0	40.0	1600.0	–	–	–	–
From: North	CTH E (Ballard Road)						
North	40.0	40.0	1600.0	–	–	–	–
East	40.0	40.0	1600.0	–	–	–	–
South	40.0	40.0	1600.0	–	–	–	–
From: West	US 41 NB Off Ramp						
North	40.0	40.0	1600.0	–	–	–	–
East	40.0	40.0	1600.0	–	–	–	–
South	40.0	40.0	1600.0	–	–	–	–

Movement Data - General

Turn	Mov. ID	Queue Space LV ft	Queue Space HV ft	Vehicle Length LV ft	Vehicle Length HV ft	HVE	P.Deg. Satn	Movement Type	Movement Control
South	CTH E (Ballard Road)								
T	8	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	18	25.00	45.00	17.00	36.00	2.00	–	*Slip*	*Yield*
North	CTH E (Ballard Road)								
L	7	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	4	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
West	US 41 NB Off Ramp								
L	5	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	2	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	12	25.00	45.00	17.00	36.00	2.00	–	*Slip*	*Yield*

Movement Type and Control parameters are set automaticly from Approach Control and Lane Type data in the Geometry dialog.

Gap Acceptance

Movement	Critical Gap sec	Follow-up Headway sec	Min. Departures veh/min	Exiting Flow Effect %
South	CTH E (Ballard Road)			
T	4.000	2.800	2.50	0
R	–	–	2.50	0
North	CTH E (Ballard Road)			
L	4.200	3.200	2.50	0
T	4.200	3.200	2.50	0
West	US 41 NB Off Ramp			
L	4.000	2.800	2.50	0
T	4.000	2.800	2.50	0
R	–	–	2.50	0

Model Settings - Options	
General Options	
Level of Service Method	Delay & v/c (HCM 2010)
Level of Service Target	LOS D
Performance Measure	Delay
Percentile Queue	95 %
Hours per Year	480 h
Gap Acceptance	
HV Method for Gap-Acceptance	Include HV Effect for all percentages
Gap-Acceptance Capacity	Traditional M1
HCM Delay Formula	Yes
Downstream Short Lane Model	
Minimum Downstream Utilisation Ratio	20 %
Minimum Downstream Distance	100 ft
Distance for Full Lane Utilisation	660 ft
Calibration Parameter	1.2

Model Settings - Roundabouts	
Roundabout Model Options	
Capacity Model	US HCM 2010
LOS Method	Same as Sign Control
US HCM 2010 Roundabout Model	
Include Origin-Destination Pattern Effects	No
Factor for Parameter A	1.000
Factor for Parameter B	1.000
Other Roundabout Models	
FHWA 2000	No
Use Urban Compact Roundabout	–
HCM 2000	No
NAASRA 1986	No

Model Settings - Cost Parameters	
Vehicle Operating Cost	
Cost Unit	$
Pump Price of Fuel	3.000 $/gal
Fuel Resource Cost Factor	0.700
Ratio of Running Cost to Fuel Cost	3.00
Vehicle Mass	
Light Vehicle Mass	3100.0 lb
Heavy Vehicle Mass	24000.0 lb
Heavy Vehicle Maximum Power	130 kW
Time Cost	
Average Income	23.00 $/h
Time Value Factor	0.400

Demand & Sensitivity	
Analysis Method:	None

Site Properties	
Site (Intersection) Type	Roundabout

Model Name	US HCM (Customary)
Drive Rule	Right-hand side of the road
New Zealand Rule	No
HCM Version	Yes
Units	US Customary

INTERSECTION SUMMARY

US 41 NB Ramps with CTH E (Ballard Road)
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	5480	veh/h	6576	pers/h
Percent Heavy Vehicles	1.0	%		
Degree of Saturation	1.485			
Practical Spare Capacity	-42.8	%		
Effective Intersection Capacity	3689	veh/h		
Control Delay (Total)	128.33	veh-h/h	153.99	pers-h/h
Control Delay (Average)	84.3	sec	84.3	sec
Control Delay (Worst Lane)	255.4	sec		
Control Delay (Worst Movement)	207.5	sec	207.5	sec
Geometric Delay (Average)	7.3	sec		
Stop-Line Delay (Average)	84.3	sec		
Intersection Level of Service (LOS)	LOS F			
95% Back of Queue - Vehicles (Worst Lane)	71.4	veh		
95% Back of Queue - Distance (Worst Lane)	1798.7	ft		
Total Effective Stops	9802	veh/h	11763	pers/h
Effective Stop Rate	1.79	per veh	1.79	per pers
Proportion Queued	0.61		0.61	
Performance Index	318.0		318.0	
Travel Distance (Total)	2130.5	veh-mi/h	2556.6	pers-mi/h
Travel Distance (Average)	2053	ft	2053	ft
Travel Time (Total)	192.7	veh-h/h	231.2	pers-h/h
Travel Time (Average)	126.6	sec	126.6	sec
Travel Speed	11.1	mph	11.1	mph
Cost (Total)	3127.78	$/h	3127.78	$/h
Fuel Consumption (Total)	155.7	gal/h		
Carbon Dioxide (Total)	1474.5	kg/h		
Hydrocarbons (Total)	2.775	kg/h		
Carbon Monoxide (Total)	98.16	kg/h		
NOx (Total)	2.944	kg/h		

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	2,630,298	veh/y	3,156,358	pers/y
Delay	61,596	veh-h/y	73,916	pers-h/y
Effective Stops	4,705,049	veh/y	5,646,059	pers/y
Travel Distance	1,022,639	veh-mi/y	1,227,167	pers-mi/y
Travel Time	92,486	veh-h/y	110,983	pers-h/y
Cost	1,501,337	$/y	1,501,337	$/y
Fuel Consumption	74,758	gal/y		
Carbon Dioxide	707,752	kg/y		
Hydrocarbons	1,332	kg/y		
Carbon Monoxide	47,118	kg/y		
NOx	1,413	kg/y		

MOVEMENT SUMMARY

Site: US 41 NB Ramps with CTH E - PM 3LN

US 41 NB Ramps with CTH E (Ballard Road)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: CTH E (Ballard Road)											
8	T	1729	1.0	1.485	207.5	LOS F	71.4	1798.7	1.00	3.83	5.6
18	R	569	1.0	0.721	19.0	LOS C	4.8	121.4	0.76	0.99	23.0
Approach		2298	1.0	1.485	160.8	LOS F	71.4	1798.7	0.94	3.13	6.8
North: CTH E (Ballard Road)											
7	L	654	1.0	0.589	10.7	LOS B	3.4	85.1	0.05	0.68	24.7
4	T	1303	1.0	0.622	10.8	LOS B	3.9	97.4	0.05	0.42	27.3
Approach		1957	1.0	0.622	10.7	LOS B	3.9	97.4	0.05	0.51	26.3
West: US 41 NB Off Ramp											
5	L	856	1.0	1.024	77.6	LOS F	10.6	267.6	0.98	1.49	11.7
2	T	1	1.0	0.854	58.2	LOS F	4.4	111.2	0.95	1.25	13.8
12	R	367	1.0	0.395	13.5	LOS B	1.4	34.4	0.72	0.90	25.2
Approach		1224	1.0	1.024	58.4	LOS F	10.6	267.6	0.90	1.32	13.7
All Vehicles		5480	1.0	1.485	84.3	LOS F	71.4	1798.7	0.61	1.79	11.1

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

LANE SUMMARY

US 41 NB Ramps with CTH E (Ballard Road)
Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Lane Length ft	SL Type	Cap. Adj. %	Prob. Block. %
South: CTH E (Ballard Road)																
Lane 1	0	629	0	629	1.0	423	1.485	100	255.4	LOS F	71.4	1798.7	1600	–	0.0	8.6
Lane 2	0	576	0	576	1.0	423	1.362	92[5]	203.6	LOS F	54.9	1382.7	1600	–	0.0	0.8
Lane 3	0	524	0	524	1.0	423	1.238	83[5]	154.2	LOS F	38.6	972.9	1600	–	0.0	0.0
Lane 4	0	0	569	569	1.0	789	0.721	100	19.0	LOS C	4.8	121.4	1600	–	0.0	0.0
Approach	0	1729	569	2298	1.0		1.485		160.8	LOS F	71.4	1798.7				
North: CTH E (Ballard Road)																
Lane 1	654	0	0	654	1.0	1111	0.589	95[5]	10.7	LOS B	3.4	85.1	1600	–	0.0	0.0
Lane 2	0	613	0	613	1.0	1111	0.551	89[5]	9.9	LOS A	2.9	73.2	1600	–	0.0	0.0
Lane 3	0	691	0	691	1.0	1111	0.622	100	11.5	LOS B	3.9	97.4	1600	–	0.0	0.0
Approach	654	1303	0	1957	1.0		0.622		10.7	LOS B	3.9	97.4				
West: US 41 NB Off Ramp																
Lane 1	312	0	0	312	1.0	304	1.024	100	96.3	LOS F	10.6	267.6	1600	–	0.0	0.0
Lane 2	286	0	0	286	1.0	304	0.939	92[5]	74.8	LOS F	6.4	161.8	1600	–	0.0	0.0
Lane 3	259	1	0	260	1.0	304	0.854	83[5]	58.2	LOS F	4.4	111.2	1600	–	0.0	0.0
Lane 4	0	0	173	173	1.0	493	0.350	89[5]	12.9	LOS B	1.2	29.2	1600	–	0.0	0.0
Lane 5	0	0	195	195	1.0	493	0.395	100	14.0	LOS B	1.4	34.4	1600	–	0.0	0.0
Approach	856	1	367	1224	1.0		1.024		58.4	LOS F	10.6	267.6				
Intersection				5480	1.0		1.485		84.3	LOS F	71.4	1798.7				

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

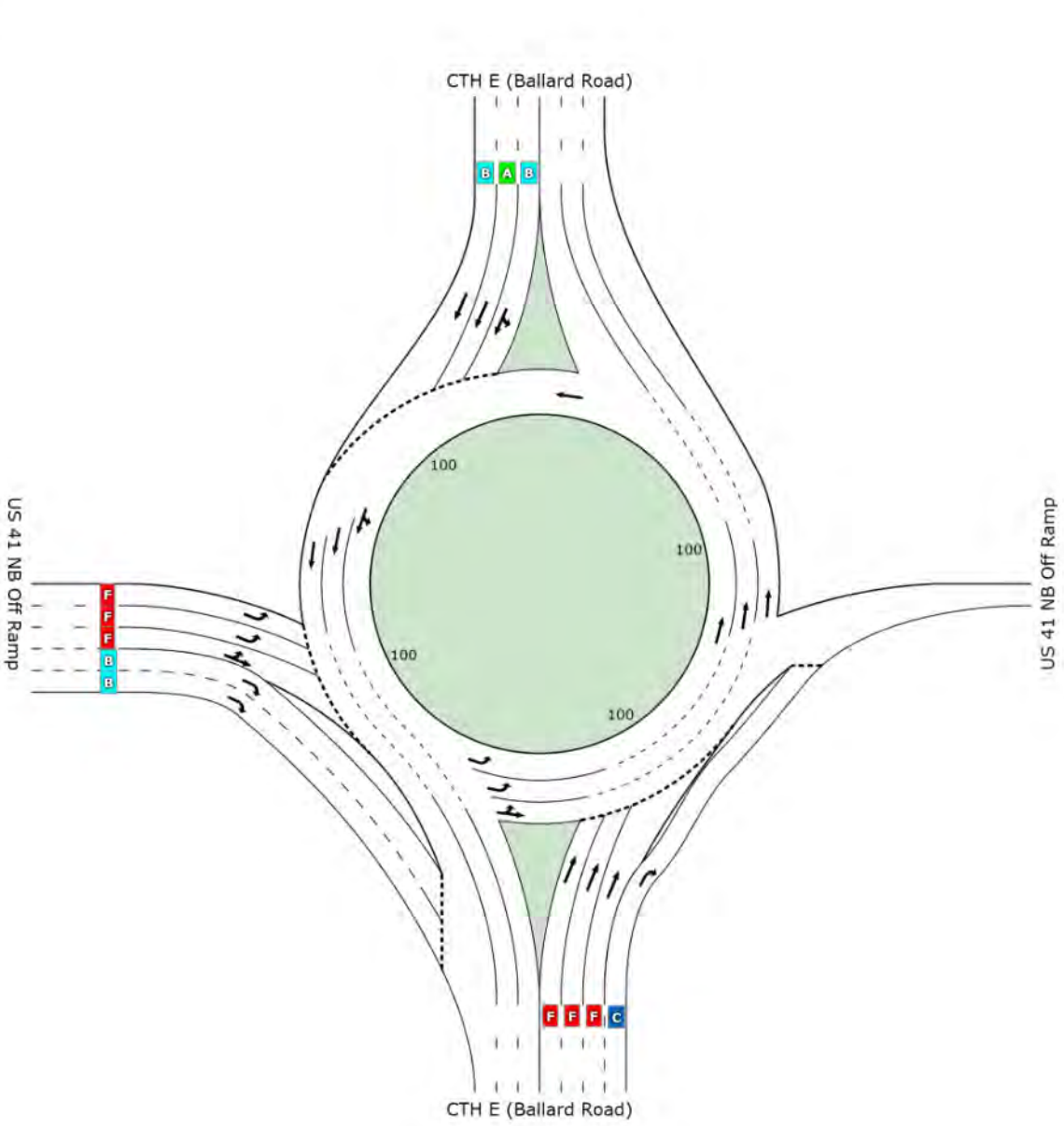
5 Lane underutilisation determined by program

SIDRA INTERSECTION

LEVEL OF SERVICE SUMMARY

Site: US 41 NB Ramps with CTH E - PM 3LN

US 41 NB Ramps with CTH E (Ballard Road)
Roundabout



	South	East	North	West	Intersection
LOS	F	NA	B	F	F

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Model used. Geometric Delay not included.

INPUT REPORT

US 41 SB Ramps with CTH E (Ballard Road)

Intersection Parameters	
Title	US 41 SB Ramps with CTH E (Ballard Road)
Intersection ID	1
Unit Time (for volumes)	60 minutes
Peak Flow Period (for performance)	15 minutes

Geometry - Approach Data

Location	Name	Type	No. of App. Lanes	No. of Exit Lanes	Median Width ft	Extra Bunching %
South	CTH E (Ballard Road)	Two-way	3	3	–	0.0
East	US 41 SB Off Ramp	One-way Approach	4	0	–	0.0
North	CTH E (Ballard Road)	Two-way	4	4	–	0.0
West	US 41 SB Off Ramp	One-way Exit	0	1	–	0.0

Geometry - Roundabout Data

Location	Name	Island Diameter ft	Circ. Width ft	Circ. Lanes	Entry Radius ft	Entry Angle degrees	Env. Factor	Entry/Circ. Flow Adjust.
South	CTH E (Ballard Road)	100.00	30.00	1	65.0	30.0	1.2000	None
East	US 41 SB Off Ramp	100.00	30.00	3	65.0	30.0	1.2000	None
North	CTH E (Ballard Road)	100.00	30.00	3	65.0	30.0	1.2000	None
West	US 41 SB Off Ramp	100.00	30.00	3	65.0	30.0	1.2000	None

Geometry - Approach Lane Data

Lane Number	Lane Type	Lane Discip.	Basic Satn Flow tcu/h	Utilisation Ratio %	Saturation Speed mph	Capacity Adjustment %
South	CTH E (Ballard Road)					
App. Lane 1	Normal	LT	1900	36.0	–	0.0
App. Lane 2	Normal	T	1900	33.0	–	0.0
App. Lane 3	Normal	T	1900	30.0	–	0.0
East	US 41 SB Off Ramp					
App. Lane 1	Normal	L	1900	36.0	–	0.0
App. Lane 2	Normal	L	1900	33.0	–	0.0
App. Lane 3	Normal	LT	1900	30.0	–	0.0
App. Lane 4	Continuous	R	1900	–	–	0.0
North	CTH E (Ballard Road)					
App. Lane 1	Normal	T	1900	36.0	–	0.0
App. Lane 2	Normal	T	1900	33.0	–	0.0
App. Lane 3	Normal	T	1900	30.0	–	0.0
App. Lane 4	Slip (Giveway/Yield)	R	1900	–	–	0.0

Geometry - Approach & Exit Lane Data

Lane Number	Lane Width ft	Lane Length ft	Grade %	SL Type
South	CTH E (Ballard Road)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–
East	US 41 SB Off Ramp			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
North	CTH E (Ballard Road)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–
Exit Lane 4	13.00	1600.0	0.00	–
West	US 41 SB Off Ramp			
Exit Lane 1	13.00	1600.0	0.00	–

Lanes are numbered from left to right in the direction of travel.

Geometry - Movement Definitions

To Approach	Movement Banned	Turn Desig.
From: South	CTH E (Ballard Road)	
South	No	L
West	No	L
North	No	T
From: East	US 41 SB Off Ramp	
South	No	L
West	No	T
North	No	R
From: North	CTH E (Ballard Road)	
North	No	T
South	No	T
West	No	R

HCM 2010 Roundabout Model Calibration

Location	Name	HCM 2010 Single Lane		HCM 2010 Multi-Lane Dominant Lane		HCM 2010 Multi-Lane Subdominant Lane	
		Para. A	Para. B	Para. A	Para. B	Para. A	Para. B
South	CTH E (Ballard Road)	1130.0	0.001000	1285.7	0.000722	1285.7	0.000722
East	US 41 SB Off Ramp	1130.0	0.001000	1285.7	0.000722	1285.7	0.000722
North	CTH E (Ballard Road)	1130.0	0.001000	1285.7	0.000722	1285.7	0.000722
West	US 41 SB Off Ramp	1130.0	0.001000	1285.7	0.000722	1285.7	0.000722

Volumes

To Approach	Total veh	HV %	Peak Flow Factor %	Vehicle Occupancy pers/veh	Flow Scale %	Growth Rate %/year
From: South	CTH E (Ballard Road)					
South	5.0	1.00	83.0	1.20	100.00	2.00
West	175.0	1.00	83.0	1.20	100.00	2.00
North	1415.0	1.00	83.0	1.20	100.00	2.00
From: East	US 41 SB Off Ramp					
South	550.0	2.00	83.0	1.20	100.00	2.00
West	1.0	2.00	83.0	1.20	100.00	2.00
North	830.0	2.00	83.0	1.20	100.00	2.00
From: North	CTH E (Ballard Road)					
North	5.0	2.00	83.0	1.20	100.00	2.00
South	1200.0	2.00	83.0	1.20	100.00	2.00
West	510.0	2.00	83.0	1.20	100.00	2.00

Path Data

To Approach	App. Cruise Speed mph	Exit Cruise Speed mph	App. Trav. Distance ft	Negn Speed mph	Negn Distance ft	Downst. Distance ft	Negn Radius ft
From: South	CTH E (Ballard Road)						
South	40.0	40.0	1600.0	–	–	–	–
West	40.0	40.0	1600.0	–	–	–	–
North	40.0	40.0	1600.0	–	–	–	–
From: East	US 41 SB Off Ramp						
South	40.0	40.0	1600.0	–	–	–	–
West	40.0	40.0	1600.0	–	–	–	–
North	40.0	40.0	1600.0	–	–	–	–
From: North	CTH E (Ballard Road)						
North	40.0	40.0	1600.0	–	–	–	–
South	40.0	40.0	1600.0	–	–	–	–
West	40.0	40.0	1600.0	–	–	–	–

Movement Data - General

Turn	Mov. ID	Queue Space LV ft	Queue Space HV ft	Vehicle Length LV ft	Vehicle Length HV ft	HVE	P.Deg. Satn	Movement Type	Movement Control
South	CTH E (Ballard Road)								
L	3	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	8	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
East	US 41 SB Off Ramp								
L	1	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	6	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	16	25.00	45.00	17.00	36.00	2.00	–	*Cont.*	–
North	CTH E (Ballard Road)								
T	4	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	14	25.00	45.00	17.00	36.00	2.00	–	*Slip*	*Yield*

Movement Type and Control parameters are set automaticly from Approach Control and Lane Type data in the Geometry dialog.

Gap Acceptance

Movement		Critical Gap sec	Follow-up Headway sec	Min. Departures veh/min	Exiting Flow Effect %
South	CTH E (Ballard Road)				
	L	4.200	3.200	2.50	0
	T	4.200	3.200	2.50	0
East	US 41 SB Off Ramp				
	L	4.000	2.800	2.50	0
	T	4.000	2.800	2.50	0
North	CTH E (Ballard Road)				
	T	4.000	2.800	2.50	0
	R	4.000	2.800	2.50	0

Model Settings - Options	
General Options	
Level of Service Method	Delay & v/c (HCM 2010)
Level of Service Target	LOS D
Performance Measure	Delay
Percentile Queue	95 %
Hours per Year	480 h
Gap Acceptance	
HV Method for Gap-Acceptance	Include HV Effect for all percentages
Gap-Acceptance Capacity	Traditional M1
HCM Delay Formula	Yes
Downstream Short Lane Model	
Minimum Downstream Utilisation Ratio	20 %
Minimum Downstream Distance	100 ft
Distance for Full Lane Utilisation	660 ft
Calibration Parameter	1.2

Model Settings - Roundabouts	
Roundabout Model Options	
Capacity Model	US HCM 2010
LOS Method	Same as Sign Control
US HCM 2010 Roundabout Model	
Include Origin-Destination Pattern Effects	No
Factor for Parameter A	1.138
Factor for Parameter B	0.997
Other Roundabout Models	
FHWA 2000	No
Use Urban Compact Roundabout	–
HCM 2000	No
NAASRA 1986	No

Model Settings - Cost Parameters	
Vehicle Operating Cost	
Cost Unit	$
Pump Price of Fuel	3.000 $/gal
Fuel Resource Cost Factor	0.700
Ratio of Running Cost to Fuel Cost	3.00
Vehicle Mass	
Light Vehicle Mass	3100.0 lb
Heavy Vehicle Mass	24000.0 lb
Heavy Vehicle Maximum Power	130 kW
Time Cost	
Average Income	23.00 $/h
Time Value Factor	0.400

Demand & Sensitivity	
Analysis Method:	None

Site Properties	
Site (Intersection) Type	Roundabout

Model Name	US HCM (Customary)
Drive Rule	Right-hand side of the road
New Zealand Rule	No
HCM Version	Yes
Units	US Customary

INTERSECTION SUMMARY

US 41 SB Ramps with CTH E (Ballard Road)
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	5652	veh/h	6782	pers/h
Percent Heavy Vehicles	1.7	%		
Degree of Saturation	0.800			
Practical Spare Capacity	6.2	%		
Effective Intersection Capacity	7064	veh/h		
Control Delay (Total)	24.45	veh-h/h	29.34	pers-h/h
Control Delay (Average)	15.6	sec	15.6	sec
Control Delay (Worst Lane)	47.1	sec		
Control Delay (Worst Movement)	40.8	sec	40.8	sec
Geometric Delay (Average)	6.6	sec		
Stop-Line Delay (Average)	15.6	sec		
Intersection Level of Service (LOS)	LOS C			
95% Back of Queue - Vehicles (Worst Lane)	5.6	veh		
95% Back of Queue - Distance (Worst Lane)	141.4	ft		
Total Effective Stops	4021	veh/h	4825	pers/h
Effective Stop Rate	0.71	per veh	0.71	per pers
Proportion Queued	0.38		0.38	
Performance Index	115.3		115.3	
Travel Distance (Total)	2175.4	veh-mi/h	2610.4	pers-mi/h
Travel Distance (Average)	2032	ft	2032	ft
Travel Time (Total)	89.1	veh-h/h	106.9	pers-h/h
Travel Time (Average)	56.8	sec	56.8	sec
Travel Speed	24.4	mph	24.4	mph
Cost (Total)	1702.64	$/h	1702.64	$/h
Fuel Consumption (Total)	113.5	gal/h		
Carbon Dioxide (Total)	1074.6	kg/h		
Hydrocarbons (Total)	1.801	kg/h		
Carbon Monoxide (Total)	80.32	kg/h		
NOx (Total)	2.534	kg/h		

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	2,712,868	veh/y	3,255,441	pers/y
Delay	11,737	veh-h/y	14,085	pers-h/y
Effective Stops	1,930,091	veh/y	2,316,109	pers/y
Travel Distance	1,044,179	veh-mi/y	1,253,015	pers-mi/y
Travel Time	42,766	veh-h/y	51,319	pers-h/y
Cost	817,268	$/y	817,268	$/y
Fuel Consumption	54,470	gal/y		
Carbon Dioxide	515,827	kg/y		
Hydrocarbons	864	kg/y		
Carbon Monoxide	38,554	kg/y		
NOx	1,217	kg/y		

MOVEMENT SUMMARY

Site: US 41 SB Ramps with CTH E - AM 3LN

US 41 SB Ramps with CTH E (Ballard Road)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: CTH E (Ballard Road)											
3	L	217	1.0	0.630	11.8	LOS B	4.0	100.6	0.07	0.85	24.3
8	T	1705	1.0	0.630	10.5	LOS B	4.0	100.6	0.06	0.41	27.5
Approach		1922	1.0	0.630	10.6	LOS B	4.0	100.6	0.07	0.46	27.1
East: US 41 SB Off Ramp											
1	L	663	2.0	0.781	40.8	LOS E	3.5	88.4	0.91	1.14	16.4
6	T	1	2.0	0.651	34.3	LOS D	2.5	62.3	0.89	1.06	18.1
16	R	1000	2.0	0.630	0.2	X	X	X	X	0.51	33.7
Approach		1664	2.0	0.781	16.4	LOS C	3.5	88.4	0.36	0.76	23.4
North: CTH E (Ballard Road)											
4	T	1452	2.0	0.800	23.3	LOS C	5.6	141.4	0.78	1.02	21.9
14	R	614	2.0	0.569	10.5	LOS B	3.0	76.7	0.45	0.63	26.8
Approach		2066	2.0	0.800	19.5	LOS C	5.6	141.4	0.68	0.90	23.1
All Vehicles		5652	1.7	0.800	15.6	LOS C	5.6	141.4	0.38	0.71	24.4

X: Not applicable for Continuous movement.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

LANE SUMMARY

Site: US 41 SB Ramps with CTH E - AM 3LN

US 41 SB Ramps with CTH E (Ballard Road)
Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Lane Length ft	SL Type	Cap. Adj. %	Prob. Block. %
South: CTH E (Ballard Road)																
Lane 1	217	482	0	699	1.0	1109	0.630	100	11.8	LOS B	4.0	100.6	1600	–	0.0	0.0
Lane 2	0	641	0	641	1.0	1109	0.578	92[5]	10.5	LOS B	3.2	81.1	1600	–	0.0	0.0
Lane 3	0	582	0	582	1.0	1109	0.525	83[5]	9.4	LOS A	2.6	65.9	1600	–	0.0	0.0
Approach	217	1705	0	1922	1.0		0.630		10.6	LOS B	4.0	100.6				
East: US 41 SB Off Ramp																
Lane 1	241	0	0	241	2.0	309	0.781	100	47.1	LOS E	3.5	88.4	1600	–	0.0	0.0
Lane 2	221	0	0	221	2.0	309	0.716	92[5]	39.9	LOS E	2.9	73.8	1600	–	0.0	0.0
Lane 3	200	1	0	201	2.0	309	0.651	83[5]	34.3	LOS D	2.5	62.3	1600	–	0.0	0.0
Lane 4	0	0	1000	1000	2.0	1588	0.630	100	0.2	X	X	X	1600	–	0.0	X
Approach	663	1	1000	1664	2.0		0.781		16.4	LOS C	3.5	88.4				
North: CTH E (Ballard Road)																
Lane 1	0	528	0	528	2.0	660	0.800	100	27.6	LOS D	5.6	141.4	1600	–	0.0	0.0
Lane 2	0	484	0	484	2.0	660	0.733	92[5]	22.6	LOS C	4.4	111.9	1600	–	0.0	0.0
Lane 3	0	440	0	440	2.0	660	0.667	83[5]	19.0	LOS C	3.6	90.3	1600	–	0.0	0.0
Lane 4	0	0	614	614	2.0	1080	0.569	100	10.5	LOS B	3.0	76.7	1600	–	0.0	0.0
Approach	0	1452	614	2066	2.0		0.800		19.5	LOS C	5.6	141.4				
Intersection				5652	1.7		0.800		15.6	LOS C	5.6	141.4				

X: Not applicable for Continuous lane.

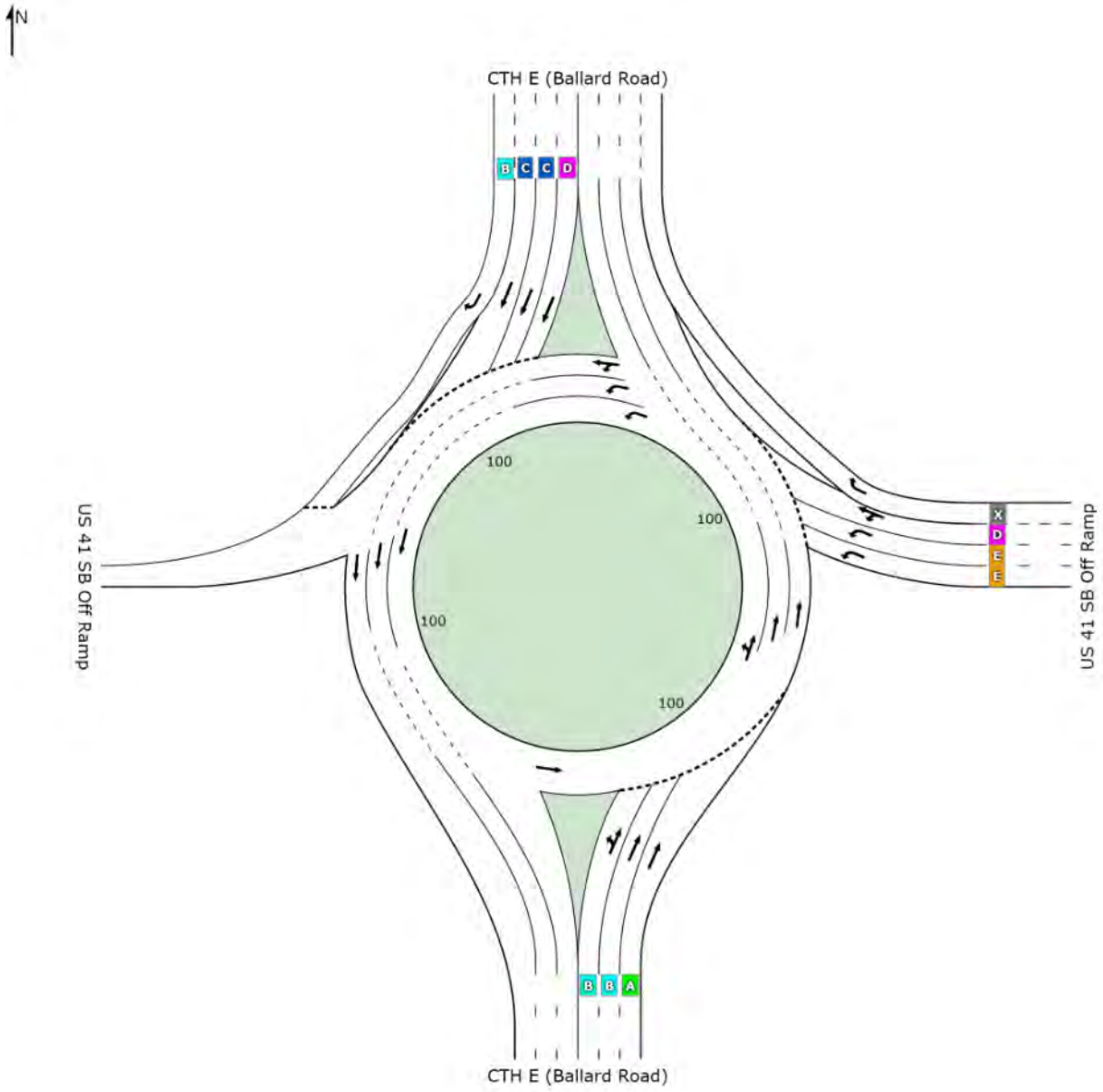
Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

5 Lane underutilisation determined by program

LEVEL OF SERVICE SUMMARY

Site: US 41 SB Ramps with CTH E - AM 3LN

US 41 SB Ramps with CTH E (Ballard Road)
Roundabout



	South	East	North	West	Intersection
LOS	B	C	C	NA	C

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Model used. Geometric Delay not included.

INPUT REPORT

US 41 SB Ramps with CTH E (Ballard Road)

Intersection Parameters	
Title	US 41 SB Ramps with CTH E (Ballard Road)
Intersection ID	1
Unit Time (for volumes)	60 minutes
Peak Flow Period (for performance)	15 minutes

Geometry - Approach Data

Location	Name	Type	No. of App. Lanes	No. of Exit Lanes	Median Width ft	Extra Bunching %
South	CTH E (Ballard Road)	Two-way	3	3	–	0.0
East	US 41 SB Off Ramp	One-way Approach	4	0	–	0.0
North	CTH E (Ballard Road)	Two-way	4	4	–	0.0
West	US 41 SB Off Ramp	One-way Exit	0	1	–	0.0

Geometry - Roundabout Data

Location	Name	Island Diameter ft	Circ. Width ft	Circ. Lanes	Entry Radius ft	Entry Angle degrees	Env. Factor	Entry/Circ. Flow Adjust.
South	CTH E (Ballard Road)	100.00	30.00	1	65.0	30.0	1.2000	None
East	US 41 SB Off Ramp	100.00	30.00	3	65.0	30.0	1.2000	None
North	CTH E (Ballard Road)	100.00	30.00	3	65.0	30.0	1.2000	None
West	US 41 SB Off Ramp	100.00	30.00	3	65.0	30.0	1.2000	None

Geometry - Approach Lane Data

Lane Number	Lane Type	Lane Discip.	Basic Satn Flow tcu/h	Utilisation Ratio %	Saturation Speed mph	Capacity Adjustment %
South	CTH E (Ballard Road)					
App. Lane 1	Normal	LT	1900	36.0	–	0.0
App. Lane 2	Normal	T	1900	33.0	–	0.0
App. Lane 3	Normal	T	1900	30.0	–	0.0
East	US 41 SB Off Ramp					
App. Lane 1	Normal	L	1900	36.0	–	0.0
App. Lane 2	Normal	L	1900	33.0	–	0.0
App. Lane 3	Normal	LT	1900	30.0	–	0.0
App. Lane 4	Continuous	R	1900	–	–	0.0
North	CTH E (Ballard Road)					
App. Lane 1	Normal	T	1900	36.0	–	0.0
App. Lane 2	Normal	T	1900	33.0	–	0.0
App. Lane 3	Normal	T	1900	30.0	–	0.0
App. Lane 4	Slip (Giveway/Yield)	R	1900	–	–	0.0

Geometry - Approach & Exit Lane Data

Lane Number	Lane Width ft	Lane Length ft	Grade %	SL Type
South	CTH E (Ballard Road)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–
East	US 41 SB Off Ramp			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
North	CTH E (Ballard Road)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–
Exit Lane 4	13.00	1600.0	0.00	–
West	US 41 SB Off Ramp			
Exit Lane 1	13.00	1600.0	0.00	–

Lanes are numbered from left to right in the direction of travel.

Geometry - Movement Definitions

To Approach	Movement Banned	Turn Desig.
From: South	CTH E (Ballard Road)	
South	No	L
West	No	L
North	No	T
From: East	US 41 SB Off Ramp	
South	No	L
West	No	T
North	No	R
From: North	CTH E (Ballard Road)	
North	No	T
South	No	T
West	No	R

HCM 2010 Roundabout Model Calibration

Location	Name	HCM 2010 Single Lane		HCM 2010 Multi-Lane Dominant Lane		HCM 2010 Multi-Lane Subdominant Lane	
		Para. A	Para. B	Para. A	Para. B	Para. A	Para. B
South	CTH E (Ballard Road)	1130.0	0.001000	1285.7	0.000722	1285.7	0.000722
East	US 41 SB Off Ramp	1130.0	0.001000	1285.7	0.000722	1285.7	0.000722
North	CTH E (Ballard Road)	1130.0	0.001000	1285.7	0.000722	1285.7	0.000722
West	US 41 SB Off Ramp	1130.0	0.001000	1285.7	0.000722	1285.7	0.000722

Volumes

To Approach	Total veh	HV %	Peak Flow Factor %	Vehicle Occupancy pers/veh	Flow Scale %	Growth Rate %/year
From: South	CTH E (Ballard Road)					
South	5.0	1.00	89.0	1.20	100.00	2.00
West	345.0	1.00	89.0	1.20	100.00	2.00
North	2080.0	1.00	89.0	1.20	100.00	2.00
From: East	US 41 SB Off Ramp					
South	490.0	1.00	89.0	1.20	100.00	2.00
West	1.0	1.00	89.0	1.20	100.00	2.00
North	490.0	1.00	89.0	1.20	100.00	2.00
From: North	CTH E (Ballard Road)					
North	5.0	2.00	89.0	1.20	100.00	2.00
South	1350.0	2.00	89.0	1.20	100.00	2.00
West	515.0	2.00	89.0	1.20	100.00	2.00

Path Data

To Approach	App. Cruise Speed mph	Exit Cruise Speed mph	App. Trav. Distance ft	Negn Speed mph	Negn Distance ft	Downst. Distance ft	Negn Radius ft
From: South	CTH E (Ballard Road)						
South	40.0	40.0	1600.0	–	–	–	–
West	40.0	40.0	1600.0	–	–	–	–
North	40.0	40.0	1600.0	–	–	–	–
From: East	US 41 SB Off Ramp						
South	40.0	40.0	1600.0	–	–	–	–
West	40.0	40.0	1600.0	–	–	–	–
North	40.0	40.0	1600.0	–	–	–	–
From: North	CTH E (Ballard Road)						
North	40.0	40.0	1600.0	–	–	–	–
South	40.0	40.0	1600.0	–	–	–	–
West	40.0	40.0	1600.0	–	–	–	–

Movement Data - General

Turn	Mov. ID	Queue Space LV ft	Queue Space HV ft	Vehicle Length LV ft	Vehicle Length HV ft	HVE	P.Deg. Satn	Movement Type	Movement Control
South	CTH E (Ballard Road)								
L	3	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	8	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
East	US 41 SB Off Ramp								
L	1	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	6	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	16	25.00	45.00	17.00	36.00	2.00	–	*Cont.*	–
North	CTH E (Ballard Road)								
T	4	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	14	25.00	45.00	17.00	36.00	2.00	–	*Slip*	*Yield*

Movement Type and Control parameters are set automaticly from Approach Control and Lane Type data in the Geometry dialog.

Gap Acceptance

Movement		Critical Gap sec	Follow-up Headway sec	Min. Departures veh/min	Exiting Flow Effect %
South	CTH E (Ballard Road)				
	L	4.200	3.200	2.50	0
	T	4.200	3.200	2.50	0
East	US 41 SB Off Ramp				
	L	4.000	2.800	2.50	0
	T	4.000	2.800	2.50	0
North	CTH E (Ballard Road)				
	T	4.000	2.800	2.50	0
	R	4.000	2.800	2.50	0

Model Settings - Options	
General Options	
Level of Service Method	Delay & v/c (HCM 2010)
Level of Service Target	LOS D
Performance Measure	Delay
Percentile Queue	95 %
Hours per Year	480 h
Gap Acceptance	
HV Method for Gap-Acceptance	Include HV Effect for all percentages
Gap-Acceptance Capacity	Traditional M1
HCM Delay Formula	Yes
Downstream Short Lane Model	
Minimum Downstream Utilisation Ratio	20 %
Minimum Downstream Distance	100 ft
Distance for Full Lane Utilisation	660 ft
Calibration Parameter	1.2

Model Settings - Roundabouts	
Roundabout Model Options	
Capacity Model	US HCM 2010
LOS Method	Same as Sign Control
US HCM 2010 Roundabout Model	
Include Origin-Destination Pattern Effects	No
Factor for Parameter A	1.000
Factor for Parameter B	1.000
Other Roundabout Models	
FHWA 2000	No
Use Urban Compact Roundabout	–
HCM 2000	No
NAASRA 1986	No

Model Settings - Cost Parameters	
Vehicle Operating Cost	
Cost Unit	$
Pump Price of Fuel	3.000 $/gal
Fuel Resource Cost Factor	0.700
Ratio of Running Cost to Fuel Cost	3.00
Vehicle Mass	
Light Vehicle Mass	3100.0 lb
Heavy Vehicle Mass	24000.0 lb
Heavy Vehicle Maximum Power	130 kW
Time Cost	
Average Income	23.00 $/h
Time Value Factor	0.400

Demand & Sensitivity	
Analysis Method:	None

Site Properties	
Site (Intersection) Type	Roundabout

Model Name	US HCM (Customary)
Drive Rule	Right-hand side of the road
New Zealand Rule	No
HCM Version	Yes
Units	US Customary

INTERSECTION SUMMARY

US 41 SB Ramps with CTH E (Ballard Road)
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	5934	veh/h	7120	pers/h
Percent Heavy Vehicles	1.4	%		
Degree of Saturation	1.160			
Practical Spare Capacity	-26.7	%		
Effective Intersection Capacity	5117	veh/h		
Control Delay (Total)	51.86	veh-h/h	62.23	pers-h/h
Control Delay (Average)	31.5	sec	31.5	sec
Control Delay (Worst Lane)	171.9	sec		
Control Delay (Worst Movement)	143.9	sec	143.9	sec
Geometric Delay (Average)	6.5	sec		
Stop-Line Delay (Average)	31.5	sec		
Intersection Level of Service (LOS)	LOS D			
95% Back of Queue - Vehicles (Worst Lane)	18.3	veh		
95% Back of Queue - Distance (Worst Lane)	460.9	ft		
Total Effective Stops	4532	veh/h	5438	pers/h
Effective Stop Rate	0.76	per veh	0.76	per pers
Proportion Queued	0.43		0.43	
Performance Index	167.5		167.5	
Travel Distance (Total)	2286.6	veh-mi/h	2743.9	pers-mi/h
Travel Distance (Average)	2035	ft	2035	ft
Travel Time (Total)	119.7	veh-h/h	143.6	pers-h/h
Travel Time (Average)	72.6	sec	72.6	sec
Travel Speed	19.1	mph	19.1	mph
Cost (Total)	2135.29	$/h	2135.29	$/h
Fuel Consumption (Total)	128.4	gal/h		
Carbon Dioxide (Total)	1216.2	kg/h		
Hydrocarbons (Total)	2.108	kg/h		
Carbon Monoxide (Total)	86.17	kg/h		
NOx (Total)	2.718	kg/h		

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	2,848,180	veh/y	3,417,816	pers/y
Delay	24,894	veh-h/y	29,873	pers-h/y
Effective Stops	2,175,149	veh/y	2,610,179	pers/y
Travel Distance	1,097,545	veh-mi/y	1,317,054	pers-mi/y
Travel Time	57,445	veh-h/y	68,935	pers-h/y
Cost	1,024,939	$/y	1,024,939	$/y
Fuel Consumption	61,655	gal/y		
Carbon Dioxide	583,788	kg/y		
Hydrocarbons	1,012	kg/y		
Carbon Monoxide	41,362	kg/y		
NOx	1,305	kg/y		

MOVEMENT SUMMARY

Site: US 41 SB Ramps with CTH E - PM 3LN

US 41 SB Ramps with CTH E (Ballard Road)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: CTH E (Ballard Road)											
3	L	393	1.0	0.895	27.3	LOS D	18.3	460.9	0.23	0.73	19.4
8	T	2337	1.0	0.895	20.4	LOS C	18.3	460.9	0.15	0.39	22.9
Approach		2730	1.0	0.895	21.4	LOS C	18.3	460.9	0.16	0.44	22.3
East: US 41 SB Off Ramp											
1	L	551	1.0	1.160	143.9	LOS F	13.5	340.5	1.00	1.69	7.7
6	T	1	1.0	0.966	113.5	LOS F	5.5	137.9	0.99	1.43	8.8
16	R	551	1.0	0.344	0.1	X	X	X	X	0.51	33.8
Approach		1102	1.0	1.160	72.0	LOS F	13.5	340.5	0.50	1.10	12.2
North: CTH E (Ballard Road)											
4	T	1522	2.0	0.851	27.3	LOS D	6.8	171.5	0.81	1.07	20.6
14	R	579	2.0	0.610	12.6	LOS B	3.6	91.1	0.60	0.82	25.8
Approach		2101	2.0	0.851	23.2	LOS C	6.8	171.5	0.75	1.00	21.8
All Vehicles		5934	1.4	1.160	31.5	LOS D	18.3	460.9	0.43	0.76	19.1

X: Not applicable for Continuous movement.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

LANE SUMMARY

US 41 SB Ramps with CTH E (Ballard Road)
Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Lane Length ft	SL Type	Cap. Adj. %	Prob. Block. %
South: CTH E (Ballard Road)																
Lane 1	393	600	0	993	1.0	1109	0.895	100	27.3	LOS D	18.3	460.9	1600	–	0.0	0.0
Lane 2	0	910	0	910	1.0	1109	0.820	92[5]	20.2	LOS C	10.3	259.8	1600	–	0.0	0.0
Lane 3	0	827	0	827	1.0	1109	0.746	83[5]	15.8	LOS C	6.8	170.5	1600	–	0.0	0.0
Approach	393	2337	0	2730	1.0		0.895		21.4	LOS C	18.3	460.9				
East: US 41 SB Off Ramp																
Lane 1	201	0	0	201	1.0	173	1.160	100	171.9	LOS F	13.5	340.5	1600	–	0.0	0.0
Lane 2	184	0	0	184	1.0	173	1.063	92[5]	140.7	LOS F	8.9	224.0	1600	–	0.0	0.0
Lane 3	166	1	0	167	1.0	173	0.966	83[5]	113.5	LOS F	5.5	137.9	1600	–	0.0	0.0
Lane 4	0	0	551	551	1.0	1599	0.344	100	0.1	X	X	X	1600	–	0.0	X
Approach	551	1	551	1102	1.0		1.160		72.0	LOS F	13.5	340.5				
North: CTH E (Ballard Road)																
Lane 1	0	554	0	554	2.0	651	0.851	100	33.2	LOS D	6.8	171.5	1600	–	0.0	0.0
Lane 2	0	507	0	507	2.0	651	0.780	92[5]	26.2	LOS D	5.1	130.1	1600	–	0.0	0.0
Lane 3	0	461	0	461	2.0	651	0.709	83[5]	21.4	LOS C	4.0	102.5	1600	–	0.0	0.0
Lane 4	0	0	579	579	2.0	949	0.610	100	12.6	LOS B	3.6	91.1	1600	–	0.0	0.0
Approach	0	1522	579	2101	2.0		0.851		23.2	LOS C	6.8	171.5				
Intersection				5934	1.4		1.160		31.5	LOS D	18.3	460.9				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

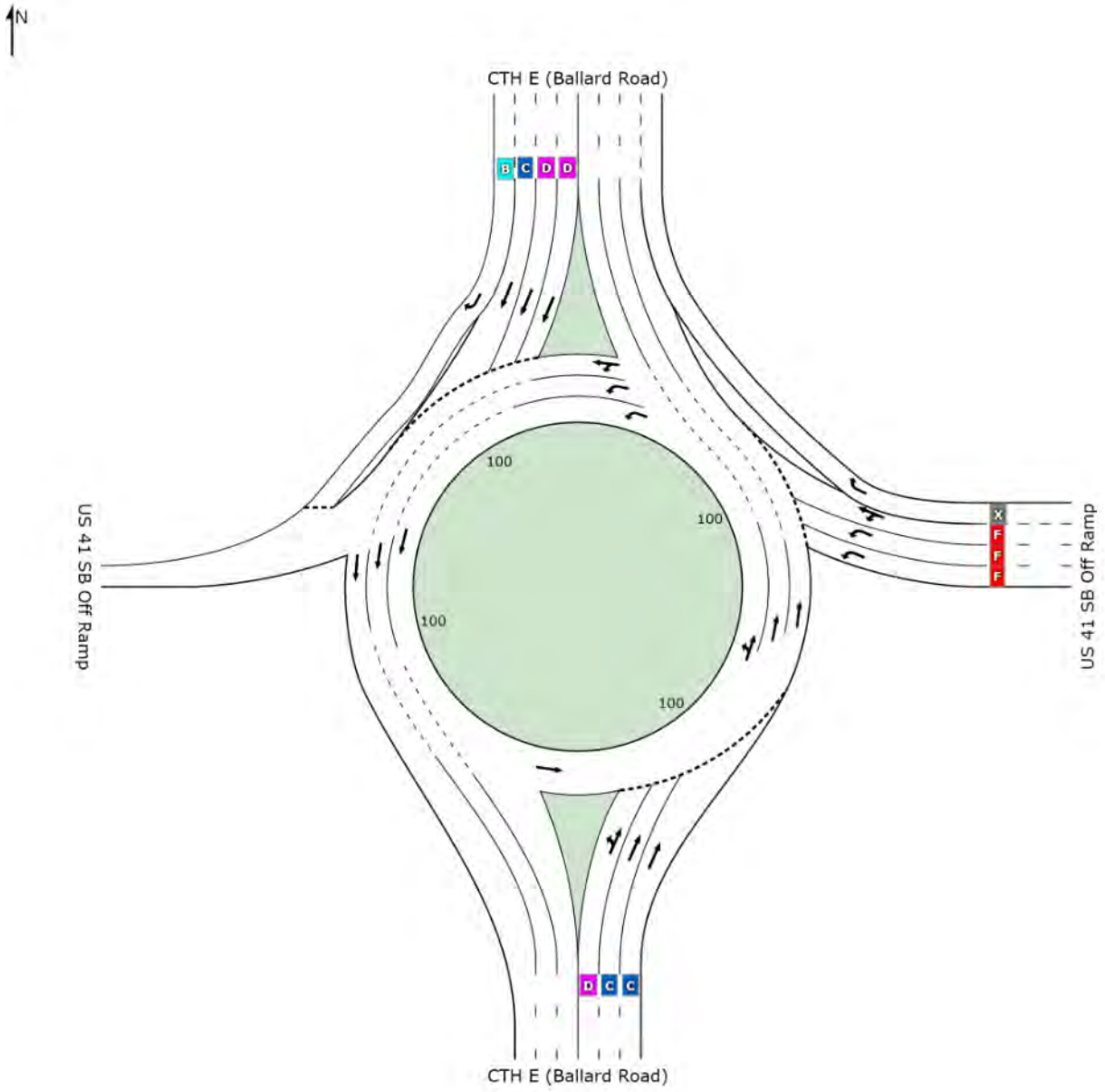
5 Lane underutilisation determined by program

SIDRA INTERSECTION

LEVEL OF SERVICE SUMMARY

Site: US 41 SB Ramps with CTH E - PM 3LN

US 41 SB Ramps with CTH E (Ballard Road)
Roundabout



	South	East	North	West	Intersection
LOS	C	F	C	NA	D

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Model used. Geometric Delay not included.

WIS 441 with County OO

INPUT REPORT

WIS 441 NB Ramps with CTH OO (Northland Ave)

Intersection Parameters	
Title	WIS 441 NB Ramps with CTH OO (Northland Ave)
Intersection ID	1
Unit Time (for volumes)	60 minutes
Peak Flow Period (for performance)	15 minutes

Geometry - Approach Data

Location	Name	Type	No. of App. Lanes	No. of Exit Lanes	Median Width ft	Extra Bunching %
South	WIS 441 NB Off Ramp	One-way Approach	4	0	–	0.0
East	CTH OO (Northland Ave)	Two-way	4	3	–	0.0
North	WIS 441 NB On Ramp	One-way Exit	0	1	–	0.0
West	CTH OO (Northland Ave)	Two-way	3	3	–	0.0

Geometry - Roundabout Data

Location	Name	Island Diameter ft	Circ. Width ft	Circ. Lanes	Entry Radius ft	Entry Angle degrees	Env. Factor	Entry/Circ. Flow Adjust.
South	WIS 441 NB Off Ramp	100.00	30.00	3	65.0	30.0	1.2000	None
East	CTH OO (Northland Ave)	100.00	30.00	2	65.0	30.0	1.2000	None
North	WIS 441 NB On Ramp	100.00	30.00	3	65.0	30.0	1.2000	None
West	CTH OO (Northland Ave)	100.00	30.00	1	65.0	30.0	1.2000	None

Geometry - Approach Lane Data

Lane Number	Lane Type	Lane Discip.	Basic Satn Flow tcu/h	Utilisation Ratio %	Saturation Speed mph	Capacity Adjustment %
South	WIS 441 NB Off Ramp					
App. Lane 1	Normal	L	1900	47.0	–	0.0
App. Lane 2	Normal	LT	1900	53.0	–	0.0
App. Lane 3	Slip (Giveway/Yield)	R	1900	–	–	0.0
App. Lane 4	Slip (Giveway/Yield)	R	1900	–	–	0.0
East	CTH OO (Northland Ave)					
App. Lane 1	Normal	T	1900	36.0	–	0.0
App. Lane 2	Normal	T	1900	33.0	–	0.0
App. Lane 3	Normal	T	1900	30.0	–	0.0
App. Lane 4	Slip (Giveway/Yield)	R	1900	–	–	0.0
West	CTH OO (Northland Ave)					
App. Lane 1	Normal	LT	1900	47.0	–	0.0
App. Lane 2	Normal	T	1900	53.0	–	0.0
App. Lane 3	Normal	T	1900	53.0	–	0.0

Geometry - Approach & Exit Lane Data

Lane Number	Lane Width ft	Lane Length ft	Grade %	SL Type
South	WIS 441 NB Off Ramp			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
East	CTH OO (Northland Ave)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–
North	WIS 441 NB On Ramp			
Exit Lane 1	13.00	1600.0	0.00	–
West	CTH OO (Northland Ave)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–

Lanes are numbered from left to right in the direction of travel.

Geometry - Movement Definitions

To Approach	Movement Banned	Turn Desig.
From: South	WIS 441 NB Off Ramp	
West	No	L
North	No	T
East	No	R
From: East	CTH OO (Northland Ave)	
East	No	T
West	No	T
North	No	R
From: West	CTH OO (Northland Ave)	
West	No	L
North	No	L
East	No	T

HCM 2010 Roundabout Model Calibration

Location	Name	HCM 2010 Single Lane		HCM 2010 Multi-Lane Dominant Lane		HCM 2010 Multi-Lane Subdominant Lane	
		Para. A	Para. B	Para. A	Para. B	Para. A	Para. B
South	WIS 441 NB Off Ramp	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
East	CTH OO (Northland Ave)	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
North	WIS 441 NB On Ramp	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
West	CTH OO (Northland Ave)	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722

Volumes

To Approach	Total veh	HV %	Peak Flow Factor %	Vehicle Occupancy pers/veh	Flow Scale %	Growth Rate %/year
From: South	WIS 441 NB Off Ramp					
West	1100.0	1.00	95.0	1.20	100.00	2.00
North	1.0	1.00	95.0	1.20	100.00	2.00
East	545.0	1.00	95.0	1.20	100.00	2.00
From: East	CTH OO (Northland Ave)					
East	5.0	2.00	95.0	1.20	100.00	2.00
West	1435.0	2.00	95.0	1.20	100.00	2.00
North	115.0	2.00	95.0	1.20	100.00	2.00
From: West	CTH OO (Northland Ave)					
West	5.0	6.00	95.0	1.20	100.00	2.00
North	50.0	6.00	95.0	1.20	100.00	2.00
East	435.0	6.00	95.0	1.20	100.00	2.00

Path Data

To Approach	App. Cruise Speed mph	Exit Cruise Speed mph	App. Trav. Distance ft	Negn Speed mph	Negn Distance ft	Downst. Distance ft	Negn Radius ft
From: South	WIS 441 NB Off Ramp						
West	40.0	40.0	1600.0	–	–	–	–
North	40.0	40.0	1600.0	–	–	–	–
East	40.0	40.0	1600.0	–	–	–	–
From: East	CTH OO (Northland Ave)						
East	40.0	40.0	1600.0	–	–	–	–
West	40.0	40.0	1600.0	–	–	–	–
North	40.0	40.0	1600.0	–	–	–	–
From: West	CTH OO (Northland Ave)						
West	40.0	40.0	1600.0	–	–	–	–
North	40.0	40.0	1600.0	–	–	–	–
East	40.0	40.0	1600.0	–	–	–	–

Movement Data - General

Turn	Mov. ID	Queue Space LV ft	Queue Space HV ft	Vehicle Length LV ft	Vehicle Length HV ft	HVE	P.Deg. Satn	Movement Type	Movement Control
South	WIS 441 NB Off Ramp								
L	3	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	8	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	18	25.00	45.00	17.00	36.00	2.00	–	*Slip*	*Yield*
East	CTH OO (Northland Ave)								
T	6	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	16	25.00	45.00	17.00	36.00	2.00	–	*Slip*	*Yield*
West	CTH OO (Northland Ave)								
L	5	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	2	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–

Movement Type and Control parameters are set automaticly from Approach Control and Lane Type data in the Geometry dialog.

Gap Acceptance

Movement		Critical Gap sec	Follow-up Headway sec	Min. Departures veh/min	Exiting Flow Effect %
South	WIS 441 NB Off Ramp				
	L	4.000	2.800	2.50	0
	T	4.000	2.800	2.50	0
	R	–	–	2.50	0
East	CTH OO (Northland Ave)				
	T	4.000	2.800	2.50	0
	R	4.000	2.800	2.50	0
West	CTH OO (Northland Ave)				
	L	4.200	3.200	2.50	0
	T	4.200	3.200	2.50	0

Model Settings - Options	
General Options	
Level of Service Method	Delay & v/c (HCM 2010)
Level of Service Target	LOS D
Performance Measure	Delay
Percentile Queue	95 %
Hours per Year	480 h
Gap Acceptance	
HV Method for Gap-Acceptance	Include HV Effect for all percentages
Gap-Acceptance Capacity	Traditional M1
HCM Delay Formula	Yes
Downstream Short Lane Model	
Minimum Downstream Utilisation Ratio	20 %
Minimum Downstream Distance	100 ft
Distance for Full Lane Utilisation	660 ft
Calibration Parameter	1.2

Model Settings - Roundabouts	
Roundabout Model Options	
Capacity Model	US HCM 2010
LOS Method	Same as Sign Control
US HCM 2010 Roundabout Model	
Include Origin-Destination Pattern Effects	No
Factor for Parameter A	1.000
Factor for Parameter B	1.000
Other Roundabout Models	
FHWA 2000	No
Use Urban Compact Roundabout	–
HCM 2000	No
NAASRA 1986	No

Model Settings - Cost Parameters	
Vehicle Operating Cost	
Cost Unit	$
Pump Price of Fuel	3.000 $/gal
Fuel Resource Cost Factor	0.700
Ratio of Running Cost to Fuel Cost	3.00
Vehicle Mass	
Light Vehicle Mass	3100.0 lb
Heavy Vehicle Mass	24000.0 lb
Heavy Vehicle Maximum Power	130 kW
Time Cost	
Average Income	23.00 $/h
Time Value Factor	0.400

Demand & Sensitivity	
Analysis Method:	None

Site Properties	
Site (Intersection) Type	Roundabout

Model Name	US HCM (Customary)
Drive Rule	Right-hand side of the road
New Zealand Rule	No
HCM Version	Yes
Units	US Customary

INTERSECTION SUMMARY

WIS 441 NB Ramps with CTH OO (Northland Ave)
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	3885	veh/h	4662	pers/h
Percent Heavy Vehicles	2.1	%		
Degree of Saturation	1.065			
Practical Spare Capacity	-20.2	%		
Effective Intersection Capacity	3650	veh/h		
Control Delay (Total)	34.79	veh-h/h	41.74	pers-h/h
Control Delay (Average)	32.2	sec	32.2	sec
Control Delay (Worst Lane)	86.0	sec		
Control Delay (Worst Movement)	65.4	sec	65.4	sec
Geometric Delay (Average)	7.6	sec		
Stop-Line Delay (Average)	32.2	sec		
Intersection Level of Service (LOS)	LOS D			
95% Back of Queue - Vehicles (Worst Lane)	20.8	veh		
95% Back of Queue - Distance (Worst Lane)	528.6	ft		
Total Effective Stops	4461	veh/h	5353	pers/h
Effective Stop Rate	1.15	per veh	1.15	per pers
Proportion Queued	0.67		0.67	
Performance Index	118.2		118.2	
Travel Distance (Total)	1514.8	veh-mi/h	1817.7	pers-mi/h
Travel Distance (Average)	2059	ft	2059	ft
Travel Time (Total)	80.8	veh-h/h	97.0	pers-h/h
Travel Time (Average)	74.9	sec	74.9	sec
Travel Speed	18.7	mph	18.7	mph
Cost (Total)	1471.16	$/h	1471.16	$/h
Fuel Consumption (Total)	90.8	gal/h		
Carbon Dioxide (Total)	859.9	kg/h		
Hydrocarbons (Total)	1.502	kg/h		
Carbon Monoxide (Total)	65.22	kg/h		
NOx (Total)	1.975	kg/h		

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	1,864,927	veh/y	2,237,912	pers/y
Delay	16,697	veh-h/y	20,037	pers-h/y
Effective Stops	2,141,338	veh/y	2,569,607	pers/y
Travel Distance	727,088	veh-mi/y	872,505	pers-mi/y
Travel Time	38,781	veh-h/y	46,538	pers-h/y
Cost	706,159	$/y	706,159	$/y
Fuel Consumption	43,580	gal/y		
Carbon Dioxide	412,755	kg/y		
Hydrocarbons	721	kg/y		
Carbon Monoxide	31,308	kg/y		
NOx	948	kg/y		

MOVEMENT SUMMARY

Site: WIS 441 NB Ramps with CTH OO - AM 3LN

WIS 441 NB Ramps with CTH OO (Northland Ave)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: WIS 441 NB Off Ramp											
3	L	1158	1.0	0.719	16.2	LOS C	5.1	127.8	0.71	1.00	22.6
8	T	1	1.0	0.719	17.8	LOS C	5.1	127.8	0.74	0.93	23.3
18	R	574	1.0	0.321	7.5	LOS A	1.1	28.6	0.47	0.73	28.5
Approach		1733	1.0	0.719	13.4	LOS B	5.1	127.8	0.63	0.91	24.2
East: CTH OO (Northland Ave)											
6	T	1516	2.0	1.065	65.4	LOS F	20.8	528.6	0.96	1.70	13.1
16	R	121	2.0	0.100	3.8	LOS A	0.3	7.6	0.12	0.50	30.9
Approach		1637	2.0	1.065	60.8	LOS F	20.8	528.6	0.90	1.61	13.7
West: CTH OO (Northland Ave)											
5	L	58	6.0	0.150	4.8	LOS A	0.4	10.5	0.03	0.87	27.4
2	T	458	6.0	0.169	4.9	LOS A	0.5	12.0	0.03	0.42	31.0
Approach		516	6.0	0.169	4.9	LOS A	0.5	12.0	0.03	0.47	30.5
All Vehicles		3885	2.1	1.065	32.2	LOS D	20.8	528.6	0.67	1.15	18.7

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

LANE SUMMARY

Site: WIS 441 NB Ramps with CTH OO - AM 3LN

WIS 441 NB Ramps with CTH OO (Northland Ave)
Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Lane Length ft	SL Type	Cap. Adj. %	Prob. Block. %
South: WIS 441 NB Off Ramp																
Lane 1	545	0	0	545	1.0	854	0.637	89[5]	14.5	LOS B	3.8	95.7	1600	–	0.0	0.0
Lane 2	613	1	0	614	1.0	854	0.719	100	17.8	LOS C	5.1	127.8	1600	–	0.0	0.0
Lane 3	0	0	287	287	1.0	893	0.321	100	7.5	LOS A	1.1	28.6	1600	–	0.0	0.0
Lane 4	0	0	287	287	1.0	893	0.321	100	7.5	LOS A	1.1	28.6	1600	–	0.0	0.0
Approach	1158	1	574	1733	1.0		0.719		13.4	LOS B	5.1	127.8				
East: CTH OO (Northland Ave)																
Lane 1	0	551	0	551	2.0	518	1.065	100	86.0	LOS F	20.8	528.6	1600	–	0.0	0.0
Lane 2	0	505	0	505	2.0	518	0.976	92[5]	61.9	LOS F	11.4	288.4	1600	–	0.0	0.0
Lane 3	0	459	0	459	2.0	518	0.887	83[5]	44.5	LOS E	6.8	171.9	1600	–	0.0	0.0
Lane 4	0	0	121	121	2.0	1210	0.100	100	3.8	LOS A	0.3	7.6	1600	–	0.0	0.0
Approach	0	1516	121	1637	2.0		1.065		60.8	LOS F	20.8	528.6				
West: CTH OO (Northland Ave)																
Lane 1	58	101	0	158	6.0	1057	0.150	89[5]	4.8	LOS A	0.4	10.5	1600	–	0.0	0.0
Lane 2	0	179	0	179	6.0	1057	0.169	100	4.9	LOS A	0.5	12.0	1600	–	0.0	0.0
Lane 3	0	179	0	179	6.0	1057	0.169	100	4.9	LOS A	0.5	12.0	1600	–	0.0	0.0
Approach	58	458	0	516	6.0		0.169		4.9	LOS A	0.5	12.0				
Intersection				3885	2.1		1.065		32.2	LOS D	20.8	528.6				

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

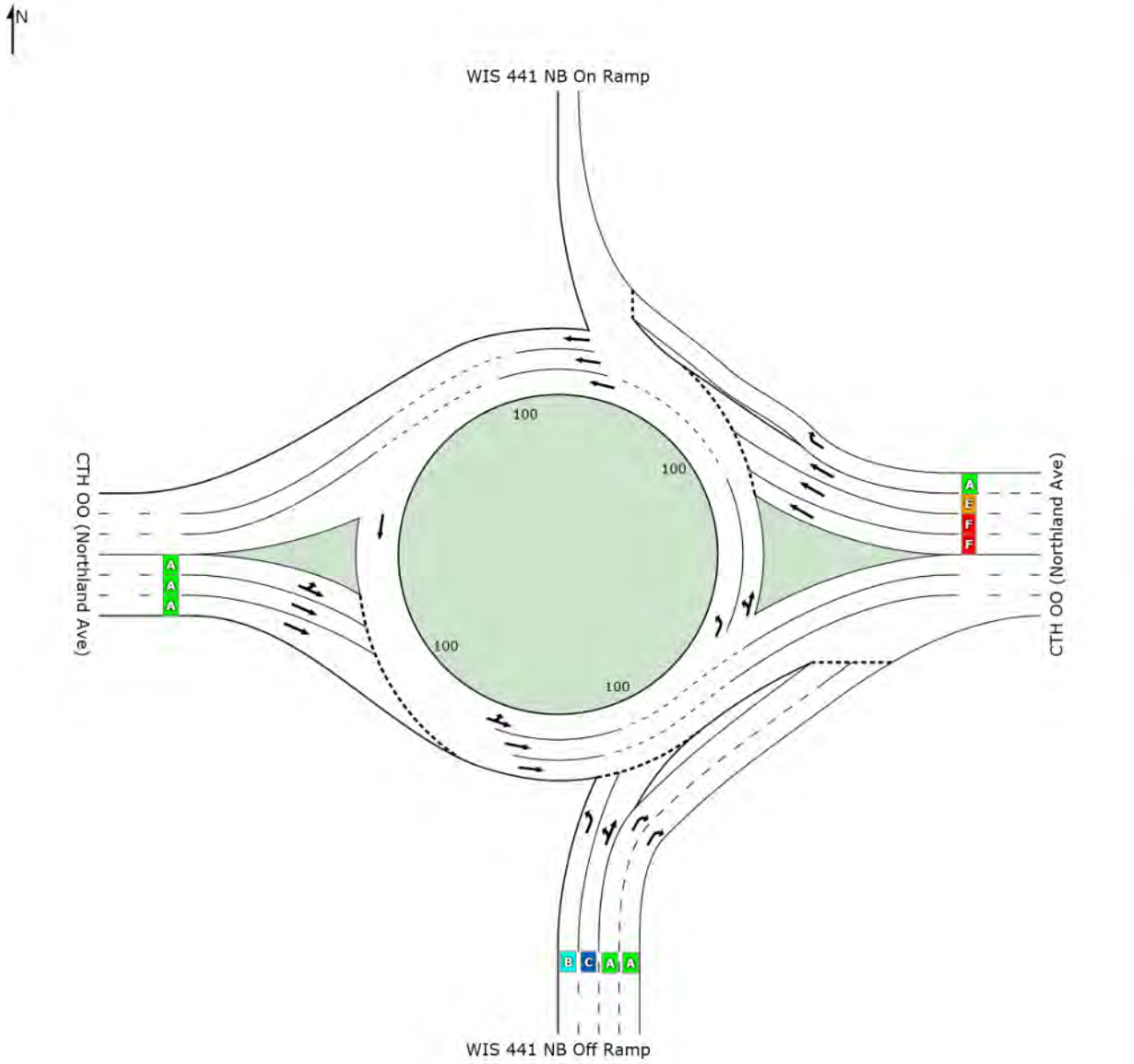
5 Lane underutilisation determined by program

SIDRA INTERSECTION

LEVEL OF SERVICE SUMMARY

Site: WIS 441 NB Ramps with CTH OO - AM 3LN

WIS 441 NB Ramps with CTH OO (Northland Ave)
Roundabout



	South	East	North	West	Intersection
LOS	B	F	NA	A	D

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Model used. Geometric Delay not included.

INPUT REPORT

WIS 441 NB Ramps with CTH OO (Northland Ave)

Intersection Parameters	
Title	WIS 441 NB Ramps with CTH OO (Northland Ave)
Intersection ID	1
Unit Time (for volumes)	60 minutes
Peak Flow Period (for performance)	15 minutes

Geometry - Approach Data

Location	Name	Type	No. of App. Lanes	No. of Exit Lanes	Median Width ft	Extra Bunching %
South	WIS 441 NB Off Ramp	One-way Approach	4	0	–	0.0
East	CTH OO (Northland Ave)	Two-way	4	3	–	0.0
North	WIS 441 NB On Ramp	One-way Exit	0	1	–	0.0
West	CTH OO (Northland Ave)	Two-way	3	3	–	0.0

Geometry - Roundabout Data

Location	Name	Island Diameter ft	Circ. Width ft	Circ. Lanes	Entry Radius ft	Entry Angle degrees	Env. Factor	Entry/Circ. Flow Adjust.
South	WIS 441 NB Off Ramp	100.00	30.00	3	65.0	30.0	1.2000	None
East	CTH OO (Northland Ave)	100.00	30.00	2	65.0	30.0	1.2000	None
North	WIS 441 NB On Ramp	100.00	30.00	3	65.0	30.0	1.2000	None
West	CTH OO (Northland Ave)	100.00	30.00	1	65.0	30.0	1.2000	None

Geometry - Approach Lane Data

Lane Number	Lane Type	Lane Discip.	Basic Satn Flow tcu/h	Utilisation Ratio %	Saturation Speed mph	Capacity Adjustment %
South	WIS 441 NB Off Ramp					
App. Lane 1	Normal	L	1900	47.0	–	0.0
App. Lane 2	Normal	LT	1900	53.0	–	0.0
App. Lane 3	Slip (Giveway/Yield)	R	1900	–	–	0.0
App. Lane 4	Slip (Giveway/Yield)	R	1900	–	–	0.0
East	CTH OO (Northland Ave)					
App. Lane 1	Normal	T	1900	36.0	–	0.0
App. Lane 2	Normal	T	1900	33.0	–	0.0
App. Lane 3	Normal	T	1900	30.0	–	0.0
App. Lane 4	Slip (Giveway/Yield)	R	1900	–	–	0.0
West	CTH OO (Northland Ave)					
App. Lane 1	Normal	LT	1900	47.0	–	0.0
App. Lane 2	Normal	T	1900	53.0	–	0.0
App. Lane 3	Normal	T	1900	53.0	–	0.0

Geometry - Approach & Exit Lane Data

Lane Number	Lane Width ft	Lane Length ft	Grade %	SL Type
South	WIS 441 NB Off Ramp			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
East	CTH OO (Northland Ave)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–
North	WIS 441 NB On Ramp			
Exit Lane 1	13.00	1600.0	0.00	–
West	CTH OO (Northland Ave)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–

Lanes are numbered from left to right in the direction of travel.

Geometry - Movement Definitions

To Approach	Movement Banned	Turn Desig.
From: South	WIS 441 NB Off Ramp	
West	No	L
North	No	T
East	No	R
From: East	CTH OO (Northland Ave)	
East	No	T
West	No	T
North	No	R
From: West	CTH OO (Northland Ave)	
West	No	L
North	No	L
East	No	T

HCM 2010 Roundabout Model Calibration

Location	Name	HCM 2010 Single Lane		HCM 2010 Multi-Lane Dominant Lane		HCM 2010 Multi-Lane Subdominant Lane	
		Para. A	Para. B	Para. A	Para. B	Para. A	Para. B
South	WIS 441 NB Off Ramp	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
East	CTH OO (Northland Ave)	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
North	WIS 441 NB On Ramp	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
West	CTH OO (Northland Ave)	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722

Volumes

To Approach	Total veh	HV %	Peak Flow Factor %	Vehicle Occupancy pers/veh	Flow Scale %	Growth Rate %/year
From: South	WIS 441 NB Off Ramp					
West	475.0	3.00	95.0	1.20	100.00	2.00
North	1.0	3.00	95.0	1.20	100.00	2.00
East	825.0	3.00	95.0	1.20	100.00	2.00
From: East	CTH OO (Northland Ave)					
East	5.0	2.00	95.0	1.20	100.00	2.00
West	1065.0	2.00	95.0	1.20	100.00	2.00
North	120.0	2.00	95.0	1.20	100.00	2.00
From: West	CTH OO (Northland Ave)					
West	5.0	1.00	95.0	1.20	100.00	2.00
North	155.0	1.00	95.0	1.20	100.00	2.00
East	1075.0	1.00	95.0	1.20	100.00	2.00

Path Data

To Approach	App. Cruise Speed mph	Exit Cruise Speed mph	App. Trav. Distance ft	Negn Speed mph	Negn Distance ft	Downst. Distance ft	Negn Radius ft
From: South	WIS 441 NB Off Ramp						
West	40.0	40.0	1600.0	–	–	–	–
North	40.0	40.0	1600.0	–	–	–	–
East	40.0	40.0	1600.0	–	–	–	–
From: East	CTH OO (Northland Ave)						
East	40.0	40.0	1600.0	–	–	–	–
West	40.0	40.0	1600.0	–	–	–	–
North	40.0	40.0	1600.0	–	–	–	–
From: West	CTH OO (Northland Ave)						
West	40.0	40.0	1600.0	–	–	–	–
North	40.0	40.0	1600.0	–	–	–	–
East	40.0	40.0	1600.0	–	–	–	–

Movement Data - General

Turn	Mov. ID	Queue Space LV ft	Queue Space HV ft	Vehicle Length LV ft	Vehicle Length HV ft	HVE	P.Deg. Satn	Movement Type	Movement Control
South	WIS 441 NB Off Ramp								
L	3	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	8	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	18	25.00	45.00	17.00	36.00	2.00	–	*Slip*	*Yield*
East	CTH OO (Northland Ave)								
T	6	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	16	25.00	45.00	17.00	36.00	2.00	–	*Slip*	*Yield*
West	CTH OO (Northland Ave)								
L	5	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	2	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–

Movement Type and Control parameters are set automaticly from Approach Control and Lane Type data in the Geometry dialog.

Gap Acceptance

Movement		Critical Gap sec	Follow-up Headway sec	Min. Departures veh/min	Exiting Flow Effect %
South	WIS 441 NB Off Ramp				
	L	4.000	2.800	2.50	0
	T	4.000	2.800	2.50	0
	R	–	–	2.50	0
East	CTH OO (Northland Ave)				
	T	4.000	2.800	2.50	0
	R	4.000	2.800	2.50	0
West	CTH OO (Northland Ave)				
	L	4.200	3.200	2.50	0
	T	4.200	3.200	2.50	0

Model Settings - Options	
General Options	
Level of Service Method	Delay & v/c (HCM 2010)
Level of Service Target	LOS D
Performance Measure	Delay
Percentile Queue	95 %
Hours per Year	480 h
Gap Acceptance	
HV Method for Gap-Acceptance	Include HV Effect for all percentages
Gap-Acceptance Capacity	Traditional M1
HCM Delay Formula	Yes
Downstream Short Lane Model	
Minimum Downstream Utilisation Ratio	20 %
Minimum Downstream Distance	100 ft
Distance for Full Lane Utilisation	660 ft
Calibration Parameter	1.2

Model Settings - Roundabouts	
Roundabout Model Options	
Capacity Model	US HCM 2010
LOS Method	Same as Sign Control
US HCM 2010 Roundabout Model	
Include Origin-Destination Pattern Effects	No
Factor for Parameter A	1.000
Factor for Parameter B	1.000
Other Roundabout Models	
FHWA 2000	No
Use Urban Compact Roundabout	–
HCM 2000	No
NAASRA 1986	No

Model Settings - Cost Parameters	
Vehicle Operating Cost	
Cost Unit	$
Pump Price of Fuel	3.000 $/gal
Fuel Resource Cost Factor	0.700
Ratio of Running Cost to Fuel Cost	3.00
Vehicle Mass	
Light Vehicle Mass	3100.0 lb
Heavy Vehicle Mass	24000.0 lb
Heavy Vehicle Maximum Power	130 kW
Time Cost	
Average Income	23.00 $/h
Time Value Factor	0.400

Demand & Sensitivity	
Analysis Method:	None

Site Properties	
Site (Intersection) Type	Roundabout

Model Name	US HCM (Customary)
Drive Rule	Right-hand side of the road
New Zealand Rule	No
HCM Version	Yes
Units	US Customary

INTERSECTION SUMMARY

WIS 441 NB Ramps with CTH OO (Northland Ave)
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	3922	veh/h	4707	pers/h
Percent Heavy Vehicles	2.0	%		
Degree of Saturation	0.797			
Practical Spare Capacity	6.7	%		
Effective Intersection Capacity	4922	veh/h		
Control Delay (Total)	16.56	veh-h/h	19.87	pers-h/h
Control Delay (Average)	15.2	sec	15.2	sec
Control Delay (Worst Lane)	31.6	sec		
Control Delay (Worst Movement)	31.6	sec	31.6	sec
Geometric Delay (Average)	6.7	sec		
Stop-Line Delay (Average)	15.2	sec		
Intersection Level of Service (LOS)	LOS C			
95% Back of Queue - Vehicles (Worst Lane)	4.8	veh		
95% Back of Queue - Distance (Worst Lane)	123.1	ft		
Total Effective Stops	3087	veh/h	3704	pers/h
Effective Stop Rate	0.79	per veh	0.79	per pers
Proportion Queued	0.48		0.48	
Performance Index	81.6		81.6	
Travel Distance (Total)	1512.2	veh-mi/h	1814.7	pers-mi/h
Travel Distance (Average)	2036	ft	2036	ft
Travel Time (Total)	61.6	veh-h/h	73.9	pers-h/h
Travel Time (Average)	56.5	sec	56.5	sec
Travel Speed	24.6	mph	24.6	mph
Cost (Total)	1190.38	$/h	1190.38	$/h
Fuel Consumption (Total)	80.5	gal/h		
Carbon Dioxide (Total)	762.2	kg/h		
Hydrocarbons (Total)	1.275	kg/h		
Carbon Monoxide (Total)	58.08	kg/h		
NOx (Total)	1.819	kg/h		

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	1,882,611	veh/y	2,259,133	pers/y
Delay	7,947	veh-h/y	9,537	pers-h/y
Effective Stops	1,481,737	veh/y	1,778,084	pers/y
Travel Distance	725,878	veh-mi/y	871,053	pers-mi/y
Travel Time	29,555	veh-h/y	35,466	pers-h/y
Cost	571,382	$/y	571,382	$/y
Fuel Consumption	38,628	gal/y		
Carbon Dioxide	365,870	kg/y		
Hydrocarbons	612	kg/y		
Carbon Monoxide	27,878	kg/y		
NOx	873	kg/y		

MOVEMENT SUMMARY

Site: WIS 441 NB Ramps with CTH OO - PM 3LN

WIS 441 NB Ramps with CTH OO (Northland Ave)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: WIS 441 NB Off Ramp											
3	L	500	3.0	0.551	18.0	LOS C	2.2	55.6	0.76	1.00	22.0
8	T	1	3.0	0.551	19.0	LOS C	2.2	55.6	0.77	0.94	22.8
18	R	868	3.0	0.797	31.6	LOS D	4.8	123.1	0.85	1.12	18.9
Approach		1369	3.0	0.797	26.7	LOS D	4.8	123.1	0.82	1.08	20.0
East: CTH OO (Northland Ave)											
6	T	1126	2.0	0.533	11.6	LOS B	2.5	63.3	0.61	0.82	26.9
16	R	126	2.0	0.113	4.2	LOS A	0.3	8.7	0.23	0.53	30.6
Approach		1253	2.0	0.533	10.9	LOS B	2.5	63.3	0.57	0.79	27.2
West: CTH OO (Northland Ave)											
5	L	168	1.0	0.360	6.9	LOS A	1.3	33.8	0.04	0.85	26.4
2	T	1132	1.0	0.406	7.3	LOS A	1.6	40.9	0.04	0.42	29.3
Approach		1300	1.0	0.406	7.3	LOS A	1.6	40.9	0.04	0.47	28.9
All Vehicles		3922	2.0	0.797	15.2	LOS C	4.8	123.1	0.48	0.79	24.6

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

LANE SUMMARY

Site: WIS 441 NB Ramps with CTH OO - PM 3LN

WIS 441 NB Ramps with CTH OO (Northland Ave)
Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Lane Length ft	SL Type	Cap. Adj. %	Prob. Block. %
South: WIS 441 NB Off Ramp																
Lane 1	235	0	0	235	3.0	482	0.489	89[5]	16.9	LOS C	1.8	46.2	1600	–	0.0	0.0
Lane 2	265	1	0	266	3.0	482	0.551	100	19.0	LOS C	2.2	55.6	1600	–	0.0	0.0
Lane 3	0	0	434	434	3.0	545	0.797	100	31.6	LOS D	4.8	123.1	1600	–	0.0	0.0
Lane 4	0	0	434	434	3.0	545	0.797	100	31.6	LOS D	4.8	123.1	1600	–	0.0	0.0
Approach	500	1	868	1369	3.0		0.797		26.7	LOS D	4.8	123.1				
East: CTH OO (Northland Ave)																
Lane 1	0	410	0	410	2.0	768	0.533	100	12.6	LOS B	2.5	63.3	1600	–	0.0	0.0
Lane 2	0	375	0	375	2.0	768	0.489	92[5]	11.5	LOS B	2.1	54.3	1600	–	0.0	0.0
Lane 3	0	341	0	341	2.0	768	0.444	83[5]	10.6	LOS B	1.8	46.2	1600	–	0.0	0.0
Lane 4	0	0	126	126	2.0	1118	0.113	100	4.2	LOS A	0.3	8.7	1600	–	0.0	0.0
Approach	0	1126	126	1253	2.0		0.533		10.9	LOS B	2.5	63.3				
West: CTH OO (Northland Ave)																
Lane 1	168	231	0	399	1.0	1110	0.360	89[5]	6.9	LOS A	1.3	33.8	1600	–	0.0	0.0
Lane 2	0	450	0	450	1.0	1110	0.406	100	7.5	LOS A	1.6	40.9	1600	–	0.0	0.0
Lane 3	0	450	0	450	1.0	1110	0.406	100	7.5	LOS A	1.6	40.9	1600	–	0.0	0.0
Approach	168	1132	0	1300	1.0		0.406		7.3	LOS A	1.6	40.9				
Intersection				3922	2.0		0.797		15.2	LOS C	4.8	123.1				

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

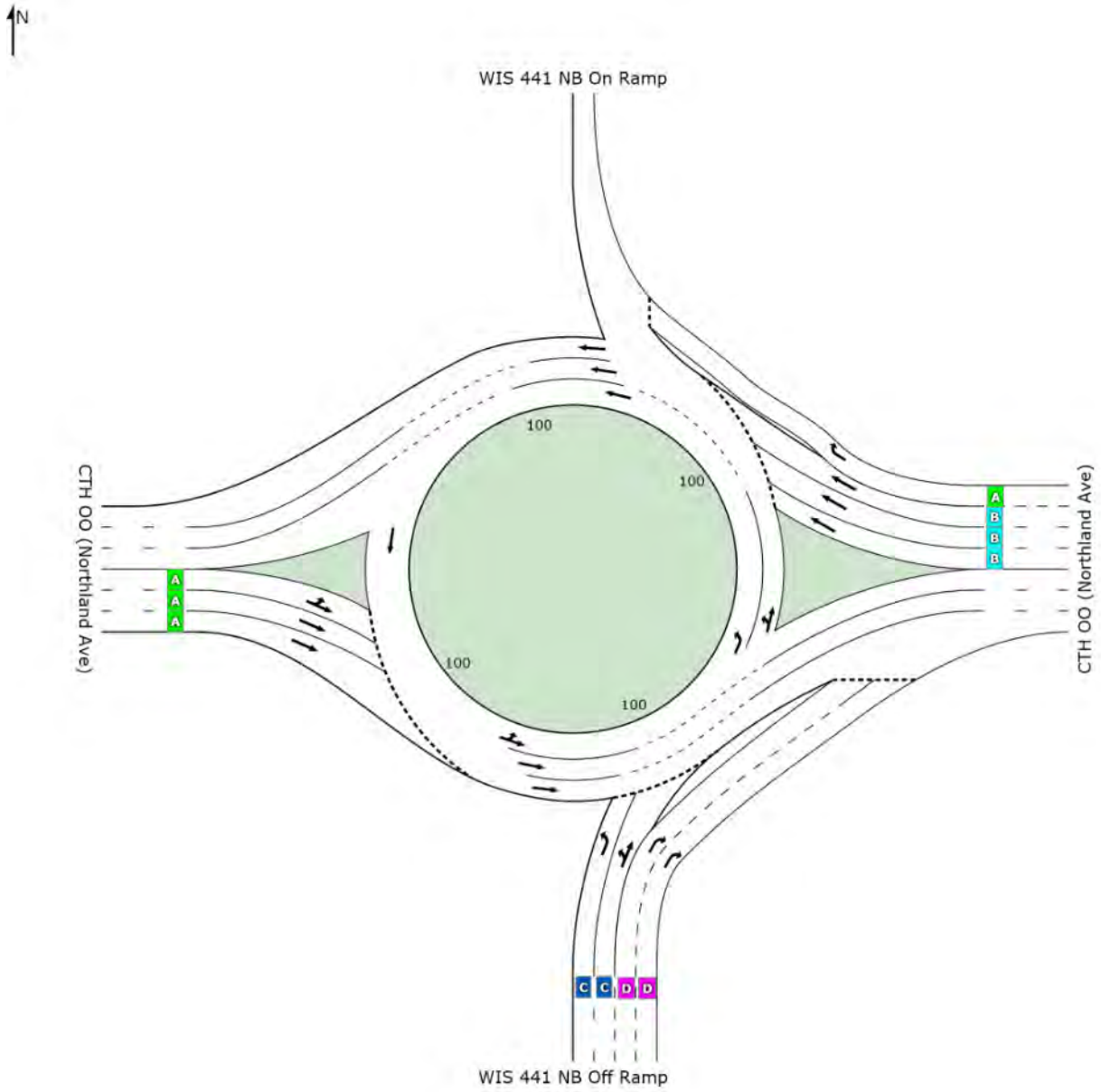
5 Lane underutilisation determined by program

SIDRA INTERSECTION

LEVEL OF SERVICE SUMMARY

Site: WIS 441 NB Ramps with CTH OO - PM 3LN

WIS 441 NB Ramps with CTH OO (Northland Ave)
Roundabout



	South	East	North	West	Intersection
LOS	D	B	NA	A	C

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Model used. Geometric Delay not included.

INPUT REPORT

WIS 441 SB Ramps with CTH OO (Northland Ave)

Intersection Parameters	
Title	WIS 441 SB Ramps with CTH OO (Northland Ave)
Intersection ID	1
Unit Time (for volumes)	60 minutes
Peak Flow Period (for performance)	15 minutes

Geometry - Approach Data

Location	Name	Type	No. of App. Lanes	No. of Exit Lanes	Median Width ft	Extra Bunching %
South	WIS 441 SB On Ramp	One-way Exit	0	2	–	0.0
East	CTH OO (Northland Ave)	Two-way	3	3	–	0.0
North	WIS 441 SB Off Ramp	One-way Approach	4	0	–	0.0
West	CTH OO (Northland Ave)	Two-way	3	3	–	0.0

Geometry - Roundabout Data

Location	Name	Island Diameter ft	Circ. Width ft	Circ. Lanes	Entry Radius ft	Entry Angle degrees	Env. Factor	Entry/Circ. Flow Adjust.
South	WIS 441 SB On Ramp	100.00	30.00	3	65.0	30.0	1.2000	None
East	CTH OO (Northland Ave)	100.00	30.00	1	65.0	30.0	1.2000	None
North	WIS 441 SB Off Ramp	100.00	30.00	3	65.0	30.0	1.2000	None
West	CTH OO (Northland Ave)	100.00	30.00	3	65.0	30.0	1.2000	None

Geometry - Approach Lane Data

Lane Number	Lane Type	Lane Discip.	Basic Satn Flow tcu/h	Utilisation Ratio %	Saturation Speed mph	Capacity Adjustment %
East	CTH OO (Northland Ave)					
App. Lane 1	Normal	LT	1900	36.0	–	0.0
App. Lane 2	Normal	T	1900	33.0	–	0.0
App. Lane 3	Normal	T	1900	30.0	–	0.0
North	WIS 441 SB Off Ramp					
App. Lane 1	Normal	L	1900	36.0	–	0.0
App. Lane 2	Normal	L	1900	33.0	–	0.0
App. Lane 3	Normal	LT	1900	30.0	–	0.0
App. Lane 4	Slip (Giveway/Yield)	R	1900	30.0	–	0.0
West	CTH OO (Northland Ave)					
App. Lane 1	Normal	T	1900	47.0	–	0.0
App. Lane 2	Normal	T	1900	53.0	–	0.0
App. Lane 3	Continuous	R	1900	47.0	–	0.0

Geometry - Approach & Exit Lane Data

Lane Number	Lane Width ft	Lane Length ft	Grade %	SL Type
South	WIS 441 SB On Ramp			
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
East	CTH OO (Northland Ave)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–
North	WIS 441 SB Off Ramp			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
West	CTH OO (Northland Ave)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–

Lanes are numbered from left to right in the direction of travel.

Geometry - Movement Definitions

To Approach	Movement Banned	Turn Desig.
From: East	CTH OO (Northland Ave)	
East	No	L
South	No	L
West	No	T
From: North	WIS 441 SB Off Ramp	
East	No	L
South	No	T
West	No	R
From: West	CTH OO (Northland Ave)	
West	No	T
East	No	T
South	No	R

HCM 2010 Roundabout Model Calibration

Location	Name	HCM 2010 Single Lane		HCM 2010 Multi-Lane Dominant Lane		HCM 2010 Multi-Lane Subdominant Lane	
		Para. A	Para. B	Para. A	Para. B	Para. A	Para. B
South	WIS 441 SB On Ramp	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
East	CTH OO (Northland Ave)	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
North	WIS 441 SB Off Ramp	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
West	CTH OO (Northland Ave)	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722

Volumes

To Approach	Total veh	HV %	Peak Flow Factor %	Vehicle Occupancy pers/veh	Flow Scale %	Growth Rate %/year
From: East	CTH OO (Northland Ave)					
East	5.0	1.00	94.0	1.20	100.00	2.00
South	620.0	1.00	94.0	1.20	100.00	2.00
West	1915.0	1.00	94.0	1.20	100.00	2.00
From: North	WIS 441 SB Off Ramp					
East	130.0	8.00	94.0	1.20	100.00	2.00
South	1.0	8.00	94.0	1.20	100.00	2.00
West	145.0	8.00	94.0	1.20	100.00	2.00
From: West	CTH OO (Northland Ave)					
West	5.0	4.00	94.0	1.20	100.00	2.00
East	350.0	4.00	94.0	1.20	100.00	2.00
South	505.0	4.00	94.0	1.20	100.00	2.00

Path Data

To Approach	App. Cruise Speed mph	Exit Cruise Speed mph	App. Trav. Distance ft	Negn Speed mph	Negn Distance ft	Downst. Distance ft	Negn Radius ft
From: East	CTH OO (Northland Ave)						
East	40.0	40.0	1600.0	–	–	–	–
South	40.0	40.0	1600.0	–	–	–	–
West	40.0	40.0	1600.0	–	–	–	–
From: North	WIS 441 SB Off Ramp						
East	40.0	40.0	1600.0	–	–	–	–
South	40.0	40.0	1600.0	–	–	–	–
West	40.0	40.0	1600.0	–	–	–	–
From: West	CTH OO (Northland Ave)						
West	40.0	40.0	1600.0	–	–	–	–
East	40.0	40.0	1600.0	–	–	–	–
South	40.0	40.0	1600.0	–	–	–	–

Movement Data - General

Turn	Mov. ID	Queue Space LV ft	Queue Space HV ft	Vehicle Length LV ft	Vehicle Length HV ft	HVE	P.Deg. Satn	Movement Type	Movement Control
East	CTH OO (Northland Ave)								
L	1	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	6	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
North	WIS 441 SB Off Ramp								
L	7	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	4	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	14	25.00	45.00	17.00	36.00	2.00	–	*Slip*	*Yield*
West	CTH OO (Northland Ave)								
T	2	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	12	25.00	45.00	17.00	36.00	2.00	–	*Cont.*	–

Movement Type and Control parameters are set automaticly from Approach Control and Lane Type data in the Geometry dialog.

Gap Acceptance

Movement		Critical Gap sec	Follow-up Headway sec	Min. Departures veh/min	Exiting Flow Effect %
East	CTH OO (Northland Ave)				
	L	4.200	3.200	2.50	0
	T	4.200	3.200	2.50	0
North	WIS 441 SB Off Ramp				
	L	4.000	2.800	2.50	0
	T	4.000	2.800	2.50	0
	R	–	–	2.50	0
West	CTH OO (Northland Ave)				
	T	4.000	2.800	2.50	0

Model Settings - Options	
General Options	
Level of Service Method	Delay & v/c (HCM 2010)
Level of Service Target	LOS D
Performance Measure	Delay
Percentile Queue	95 %
Hours per Year	480 h
Gap Acceptance	
HV Method for Gap-Acceptance	Include HV Effect for all percentages
Gap-Acceptance Capacity	Traditional M1
HCM Delay Formula	Yes
Downstream Short Lane Model	
Minimum Downstream Utilisation Ratio	20 %
Minimum Downstream Distance	100 ft
Distance for Full Lane Utilisation	660 ft
Calibration Parameter	1.2

Model Settings - Roundabouts	
Roundabout Model Options	
Capacity Model	US HCM 2010
LOS Method	Same as Sign Control
US HCM 2010 Roundabout Model	
Include Origin-Destination Pattern Effects	No
Factor for Parameter A	1.000
Factor for Parameter B	1.000
Other Roundabout Models	
FHWA 2000	No
Use Urban Compact Roundabout	–
HCM 2000	No
NAASRA 1986	No

Model Settings - Cost Parameters	
Vehicle Operating Cost	
Cost Unit	$
Pump Price of Fuel	3.000 $/gal
Fuel Resource Cost Factor	0.700
Ratio of Running Cost to Fuel Cost	3.00
Vehicle Mass	
Light Vehicle Mass	3100.0 lb
Heavy Vehicle Mass	24000.0 lb
Heavy Vehicle Maximum Power	130 kW
Time Cost	
Average Income	23.00 $/h
Time Value Factor	0.400

Demand & Sensitivity	
Analysis Method:	None

Site Properties	
Site (Intersection) Type	Roundabout

Model Name	US HCM (Customary)
Drive Rule	Right-hand side of the road
New Zealand Rule	No
HCM Version	Yes
Units	US Customary

INTERSECTION SUMMARY

WIS 441 SB Ramps with CTH OO (Northland Ave)
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	3911	veh/h	4693	pers/h
Percent Heavy Vehicles	2.2	%		
Degree of Saturation	0.886			
Practical Spare Capacity	-55.6	%		
Effective Intersection Capacity	2042	veh/h		
Control Delay (Total)	19.10	veh-h/h	22.92	pers-h/h
Control Delay (Average)	17.6	sec	17.6	sec
Control Delay (Worst Lane)	32.9	sec		
Control Delay (Worst Movement)	32.9	sec	32.9	sec
Geometric Delay (Average)	6.8	sec		
Stop-Line Delay (Average)	17.6	sec		
Intersection Level of Service (LOS)	LOS C			
95% Back of Queue - Vehicles (Worst Lane)	16.8	veh		
95% Back of Queue - Distance (Worst Lane)	423.2	ft		
Total Effective Stops	2111	veh/h	2533	pers/h
Effective Stop Rate	0.54	per veh	0.54	per pers
Proportion Queued	0.22		0.22	
Performance Index	84.2		84.2	
Travel Distance (Total)	1512.6	veh-mi/h	1815.2	pers-mi/h
Travel Distance (Average)	2042	ft	2042	ft
Travel Time (Total)	64.2	veh-h/h	77.1	pers-h/h
Travel Time (Average)	59.1	sec	59.1	sec
Travel Speed	23.5	mph	23.5	mph
Cost (Total)	1210.39	$/h	1210.39	$/h
Fuel Consumption (Total)	79.1	gal/h		
Carbon Dioxide (Total)	749.5	kg/h		
Hydrocarbons (Total)	1.242	kg/h		
Carbon Monoxide (Total)	53.74	kg/h		
NOx (Total)	1.730	kg/h		

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	1,877,106	veh/y	2,252,528	pers/y
Delay	9,169	veh-h/y	11,002	pers-h/y
Effective Stops	1,013,314	veh/y	1,215,977	pers/y
Travel Distance	726,061	veh-mi/y	871,273	pers-mi/y
Travel Time	30,837	veh-h/y	37,004	pers-h/y
Cost	580,985	$/y	580,985	$/y
Fuel Consumption	37,980	gal/y		
Carbon Dioxide	359,764	kg/y		
Hydrocarbons	596	kg/y		
Carbon Monoxide	25,797	kg/y		
NOx	831	kg/y		

MOVEMENT SUMMARY

Site: WIS 441 SB Ramps with CTH OO - AM 3LN

WIS 441 SB Ramps with CTH OO (Northland Ave)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
East: CTH OO (Northland Ave)											
1	L	665	1.0	0.886	26.2	LOS D	16.8	423.2	0.21	0.68	19.7
6	T	2037	1.0	0.886	18.9	LOS C	16.8	423.2	0.13	0.40	23.5
Approach		2702	1.0	0.886	20.7	LOS C	16.8	423.2	0.15	0.47	22.4
North: WIS 441 SB Off Ramp											
7	L	138	8.0	0.307	31.6	LOS D	0.8	20.4	0.89	1.00	18.3
4	T	1	8.0	0.256	30.3	LOS D	0.6	16.7	0.89	0.96	19.1
14	R	154	8.0	1.915	32.9	LOS F	1.8	49.0	0.88	1.04	18.6
Approach		294	8.0	0.575	32.3	LOS D	1.8	49.0	0.89	1.02	18.5
West: CTH OO (Northland Ave)											
2	T	378	4.0	0.293	8.7	LOS A	0.9	24.0	0.55	0.75	28.5
12	R	537	4.0	0.730	0.1	X	X	X	X	0.50	34.0
Approach		915	4.0	0.343	3.6	LOS A	0.9	24.0	0.23	0.60	31.5
All Vehicles		3911	2.2	0.886	17.6	LOS C	16.8	423.2	0.22	0.54	23.5

X: Not applicable for Continuous movement.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

LANE SUMMARY

Site: WIS 441 SB Ramps with CTH OO - AM 3LN

WIS 441 SB Ramps with CTH OO (Northland Ave)
Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Lane Length ft	SL Type	Cap. Adj. %	Prob. Block. %
East: CTH OO (Northland Ave)																
Lane 1	665	318	0	983	1.0	1109	0.886	100	26.2	LOS D	16.8	423.2	1600	–	0.0	0.0
Lane 2	0	901	0	901	1.0	1109	0.812	92[5]	19.5	LOS C	9.8	246.3	1600	–	0.0	0.0
Lane 3	0	819	0	819	1.0	1109	0.738	83[5]	15.5	LOS C	6.5	164.0	1600	–	0.0	0.0
Approach	665	2037	0	2702	1.0		0.886		20.7	LOS C	16.8	423.2				
North: WIS 441 SB Off Ramp																
Lane 1	51	0	0	51	8.0	165	0.307	100	32.7	LOS D	0.8	20.4	1600	–	0.0	0.0
Lane 2	46	0	0	46	8.0	165	0.281	92[5]	31.5	LOS D	0.7	18.5	1600	–	0.0	0.0
Lane 3	41	1	0	42	8.0	165	0.256	83[5]	30.3	LOS D	0.6	16.7	1600	–	0.0	0.0
Lane 4	0	0	154	154	8.0	268	0.575	100	32.9	LOS D	1.8	49.0	1600	–	0.0	0.0
Approach	138	1	154	294	8.0		0.575		32.3	LOS D	1.8	49.0				
West: CTH OO (Northland Ave)																
Lane 1	0	178	0	178	4.0	683	0.260	89[5]	8.4	LOS A	0.8	20.6	1600	–	0.0	0.0
Lane 2	0	200	0	200	4.0	683	0.293	100	8.9	LOS A	0.9	24.0	1600	–	0.0	0.0
Lane 3	0	0	537	537	4.0	1566	0.343	100	0.1	X	X	X	1600	–	0.0	X
Approach	0	378	537	915	4.0		0.343		3.6	LOS A	0.9	24.0				
Intersection				3911	2.2		0.886		17.6	LOS C	16.8	423.2				

X: Not applicable for Continuous lane.

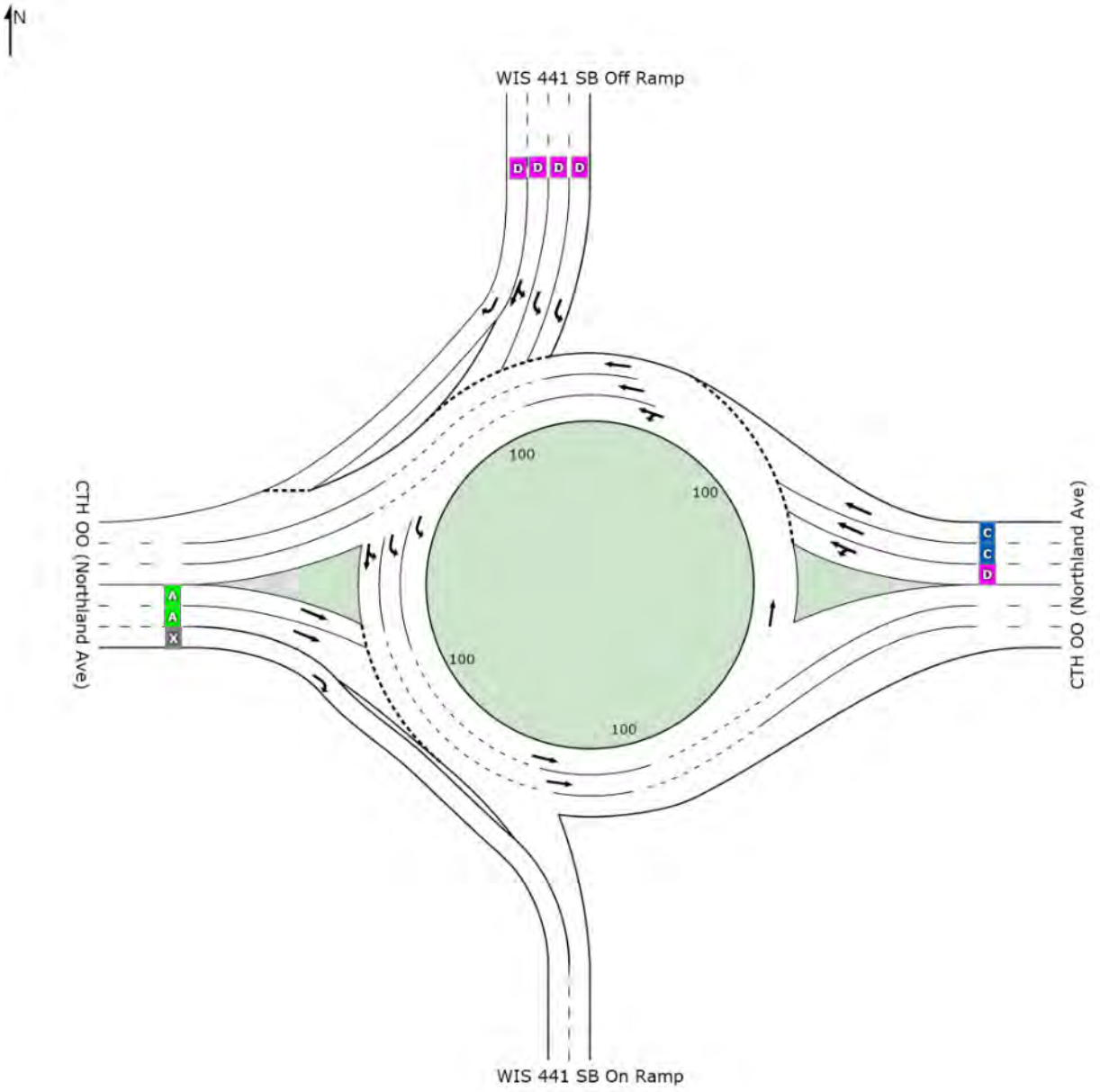
Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

5 Lane underutilisation determined by program

LEVEL OF SERVICE SUMMARY

Site: WIS 441 SB Ramps with CTH OO - AM 3LN

WIS 441 SB Ramps with CTH OO (Northland Ave)
Roundabout



	South	East	North	West	Intersection
LOS	NA	C	D	A	C

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Model used. Geometric Delay not included.

INPUT REPORT

WIS 441 SB Ramps with CTH OO (Northland Ave)

Intersection Parameters	
Title	WIS 441 SB Ramps with CTH OO (Northland Ave)
Intersection ID	1
Unit Time (for volumes)	60 minutes
Peak Flow Period (for performance)	15 minutes

Geometry - Approach Data

Location	Name	Type	No. of App. Lanes	No. of Exit Lanes	Median Width ft	Extra Bunching %
South	WIS 441 SB On Ramp	One-way Exit	0	2	–	0.0
East	CTH OO (Northland Ave)	Two-way	3	3	–	0.0
North	WIS 441 SB Off Ramp	One-way Approach	4	0	–	0.0
West	CTH OO (Northland Ave)	Two-way	3	3	–	0.0

Geometry - Roundabout Data

Location	Name	Island Diameter ft	Circ. Width ft	Circ. Lanes	Entry Radius ft	Entry Angle degrees	Env. Factor	Entry/Circ. Flow Adjust.
South	WIS 441 SB On Ramp	100.00	30.00	3	65.0	30.0	1.2000	None
East	CTH OO (Northland Ave)	100.00	30.00	1	65.0	30.0	1.2000	None
North	WIS 441 SB Off Ramp	100.00	30.00	3	65.0	30.0	1.2000	None
West	CTH OO (Northland Ave)	100.00	30.00	3	65.0	30.0	1.2000	None

Geometry - Approach Lane Data

Lane Number	Lane Type	Lane Discip.	Basic Satn Flow tcu/h	Utilisation Ratio %	Saturation Speed mph	Capacity Adjustment %
East	CTH OO (Northland Ave)					
App. Lane 1	Normal	LT	1900	36.0	–	0.0
App. Lane 2	Normal	T	1900	33.0	–	0.0
App. Lane 3	Normal	T	1900	30.0	–	0.0
North	WIS 441 SB Off Ramp					
App. Lane 1	Normal	L	1900	36.0	–	0.0
App. Lane 2	Normal	L	1900	33.0	–	0.0
App. Lane 3	Normal	LT	1900	30.0	–	0.0
App. Lane 4	Slip (Giveway/Yield)	R	1900	30.0	–	0.0
West	CTH OO (Northland Ave)					
App. Lane 1	Normal	T	1900	47.0	–	0.0
App. Lane 2	Normal	T	1900	53.0	–	0.0
App. Lane 3	Continuous	R	1900	47.0	–	0.0

Geometry - Approach & Exit Lane Data

Lane Number	Lane Width ft	Lane Length ft	Grade %	SL Type
South	WIS 441 SB On Ramp			
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
East	CTH OO (Northland Ave)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–
North	WIS 441 SB Off Ramp			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
West	CTH OO (Northland Ave)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–

Lanes are numbered from left to right in the direction of travel.

Geometry - Movement Definitions

To Approach	Movement Banned	Turn Desig.
From: East	CTH OO (Northland Ave)	
East	No	L
South	No	L
West	No	T
From: North	WIS 441 SB Off Ramp	
East	No	L
South	No	T
West	No	R
From: West	CTH OO (Northland Ave)	
West	No	T
East	No	T
South	No	R

HCM 2010 Roundabout Model Calibration

Location	Name	HCM 2010 Single Lane		HCM 2010 Multi-Lane Dominant Lane		HCM 2010 Multi-Lane Subdominant Lane	
		Para. A	Para. B	Para. A	Para. B	Para. A	Para. B
South	WIS 441 SB On Ramp	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
East	CTH OO (Northland Ave)	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
North	WIS 441 SB Off Ramp	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
West	CTH OO (Northland Ave)	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722

Volumes

To Approach	Total veh	HV %	Peak Flow Factor %	Vehicle Occupancy pers/veh	Flow Scale %	Growth Rate %/year
From: East	CTH OO (Northland Ave)					
East	5.0	2.00	97.0	1.20	100.00	2.00
South	485.0	2.00	97.0	1.20	100.00	2.00
West	1055.0	2.00	97.0	1.20	100.00	2.00
From: North	WIS 441 SB Off Ramp					
East	90.0	6.00	97.0	1.20	100.00	2.00
South	1.0	6.00	97.0	1.20	100.00	2.00
West	30.0	6.00	97.0	1.20	100.00	2.00
From: West	CTH OO (Northland Ave)					
West	5.0	1.00	97.0	1.20	100.00	2.00
East	1140.0	1.00	97.0	1.20	100.00	2.00
South	950.0	1.00	97.0	1.20	100.00	2.00

Path Data

To Approach	App. Cruise Speed mph	Exit Cruise Speed mph	App. Trav. Distance ft	Negn Speed mph	Negn Distance ft	Downst. Distance ft	Negn Radius ft
From: East	CTH OO (Northland Ave)						
East	40.0	40.0	1600.0	–	–	–	–
South	40.0	40.0	1600.0	–	–	–	–
West	40.0	40.0	1600.0	–	–	–	–
From: North	WIS 441 SB Off Ramp						
East	40.0	40.0	1600.0	–	–	–	–
South	40.0	40.0	1600.0	–	–	–	–
West	40.0	40.0	1600.0	–	–	–	–
From: West	CTH OO (Northland Ave)						
West	40.0	40.0	1600.0	–	–	–	–
East	40.0	40.0	1600.0	–	–	–	–
South	40.0	40.0	1600.0	–	–	–	–

Movement Data - General

Turn	Mov. ID	Queue Space LV ft	Queue Space HV ft	Vehicle Length LV ft	Vehicle Length HV ft	HVE	P.Deg. Satn	Movement Type	Movement Control
East	CTH OO (Northland Ave)								
L	1	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	6	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
North	WIS 441 SB Off Ramp								
L	7	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	4	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	14	25.00	45.00	17.00	36.00	2.00	–	*Slip*	*Yield*
West	CTH OO (Northland Ave)								
T	2	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	12	25.00	45.00	17.00	36.00	2.00	–	*Cont.*	–

Movement Type and Control parameters are set automaticly from Approach Control and Lane Type data in the Geometry dialog.

Gap Acceptance

Movement		Critical Gap sec	Follow-up Headway sec	Min. Departures veh/min	Exiting Flow Effect %
East	CTH OO (Northland Ave)				
	L	4.200	3.200	2.50	0
	T	4.200	2.800	2.50	0
North	WIS 441 SB Off Ramp				
	L	4.000	2.800	2.50	0
	T	4.000	2.800	2.50	0
	R	–	–	2.50	0
West	CTH OO (Northland Ave)				
	T	4.000	2.800	2.50	0

Model Settings - Options	
General Options	
Level of Service Method	Delay & v/c (HCM 2010)
Level of Service Target	LOS D
Performance Measure	Delay
Percentile Queue	95 %
Hours per Year	480 h
Gap Acceptance	
HV Method for Gap-Acceptance	Include HV Effect for all percentages
Gap-Acceptance Capacity	Traditional M1
HCM Delay Formula	Yes
Downstream Short Lane Model	
Minimum Downstream Utilisation Ratio	20 %
Minimum Downstream Distance	100 ft
Distance for Full Lane Utilisation	660 ft
Calibration Parameter	1.2

Model Settings - Roundabouts	
Roundabout Model Options	
Capacity Model	US HCM 2010
LOS Method	Same as Sign Control
US HCM 2010 Roundabout Model	
Include Origin-Destination Pattern Effects	No
Factor for Parameter A	1.000
Factor for Parameter B	1.000
Other Roundabout Models	
FHWA 2000	No
Use Urban Compact Roundabout	–
HCM 2000	No
NAASRA 1986	No

Model Settings - Cost Parameters	
Vehicle Operating Cost	
Cost Unit	$
Pump Price of Fuel	3.000 $/gal
Fuel Resource Cost Factor	0.700
Ratio of Running Cost to Fuel Cost	3.00
Vehicle Mass	
Light Vehicle Mass	3100.0 lb
Heavy Vehicle Mass	24000.0 lb
Heavy Vehicle Maximum Power	130 kW
Time Cost	
Average Income	23.00 $/h
Time Value Factor	0.400

Demand & Sensitivity	
Analysis Method:	None

Site Properties	
Site (Intersection) Type	Roundabout

Model Name	US HCM (Customary)
Drive Rule	Right-hand side of the road
New Zealand Rule	No
HCM Version	Yes
Units	US Customary

INTERSECTION SUMMARY

WIS 441 SB Ramps with CTH OO (Northland Ave)
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	3877	veh/h	4653	pers/h
Percent Heavy Vehicles	1.6	%		
Degree of Saturation	0.766			
Practical Spare Capacity	-24.8	%		
Effective Intersection Capacity	2975	veh/h		
Control Delay (Total)	9.99	veh-h/h	11.99	pers-h/h
Control Delay (Average)	9.3	sec	9.3	sec
Control Delay (Worst Lane)	21.1	sec		
Control Delay (Worst Movement)	19.0	sec	19.0	sec
Geometric Delay (Average)	6.5	sec		
Stop-Line Delay (Average)	9.3	sec		
Intersection Level of Service (LOS)	LOS A			
95% Back of Queue - Vehicles (Worst Lane)	5.8	veh		
95% Back of Queue - Distance (Worst Lane)	146.9	ft		
Total Effective Stops	2553	veh/h	3064	pers/h
Effective Stop Rate	0.66	per veh	0.66	per pers
Proportion Queued	0.27		0.27	
Performance Index	68.5		68.5	
Travel Distance (Total)	1492.8	veh-mi/h	1791.3	pers-mi/h
Travel Distance (Average)	2033	ft	2033	ft
Travel Time (Total)	54.2	veh-h/h	65.1	pers-h/h
Travel Time (Average)	50.4	sec	50.4	sec
Travel Speed	27.5	mph	27.5	mph
Cost (Total)	1068.92	$/h	1068.92	$/h
Fuel Consumption (Total)	74.3	gal/h		
Carbon Dioxide (Total)	703.2	kg/h		
Hydrocarbons (Total)	1.159	kg/h		
Carbon Monoxide (Total)	52.97	kg/h		
NOx (Total)	1.685	kg/h		

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	1,861,113	veh/y	2,233,336	pers/y
Delay	4,796	veh-h/y	5,755	pers-h/y
Effective Stops	1,225,662	veh/y	1,470,794	pers/y
Travel Distance	716,531	veh-mi/y	859,838	pers-mi/y
Travel Time	26,035	veh-h/y	31,242	pers-h/y
Cost	513,082	$/y	513,082	$/y
Fuel Consumption	35,643	gal/y		
Carbon Dioxide	337,522	kg/y		
Hydrocarbons	556	kg/y		
Carbon Monoxide	25,427	kg/y		
NOx	809	kg/y		

MOVEMENT SUMMARY

Site: WIS 441 SB Ramps with CTH OO - PM 3LN

WIS 441 SB Ramps with CTH OO (Northland Ave)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
East: CTH OO (Northland Ave)											
1	L	505	2.0	0.482	8.7	LOS A	2.2	55.6	0.05	0.70	25.6
6	T	1088	2.0	0.482	7.1	LOS A	2.3	57.8	0.05	0.42	29.5
Approach		1593	2.0	0.482	7.6	LOS A	2.3	57.8	0.05	0.51	28.0
North: WIS 441 SB Off Ramp											
7	L	93	6.0	0.091	10.9	LOS B	0.2	6.2	0.71	0.92	24.6
4	T	1	6.0	0.076	10.8	LOS B	0.2	5.1	0.71	0.81	26.5
14	R	31	6.0	0.190	7.3	LOS A	0.2	3.9	0.57	0.79	28.6
Approach		125	6.0	0.091	10.0	LOS B	0.2	6.2	0.67	0.88	25.4
West: CTH OO (Northland Ave)											
2	T	1180	1.0	0.766	19.0	LOS C	5.8	146.9	0.76	0.97	23.5
12	R	979	1.0	1.303	0.2	X	X	X	X	0.49	33.9
Approach		2160	1.0	0.766	10.5	LOS B	5.8	146.9	0.42	0.76	27.3
All Vehicles		3877	1.6	0.766	9.3	LOS A	5.8	146.9	0.27	0.66	27.5

X: Not applicable for Continuous movement.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

LANE SUMMARY

Site: WIS 441 SB Ramps with CTH OO - PM 3LN

WIS 441 SB Ramps with CTH OO (Northland Ave)
Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Lane Length ft	SL Type	Cap. Adj. %	Prob. Block. %
East: CTH OO (Northland Ave)																
Lane 1	505	28	0	533	2.0	1106	0.482	100	8.7	LOS A	2.2	55.6	1600	–	0.0	0.0
Lane 2	0	555	0	555	2.0	1255	0.442	92[5]	7.3	LOS A	2.3	57.8	1600	–	0.0	0.0
Lane 3	0	504	0	504	2.0	1255	0.402	83[5]	6.8	LOS A	1.9	49.1	1600	–	0.0	0.0
Approach	505	1088	0	1593	2.0		0.482		7.6	LOS A	2.3	57.8				
North: WIS 441 SB Off Ramp																
Lane 1	34	0	0	34	6.0	374	0.091	100	11.1	LOS B	0.2	6.2	1600	–	0.0	0.0
Lane 2	31	0	0	31	6.0	374	0.084	92[5]	10.9	LOS B	0.2	5.6	1600	–	0.0	0.0
Lane 3	27	1	0	28	6.0	375	0.076	83[5]	10.8	LOS B	0.2	5.1	1600	–	0.0	0.0
Lane 4	0	0	31	31	6.0	543	0.057	100	7.3	LOS A	0.2	3.9	1600	–	0.0	0.0
Approach	93	1	31	125	6.0		0.091		10.0	LOS B	0.2	6.2				
West: CTH OO (Northland Ave)																
Lane 1	0	555	0	555	1.0	817	0.679	89[5]	16.6	LOS C	4.3	107.5	1600	–	0.0	0.0
Lane 2	0	626	0	626	1.0	817	0.766	100	21.1	LOS C	5.8	146.9	1600	–	0.0	0.0
Lane 3	0	0	979	979	1.0	1599	0.612	100	0.2	X	X	X	1600	–	0.0	X
Approach	0	1180	979	2160	1.0		0.766		10.5	LOS B	5.8	146.9				
Intersection				3877	1.6		0.766		9.3	LOS A	5.8	146.9				

X: Not applicable for Continuous lane.

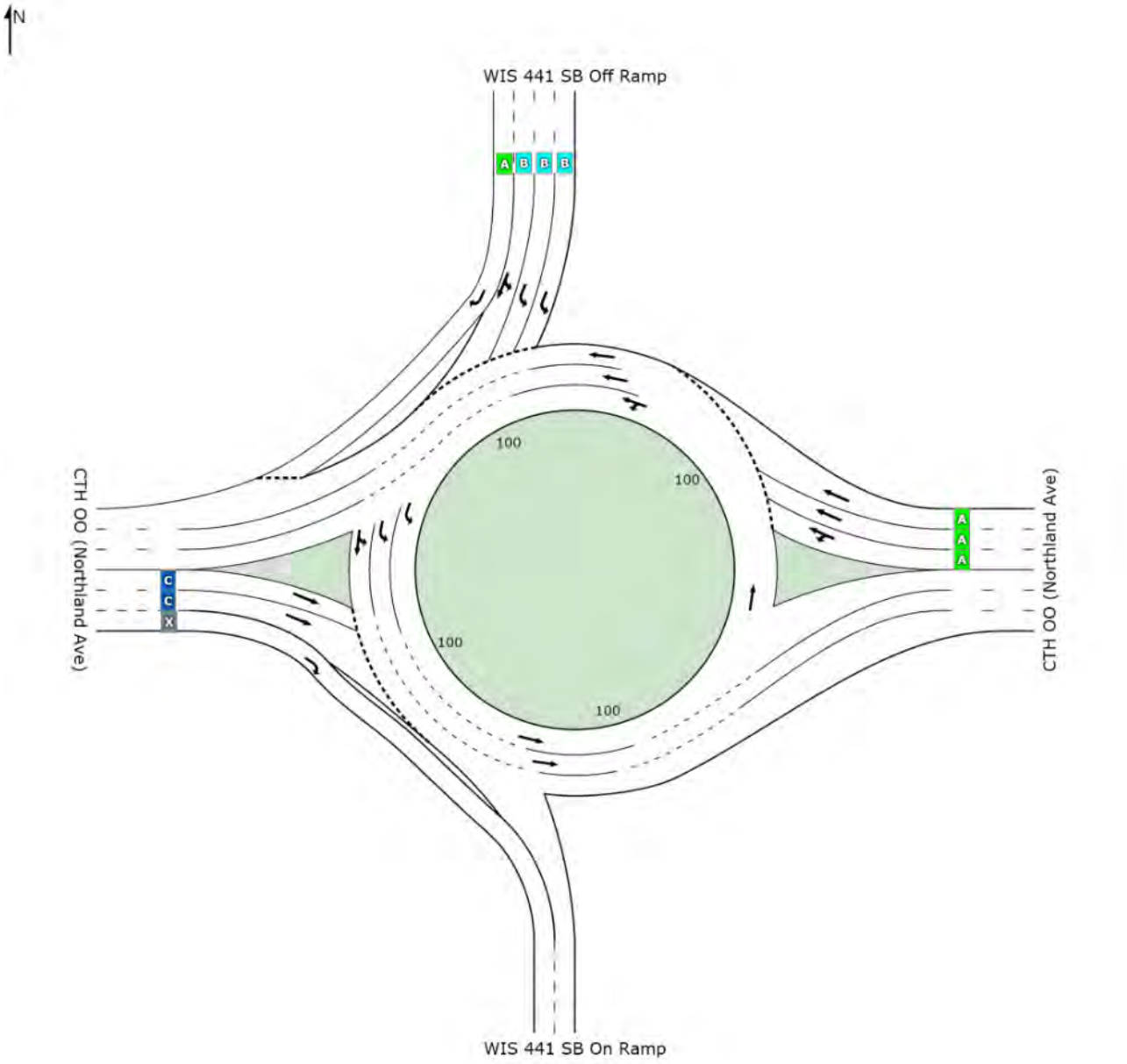
Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

5 Lane underutilisation determined by program

LEVEL OF SERVICE SUMMARY

Site: WIS 441 SB Ramps with CTH OO - PM 3LN

WIS 441 SB Ramps with CTH OO (Northland Ave)
Roundabout



	South	East	North	West	Intersection
LOS	NA	A	B	B	A

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Model used. Geometric Delay not included.

US 41 with WIS 47

INPUT REPORT

US 41 NB Ramps with WIS 47 (Richmond Street)

Intersection Parameters	
Title	US 41 NB Ramps with WIS 47 (Richmond Street)
Intersection ID	1
Unit Time (for volumes)	60 minutes
Peak Flow Period (for performance)	15 minutes

Geometry - Approach Data

Location	Name	Type	No. of App. Lanes	No. of Exit Lanes	Median Width ft	Extra Bunching %
South	WIS 47 (Richmond St)	Two-way	4	2	–	0.0
East	US 41 NB On Ramp	One-way Exit	0	2	–	0.0
North	WIS 47 (Richmond St)	Two-way	3	3	–	0.0
West	US 41 NB Off Ramp	One-way Approach	5	0	–	0.0

Geometry - Roundabout Data

Location	Name	Island Diameter ft	Circ. Width ft	Circ. Lanes	Entry Radius ft	Entry Angle degrees	Env. Factor	Entry/Circ. Flow Adjust.
South	WIS 47 (Richmond St)	100.00	30.00	3	65.0	30.0	1.2000	None
East	US 41 NB On Ramp	100.00	30.00	3	65.0	30.0	1.2000	None
North	WIS 47 (Richmond St)	100.00	30.00	1	65.0	30.0	1.2000	None
West	US 41 NB Off Ramp	100.00	30.00	3	65.0	30.0	1.2000	None

Geometry - Approach Lane Data

Lane Number	Lane Type	Lane Discip.	Basic Satn Flow tcu/h	Utilisation Ratio %	Saturation Speed mph	Capacity Adjustment %
South	WIS 47 (Richmond St)					
App. Lane 1	Normal	T	1900	36.0	–	0.0
App. Lane 2	Normal	T	1900	33.0	–	0.0
App. Lane 3	Normal	T	1900	30.0	–	0.0
App. Lane 4	Continuous	R	1900	47.0	–	0.0
North	WIS 47 (Richmond St)					
App. Lane 1	Normal	LT	1900	47.0	–	0.0
App. Lane 2	Normal	T	1900	53.0	–	0.0
App. Lane 3	Normal	T	1900	53.0	–	0.0
West	US 41 NB Off Ramp					
App. Lane 1	Normal	L	1900	36.0	–	0.0
App. Lane 2	Normal	L	1900	33.0	–	0.0
App. Lane 3	Normal	LT	1900	30.0	–	0.0
App. Lane 4	Slip (Giveway/Yield)	R	1900	–	–	0.0
App. Lane 5	Slip (Giveway/Yield)	R	1900	–	–	0.0

Geometry - Approach & Exit Lane Data

Lane Number	Lane Width ft	Lane Length ft	Grade %	SL Type
South	WIS 47 (Richmond St)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
East	US 41 NB On Ramp			
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
North	WIS 47 (Richmond St)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–
West	US 41 NB Off Ramp			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
App. Lane 5	13.00	1600.0	0.00	–

Lanes are numbered from left to right in the direction of travel.

Geometry - Movement Definitions

To Approach	Movement Banned	Turn Desig.
From: South	WIS 47 (Richmond St)	
South	No	T
North	No	T
East	No	R
From: North	WIS 47 (Richmond St)	
North	No	T
East	No	L
South	No	T
From: West	US 41 NB Off Ramp	
North	No	L
East	No	T
South	No	R

HCM 2010 Roundabout Model Calibration

Location	Name	HCM 2010 Single Lane		HCM 2010 Multi-Lane Dominant Lane		HCM 2010 Multi-Lane Subdominant Lane	
		Para. A	Para. B	Para. A	Para. B	Para. A	Para. B
South	WIS 47 (Richmond St)	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
East	US 41 NB On Ramp	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
North	WIS 47 (Richmond St)	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
West	US 41 NB Off Ramp	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722

Volumes

To Approach	Total veh	HV %	Peak Flow Factor %	Vehicle Occupancy pers/veh	Flow Scale %	Growth Rate %/year
From: South	WIS 47 (Richmond St)					
South	5.0	2.00	90.0	1.20	100.00	2.00
North	710.0	2.00	90.0	1.20	100.00	2.00
East	890.0	2.00	90.0	1.20	100.00	2.00
From: North	WIS 47 (Richmond St)					
North	5.0	1.00	90.0	1.20	100.00	2.00
East	335.0	1.00	90.0	1.20	100.00	2.00
South	1400.0	1.00	90.0	1.20	100.00	2.00
From: West	US 41 NB Off Ramp					
North	430.0	1.00	90.0	1.20	100.00	2.00
East	1.0	1.00	90.0	1.20	100.00	2.00
South	175.0	1.00	90.0	1.20	100.00	2.00

Path Data

To Approach	App. Cruise Speed mph	Exit Cruise Speed mph	App. Trav. Distance ft	Negn Speed mph	Negn Distance ft	Downst. Distance ft	Negn Radius ft
From: South	WIS 47 (Richmond St)						
South	40.0	40.0	1600.0	–	–	–	–
North	40.0	40.0	1600.0	–	–	–	–
East	40.0	40.0	1600.0	–	–	–	–
From: North	WIS 47 (Richmond St)						
North	40.0	40.0	1600.0	–	–	–	–
East	40.0	40.0	1600.0	–	–	–	–
South	40.0	40.0	1600.0	–	–	–	–
From: West	US 41 NB Off Ramp						
North	40.0	40.0	1600.0	–	–	–	–
East	40.0	40.0	1600.0	–	–	–	–
South	40.0	40.0	1600.0	–	–	–	–

Movement Data - General

Turn	Mov. ID	Queue Space LV ft	Queue Space HV ft	Vehicle Length LV ft	Vehicle Length HV ft	HVE	P.Deg. Satn	Movement Type	Movement Control
South	WIS 47 (Richmond St)								
T	8	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	18	25.00	45.00	17.00	36.00	2.00	–	*Cont.*	–
North	WIS 47 (Richmond St)								
L	7	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	4	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
West	US 41 NB Off Ramp								
L	5	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	2	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	12	25.00	45.00	17.00	36.00	2.00	–	*Slip*	*Yield*

Movement Type and Control parameters are set automaticly from Approach Control and Lane Type data in the Geometry dialog.

Gap Acceptance

Movement		Critical Gap sec	Follow-up Headway sec	Min. Departures veh/min	Exiting Flow Effect %
South	WIS 47 (Richmond St)				
	T	4.000	2.800	2.50	0
North	WIS 47 (Richmond St)				
	L	4.200	3.200	2.50	0
	T	4.200	3.200	2.50	0
West	US 41 NB Off Ramp				
	L	4.000	2.800	2.50	0
	T	4.000	2.800	2.50	0
	R	–	–	2.50	0

Model Settings - Options	
General Options	
Level of Service Method	Delay & v/c (HCM 2010)
Level of Service Target	LOS D
Performance Measure	Delay
Percentile Queue	95 %
Hours per Year	480 h
Gap Acceptance	
HV Method for Gap-Acceptance	Include HV Effect for all percentages
Gap-Acceptance Capacity	Traditional M1
HCM Delay Formula	Yes
Downstream Short Lane Model	
Minimum Downstream Utilisation Ratio	20 %
Minimum Downstream Distance	100 ft
Distance for Full Lane Utilisation	660 ft
Calibration Parameter	1.2

Model Settings - Roundabouts	
Roundabout Model Options	
Capacity Model	US HCM 2010
LOS Method	Same as Sign Control
US HCM 2010 Roundabout Model	
Include Origin-Destination Pattern Effects	No
Factor for Parameter A	1.000
Factor for Parameter B	1.000
Other Roundabout Models	
FHWA 2000	No
Use Urban Compact Roundabout	–
HCM 2000	No
NAASRA 1986	No

Model Settings - Cost Parameters	
Vehicle Operating Cost	
Cost Unit	$
Pump Price of Fuel	3.000 $/gal
Fuel Resource Cost Factor	0.700
Ratio of Running Cost to Fuel Cost	3.00
Vehicle Mass	
Light Vehicle Mass	3100.0 lb
Heavy Vehicle Mass	24000.0 lb
Heavy Vehicle Maximum Power	130 kW
Time Cost	
Average Income	23.00 $/h
Time Value Factor	0.400

Demand & Sensitivity	
Analysis Method:	None

Site Properties	
Site (Intersection) Type	Roundabout

Model Name	US HCM (Customary)
Drive Rule	Right-hand side of the road
New Zealand Rule	No
HCM Version	Yes
Units	US Customary

INTERSECTION SUMMARY

US 41 NB Ramps with WIS 47 (Richmond Street)
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	4390	veh/h	5268	pers/h
Percent Heavy Vehicles	1.4	%		
Degree of Saturation	0.623			
Practical Spare Capacity	-26.0	%		
Effective Intersection Capacity	3313	veh/h		
Control Delay (Total)	12.31	veh-h/h	14.77	pers-h/h
Control Delay (Average)	10.1	sec	10.1	sec
Control Delay (Worst Lane)	28.4	sec		
Control Delay (Worst Movement)	26.2	sec	26.2	sec
Geometric Delay (Average)	6.8	sec		
Stop-Line Delay (Average)	10.1	sec		
Intersection Level of Service (LOS)	LOS B			
95% Back of Queue - Vehicles (Worst Lane)	3.6	veh		
95% Back of Queue - Distance (Worst Lane)	90.2	ft		
Total Effective Stops	2753	veh/h	3303	pers/h
Effective Stop Rate	0.63	per veh	0.63	per pers
Proportion Queued	0.26		0.26	
Performance Index	78.4		78.4	
Travel Distance (Total)	1694.7	veh-mi/h	2033.6	pers-mi/h
Travel Distance (Average)	2038	ft	2038	ft
Travel Time (Total)	63.0	veh-h/h	75.6	pers-h/h
Travel Time (Average)	51.6	sec	51.6	sec
Travel Speed	26.9	mph	26.9	mph
Cost (Total)	1226.57	$/h	1226.57	$/h
Fuel Consumption (Total)	84.0	gal/h		
Carbon Dioxide (Total)	795.7	kg/h		
Hydrocarbons (Total)	1.318	kg/h		
Carbon Monoxide (Total)	59.34	kg/h		
NOx (Total)	1.890	kg/h		

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	2,107,200	veh/y	2,528,641	pers/y
Delay	5,909	veh-h/y	7,091	pers-h/y
Effective Stops	1,321,293	veh/y	1,585,552	pers/y
Travel Distance	813,459	veh-mi/y	976,151	pers-mi/y
Travel Time	30,226	veh-h/y	36,271	pers-h/y
Cost	588,753	$/y	588,753	$/y
Fuel Consumption	40,335	gal/y		
Carbon Dioxide	381,921	kg/y		
Hydrocarbons	633	kg/y		
Carbon Monoxide	28,482	kg/y		
NOx	907	kg/y		

MOVEMENT SUMMARY

Site: US 41 NB Ramps with WIS 47 - AM 3LN

US 41 NB Ramps with WIS 47 (Richmond Street)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: WIS 47 (Richmond St)											
8	T	794	2.0	0.428	10.8	LOS B	1.7	42.0	0.60	0.81	27.3
18	R	989	2.0	1.325	0.2	X	X	X	X	0.51	33.7
Approach		1783	2.0	0.623	4.9	LOS A	1.7	42.0	0.27	0.64	30.5
North: WIS 47 (Richmond St)											
7	L	372	1.0	0.535	9.6	LOS A	2.7	68.6	0.06	0.78	25.2
4	T	1561	1.0	0.604	10.9	LOS B	3.6	90.2	0.06	0.41	27.3
Approach		1933	1.0	0.604	10.6	LOS B	3.6	90.2	0.06	0.48	26.8
West: US 41 NB Off Ramp											
5	L	478	1.0	0.563	26.2	LOS D	2.0	49.8	0.87	1.04	19.6
2	T	1	1.0	0.469	23.8	LOS C	1.5	38.7	0.85	0.98	21.0
12	R	194	1.0	0.238	12.8	LOS B	0.7	17.4	0.74	0.88	25.5
Approach		673	1.0	0.563	22.3	LOS C	2.0	49.8	0.83	1.00	20.9
All Vehicles		4390	1.4	0.623	10.1	LOS B	3.6	90.2	0.26	0.63	26.9

X: Not applicable for Continuous movement.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

LANE SUMMARY

Site: US 41 NB Ramps with WIS 47 - AM 3LN

US 41 NB Ramps with WIS 47 (Richmond Street)
Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Lane Length ft	SL Type	Cap. Adj. %	Prob. Block. %
South: WIS 47 (Richmond St)																
Lane 1	0	289	0	289	2.0	675	0.428	100	11.4	LOS B	1.7	42.0	1600	–	0.0	0.0
Lane 2	0	265	0	265	2.0	675	0.392	92[5]	10.7	LOS B	1.4	36.8	1600	–	0.0	0.0
Lane 3	0	241	0	241	2.0	675	0.357	83[5]	10.0	LOS B	1.3	31.9	1600	–	0.0	0.0
Lane 4	0	0	989	989	2.0	1588	0.623	100	0.2	X	X	X	1600	–	0.0	X
Approach	0	794	989	1783	2.0		0.623		4.9	LOS A	1.7	42.0				
North: WIS 47 (Richmond St)																
Lane 1	372	222	0	594	1.0	1109	0.535	89[5]	9.6	LOS A	2.7	68.6	1600	–	0.0	0.0
Lane 2	0	670	0	670	1.0	1109	0.604	100	11.1	LOS B	3.6	90.2	1600	–	0.0	0.0
Lane 3	0	670	0	670	1.0	1109	0.604	100	11.1	LOS B	3.6	90.2	1600	–	0.0	0.0
Approach	372	1561	0	1933	1.0		0.604		10.6	LOS B	3.6	90.2				
West: US 41 NB Off Ramp																
Lane 1	174	0	0	174	1.0	309	0.563	100	28.4	LOS D	2.0	49.8	1600	–	0.0	0.0
Lane 2	160	0	0	160	1.0	309	0.516	92[5]	26.0	LOS D	1.7	44.0	1600	–	0.0	0.0
Lane 3	144	1	0	145	1.0	309	0.469	83[5]	23.8	LOS C	1.5	38.7	1600	–	0.0	0.0
Lane 4	0	0	97	97	1.0	408	0.238	100	12.8	LOS B	0.7	17.4	1600	–	0.0	0.0
Lane 5	0	0	97	97	1.0	408	0.238	100	12.8	LOS B	0.7	17.4	1600	–	0.0	0.0
Approach	478	1	194	673	1.0		0.563		22.3	LOS C	2.0	49.8				
Intersection				4390	1.4		0.623		10.1	LOS B	3.6	90.2				

X: Not applicable for Continuous lane.

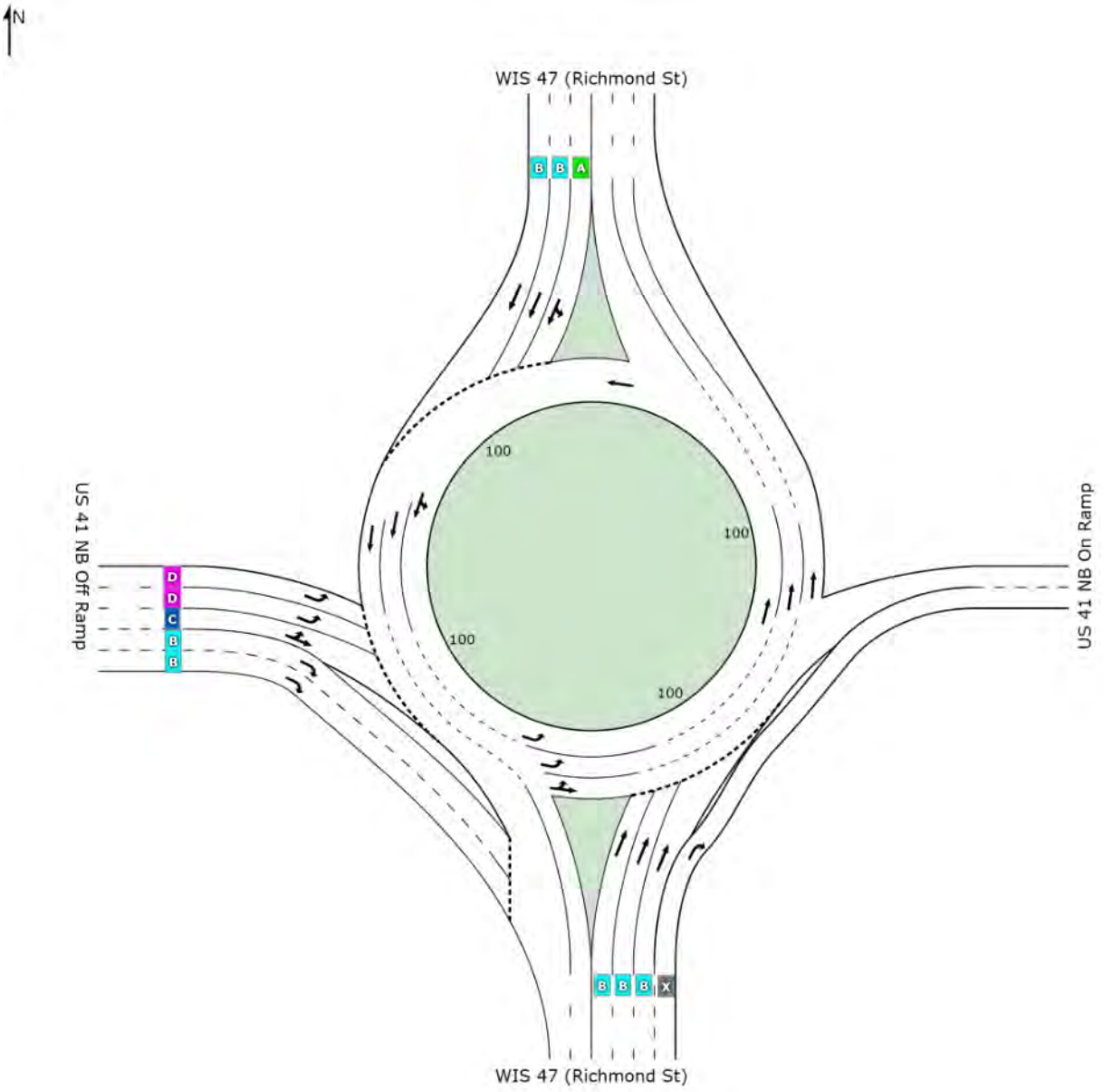
Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

5 Lane underutilisation determined by program

LEVEL OF SERVICE SUMMARY

Site: US 41 NB Ramps with WIS 47 - AM 3LN

US 41 NB Ramps with WIS 47 (Richmond Street)
Roundabout



	South	East	North	West	Intersection
LOS	A	NA	B	C	B

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Model used. Geometric Delay not included.

INPUT REPORT

US 41 NB Ramps with WIS 47 (Richmond Street)

Intersection Parameters	
Title	US 41 NB Ramps with WIS 47 (Richmond Street)
Intersection ID	1
Unit Time (for volumes)	60 minutes
Peak Flow Period (for performance)	15 minutes

Geometry - Approach Data

Location	Name	Type	No. of App. Lanes	No. of Exit Lanes	Median Width ft	Extra Bunching %
South	WIS 47 (Richmond St)	Two-way	4	2	–	0.0
East	US 41 NB On Ramp	One-way Exit	0	2	–	0.0
North	WIS 47 (Richmond St)	Two-way	3	3	–	0.0
West	US 41 NB Off Ramp	One-way Approach	5	0	–	0.0

Geometry - Roundabout Data

Location	Name	Island Diameter ft	Circ. Width ft	Circ. Lanes	Entry Radius ft	Entry Angle degrees	Env. Factor	Entry/Circ. Flow Adjust.
South	WIS 47 (Richmond St)	100.00	30.00	3	65.0	30.0	1.2000	None
East	US 41 NB On Ramp	100.00	30.00	3	65.0	30.0	1.2000	None
North	WIS 47 (Richmond St)	100.00	30.00	1	65.0	30.0	1.2000	None
West	US 41 NB Off Ramp	100.00	30.00	3	65.0	30.0	1.2000	None

Geometry - Approach Lane Data

Lane Number	Lane Type	Lane Discip.	Basic Satn Flow tcu/h	Utilisation Ratio %	Saturation Speed mph	Capacity Adjustment %
South	WIS 47 (Richmond St)					
App. Lane 1	Normal	T	1900	36.0	–	0.0
App. Lane 2	Normal	T	1900	33.0	–	0.0
App. Lane 3	Normal	T	1900	30.0	–	0.0
App. Lane 4	Continuous	R	1900	47.0	–	0.0
North	WIS 47 (Richmond St)					
App. Lane 1	Normal	LT	1900	47.0	–	0.0
App. Lane 2	Normal	T	1900	53.0	–	0.0
App. Lane 3	Normal	T	1900	53.0	–	0.0
West	US 41 NB Off Ramp					
App. Lane 1	Normal	L	1900	36.0	–	0.0
App. Lane 2	Normal	L	1900	33.0	–	0.0
App. Lane 3	Normal	LT	1900	30.0	–	0.0
App. Lane 4	Slip (Giveway/Yield)	R	1900	–	–	0.0
App. Lane 5	Slip (Giveway/Yield)	R	1900	–	–	0.0

Geometry - Approach & Exit Lane Data

Lane Number	Lane Width ft	Lane Length ft	Grade %	SL Type
South	WIS 47 (Richmond St)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
East	US 41 NB On Ramp			
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
North	WIS 47 (Richmond St)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–
West	US 41 NB Off Ramp			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
App. Lane 5	13.00	1600.0	0.00	–

Lanes are numbered from left to right in the direction of travel.

Geometry - Movement Definitions

To Approach	Movement Banned	Turn Desig.
From: South	WIS 47 (Richmond St)	
South	No	T
North	No	T
East	No	R
From: North	WIS 47 (Richmond St)	
North	No	T
East	No	L
South	No	T
From: West	US 41 NB Off Ramp	
North	No	L
East	No	T
South	No	R

HCM 2010 Roundabout Model Calibration

Location	Name	HCM 2010 Single Lane		HCM 2010 Multi-Lane Dominant Lane		HCM 2010 Multi-Lane Subdominant Lane	
		Para. A	Para. B	Para. A	Para. B	Para. A	Para. B
South	WIS 47 (Richmond St)	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
East	US 41 NB On Ramp	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
North	WIS 47 (Richmond St)	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
West	US 41 NB Off Ramp	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722

Volumes

To Approach	Total veh	HV %	Peak Flow Factor %	Vehicle Occupancy pers/veh	Flow Scale %	Growth Rate %/year
From: South	WIS 47 (Richmond St)					
South	5.0	2.00	93.0	1.20	100.00	2.00
North	840.0	2.00	93.0	1.20	100.00	2.00
East	805.0	2.00	93.0	1.20	100.00	2.00
From: North	WIS 47 (Richmond St)					
North	5.0	1.00	93.0	1.20	100.00	2.00
East	355.0	1.00	93.0	1.20	100.00	2.00
South	1245.0	1.00	93.0	1.20	100.00	2.00
From: West	US 41 NB Off Ramp					
North	715.0	2.00	93.0	1.20	100.00	2.00
East	1.0	2.00	93.0	1.20	100.00	2.00
South	395.0	2.00	93.0	1.20	100.00	2.00

Path Data

To Approach	App. Cruise Speed mph	Exit Cruise Speed mph	App. Trav. Distance ft	Negn Speed mph	Negn Distance ft	Downst. Distance ft	Negn Radius ft
From: South	WIS 47 (Richmond St)						
South	40.0	40.0	1600.0	–	–	–	–
North	40.0	40.0	1600.0	–	–	–	–
East	40.0	40.0	1600.0	–	–	–	–
From: North	WIS 47 (Richmond St)						
North	40.0	40.0	1600.0	–	–	–	–
East	40.0	40.0	1600.0	–	–	–	–
South	40.0	40.0	1600.0	–	–	–	–
From: West	US 41 NB Off Ramp						
North	40.0	40.0	1600.0	–	–	–	–
East	40.0	40.0	1600.0	–	–	–	–
South	40.0	40.0	1600.0	–	–	–	–

Movement Data - General

Turn	Mov. ID	Queue Space LV ft	Queue Space HV ft	Vehicle Length LV ft	Vehicle Length HV ft	HVE	P.Deg. Satn	Movement Type	Movement Control
South	WIS 47 (Richmond St)								
T	8	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	18	25.00	45.00	17.00	36.00	2.00	–	*Cont.*	–
North	WIS 47 (Richmond St)								
L	7	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	4	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
West	US 41 NB Off Ramp								
L	5	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	2	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	12	25.00	45.00	17.00	36.00	2.00	–	*Slip*	*Yield*

Movement Type and Control parameters are set automaticly from Approach Control and Lane Type data in the Geometry dialog.

Gap Acceptance

Movement		Critical Gap sec	Follow-up Headway sec	Min. Departures veh/min	Exiting Flow Effect %
South	WIS 47 (Richmond St)				
	T	4.000	2.800	2.50	0
North	WIS 47 (Richmond St)				
	L	4.200	3.200	2.50	0
	T	4.200	3.200	2.50	0
West	US 41 NB Off Ramp				
	L	4.000	2.800	2.50	0
	T	4.000	2.800	2.50	0
	R	–	–	2.50	0

Model Settings - Options	
General Options	
Level of Service Method	Delay & v/c (HCM 2010)
Level of Service Target	LOS D
Performance Measure	Delay
Percentile Queue	95 %
Hours per Year	480 h
Gap Acceptance	
HV Method for Gap-Acceptance	Include HV Effect for all percentages
Gap-Acceptance Capacity	Traditional M1
HCM Delay Formula	Yes
Downstream Short Lane Model	
Minimum Downstream Utilisation Ratio	20 %
Minimum Downstream Distance	100 ft
Distance for Full Lane Utilisation	660 ft
Calibration Parameter	1.2

Model Settings - Roundabouts	
Roundabout Model Options	
Capacity Model	US HCM 2010
LOS Method	Same as Sign Control
US HCM 2010 Roundabout Model	
Include Origin-Destination Pattern Effects	No
Factor for Parameter A	1.000
Factor for Parameter B	1.000
Other Roundabout Models	
FHWA 2000	No
Use Urban Compact Roundabout	–
HCM 2000	No
NAASRA 1986	No

Model Settings - Cost Parameters	
Vehicle Operating Cost	
Cost Unit	$
Pump Price of Fuel	3.000 $/gal
Fuel Resource Cost Factor	0.700
Ratio of Running Cost to Fuel Cost	3.00
Vehicle Mass	
Light Vehicle Mass	3100.0 lb
Heavy Vehicle Mass	24000.0 lb
Heavy Vehicle Maximum Power	130 kW
Time Cost	
Average Income	23.00 $/h
Time Value Factor	0.400

Demand & Sensitivity	
Analysis Method:	None

Site Properties	
Site (Intersection) Type	Roundabout

Model Name	US HCM (Customary)
Drive Rule	Right-hand side of the road
New Zealand Rule	No
HCM Version	Yes
Units	US Customary

INTERSECTION SUMMARY

Site: US 41 NB Ramps with WIS 47 - PM 3LN

US 41 NB Ramps with WIS 47 (Richmond Street)
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	4695	veh/h	5634	pers/h
Percent Heavy Vehicles	1.6	%		
Degree of Saturation	0.785			
Practical Spare Capacity	-15.5	%		
Effective Intersection Capacity	4048	veh/h		
Control Delay (Total)	18.75	veh-h/h	22.50	pers-h/h
Control Delay (Average)	14.4	sec	14.4	sec
Control Delay (Worst Lane)	42.5	sec		
Control Delay (Worst Movement)	36.7	sec	36.7	sec
Geometric Delay (Average)	7.2	sec		
Stop-Line Delay (Average)	14.4	sec		
Intersection Level of Service (LOS)	LOS B			
95% Back of Queue - Vehicles (Worst Lane)	3.7	veh		
95% Back of Queue - Distance (Worst Lane)	95.1	ft		
Total Effective Stops	3418	veh/h	4102	pers/h
Effective Stop Rate	0.73	per veh	0.73	per pers
Proportion Queued	0.38		0.38	
Performance Index	94.3		94.3	
Travel Distance (Total)	1819.4	veh-mi/h	2183.3	pers-mi/h
Travel Distance (Average)	2046	ft	2046	ft
Travel Time (Total)	73.6	veh-h/h	88.3	pers-h/h
Travel Time (Average)	56.4	sec	56.4	sec
Travel Speed	24.7	mph	24.7	mph
Cost (Total)	1412.19	$/h	1412.19	$/h
Fuel Consumption (Total)	94.7	gal/h		
Carbon Dioxide (Total)	896.7	kg/h		
Hydrocarbons (Total)	1.505	kg/h		
Carbon Monoxide (Total)	67.63	kg/h		
NOx (Total)	2.121	kg/h		

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	2,253,420	veh/y	2,704,104	pers/y
Delay	8,998	veh-h/y	10,798	pers-h/y
Effective Stops	1,640,633	veh/y	1,968,759	pers/y
Travel Distance	873,309	veh-mi/y	1,047,971	pers-mi/y
Travel Time	35,329	veh-h/y	42,395	pers-h/y
Cost	677,853	$/y	677,853	$/y
Fuel Consumption	45,450	gal/y		
Carbon Dioxide	430,404	kg/y		
Hydrocarbons	723	kg/y		
Carbon Monoxide	32,462	kg/y		
NOx	1,018	kg/y		

MOVEMENT SUMMARY

Site: US 41 NB Ramps with WIS 47 - PM 3LN

US 41 NB Ramps with WIS 47 (Richmond Street)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: WIS 47 (Richmond St)											
8	T	909	2.0	0.613	17.9	LOS C	2.7	69.5	0.75	0.94	23.9
18	R	866	2.0	1.160	0.1	X	X	X	X	0.51	33.7
Approach		1774	2.0	0.613	9.3	LOS A	2.7	69.5	0.38	0.73	27.9
North: WIS 47 (Richmond St)											
7	L	382	1.0	0.478	8.6	LOS A	2.2	54.7	0.05	0.76	25.6
4	T	1344	1.0	0.539	9.5	LOS A	2.8	69.6	0.05	0.42	28.0
Approach		1726	1.0	0.539	9.3	LOS A	2.8	69.6	0.05	0.49	27.4
West: US 41 NB Off Ramp											
5	L	769	2.0	0.785	36.7	LOS E	3.7	95.1	0.90	1.13	17.2
2	T	1	2.0	0.654	30.6	LOS D	2.6	66.1	0.88	1.04	19.1
12	R	425	2.0	0.449	15.9	LOS C	1.6	40.7	0.75	0.94	24.1
Approach		1195	2.0	0.785	29.3	LOS D	3.7	95.1	0.84	1.06	19.1
All Vehicles		4695	1.6	0.785	14.4	LOS B	3.7	95.1	0.38	0.73	24.7

X: Not applicable for Continuous movement.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

LANE SUMMARY

Site: US 41 NB Ramps with WIS 47 - PM 3LN

US 41 NB Ramps with WIS 47 (Richmond Street)
Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Lane Length ft	SL Type	Cap. Adj. %	Prob. Block. %
South: WIS 47 (Richmond St)																
Lane 1	0	330	0	330	2.0	539	0.613	100	19.7	LOS C	2.7	69.5	1600	–	0.0	0.0
Lane 2	0	303	0	303	2.0	539	0.562	92[5]	17.7	LOS C	2.4	59.9	1600	–	0.0	0.0
Lane 3	0	275	0	275	2.0	539	0.511	83[5]	16.0	LOS C	2.0	51.4	1600	–	0.0	0.0
Lane 4	0	0	866	866	2.0	1588	0.545	100	0.1	X	X	X	1600	–	0.0	X
Approach	0	909	866	1774	2.0		0.613		9.3	LOS A	2.7	69.5				
North: WIS 47 (Richmond St)																
Lane 1	382	148	0	530	1.0	1109	0.478	89[5]	8.6	LOS A	2.2	54.7	1600	–	0.0	0.0
Lane 2	0	598	0	598	1.0	1109	0.539	100	9.7	LOS A	2.8	69.6	1600	–	0.0	0.0
Lane 3	0	598	0	598	1.0	1109	0.539	100	9.7	LOS A	2.8	69.6	1600	–	0.0	0.0
Approach	382	1344	0	1726	1.0		0.539		9.3	LOS A	2.8	69.6				
West: US 41 NB Off Ramp																
Lane 1	280	0	0	280	2.0	357	0.785	100	42.5	LOS E	3.7	95.1	1600	–	0.0	0.0
Lane 2	257	0	0	257	2.0	357	0.720	92[5]	35.8	LOS E	3.1	78.7	1600	–	0.0	0.0
Lane 3	232	1	0	233	2.0	357	0.654	83[5]	30.6	LOS D	2.6	66.1	1600	–	0.0	0.0
Lane 4	0	0	212	212	2.0	473	0.449	100	15.9	LOS C	1.6	40.7	1600	–	0.0	0.0
Lane 5	0	0	212	212	2.0	473	0.449	100	15.9	LOS C	1.6	40.7	1600	–	0.0	0.0
Approach	769	1	425	1195	2.0		0.785		29.3	LOS D	3.7	95.1				
Intersection				4695	1.6		0.785		14.4	LOS B	3.7	95.1				

X: Not applicable for Continuous lane.

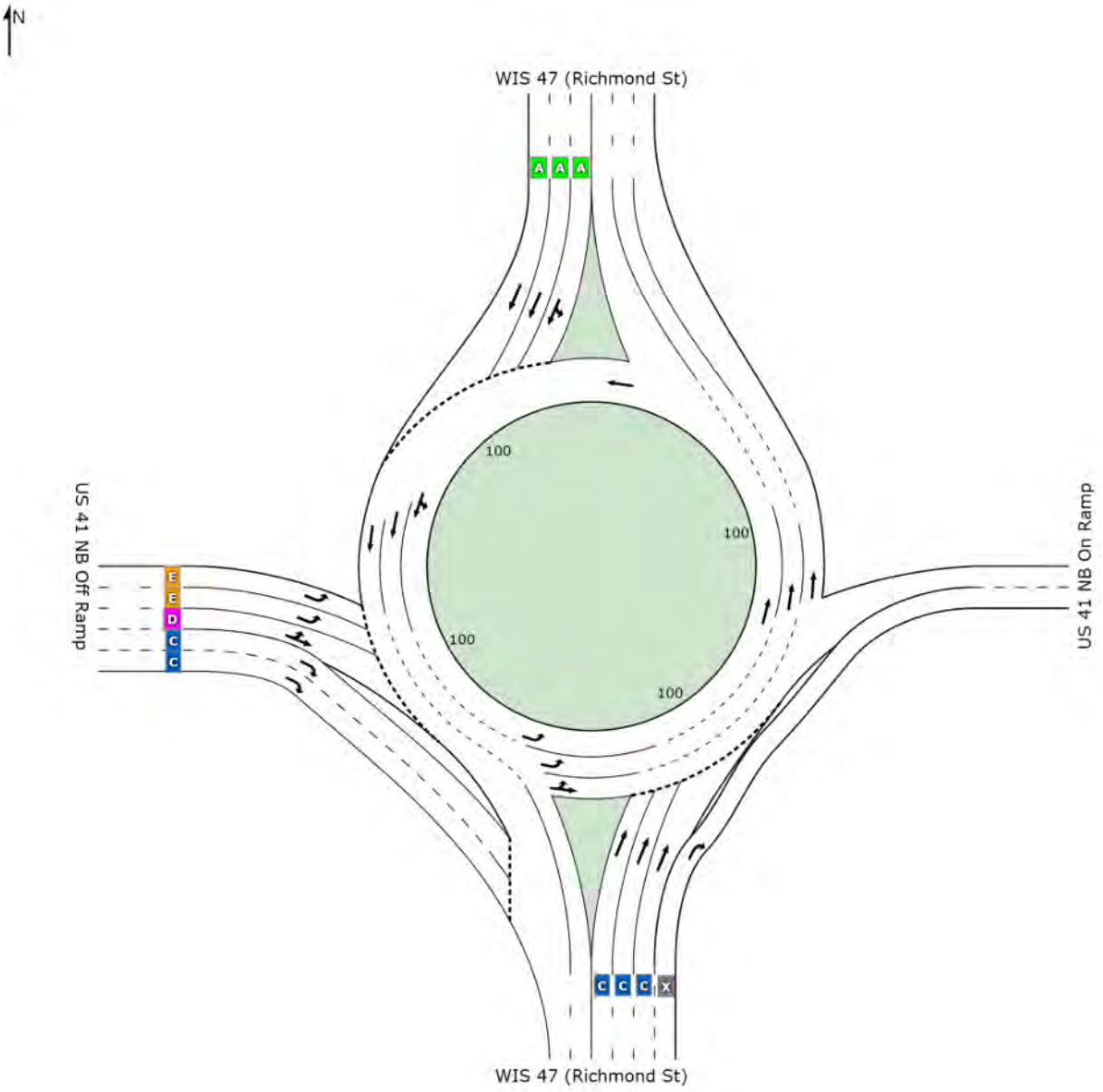
Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

5 Lane underutilisation determined by program

LEVEL OF SERVICE SUMMARY

Site: US 41 NB Ramps with WIS 47 - PM 3LN

US 41 NB Ramps with WIS 47 (Richmond Street)
Roundabout



	South	East	North	West	Intersection
LOS	A	NA	A	D	B

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Model used. Geometric Delay not included.

INPUT REPORT

US 41 SB Ramps with WIS 47 (Richmond Street)

Intersection Parameters	
Title	US 41 SB Ramps with WIS 47 (Richmond Street)
Intersection ID	1
Unit Time (for volumes)	60 minutes
Peak Flow Period (for performance)	15 minutes

Geometry - Approach Data

Location	Name	Type	No. of App. Lanes	No. of Exit Lanes	Median Width ft	Extra Bunching %
South	WIS 47 (Richmond St)	Two-way	3	3	–	0.0
East	US 41 SB Off Ramp	One-way Approach	4	0	–	0.0
North	WIS 47 (Richmond St)	Two-way	4	2	–	0.0
West	US 41 SB On Ramp	One-way Exit	0	1	–	0.0

Geometry - Roundabout Data

Location	Name	Island Diameter ft	Circ. Width ft	Circ. Lanes	Entry Radius ft	Entry Angle degrees	Env. Factor	Entry/Circ. Flow Adjust.
South	WIS 47 (Richmond St)	100.00	30.00	1	65.0	30.0	1.2000	None
East	US 41 SB Off Ramp	100.00	30.00	3	65.0	30.0	1.2000	None
North	WIS 47 (Richmond St)	100.00	30.00	3	65.0	30.0	1.2000	None
West	US 41 SB On Ramp	100.00	30.00	3	65.0	30.0	1.2000	None

Geometry - Approach Lane Data

Lane Number	Lane Type	Lane Discip.	Basic Satn Flow tcu/h	Utilisation Ratio %	Saturation Speed mph	Capacity Adjustment %
South	WIS 47 (Richmond St)					
App. Lane 1	Normal	LT	1900	47.0	–	0.0
App. Lane 2	Normal	T	1900	53.0	–	0.0
App. Lane 3	Normal	T	1900	53.0	–	0.0
East	US 41 SB Off Ramp					
App. Lane 1	Normal	L	1900	36.0	–	0.0
App. Lane 2	Normal	L	1900	33.0	–	0.0
App. Lane 3	Normal	LT	1900	30.0	–	0.0
App. Lane 4	Slip (Giveway/Yield)	R	1900	–	–	0.0
North	WIS 47 (Richmond St)					
App. Lane 1	Normal	T	1900	36.0	–	0.0
App. Lane 2	Normal	T	1900	33.0	–	0.0
App. Lane 3	Normal	T	1900	30.0	–	0.0
App. Lane 4	Slip (Giveway/Yield)	R	1900	–	–	0.0

Geometry - Approach & Exit Lane Data

Lane Number	Lane Width ft	Lane Length ft	Grade %	SL Type
South	WIS 47 (Richmond St)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–
East	US 41 SB Off Ramp			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
North	WIS 47 (Richmond St)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
West	US 41 SB On Ramp			
Exit Lane 1	13.00	1600.0	0.00	–

Lanes are numbered from left to right in the direction of travel.

Geometry - Movement Definitions

To Approach	Movement Banned	Turn Desig.
From: South	WIS 47 (Richmond St)	
South	No	L
West	No	L
North	No	T
From: East	US 41 SB Off Ramp	
South	No	L
West	No	T
North	No	R
From: North	WIS 47 (Richmond St)	
North	No	T
South	No	T
West	No	R

HCM 2010 Roundabout Model Calibration

Location	Name	HCM 2010 Single Lane		HCM 2010 Multi-Lane Dominant Lane		HCM 2010 Multi-Lane Subdominant Lane	
		Para. A	Para. B	Para. A	Para. B	Para. A	Para. B
South	WIS 47 (Richmond St)	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
East	US 41 SB Off Ramp	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
North	WIS 47 (Richmond St)	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
West	US 41 SB On Ramp	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722

Volumes

To Approach	Total veh	HV %	Peak Flow Factor %	Vehicle Occupancy pers/veh	Flow Scale %	Growth Rate %/year
From: South	WIS 47 (Richmond St)					
South	5.0	1.00	87.0	1.20	100.00	2.00
West	355.0	1.00	87.0	1.20	100.00	2.00
North	780.0	1.00	87.0	1.20	100.00	2.00
From: East	US 41 SB Off Ramp					
South	620.0	2.00	87.0	1.20	100.00	2.00
West	1.0	2.00	87.0	1.20	100.00	2.00
North	305.0	2.00	87.0	1.20	100.00	2.00
From: North	WIS 47 (Richmond St)					
North	5.0	2.00	87.0	1.20	100.00	2.00
South	1115.0	2.00	87.0	1.20	100.00	2.00
West	630.0	2.00	87.0	1.20	100.00	2.00

Path Data

To Approach	App. Cruise Speed mph	Exit Cruise Speed mph	App. Trav. Distance ft	Negn Speed mph	Negn Distance ft	Downst. Distance ft	Negn Radius ft
From: South	WIS 47 (Richmond St)						
South	40.0	40.0	1600.0	–	–	–	–
West	40.0	40.0	1600.0	–	–	–	–
North	40.0	40.0	1600.0	–	–	–	–
From: East	US 41 SB Off Ramp						
South	40.0	40.0	1600.0	–	–	–	–
West	40.0	40.0	1600.0	–	–	–	–
North	40.0	40.0	1600.0	–	–	–	–
From: North	WIS 47 (Richmond St)						
North	40.0	40.0	1600.0	–	–	–	–
South	40.0	40.0	1600.0	–	–	–	–
West	40.0	40.0	1600.0	–	–	–	–

Movement Data - General

Turn	Mov. ID	Queue Space LV ft	Queue Space HV ft	Vehicle Length LV ft	Vehicle Length HV ft	HVE	P.Deg. Satn	Movement Type	Movement Control
South	WIS 47 (Richmond St)								
L	3	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	8	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
East	US 41 SB Off Ramp								
L	1	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	6	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	16	25.00	45.00	17.00	36.00	2.00	–	*Slip*	*Yield*
North	WIS 47 (Richmond St)								
T	4	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	14	25.00	45.00	17.00	36.00	2.00	–	*Slip*	*Yield*

Movement Type and Control parameters are set automaticly from Approach Control and Lane Type data in the Geometry dialog.

Gap Acceptance

Movement		Critical Gap sec	Follow-up Headway sec	Min. Departures veh/min	Exiting Flow Effect %
South	WIS 47 (Richmond St)				
	L	4.200	3.200	2.50	0
	T	4.200	3.200	2.50	0
East	US 41 SB Off Ramp				
	L	4.000	2.800	2.50	0
	T	4.000	2.800	2.50	0
	R	–	–	2.50	0
North	WIS 47 (Richmond St)				
	T	4.000	2.800	2.50	0
	R	–	–	2.50	0

Model Settings - Options	
General Options	
Level of Service Method	Delay & v/c (HCM 2010)
Level of Service Target	LOS D
Performance Measure	Delay
Percentile Queue	95 %
Hours per Year	480 h
Gap Acceptance	
HV Method for Gap-Acceptance	Include HV Effect for all percentages
Gap-Acceptance Capacity	Traditional M1
HCM Delay Formula	Yes
Downstream Short Lane Model	
Minimum Downstream Utilisation Ratio	20 %
Minimum Downstream Distance	100 ft
Distance for Full Lane Utilisation	660 ft
Calibration Parameter	1.2

Model Settings - Roundabouts	
Roundabout Model Options	
Capacity Model	US HCM 2010
LOS Method	Same as Sign Control
US HCM 2010 Roundabout Model	
Include Origin-Destination Pattern Effects	No
Factor for Parameter A	1.000
Factor for Parameter B	1.000
Other Roundabout Models	
FHWA 2000	No
Use Urban Compact Roundabout	–
HCM 2000	No
NAASRA 1986	No

Model Settings - Cost Parameters	
Vehicle Operating Cost	
Cost Unit	$
Pump Price of Fuel	3.000 $/gal
Fuel Resource Cost Factor	0.700
Ratio of Running Cost to Fuel Cost	3.00
Vehicle Mass	
Light Vehicle Mass	3100.0 lb
Heavy Vehicle Mass	24000.0 lb
Heavy Vehicle Maximum Power	130 kW
Time Cost	
Average Income	23.00 $/h
Time Value Factor	0.400

Demand & Sensitivity	
Analysis Method:	None

Site Properties	
Site (Intersection) Type	Roundabout

Model Name	US HCM (Customary)
Drive Rule	Right-hand side of the road
New Zealand Rule	No
HCM Version	Yes
Units	US Customary

INTERSECTION SUMMARY

US 41 SB Ramps with WIS 47 (Richmond Street)
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	4386	veh/h	5263	pers/h
Percent Heavy Vehicles	1.7	%		
Degree of Saturation	0.850			
Practical Spare Capacity	0.0	%		
Effective Intersection Capacity	5162	veh/h		
Control Delay (Total)	22.42	veh-h/h	26.91	pers-h/h
Control Delay (Average)	18.4	sec	18.4	sec
Control Delay (Worst Lane)	37.3	sec		
Control Delay (Worst Movement)	30.9	sec	30.9	sec
Geometric Delay (Average)	7.3	sec		
Stop-Line Delay (Average)	18.4	sec		
Intersection Level of Service (LOS)	LOS C			
95% Back of Queue - Vehicles (Worst Lane)	6.7	veh		
95% Back of Queue - Distance (Worst Lane)	170.4	ft		
Total Effective Stops	3836	veh/h	4603	pers/h
Effective Stop Rate	0.87	per veh	0.87	per pers
Proportion Queued	0.57		0.57	
Performance Index	99.8		99.8	
Travel Distance (Total)	1702.2	veh-mi/h	2042.7	pers-mi/h
Travel Distance (Average)	2049	ft	2049	ft
Travel Time (Total)	73.8	veh-h/h	88.5	pers-h/h
Travel Time (Average)	60.5	sec	60.5	sec
Travel Speed	23.1	mph	23.1	mph
Cost (Total)	1404.10	$/h	1404.10	$/h
Fuel Consumption (Total)	92.9	gal/h		
Carbon Dioxide (Total)	880.2	kg/h		
Hydrocarbons (Total)	1.499	kg/h		
Carbon Monoxide (Total)	67.90	kg/h		
NOx (Total)	2.091	kg/h		

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	2,105,380	veh/y	2,526,456	pers/y
Delay	10,763	veh-h/y	12,915	pers-h/y
Effective Stops	1,841,283	veh/y	2,209,540	pers/y
Travel Distance	817,066	veh-mi/y	980,479	pers-mi/y
Travel Time	35,411	veh-h/y	42,494	pers-h/y
Cost	673,968	$/y	673,968	$/y
Fuel Consumption	44,613	gal/y		
Carbon Dioxide	422,491	kg/y		
Hydrocarbons	720	kg/y		
Carbon Monoxide	32,594	kg/y		
NOx	1,004	kg/y		

MOVEMENT SUMMARY

Site: US 41 SB Ramps with WIS 47 - AM 3LN

US 41 SB Ramps with WIS 47 (Richmond Street)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: WIS 47 (Richmond St)											
3	L	414	1.0	0.373	7.0	LOS A	1.4	35.7	0.04	0.69	26.3
8	T	897	1.0	0.404	7.5	LOS A	1.6	40.6	0.04	0.42	29.3
Approach		1310	1.0	0.404	7.3	LOS A	1.6	40.6	0.04	0.51	28.2
East: US 41 SB Off Ramp											
1	L	713	2.0	0.538	17.1	LOS C	2.1	53.5	0.76	1.00	22.3
6	T	1	2.0	0.448	15.6	LOS C	1.6	40.8	0.74	0.89	24.2
16	R	351	2.0	0.537	14.4	LOS B	2.4	59.9	0.67	0.90	24.9
Approach		1064	2.0	0.538	16.2	LOS C	2.4	59.9	0.73	0.97	23.1
North: WIS 47 (Richmond St)											
4	T	1287	2.0	0.850	30.9	LOS D	6.0	151.7	0.85	1.11	19.5
14	R	724	2.0	0.774	19.5	LOS C	6.7	170.4	0.77	0.99	22.8
Approach		2011	2.0	0.850	26.8	LOS D	6.7	170.4	0.82	1.06	20.6
All Vehicles		4386	1.7	0.850	18.4	LOS C	6.7	170.4	0.57	0.87	23.1

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

LANE SUMMARY

Site: US 41 SB Ramps with WIS 47 - AM 3LN

US 41 SB Ramps with WIS 47 (Richmond Street)
Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Lane Length ft	SL Type	Cap. Adj. %	Prob. Block. %
South: WIS 47 (Richmond St)																
Lane 1	414	0	0	414	1.0	1109	0.373	92[5]	7.0	LOS A	1.4	35.7	1600	–	0.0	0.0
Lane 2	0	448	0	448	1.0	1109	0.404	100	7.5	LOS A	1.6	40.6	1600	–	0.0	0.0
Lane 3	0	448	0	448	1.0	1109	0.404	100	7.5	LOS A	1.6	40.6	1600	–	0.0	0.0
Approach	414	897	0	1310	1.0		0.404		7.3	LOS A	1.6	40.6				
East: US 41 SB Off Ramp																
Lane 1	260	0	0	260	2.0	483	0.538	100	18.5	LOS C	2.1	53.5	1600	–	0.0	0.0
Lane 2	238	0	0	238	2.0	483	0.493	92[5]	17.0	LOS C	1.8	46.9	1600	–	0.0	0.0
Lane 3	215	1	0	216	2.0	483	0.448	83[5]	15.6	LOS C	1.6	40.8	1600	–	0.0	0.0
Lane 4	0	0	351	351	2.0	653	0.537	100	14.4	LOS B	2.4	59.9	1600	–	0.0	0.0
Approach	713	1	351	1064	2.0		0.538		16.2	LOS C	2.4	59.9				
North: WIS 47 (Richmond St)																
Lane 1	0	468	0	468	2.0	551	0.850	100	37.3	LOS E	6.0	151.7	1600	–	0.0	0.0
Lane 2	0	429	0	429	2.0	551	0.779	92[5]	29.7	LOS D	4.6	116.6	1600	–	0.0	0.0
Lane 3	0	390	0	390	2.0	551	0.708	83[5]	24.4	LOS C	3.7	93.0	1600	–	0.0	0.0
Lane 4	0	0	724	724	2.0	936	0.774	100	19.5	LOS C	6.7	170.4	1600	–	0.0	0.0
Approach	0	1287	724	2011	2.0		0.850		26.8	LOS D	6.7	170.4				
Intersection				4386	1.7		0.850		18.4	LOS C	6.7	170.4				

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

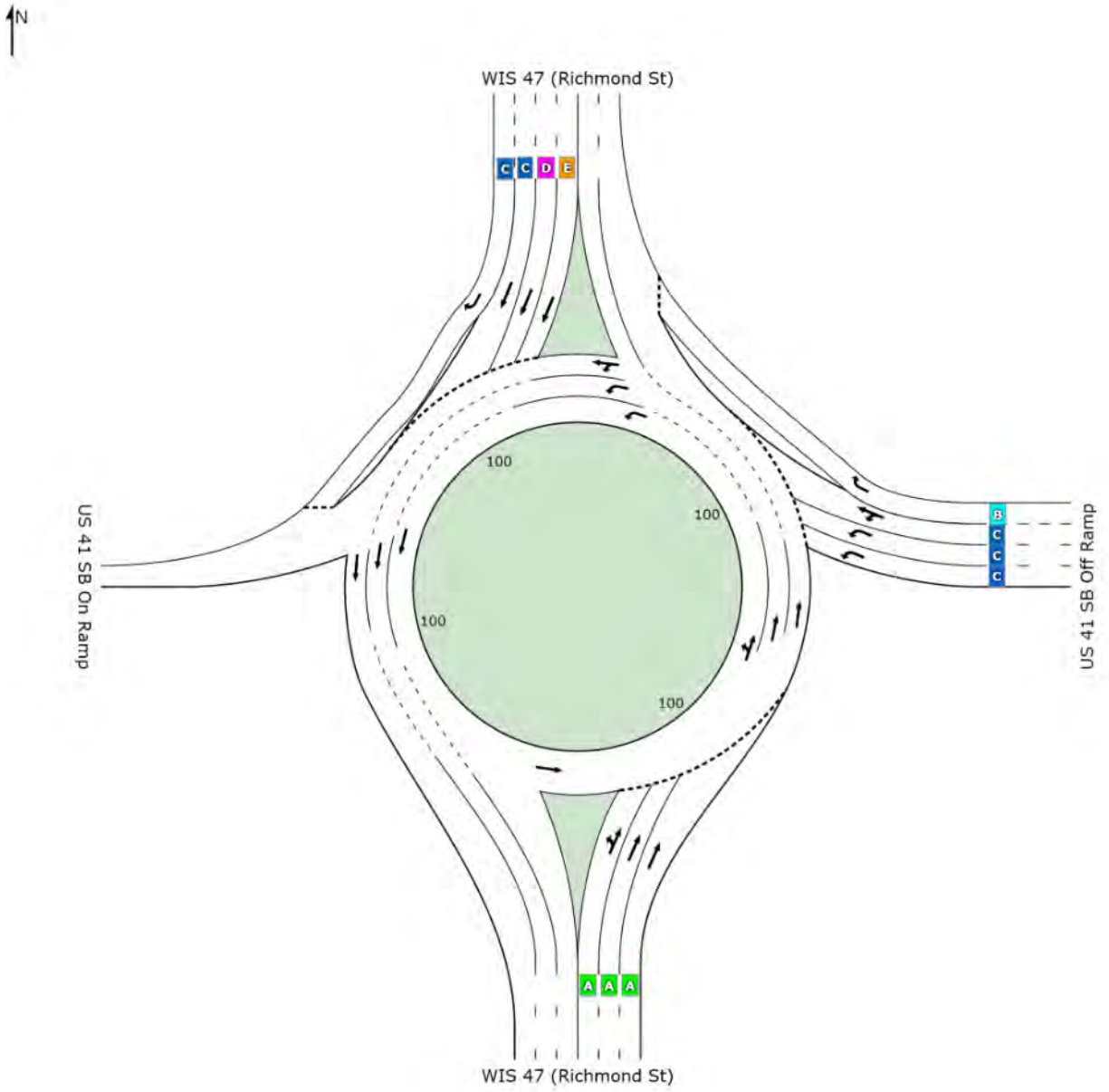
5 Lane underutilisation determined by program

SIDRA INTERSECTION

LEVEL OF SERVICE SUMMARY

Site: US 41 SB Ramps with WIS 47 - AM 3LN

US 41 SB Ramps with WIS 47 (Richmond Street)
Roundabout



	South	East	North	West	Intersection
LOS	A	C	D	NA	C

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Model used. Geometric Delay not included.

INPUT REPORT

US 41 SB Ramps with WIS 47 (Richmond Street)

Intersection Parameters

Title	US 41 SB Ramps with WIS 47 (Richmond Street)
Intersection ID	1
Unit Time (for volumes)	60 minutes
Peak Flow Period (for performance)	15 minutes

Geometry - Approach Data

Location	Name	Type	No. of App. Lanes	No. of Exit Lanes	Median Width ft	Extra Bunching %
South	WIS 47 (Richmond St)	Two-way	3	3	–	0.0
East	US 41 SB Off Ramp	One-way Approach	4	0	–	0.0
North	WIS 47 (Richmond St)	Two-way	4	2	–	0.0
West	US 41 SB On Ramp	One-way Exit	0	1	–	0.0

Geometry - Roundabout Data

Location	Name	Island Diameter ft	Circ. Width ft	Circ. Lanes	Entry Radius ft	Entry Angle degrees	Env. Factor	Entry/Circ. Flow Adjust.
South	WIS 47 (Richmond St)	100.00	30.00	1	65.0	30.0	1.2000	None
East	US 41 SB Off Ramp	100.00	30.00	3	65.0	30.0	1.2000	None
North	WIS 47 (Richmond St)	100.00	30.00	3	65.0	30.0	1.2000	None
West	US 41 SB On Ramp	100.00	30.00	3	65.0	30.0	1.2000	None

Geometry - Approach Lane Data

Lane Number	Lane Type	Lane Discip.	Basic Satn Flow tcu/h	Utilisation Ratio %	Saturation Speed mph	Capacity Adjustment %
South	WIS 47 (Richmond St)					
App. Lane 1	Normal	LT	1900	47.0	–	0.0
App. Lane 2	Normal	T	1900	53.0	–	0.0
App. Lane 3	Normal	T	1900	53.0	–	0.0
East	US 41 SB Off Ramp					
App. Lane 1	Normal	L	1900	36.0	–	0.0
App. Lane 2	Normal	L	1900	33.0	–	0.0
App. Lane 3	Normal	LT	1900	30.0	–	0.0
App. Lane 4	Slip (Giveway/Yield)	R	1900	–	–	0.0
North	WIS 47 (Richmond St)					
App. Lane 1	Normal	T	1900	36.0	–	0.0
App. Lane 2	Normal	T	1900	33.0	–	0.0
App. Lane 3	Normal	T	1900	30.0	–	0.0
App. Lane 4	Slip (Giveway/Yield)	R	1900	–	–	0.0

Geometry - Approach & Exit Lane Data

Lane Number	Lane Width ft	Lane Length ft	Grade %	SL Type
South	WIS 47 (Richmond St)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–
East	US 41 SB Off Ramp			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
North	WIS 47 (Richmond St)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
West	US 41 SB On Ramp			
Exit Lane 1	13.00	1600.0	0.00	–

Lanes are numbered from left to right in the direction of travel.

Geometry - Movement Definitions

To Approach	Movement Banned	Turn Desig.
From: South	WIS 47 (Richmond St)	
South	No	L
West	No	L
North	No	T
From: East	US 41 SB Off Ramp	
South	No	L
West	No	T
North	No	R
From: North	WIS 47 (Richmond St)	
North	No	T
South	No	T
West	No	R

HCM 2010 Roundabout Model Calibration

Location	Name	HCM 2010 Single Lane		HCM 2010 Multi-Lane Dominant Lane		HCM 2010 Multi-Lane Subdominant Lane	
		Para. A	Para. B	Para. A	Para. B	Para. A	Para. B
South	WIS 47 (Richmond St)	1125.0	0.000722	1285.7	0.000722	1285.7	0.000722
East	US 41 SB Off Ramp	1125.0	0.000722	1285.7	0.000722	1285.7	0.000722
North	WIS 47 (Richmond St)	1125.0	0.000722	1285.7	0.000722	1285.7	0.000722
West	US 41 SB On Ramp	1125.0	0.000722	1285.7	0.000722	1285.7	0.000722

Volumes

To Approach	Total veh	HV %	Peak Flow Factor %	Vehicle Occupancy pers/veh	Flow Scale %	Growth Rate %/year
From: South	WIS 47 (Richmond St)					
South	5.0	1.00	91.0	1.20	100.00	2.00
West	225.0	1.00	91.0	1.20	100.00	2.00
North	1330.0	1.00	91.0	1.20	100.00	2.00
From: East	US 41 SB Off Ramp					
South	695.0	2.00	91.0	1.20	100.00	2.00
West	1.0	2.00	91.0	1.20	100.00	2.00
North	255.0	2.00	91.0	1.20	100.00	2.00
From: North	WIS 47 (Richmond St)					
North	5.0	2.00	91.0	1.20	100.00	2.00
South	905.0	2.00	91.0	1.20	100.00	2.00
West	380.0	2.00	91.0	1.20	100.00	2.00

Path Data

To Approach	App. Cruise Speed mph	Exit Cruise Speed mph	App. Trav. Distance ft	Negn Speed mph	Negn Distance ft	Downst. Distance ft	Negn Radius ft
From: South	WIS 47 (Richmond St)						
South	40.0	40.0	1600.0	–	–	–	–
West	40.0	40.0	1600.0	–	–	–	–
North	40.0	40.0	1600.0	–	–	–	–
From: East	US 41 SB Off Ramp						
South	40.0	40.0	1600.0	–	–	–	–
West	40.0	40.0	1600.0	–	–	–	–
North	40.0	40.0	1600.0	–	–	–	–
From: North	WIS 47 (Richmond St)						
North	40.0	40.0	1600.0	–	–	–	–
South	40.0	40.0	1600.0	–	–	–	–
West	40.0	40.0	1600.0	–	–	–	–

Movement Data - General

Turn	Mov. ID	Queue Space LV ft	Queue Space HV ft	Vehicle Length LV ft	Vehicle Length HV ft	HVE	P.Deg. Satn	Movement Type	Movement Control
South	WIS 47 (Richmond St)								
L	3	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	8	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
East	US 41 SB Off Ramp								
L	1	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	6	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	16	25.00	45.00	17.00	36.00	2.00	–	*Slip*	*Yield*
North	WIS 47 (Richmond St)								
T	4	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	14	25.00	45.00	17.00	36.00	2.00	–	*Slip*	*Yield*

Movement Type and Control parameters are set automaticly from Approach Control and Lane Type data in the Geometry dialog.

Gap Acceptance

Movement		Critical Gap sec	Follow-up Headway sec	Min. Departures veh/min	Exiting Flow Effect %
South	WIS 47 (Richmond St)				
	L	4.200	3.200	2.50	0
	T	4.200	3.200	2.50	0
East	US 41 SB Off Ramp				
	L	4.000	2.800	2.50	0
	T	4.000	2.800	2.50	0
	R	4.000	2.800	2.50	0
North	WIS 47 (Richmond St)				
	T	4.000	2.800	2.50	0
	R	4.000	2.800	2.50	0

Model Settings - Options	
General Options	
Level of Service Method	Delay & v/c (HCM 2010)
Level of Service Target	LOS D
Performance Measure	Delay
Percentile Queue	95 %
Hours per Year	480 h
Gap Acceptance	
HV Method for Gap-Acceptance	Include HV Effect for all percentages
Gap-Acceptance Capacity	Traditional M1
HCM Delay Formula	Yes
Downstream Short Lane Model	
Minimum Downstream Utilisation Ratio	20 %
Minimum Downstream Distance	100 ft
Distance for Full Lane Utilisation	660 ft
Calibration Parameter	1.2

Model Settings - Roundabouts	
Roundabout Model Options	
Capacity Model	US HCM 2010
LOS Method	Same as Sign Control
US HCM 2010 Roundabout Model	
Include Origin-Destination Pattern Effects	No
Factor for Parameter A	1.000
Factor for Parameter B	1.000
Other Roundabout Models	
FHWA 2000	No
Use Urban Compact Roundabout	–
HCM 2000	No
NAASRA 1986	No

Model Settings - Cost Parameters	
Vehicle Operating Cost	
Cost Unit	$
Pump Price of Fuel	3.000 $/gal
Fuel Resource Cost Factor	0.700
Ratio of Running Cost to Fuel Cost	3.00
Vehicle Mass	
Light Vehicle Mass	3100.0 lb
Heavy Vehicle Mass	24000.0 lb
Heavy Vehicle Maximum Power	130 kW
Time Cost	
Average Income	23.00 $/h
Time Value Factor	0.400

Demand & Sensitivity	
Analysis Method:	None

Site Properties	
Site (Intersection) Type	Roundabout

Model Name	US HCM (Customary)
Drive Rule	Right-hand side of the road
New Zealand Rule	No
HCM Version	Yes
Units	US Customary

INTERSECTION SUMMARY

US 41 SB Ramps with WIS 47 (Richmond Street)
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	4177	veh/h	5012	pers/h
Percent Heavy Vehicles	1.6	%		
Degree of Saturation	0.774			
Practical Spare Capacity	9.9	%		
Effective Intersection Capacity	5399	veh/h		
Control Delay (Total)	19.37	veh-h/h	23.24	pers-h/h
Control Delay (Average)	16.7	sec	16.7	sec
Control Delay (Worst Lane)	40.9	sec		
Control Delay (Worst Movement)	35.4	sec	35.4	sec
Geometric Delay (Average)	7.1	sec		
Stop-Line Delay (Average)	16.7	sec		
Intersection Level of Service (LOS)	LOS C			
95% Back of Queue - Vehicles (Worst Lane)	3.6	veh		
95% Back of Queue - Distance (Worst Lane)	92.2	ft		
Total Effective Stops	3137	veh/h	3765	pers/h
Effective Stop Rate	0.75	per veh	0.75	per pers
Proportion Queued	0.45		0.45	
Performance Index	88.8		88.8	
Travel Distance (Total)	1620.2	veh-mi/h	1944.2	pers-mi/h
Travel Distance (Average)	2048	ft	2048	ft
Travel Time (Total)	68.0	veh-h/h	81.6	pers-h/h
Travel Time (Average)	58.6	sec	58.6	sec
Travel Speed	23.8	mph	23.8	mph
Cost (Total)	1292.00	$/h	1292.00	$/h
Fuel Consumption (Total)	85.4	gal/h		
Carbon Dioxide (Total)	808.6	kg/h		
Hydrocarbons (Total)	1.364	kg/h		
Carbon Monoxide (Total)	60.64	kg/h		
NOx (Total)	1.902	kg/h		

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	2,004,923	veh/y	2,405,908	pers/y
Delay	9,298	veh-h/y	11,158	pers-h/y
Effective Stops	1,505,814	veh/y	1,806,977	pers/y
Travel Distance	777,693	veh-mi/y	933,232	pers-mi/y
Travel Time	32,659	veh-h/y	39,191	pers-h/y
Cost	620,159	$/y	620,159	$/y
Fuel Consumption	40,988	gal/y		
Carbon Dioxide	388,148	kg/y		
Hydrocarbons	655	kg/y		
Carbon Monoxide	29,106	kg/y		
NOx	913	kg/y		

MOVEMENT SUMMARY

Site: US 41 SB Ramps with WIS 47 - PM 3LN

US 41 SB Ramps with WIS 47 (Richmond Street)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: WIS 47 (Richmond St)											
3	L	253	1.0	0.475	8.5	LOS A	2.1	54.0	0.05	0.82	25.6
8	T	1462	1.0	0.535	9.4	LOS A	2.7	68.6	0.05	0.42	28.1
Approach		1714	1.0	0.535	9.3	LOS A	2.7	68.6	0.05	0.48	27.7
East: US 41 SB Off Ramp											
1	L	764	2.0	0.774	35.4	LOS E	3.6	92.2	0.89	1.12	17.5
6	T	1	2.0	0.645	29.7	LOS D	2.5	64.6	0.87	1.04	19.3
16	R	280	2.0	0.648	25.7	LOS D	2.8	70.0	0.84	1.04	20.7
Approach		1045	2.0	0.774	32.8	LOS D	3.6	92.2	0.88	1.10	18.2
North: WIS 47 (Richmond St)											
4	T	1000	2.0	0.609	16.4	LOS C	2.8	72.0	0.71	0.91	24.6
14	R	418	2.0	0.397	7.6	LOS A	1.6	40.7	0.38	0.62	28.4
Approach		1418	2.0	0.609	13.8	LOS B	2.8	72.0	0.62	0.83	25.6
All Vehicles		4177	1.6	0.774	16.7	LOS C	3.6	92.2	0.45	0.75	23.8

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

LANE SUMMARY

Site: US 41 SB Ramps with WIS 47 - PM 3LN

US 41 SB Ramps with WIS 47 (Richmond Street)
Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Lane Length ft	SL Type	Cap. Adj. %	Prob. Block. %
South: WIS 47 (Richmond St)																
Lane 1	253	274	0	527	1.0	1109	0.475	89[5]	8.5	LOS A	2.1	54.0	1600	–	0.0	0.0
Lane 2	0	594	0	594	1.0	1109	0.535	100	9.6	LOS A	2.7	68.6	1600	–	0.0	0.0
Lane 3	0	594	0	594	1.0	1109	0.535	100	9.6	LOS A	2.7	68.6	1600	–	0.0	0.0
Approach	253	1462	0	1714	1.0		0.535		9.3	LOS A	2.7	68.6				
East: US 41 SB Off Ramp																
Lane 1	278	0	0	278	2.0	360	0.774	100	40.9	LOS E	3.6	92.2	1600	–	0.0	0.0
Lane 2	255	0	0	255	2.0	360	0.709	92[5]	34.6	LOS D	3.0	76.7	1600	–	0.0	0.0
Lane 3	231	1	0	232	2.0	360	0.645	83[5]	29.7	LOS D	2.5	64.6	1600	–	0.0	0.0
Lane 4	0	0	280	280	2.0	432	0.648	100	25.7	LOS D	2.8	70.0	1600	–	0.0	0.0
Approach	764	1	280	1045	2.0		0.774		32.8	LOS D	3.6	92.2				
North: WIS 47 (Richmond St)																
Lane 1	0	364	0	364	2.0	597	0.609	100	18.0	LOS C	2.8	72.0	1600	–	0.0	0.0
Lane 2	0	333	0	333	2.0	597	0.559	92[5]	16.2	LOS C	2.4	61.8	1600	–	0.0	0.0
Lane 3	0	303	0	303	2.0	597	0.508	83[5]	14.6	LOS B	2.1	52.8	1600	–	0.0	0.0
Lane 4	0	0	418	418	2.0	1052	0.397	100	7.6	LOS A	1.6	40.7	1600	–	0.0	0.0
Approach	0	1000	418	1418	2.0		0.609		13.8	LOS B	2.8	72.0				
Intersection				4177	1.6		0.774		16.7	LOS C	3.6	92.2				

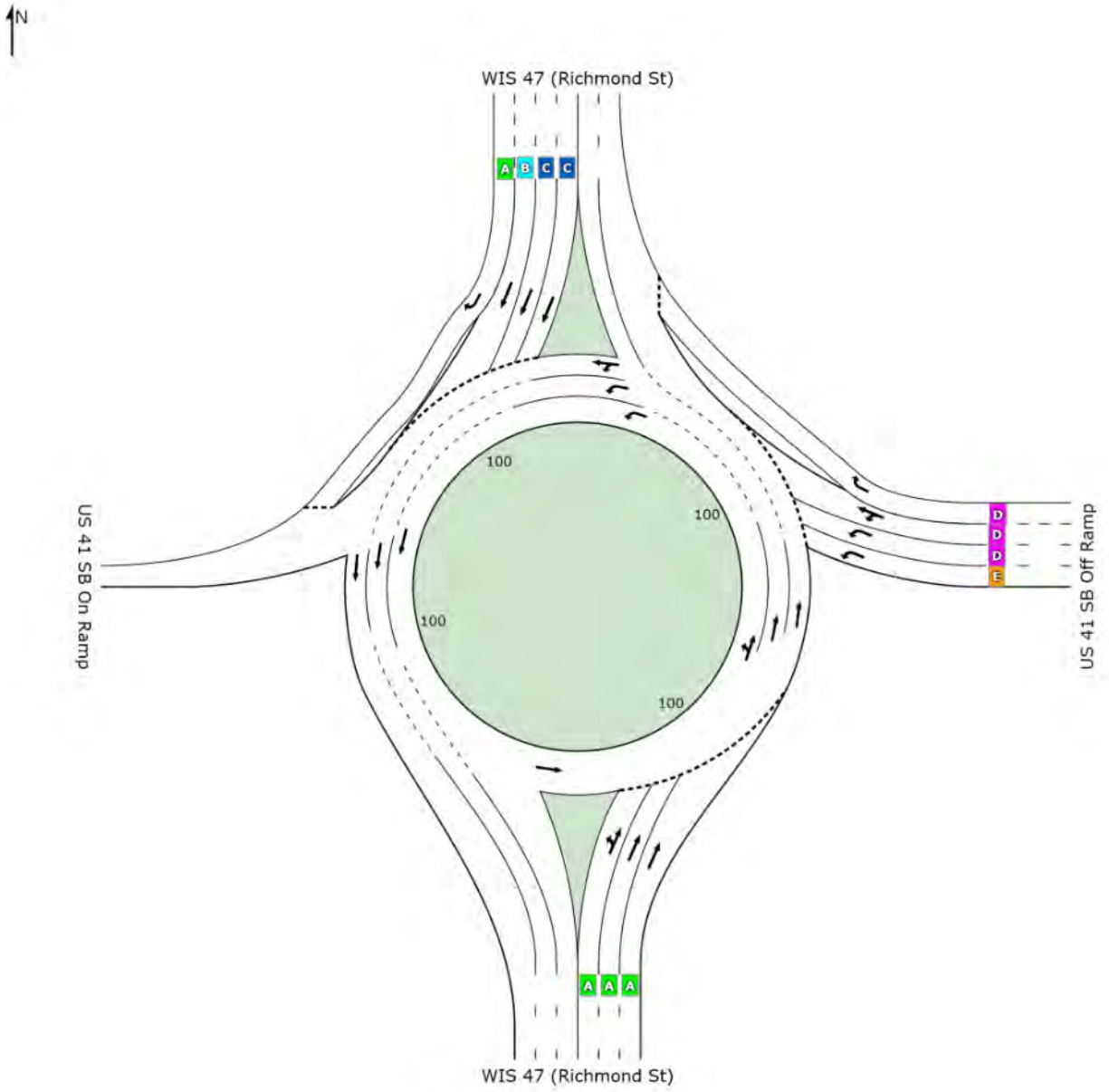
Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

5 Lane underutilisation determined by program

SIDRA INTERSECTION

LEVEL OF SERVICE SUMMARY

US 41 SB Ramps with WIS 47 (Richmond Street)
Roundabout



	South	East	North	West	Intersection
LOS	A	D	B	NA	C

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Model used. Geometric Delay not included.

US 41 with WIS 96

INPUT REPORT

US 41 NB Ramps with WIS 96 (Wisconsin Ave)

Intersection Parameters	
Title	US 41 NB Ramps with WIS 96 (Wisconsin Ave)
Intersection ID	1
Unit Time (for volumes)	60 minutes
Peak Flow Period (for performance)	15 minutes

Geometry - Approach Data

Location	Name	Type	No. of App. Lanes	No. of Exit Lanes	Median Width ft	Extra Bunching %
South	US 41 NB Off Ramp	One-way Approach	4	0	–	0.0
East	WIS 96 (Wisconsin Ave)	Two-way	4	4	–	0.0
North	US 41 NB On Ramp	One-way Exit	0	1	–	0.0
West	WIS 96 (Wisconsin Ave)	Two-way	3	3	–	0.0

Geometry - Roundabout Data

Location	Name	Island Diameter ft	Circ. Width ft	Circ. Lanes	Entry Radius ft	Entry Angle degrees	Env. Factor	Entry/Circ. Flow Adjust.
South	US 41 NB Off Ramp	100.00	30.00	3	65.0	30.0	1.2000	None
East	WIS 96 (Wisconsin Ave)	100.00	30.00	3	65.0	30.0	1.2000	None
North	US 41 NB On Ramp	100.00	30.00	3	65.0	30.0	1.2000	None
West	WIS 96 (Wisconsin Ave)	100.00	30.00	1	65.0	30.0	1.2000	None

Geometry - Approach Lane Data

Lane Number	Lane Type	Lane Discip.	Basic Satn Flow tcu/h	Utilisation Ratio %	Saturation Speed mph	Capacity Adjustment %
South	US 41 NB Off Ramp					
App. Lane 1	Normal	L	1900	36.0	–	0.0
App. Lane 2	Normal	L	1900	33.0	–	0.0
App. Lane 3	Normal	LT	1900	30.0	–	0.0
App. Lane 4	Continuous	R	1900	–	–	0.0
East	WIS 96 (Wisconsin Ave)					
App. Lane 1	Normal	T	1900	36.0	–	0.0
App. Lane 2	Normal	T	1900	33.0	–	0.0
App. Lane 3	Normal	T	1900	30.0	–	0.0
App. Lane 4	Slip (Giveway/Yield)	R	1900	–	–	0.0
West	WIS 96 (Wisconsin Ave)					
App. Lane 1	Normal	LT	1900	47.0	–	0.0
App. Lane 2	Normal	T	1900	47.0	–	0.0
App. Lane 3	Normal	T	1900	53.0	–	0.0

Geometry - Approach & Exit Lane Data

Lane Number	Lane Width ft	Lane Length ft	Grade %	SL Type
South	US 41 NB Off Ramp			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
East	WIS 96 (Wisconsin Ave)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–
Exit Lane 4	13.00	1600.0	0.00	–
North	US 41 NB On Ramp			
Exit Lane 1	13.00	1600.0	0.00	–
West	WIS 96 (Wisconsin Ave)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–

Lanes are numbered from left to right in the direction of travel.

Geometry - Movement Definitions

To Approach	Movement Banned	Turn Desig.
From: South	US 41 NB Off Ramp	
West	No	L
North	No	T
East	No	R
From: East	WIS 96 (Wisconsin Ave)	
East	No	T
West	No	T
North	No	R
From: West	WIS 96 (Wisconsin Ave)	
West	No	L
North	No	L
East	No	T

HCM 2010 Roundabout Model Calibration

Location	Name	HCM 2010 Single Lane		HCM 2010 Multi-Lane Dominant Lane		HCM 2010 Multi-Lane Subdominant Lane	
		Para. A	Para. B	Para. A	Para. B	Para. A	Para. B
South	US 41 NB Off Ramp	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
East	WIS 96 (Wisconsin Ave)	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
North	US 41 NB On Ramp	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
West	WIS 96 (Wisconsin Ave)	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722

Volumes

To Approach	Total veh	HV %	Peak Flow Factor %	Vehicle Occupancy pers/veh	Flow Scale %	Growth Rate %/year
From: South	US 41 NB Off Ramp					
West	450.0	2.00	81.0	1.20	100.00	2.00
North	1.0	2.00	81.0	1.20	100.00	2.00
East	685.0	2.00	81.0	1.20	100.00	2.00
From: East	WIS 96 (Wisconsin Ave)					
East	5.0	2.00	81.0	1.20	100.00	2.00
West	1105.0	2.00	81.0	1.20	100.00	2.00
North	130.0	2.00	81.0	1.20	100.00	2.00
From: West	WIS 96 (Wisconsin Ave)					
West	5.0	2.00	81.0	1.20	100.00	2.00
North	230.0	2.00	81.0	1.20	100.00	2.00
East	1055.0	2.00	81.0	1.20	100.00	2.00

Path Data

To Approach	App. Cruise Speed mph	Exit Cruise Speed mph	App. Trav. Distance ft	Negn Speed mph	Negn Distance ft	Downst. Distance ft	Negn Radius ft
From: South	US 41 NB Off Ramp						
West	40.0	40.0	1600.0	–	–	–	–
North	40.0	40.0	1600.0	–	–	–	–
East	40.0	40.0	1600.0	–	–	–	–
From: East	WIS 96 (Wisconsin Ave)						
East	40.0	40.0	1600.0	–	–	–	–
West	40.0	40.0	1600.0	–	–	–	–
North	40.0	40.0	1600.0	–	–	–	–
From: West	WIS 96 (Wisconsin Ave)						
West	40.0	40.0	1600.0	–	–	–	–
North	40.0	40.0	1600.0	–	–	–	–
East	40.0	40.0	1600.0	–	–	–	–

Movement Data - General

Turn	Mov. ID	Queue Space LV ft	Queue Space HV ft	Vehicle Length LV ft	Vehicle Length HV ft	HVE	P.Deg. Satn	Movement Type	Movement Control
South	US 41 NB Off Ramp								
L	3	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	8	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	18	25.00	45.00	17.00	36.00	2.00	–	*Cont.*	–
East	WIS 96 (Wisconsin Ave)								
T	6	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	16	25.00	45.00	17.00	36.00	2.00	–	*Slip*	*Yield*
West	WIS 96 (Wisconsin Ave)								
L	5	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	2	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–

Movement Type and Control parameters are set automaticly from Approach Control and Lane Type data in the Geometry dialog.

Gap Acceptance

Movement		Critical Gap sec	Follow-up Headway sec	Min. Departures veh/min	Exiting Flow Effect %
South	US 41 NB Off Ramp				
L		4.000	2.800	2.50	0
T		4.000	2.800	2.50	0
East	WIS 96 (Wisconsin Ave)				
T		4.000	2.800	2.50	0
R		4.000	2.800	2.50	0
West	WIS 96 (Wisconsin Ave)				
L		4.200	3.200	2.50	0
T		4.200	3.200	2.50	0

Model Settings - Options	
General Options	
Level of Service Method	Delay & v/c (HCM 2010)
Level of Service Target	LOS D
Performance Measure	Delay
Percentile Queue	95 %
Hours per Year	480 h
Gap Acceptance	
HV Method for Gap-Acceptance	Include HV Effect for all percentages
Gap-Acceptance Capacity	Traditional M1
HCM Delay Formula	Yes
Downstream Short Lane Model	
Minimum Downstream Utilisation Ratio	20 %
Minimum Downstream Distance	100 ft
Distance for Full Lane Utilisation	660 ft
Calibration Parameter	1.2

Model Settings - Roundabouts	
Roundabout Model Options	
Capacity Model	US HCM 2010
LOS Method	Same as Sign Control
US HCM 2010 Roundabout Model	
Include Origin-Destination Pattern Effects	No
Factor for Parameter A	1.000
Factor for Parameter B	1.000
Other Roundabout Models	
FHWA 2000	No
Use Urban Compact Roundabout	–
HCM 2000	No
NAASRA 1986	No

Model Settings - Cost Parameters	
Vehicle Operating Cost	
Cost Unit	$
Pump Price of Fuel	3.000 $/gal
Fuel Resource Cost Factor	0.700
Ratio of Running Cost to Fuel Cost	3.00
Vehicle Mass	
Light Vehicle Mass	3100.0 lb
Heavy Vehicle Mass	24000.0 lb
Heavy Vehicle Maximum Power	130 kW
Time Cost	
Average Income	23.00 $/h
Time Value Factor	0.400

Demand & Sensitivity	
Analysis Method:	None

Site Properties	
Site (Intersection) Type	Roundabout

Model Name	US HCM (Customary)
Drive Rule	Right-hand side of the road
New Zealand Rule	No
HCM Version	Yes
Units	US Customary

INTERSECTION SUMMARY

US 41 NB Ramps with WIS 96 (Wisconsin Ave)
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	4526	veh/h	5431	pers/h
Percent Heavy Vehicles	2.0	%		
Degree of Saturation	0.738			
Practical Spare Capacity	15.2	%		
Effective Intersection Capacity	6135	veh/h		
Control Delay (Total)	14.67	veh-h/h	17.61	pers-h/h
Control Delay (Average)	11.7	sec	11.7	sec
Control Delay (Worst Lane)	22.5	sec		
Control Delay (Worst Movement)	20.0	sec	20.0	sec
Geometric Delay (Average)	6.7	sec		
Stop-Line Delay (Average)	11.7	sec		
Intersection Level of Service (LOS)	LOS B			
95% Back of Queue - Vehicles (Worst Lane)	4.5	veh		
95% Back of Queue - Distance (Worst Lane)	115.3	ft		
Total Effective Stops	3184	veh/h	3820	pers/h
Effective Stop Rate	0.70	per veh	0.70	per pers
Proportion Queued	0.35		0.35	
Performance Index	85.4		85.4	
Travel Distance (Total)	1747.1	veh-mi/h	2096.5	pers-mi/h
Travel Distance (Average)	2038	ft	2038	ft
Travel Time (Total)	66.8	veh-h/h	80.1	pers-h/h
Travel Time (Average)	53.1	sec	53.1	sec
Travel Speed	26.2	mph	26.2	mph
Cost (Total)	1307.08	$/h	1307.08	$/h
Fuel Consumption (Total)	89.9	gal/h		
Carbon Dioxide (Total)	851.8	kg/h		
Hydrocarbons (Total)	1.409	kg/h		
Carbon Monoxide (Total)	64.48	kg/h		
NOx (Total)	2.035	kg/h		

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	2,172,445	veh/y	2,606,934	pers/y
Delay	7,044	veh-h/y	8,453	pers-h/y
Effective Stops	1,528,161	veh/y	1,833,793	pers/y
Travel Distance	838,612	veh-mi/y	1,006,335	pers-mi/y
Travel Time	32,047	veh-h/y	38,456	pers-h/y
Cost	627,398	$/y	627,398	$/y
Fuel Consumption	43,167	gal/y		
Carbon Dioxide	408,841	kg/y		
Hydrocarbons	676	kg/y		
Carbon Monoxide	30,950	kg/y		
NOx	977	kg/y		

MOVEMENT SUMMARY

Site: US 41 NB Ramps with WIS 96 - AM 3LN

US 41 NB Ramps with WIS 96 (Wisconsin Ave)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: US 41 NB Off Ramp											
3	L	556	2.0	0.522	20.0	LOS C	1.9	47.6	0.81	1.01	21.4
8	T	1	2.0	0.435	18.4	LOS C	1.5	36.9	0.80	0.93	23.0
18	R	846	2.0	0.533	0.1	X	X	X	X	0.51	33.7
Approach		1402	2.0	0.533	8.0	LOS A	1.9	47.6	0.32	0.71	27.2
East: WIS 96 (Wisconsin Ave)											
6	T	1370	2.0	0.738	19.6	LOS C	4.5	115.3	0.74	0.96	23.3
16	R	160	2.0	0.157	5.0	LOS A	0.5	12.4	0.32	0.59	30.1
Approach		1531	2.0	0.738	18.0	LOS C	4.5	115.3	0.70	0.92	23.8
West: WIS 96 (Wisconsin Ave)											
5	L	290	2.0	0.464	8.4	LOS A	2.0	51.2	0.05	0.80	25.7
2	T	1302	2.0	0.523	8.9	LOS A	2.5	64.5	0.05	0.42	28.4
Approach		1593	2.0	0.523	8.8	LOS A	2.5	64.5	0.05	0.48	27.8
All Vehicles		4526	2.0	0.738	11.7	LOS B	4.5	115.3	0.35	0.70	26.2

X: Not applicable for Continuous movement.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

LANE SUMMARY

Site: US 41 NB Ramps with WIS 96 - AM 3LN

US 41 NB Ramps with WIS 96 (Wisconsin Ave)
Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Lane Length ft	SL Type	Cap. Adj. %	Prob. Block. %
South: US 41 NB Off Ramp																
Lane 1	202	0	0	202	2.0	388	0.522	100	21.6	LOS C	1.9	47.6	1600	–	0.0	0.0
Lane 2	186	0	0	186	2.0	388	0.478	92[5]	19.9	LOS C	1.7	42.1	1600	–	0.0	0.0
Lane 3	168	1	0	169	2.0	388	0.435	83[5]	18.4	LOS C	1.5	36.9	1600	–	0.0	0.0
Lane 4	0	0	846	846	2.0	1588	0.533	100	0.1	X	X	X	1600	–	0.0	X
Approach	556	1	846	1402	2.0		0.533		8.0	LOS A	1.9	47.6				
East: WIS 96 (Wisconsin Ave)																
Lane 1	0	498	0	498	2.0	675	0.738	100	22.5	LOS C	4.5	115.3	1600	–	0.0	0.0
Lane 2	0	457	0	457	2.0	675	0.676	92[5]	19.1	LOS C	3.7	94.4	1600	–	0.0	0.0
Lane 3	0	415	0	415	2.0	675	0.615	83[5]	16.5	LOS C	3.1	77.7	1600	–	0.0	0.0
Lane 4	0	0	160	160	2.0	1022	0.157	100	5.0	LOS A	0.5	12.4	1600	–	0.0	0.0
Approach	0	1370	160	1531	2.0		0.738		18.0	LOS C	4.5	115.3				
West: WIS 96 (Wisconsin Ave)																
Lane 1	290	219	0	509	2.0	1098	0.464	89[5]	8.4	LOS A	2.0	51.2	1600	–	0.0	0.0
Lane 2	0	509	0	509	2.0	1098	0.464	89[5]	8.4	LOS A	2.0	51.2	1600	–	0.0	0.0
Lane 3	0	574	0	574	2.0	1098	0.523	100	9.4	LOS A	2.5	64.5	1600	–	0.0	0.0
Approach	290	1302	0	1593	2.0		0.523		8.8	LOS A	2.5	64.5				
Intersection				4526	2.0		0.738		11.7	LOS B	4.5	115.3				

X: Not applicable for Continuous lane.

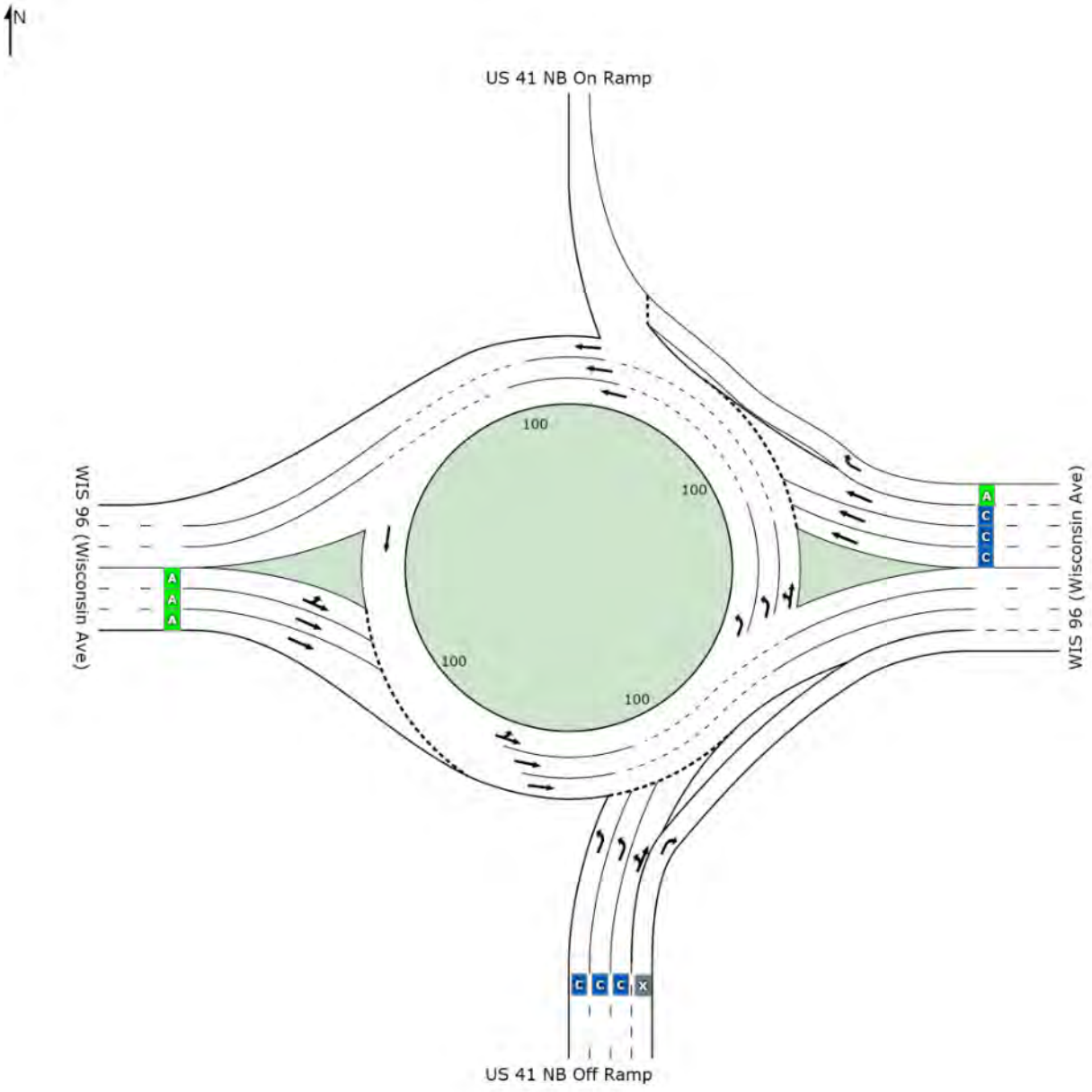
Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

5 Lane underutilisation determined by program

LEVEL OF SERVICE SUMMARY

Site: US 41 NB Ramps with WIS 96 - AM 3LN

US 41 NB Ramps with WIS 96 (Wisconsin Ave)
Roundabout



	South	East	North	West	Intersection
LOS	A	C	NA	A	B

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Model used. Geometric Delay not included.

INPUT REPORT

US 41 NB Ramps with WIS 96 (Wisconsin Ave)

Intersection Parameters	
Title	US 41 NB Ramps with WIS 96 (Wisconsin Ave)
Intersection ID	1
Unit Time (for volumes)	60 minutes
Peak Flow Period (for performance)	15 minutes

Geometry - Approach Data

Location	Name	Type	No. of App. Lanes	No. of Exit Lanes	Median Width ft	Extra Bunching %
South	US 41 NB Off Ramp	One-way Approach	4	0	–	0.0
East	WIS 96 (Wisconsin Ave)	Two-way	4	4	–	0.0
North	US 41 NB On Ramp	One-way Exit	0	1	–	0.0
West	WIS 96 (Wisconsin Ave)	Two-way	3	3	–	0.0

Geometry - Roundabout Data

Location	Name	Island Diameter ft	Circ. Width ft	Circ. Lanes	Entry Radius ft	Entry Angle degrees	Env. Factor	Entry/Circ. Flow Adjust.
South	US 41 NB Off Ramp	100.00	30.00	3	65.0	30.0	1.2000	None
East	WIS 96 (Wisconsin Ave)	100.00	30.00	3	65.0	30.0	1.2000	None
North	US 41 NB On Ramp	100.00	30.00	3	65.0	30.0	1.2000	None
West	WIS 96 (Wisconsin Ave)	100.00	30.00	1	65.0	30.0	1.2000	None

Geometry - Approach Lane Data

Lane Number	Lane Type	Lane Discip.	Basic Satn Flow tcu/h	Utilisation Ratio %	Saturation Speed mph	Capacity Adjustment %
South	US 41 NB Off Ramp					
App. Lane 1	Normal	L	1900	36.0	–	0.0
App. Lane 2	Normal	L	1900	33.0	–	0.0
App. Lane 3	Normal	LT	1900	30.0	–	0.0
App. Lane 4	Continuous	R	1900	–	–	0.0
East	WIS 96 (Wisconsin Ave)					
App. Lane 1	Normal	T	1900	36.0	–	0.0
App. Lane 2	Normal	T	1900	33.0	–	0.0
App. Lane 3	Normal	T	1900	30.0	–	0.0
App. Lane 4	Slip (Giveway/Yield)	R	1900	–	–	0.0
West	WIS 96 (Wisconsin Ave)					
App. Lane 1	Normal	LT	1900	36.0	–	0.0
App. Lane 2	Normal	T	1900	33.0	–	0.0
App. Lane 3	Normal	T	1900	30.0	–	0.0

Geometry - Approach & Exit Lane Data

Lane Number	Lane Width ft	Lane Length ft	Grade %	SL Type
South	US 41 NB Off Ramp			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
East	WIS 96 (Wisconsin Ave)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–
Exit Lane 4	13.00	1600.0	0.00	–
North	US 41 NB On Ramp			
Exit Lane 1	13.00	1600.0	0.00	–
West	WIS 96 (Wisconsin Ave)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–

Lanes are numbered from left to right in the direction of travel.

Geometry - Movement Definitions

To Approach	Movement Banned	Turn Desig.
From: South	US 41 NB Off Ramp	
West	No	L
North	No	T
East	No	R
From: East	WIS 96 (Wisconsin Ave)	
East	No	T
West	No	T
North	No	R
From: West	WIS 96 (Wisconsin Ave)	
West	No	L
North	No	L
East	No	T

HCM 2010 Roundabout Model Calibration

Location	Name	HCM 2010 Single Lane		HCM 2010 Multi-Lane Dominant Lane		HCM 2010 Multi-Lane Subdominant Lane	
		Para. A	Para. B	Para. A	Para. B	Para. A	Para. B
South	US 41 NB Off Ramp	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
East	WIS 96 (Wisconsin Ave)	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
North	US 41 NB On Ramp	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
West	WIS 96 (Wisconsin Ave)	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722

Volumes

To Approach	Total veh	HV %	Peak Flow Factor %	Vehicle Occupancy pers/veh	Flow Scale %	Growth Rate %/year
From: South	US 41 NB Off Ramp					
West	715.0	2.00	98.0	1.20	100.00	2.00
North	1.0	2.00	98.0	1.20	100.00	2.00
East	635.0	2.00	98.0	1.20	100.00	2.00
From: East	WIS 96 (Wisconsin Ave)					
East	5.0	2.00	98.0	1.20	100.00	2.00
West	2545.0	2.00	98.0	1.20	100.00	2.00
North	200.0	2.00	98.0	1.20	100.00	2.00
From: West	WIS 96 (Wisconsin Ave)					
West	5.0	2.00	98.0	1.20	100.00	2.00
North	760.0	2.00	98.0	1.20	100.00	2.00
East	1750.0	2.00	98.0	1.20	100.00	2.00

Path Data

To Approach	App. Cruise Speed mph	Exit Cruise Speed mph	App. Trav. Distance ft	Negn Speed mph	Negn Distance ft	Downst. Distance ft	Negn Radius ft
From: South	US 41 NB Off Ramp						
West	40.0	40.0	1600.0	–	–	–	–
North	40.0	40.0	1600.0	–	–	–	–
East	40.0	40.0	1600.0	–	–	–	–
From: East	WIS 96 (Wisconsin Ave)						
East	40.0	40.0	1600.0	–	–	–	–
West	40.0	40.0	1600.0	–	–	–	–
North	40.0	40.0	1600.0	–	–	–	–
From: West	WIS 96 (Wisconsin Ave)						
West	40.0	40.0	1600.0	–	–	–	–
North	40.0	40.0	1600.0	–	–	–	–
East	40.0	40.0	1600.0	–	–	–	–

Movement Data - General

Turn	Mov. ID	Queue Space LV ft	Queue Space HV ft	Vehicle Length LV ft	Vehicle Length HV ft	HVE	P.Deg. Satn	Movement Type	Movement Control
South	US 41 NB Off Ramp								
L	3	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	8	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	18	25.00	45.00	17.00	36.00	2.00	–	*Cont.*	–
East	WIS 96 (Wisconsin Ave)								
T	6	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	16	25.00	45.00	17.00	36.00	2.00	–	*Slip*	*Yield*
West	WIS 96 (Wisconsin Ave)								
L	5	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	2	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–

Movement Type and Control parameters are set automaticly from Approach Control and Lane Type data in the Geometry dialog.

Gap Acceptance

Movement		Critical Gap sec	Follow-up Headway sec	Min. Departures veh/min	Exiting Flow Effect %
South	US 41 NB Off Ramp				
L		4.000	2.800	2.50	0
T		4.000	2.800	2.50	0
East	WIS 96 (Wisconsin Ave)				
T		4.000	2.800	2.50	0
R		4.000	2.800	2.50	0
West	WIS 96 (Wisconsin Ave)				
L		4.200	3.200	2.50	0
T		4.200	3.200	2.50	0

Model Settings - Options	
General Options	
Level of Service Method	Delay & v/c (HCM 2010)
Level of Service Target	LOS D
Performance Measure	Delay
Percentile Queue	95 %
Hours per Year	480 h
Gap Acceptance	
HV Method for Gap-Acceptance	Include HV Effect for all percentages
Gap-Acceptance Capacity	Traditional M1
HCM Delay Formula	Yes
Downstream Short Lane Model	
Minimum Downstream Utilisation Ratio	20 %
Minimum Downstream Distance	100 ft
Distance for Full Lane Utilisation	660 ft
Calibration Parameter	1.2

Model Settings - Roundabouts	
Roundabout Model Options	
Capacity Model	US HCM 2010
LOS Method	Same as Sign Control
US HCM 2010 Roundabout Model	
Include Origin-Destination Pattern Effects	No
Factor for Parameter A	1.000
Factor for Parameter B	1.000
Other Roundabout Models	
FHWA 2000	No
Use Urban Compact Roundabout	–
HCM 2000	No
NAASRA 1986	No

Model Settings - Cost Parameters	
Vehicle Operating Cost	
Cost Unit	$
Pump Price of Fuel	3.000 $/gal
Fuel Resource Cost Factor	0.700
Ratio of Running Cost to Fuel Cost	3.00
Vehicle Mass	
Light Vehicle Mass	3100.0 lb
Heavy Vehicle Mass	24000.0 lb
Heavy Vehicle Maximum Power	130 kW
Time Cost	
Average Income	23.00 $/h
Time Value Factor	0.400

Demand & Sensitivity	
Analysis Method:	None

Site Properties	
Site (Intersection) Type	Roundabout

Model Name	US HCM (Customary)
Drive Rule	Right-hand side of the road
New Zealand Rule	No
HCM Version	Yes
Units	US Customary

INTERSECTION SUMMARY

Site: US 41 NB Ramps with WIS 96 - PM 3LN

US 41 NB Ramps with WIS 96 (Wisconsin Ave)
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	6751	veh/h	8101	pers/h
Percent Heavy Vehicles	2.0	%		
Degree of Saturation	2.030			
Practical Spare Capacity	-58.1	%		
Effective Intersection Capacity	3326	veh/h		
Control Delay (Total)	361.05	veh-h/h	433.26	pers-h/h
Control Delay (Average)	192.5	sec	192.5	sec
Control Delay (Worst Lane)	491.0	sec		
Control Delay (Worst Movement)	420.8	sec	420.8	sec
Geometric Delay (Average)	6.9	sec		
Stop-Line Delay (Average)	192.5	sec		
Intersection Level of Service (LOS)	LOS F			
95% Back of Queue - Vehicles (Worst Lane)	159.0	veh		
95% Back of Queue - Distance (Worst Lane)	4039.7	ft		
Total Effective Stops	19388	veh/h	23266	pers/h
Effective Stop Rate	2.87	per veh	2.87	per pers
Proportion Queued	0.54		0.54	
Performance Index	732.4		732.4	
Travel Distance (Total)	2615.0	veh-mi/h	3138.1	pers-mi/h
Travel Distance (Average)	2045	ft	2045	ft
Travel Time (Total)	439.3	veh-h/h	527.1	pers-h/h
Travel Time (Average)	234.2	sec	234.2	sec
Travel Speed	6.0	mph	6.0	mph
Cost (Total)	6650.87	$/h	6650.87	$/h
Fuel Consumption (Total)	277.0	gal/h		
Carbon Dioxide (Total)	2623.9	kg/h		
Hydrocarbons (Total)	5.224	kg/h		
Carbon Monoxide (Total)	148.58	kg/h		
NOx (Total)	4.415	kg/h		

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	3,240,490	veh/y	3,888,588	pers/y
Delay	173,302	veh-h/y	207,963	pers-h/y
Effective Stops	9,306,417	veh/y	11,167,700	pers/y
Travel Distance	1,255,222	veh-mi/y	1,506,266	pers-mi/y
Travel Time	210,844	veh-h/y	253,012	pers-h/y
Cost	3,192,416	$/y	3,192,416	$/y
Fuel Consumption	132,980	gal/y		
Carbon Dioxide	1,259,458	kg/y		
Hydrocarbons	2,508	kg/y		
Carbon Monoxide	71,320	kg/y		
NOx	2,119	kg/y		

MOVEMENT SUMMARY

Site: US 41 NB Ramps with WIS 96 - PM 3LN

US 41 NB Ramps with WIS 96 (Wisconsin Ave)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: US 41 NB Off Ramp											
3	L	730	2.0	1.399	213.5	LOS F	28.6	727.2	1.00	2.38	5.6
8	T	1	2.0	1.166	167.6	LOS F	14.8	377.0	1.00	2.02	6.6
18	R	648	2.0	0.408	0.1	X	X	X	X	0.51	33.8
Approach		1379	2.0	1.399	113.2	LOS F	28.6	727.2	0.53	1.50	9.0
East: WIS 96 (Wisconsin Ave)											
6	T	2602	2.0	2.030	420.8	LOS F	159.0	4039.7	1.00	6.10	3.0
16	R	204	2.0	0.287	8.5	LOS A	0.9	23.5	0.55	0.78	27.9
Approach		2806	2.0	2.030	390.8	LOS F	159.0	4039.7	0.97	5.72	3.2
West: WIS 96 (Wisconsin Ave)											
5	L	781	2.0	0.848	22.5	LOS C	11.8	300.2	0.10	0.69	20.6
2	T	1786	2.0	0.848	16.5	LOS C	11.8	300.2	0.07	0.41	24.5
Approach		2566	2.0	0.848	18.3	LOS C	11.8	300.2	0.08	0.50	23.1
All Vehicles		6751	2.0	2.030	192.5	LOS F	159.0	4039.7	0.54	2.87	6.0

X: Not applicable for Continuous movement.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

LANE SUMMARY

Site: US 41 NB Ramps with WIS 96 - PM 3LN

US 41 NB Ramps with WIS 96 (Wisconsin Ave)
Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Lane Length ft	SL Type	Cap. Adj. %	Prob. Block. %
South: US 41 NB Off Ramp																
Lane 1	266	0	0	266	2.0	190	1.399	100	255.0	LOS F	28.6	727.2	1600	–	0.0	0.0
Lane 2	244	0	0	244	2.0	190	1.282	92[5]	209.8	LOS F	21.6	549.2	1600	–	0.0	0.0
Lane 3	220	1	0	221	2.0	190	1.166	83[5]	167.6	LOS F	14.8	377.0	1600	–	0.0	0.0
Lane 4	0	0	648	648	2.0	1588	0.408	100	0.1	X	X	X	1600	–	0.0	X
Approach	730	1	648	1379	2.0		1.399		113.2	LOS F	28.6	727.2				
East: WIS 96 (Wisconsin Ave)																
Lane 1	0	946	0	946	2.0	466	2.030	100	491.0	LOS F	159.0	4039.7	1600	–	0.0	51.9
Lane 2	0	867	0	867	2.0	466	1.861	92[5]	416.1	LOS F	133.9	3401.1	1600	–	0.0	36.2
Lane 3	0	788	0	788	2.0	466	1.692	83[5]	341.8	LOS F	108.8	2763.5	1600	–	0.0	24.7
Lane 4	0	0	204	204	2.0	711	0.287	100	8.5	LOS A	0.9	23.5	1600	–	0.0	0.0
Approach	0	2602	204	2806	2.0		2.030		390.8	LOS F	159.0	4039.7				
West: WIS 96 (Wisconsin Ave)																
Lane 1	781	153	0	933	2.0	1101	0.848	100	22.5	LOS C	11.8	300.2	1600	–	0.0	0.0
Lane 2	0	855	0	855	2.0	1101	0.777	92[5]	17.5	LOS C	7.7	195.8	1600	–	0.0	0.0
Lane 3	0	778	0	778	2.0	1101	0.707	83[5]	14.3	LOS B	5.4	138.1	1600	–	0.0	0.0
Approach	781	1786	0	2566	2.0		0.848		18.3	LOS C	11.8	300.2				
Intersection				6751	2.0		2.030		192.5	LOS F	159.0	4039.7				

X: Not applicable for Continuous lane.

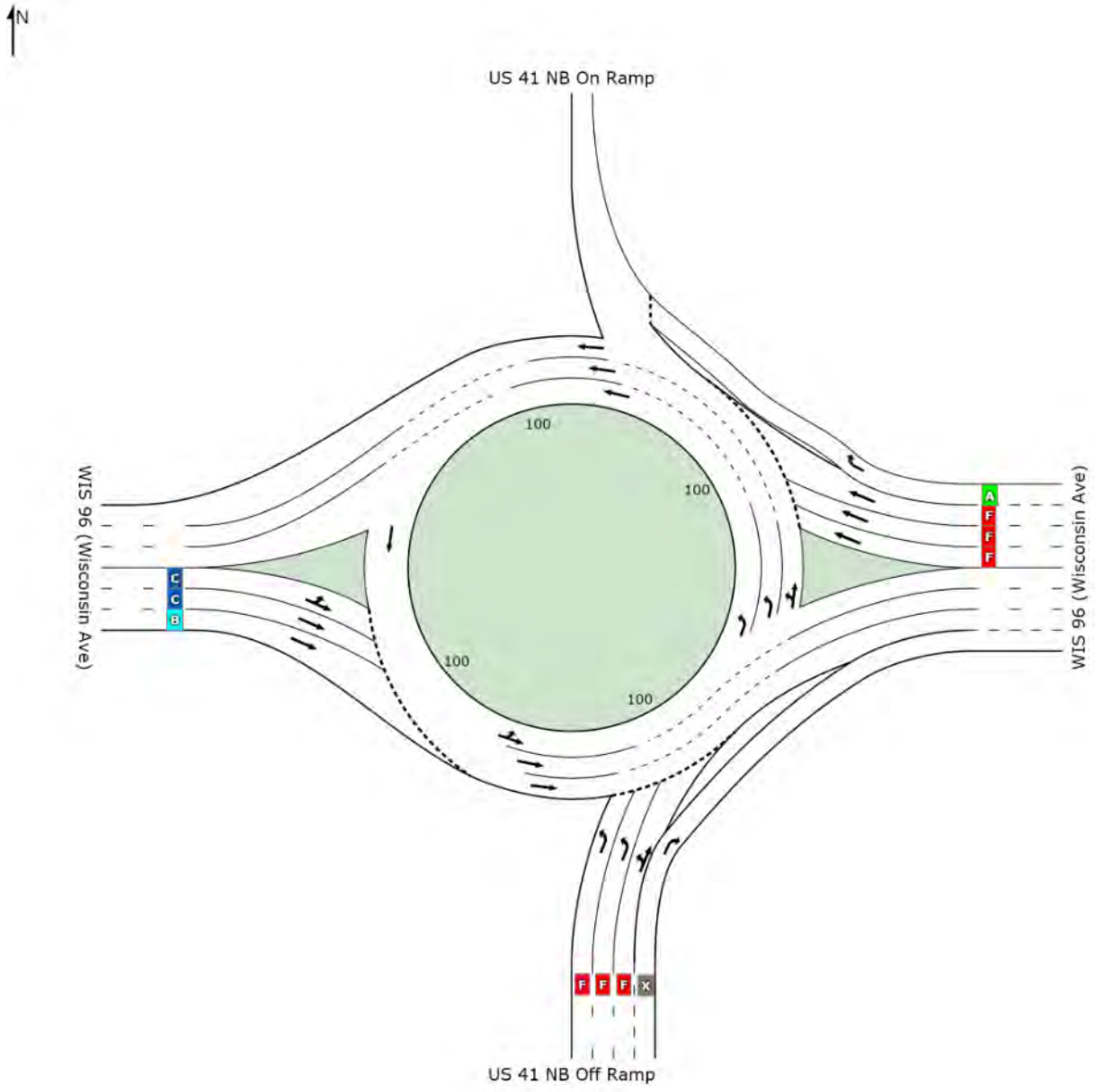
Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

5 Lane underutilisation determined by program

LEVEL OF SERVICE SUMMARY

Site: US 41 NB Ramps with WIS 96 - PM 3LN

US 41 NB Ramps with WIS 96 (Wisconsin Ave)
Roundabout



	South	East	North	West	Intersection
LOS	F	F	NA	C	F

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Model used. Geometric Delay not included.

INPUT REPORT

US 41 SB Ramps with WIS 96 (Wisconsin Ave)

Intersection Parameters	
Title	US 41 SB Ramps with WIS 96 (Wisconsin Ave)
Intersection ID	1
Unit Time (for volumes)	60 minutes
Peak Flow Period (for performance)	15 minutes

Geometry - Approach Data

Location	Name	Type	No. of App. Lanes	No. of Exit Lanes	Median Width ft	Extra Bunching %
South	US 41 SB On Ramp	One-way Exit	0	2	–	0.0
East	WIS 96 (Wisconsin Ave)	Two-way	3	3	–	0.0
North	US 41 SB Off Ramp	One-way Approach	4	0	–	0.0
West	WIS 96 (Wisconsin Ave)	Two-way	4	3	–	0.0

Geometry - Roundabout Data

Location	Name	Island Diameter ft	Circ. Width ft	Circ. Lanes	Entry Radius ft	Entry Angle degrees	Env. Factor	Entry/Circ. Flow Adjust.
South	US 41 SB On Ramp	100.00	30.00	3	65.0	30.0	1.2000	None
East	WIS 96 (Wisconsin Ave)	100.00	30.00	1	65.0	30.0	1.2000	None
North	US 41 SB Off Ramp	100.00	30.00	3	65.0	30.0	1.2000	None
West	WIS 96 (Wisconsin Ave)	100.00	30.00	3	65.0	30.0	1.2000	None

Geometry - Approach Lane Data

Lane Number	Lane Type	Lane Discip.	Basic Satn Flow tcu/h	Utilisation Ratio %	Saturation Speed mph	Capacity Adjustment %
East	WIS 96 (Wisconsin Ave)					
App. Lane 1	Normal	LT	1900	36.0	–	0.0
App. Lane 2	Normal	T	1900	33.0	–	0.0
App. Lane 3	Normal	T	1900	30.0	–	0.0
North	US 41 SB Off Ramp					
App. Lane 1	Normal	L	1900	36.0	–	0.0
App. Lane 2	Normal	L	1900	33.0	–	0.0
App. Lane 3	Normal	LT	1900	30.0	–	0.0
App. Lane 4	Continuous	R	1900	–	–	0.0
West	WIS 96 (Wisconsin Ave)					
App. Lane 1	Normal	T	1900	33.0	–	0.0
App. Lane 2	Normal	T	1900	33.0	–	0.0
App. Lane 3	Normal	T	1900	30.0	–	0.0
App. Lane 4	Continuous	R	1900	47.0	–	0.0

Geometry - Approach & Exit Lane Data

Lane Number	Lane Width ft	Lane Length ft	Grade %	SL Type
South	US 41 SB On Ramp			
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
East	WIS 96 (Wisconsin Ave)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–
North	US 41 SB Off Ramp			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
West	WIS 96 (Wisconsin Ave)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–

Lanes are numbered from left to right in the direction of travel.

Geometry - Movement Definitions

To Approach	Movement Banned	Turn Desig.
From: East	WIS 96 (Wisconsin Ave)	
East	No	L
South	No	L
West	No	T
From: North	US 41 SB Off Ramp	
East	No	L
South	No	T
West	No	R
From: West	WIS 96 (Wisconsin Ave)	
West	No	T
East	No	T
South	No	R

HCM 2010 Roundabout Model Calibration

Location	Name	HCM 2010 Single Lane		HCM 2010 Multi-Lane Dominant Lane		HCM 2010 Multi-Lane Subdominant Lane	
		Para. A	Para. B	Para. A	Para. B	Para. A	Para. B
South	US 41 SB On Ramp	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
East	WIS 96 (Wisconsin Ave)	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
North	US 41 SB Off Ramp	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
West	WIS 96 (Wisconsin Ave)	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722

Volumes

To Approach	Total veh	HV %	Peak Flow Factor %	Vehicle Occupancy pers/veh	Flow Scale %	Growth Rate %/year
From: East	WIS 96 (Wisconsin Ave)					
East	5.0	2.00	78.0	1.20	100.00	2.00
South	370.0	2.00	78.0	1.20	100.00	2.00
West	1185.0	2.00	78.0	1.20	100.00	2.00
From: North	US 41 SB Off Ramp					
East	345.0	2.00	78.0	1.20	100.00	2.00
South	1.0	2.00	78.0	1.20	100.00	2.00
West	435.0	2.00	78.0	1.20	100.00	2.00
From: West	WIS 96 (Wisconsin Ave)					
West	5.0	2.00	78.0	1.20	100.00	2.00
East	940.0	2.00	78.0	1.20	100.00	2.00
South	255.0	2.00	78.0	1.20	100.00	2.00

Path Data

To Approach	App. Cruise Speed mph	Exit Cruise Speed mph	App. Trav. Distance ft	Negn Speed mph	Negn Distance ft	Downst. Distance ft	Negn Radius ft
From: East	WIS 96 (Wisconsin Ave)						
East	40.0	40.0	1600.0	–	–	–	–
South	40.0	40.0	1600.0	–	–	–	–
West	40.0	40.0	1600.0	–	–	–	–
From: North	US 41 SB Off Ramp						
East	40.0	40.0	1600.0	–	–	–	–
South	40.0	40.0	1600.0	–	–	–	–
West	40.0	40.0	1600.0	–	–	–	–
From: West	WIS 96 (Wisconsin Ave)						
West	40.0	40.0	1600.0	–	–	–	–
East	40.0	40.0	1600.0	–	–	–	–
South	40.0	40.0	1600.0	–	–	–	–

Movement Data - General

Turn	Mov. ID	Queue Space LV ft	Queue Space HV ft	Vehicle Length LV ft	Vehicle Length HV ft	HVE	P.Deg. Satn	Movement Type	Movement Control
East	WIS 96 (Wisconsin Ave)								
L	1	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	6	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
North	US 41 SB Off Ramp								
L	7	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	4	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	14	25.00	45.00	17.00	36.00	2.00	–	*Cont.*	–
West	WIS 96 (Wisconsin Ave)								
T	2	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	12	25.00	45.00	17.00	36.00	2.00	–	*Cont.*	–

Movement Type and Control parameters are set automaticly from Approach Control and Lane Type data in the Geometry dialog.

Gap Acceptance

Movement		Critical Gap sec	Follow-up Headway sec	Min. Departures veh/min	Exiting Flow Effect %
East	WIS 96 (Wisconsin Ave)				
	L	4.200	3.200	2.50	0
	T	4.200	3.200	2.50	0
North	US 41 SB Off Ramp				
	L	4.000	2.800	2.50	0
	T	4.000	2.800	2.50	0
West	WIS 96 (Wisconsin Ave)				
	T	4.000	2.800	2.50	0

Model Settings - Options	
General Options	
Level of Service Method	Delay & v/c (HCM 2010)
Level of Service Target	LOS D
Performance Measure	Delay
Percentile Queue	95 %
Hours per Year	480 h
Gap Acceptance	
HV Method for Gap-Acceptance	Include HV Effect for all percentages
Gap-Acceptance Capacity	Traditional M1
HCM Delay Formula	Yes
Downstream Short Lane Model	
Minimum Downstream Utilisation Ratio	20 %
Minimum Downstream Distance	100 ft
Distance for Full Lane Utilisation	660 ft
Calibration Parameter	1.2

Model Settings - Roundabouts	
Roundabout Model Options	
Capacity Model	US HCM 2010
LOS Method	Same as Sign Control
US HCM 2010 Roundabout Model	
Include Origin-Destination Pattern Effects	No
Factor for Parameter A	1.000
Factor for Parameter B	1.000
Other Roundabout Models	
FHWA 2000	No
Use Urban Compact Roundabout	–
HCM 2000	No
NAASRA 1986	No

Model Settings - Cost Parameters	
Vehicle Operating Cost	
Cost Unit	$
Pump Price of Fuel	3.000 $/gal
Fuel Resource Cost Factor	0.700
Ratio of Running Cost to Fuel Cost	3.00
Vehicle Mass	
Light Vehicle Mass	3100.0 lb
Heavy Vehicle Mass	24000.0 lb
Heavy Vehicle Maximum Power	130 kW
Time Cost	
Average Income	23.00 $/h
Time Value Factor	0.400

Demand & Sensitivity	
Analysis Method:	None

Site Properties	
Site (Intersection) Type	Roundabout

Model Name	US HCM (Customary)
Drive Rule	Right-hand side of the road
New Zealand Rule	No
HCM Version	Yes
Units	US Customary

INTERSECTION SUMMARY

US 41 SB Ramps with WIS 96 (Wisconsin Ave)
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	4540	veh/h	5448	pers/h
Percent Heavy Vehicles	2.0	%		
Degree of Saturation	0.663			
Practical Spare Capacity	28.3	%		
Effective Intersection Capacity	6852	veh/h		
Control Delay (Total)	15.90	veh-h/h	19.08	pers-h/h
Control Delay (Average)	12.6	sec	12.6	sec
Control Delay (Worst Lane)	30.2	sec		
Control Delay (Worst Movement)	27.9	sec	27.9	sec
Geometric Delay (Average)	6.8	sec		
Stop-Line Delay (Average)	12.6	sec		
Intersection Level of Service (LOS)	LOS B			
95% Back of Queue - Vehicles (Worst Lane)	4.5	veh		
95% Back of Queue - Distance (Worst Lane)	113.1	ft		
Total Effective Stops	3040	veh/h	3648	pers/h
Effective Stop Rate	0.67	per veh	0.67	per pers
Proportion Queued	0.31		0.31	
Performance Index	86.9		86.9	
Travel Distance (Total)	1755.2	veh-mi/h	2106.3	pers-mi/h
Travel Distance (Average)	2041	ft	2041	ft
Travel Time (Total)	68.3	veh-h/h	82.0	pers-h/h
Travel Time (Average)	54.2	sec	54.2	sec
Travel Speed	25.7	mph	25.7	mph
Cost (Total)	1326.41	$/h	1326.41	$/h
Fuel Consumption (Total)	90.3	gal/h		
Carbon Dioxide (Total)	855.1	kg/h		
Hydrocarbons (Total)	1.415	kg/h		
Carbon Monoxide (Total)	63.93	kg/h		
NOx (Total)	2.027	kg/h		

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	2,179,077	veh/y	2,614,893	pers/y
Delay	7,633	veh-h/y	9,160	pers-h/y
Effective Stops	1,459,107	veh/y	1,750,928	pers/y
Travel Distance	842,500	veh-mi/y	1,011,001	pers-mi/y
Travel Time	32,801	veh-h/y	39,361	pers-h/y
Cost	636,678	$/y	636,678	$/y
Fuel Consumption	43,337	gal/y		
Carbon Dioxide	410,445	kg/y		
Hydrocarbons	679	kg/y		
Carbon Monoxide	30,685	kg/y		
NOx	973	kg/y		

MOVEMENT SUMMARY

Site: US 41 SB Ramps with WIS 96-AM 3LN

US 41 SB Ramps with WIS 96 (Wisconsin Ave)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
East: WIS 96 (Wisconsin Ave)											
1	L	481	2.0	0.663	12.8	LOS B	4.5	113.1	0.08	0.75	23.9
6	T	1519	2.0	0.663	11.0	LOS B	4.5	113.1	0.07	0.41	27.2
Approach		2000	2.0	0.663	11.4	LOS B	4.5	113.1	0.07	0.49	26.3
North: US 41 SB Off Ramp											
7	L	442	2.0	0.561	27.9	LOS D	1.9	48.5	0.87	1.05	19.2
4	T	1	2.0	0.468	25.4	LOS D	1.5	37.8	0.86	0.98	20.5
14	R	558	2.0	0.351	0.1	X	X	X	X	0.51	33.8
Approach		1001	2.0	0.561	12.4	LOS B	1.9	48.5	0.39	0.75	25.0
West: WIS 96 (Wisconsin Ave)											
2	T	1212	2.0	0.653	18.1	LOS C	3.3	84.9	0.72	0.94	23.8
12	R	327	2.0	0.438	0.0	X	X	X	X	0.51	33.8
Approach		1538	2.0	0.653	14.3	LOS B	3.3	84.9	0.57	0.85	25.4
All Vehicles		4540	2.0	0.663	12.6	LOS B	4.5	113.1	0.31	0.67	25.7

X: Not applicable for Continuous movement.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

LANE SUMMARY

US 41 SB Ramps with WIS 96 (Wisconsin Ave)
Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Lane Length ft	SL Type	Cap. Adj. %	Prob. Block. %
East: WIS 96 (Wisconsin Ave)																
Lane 1	481	247	0	727	2.0	1098	0.663	100	12.8	LOS B	4.5	113.1	1600	–	0.0	0.0
Lane 2	0	667	0	667	2.0	1098	0.607	92[5]	11.2	LOS B	3.5	90.0	1600	–	0.0	0.0
Lane 3	0	606	0	606	2.0	1098	0.552	83[5]	10.0	LOS B	2.8	72.3	1600	–	0.0	0.0
Approach	481	1519	0	2000	2.0		0.663		11.4	LOS B	4.5	113.1				
North: US 41 SB Off Ramp																
Lane 1	161	0	0	161	2.0	287	0.561	100	30.2	LOS D	1.9	48.5	1600	–	0.0	0.0
Lane 2	148	0	0	148	2.0	287	0.514	92[5]	27.6	LOS D	1.7	42.9	1600	–	0.0	0.0
Lane 3	133	1	0	134	2.0	288	0.468	83[5]	25.4	LOS D	1.5	37.8	1600	–	0.0	0.0
Lane 4	0	0	558	558	2.0	1588	0.351	100	0.1	X	X	X	1600	–	0.0	X
Approach	442	1	558	1001	2.0		0.561		12.4	LOS B	1.9	48.5				
West: WIS 96 (Wisconsin Ave)																
Lane 1	0	416	0	416	2.0	638	0.653	100	18.9	LOS C	3.3	84.9	1600	–	0.0	0.0
Lane 2	0	416	0	416	2.0	638	0.653	100	18.9	LOS C	3.3	84.9	1600	–	0.0	0.0
Lane 3	0	379	0	379	2.0	638	0.593	91[5]	16.5	LOS C	2.8	70.8	1600	–	0.0	0.0
Lane 4	0	0	327	327	2.0	1588	0.206	100	0.0	X	X	X	1600	–	0.0	X
Approach	0	1212	327	1538	2.0		0.653		14.3	LOS B	3.3	84.9				
Intersection				4540	2.0		0.663		12.6	LOS B	4.5	113.1				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

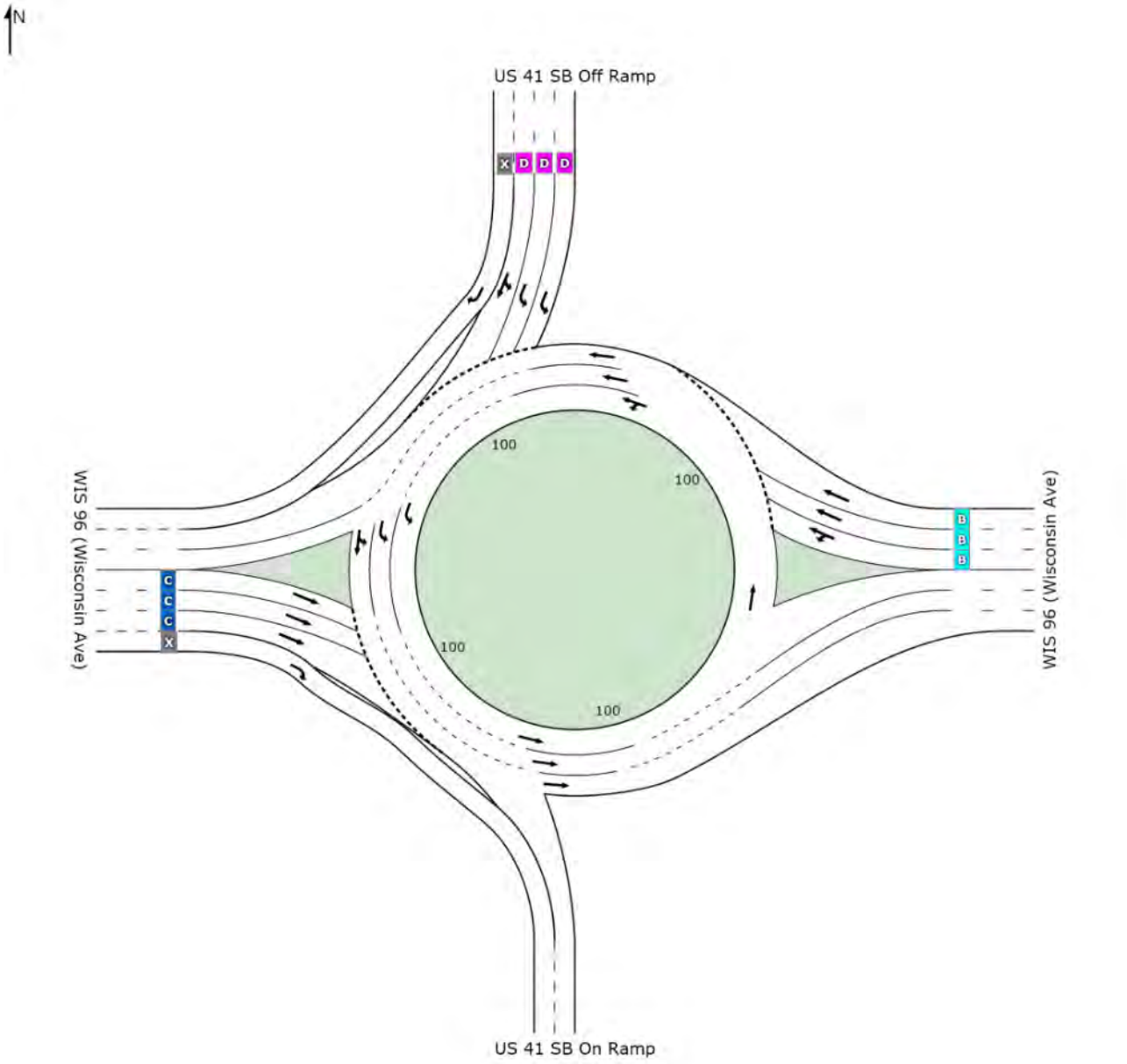
5 Lane underutilisation determined by program

SIDRA INTERSECTION

LEVEL OF SERVICE SUMMARY

Site: US 41 SB Ramps with WIS 96-AM 3LN

US 41 SB Ramps with WIS 96 (Wisconsin Ave)
Roundabout



	South	East	North	West	Intersection
LOS	NA	B	B	B	B

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Model used. Geometric Delay not included.

INPUT REPORT

US 41 SB Ramps with WIS 96 (Wisconsin Ave)

Intersection Parameters	
Title	US 41 SB Ramps with WIS 96 (Wisconsin Ave)
Intersection ID	1
Unit Time (for volumes)	60 minutes
Peak Flow Period (for performance)	15 minutes

Geometry - Approach Data

Location	Name	Type	No. of App. Lanes	No. of Exit Lanes	Median Width ft	Extra Bunching %
South	US 41 SB On Ramp	One-way Exit	0	2	–	0.0
East	WIS 96 (Wisconsin Ave)	Two-way	3	3	–	0.0
North	US 41 SB Off Ramp	One-way Approach	4	0	–	0.0
West	WIS 96 (Wisconsin Ave)	Two-way	4	3	–	0.0

Geometry - Roundabout Data

Location	Name	Island Diameter ft	Circ. Width ft	Circ. Lanes	Entry Radius ft	Entry Angle degrees	Env. Factor	Entry/Circ. Flow Adjust.
South	US 41 SB On Ramp	100.00	30.00	3	65.0	30.0	1.2000	None
East	WIS 96 (Wisconsin Ave)	100.00	30.00	1	65.0	30.0	1.2000	None
North	US 41 SB Off Ramp	100.00	30.00	3	65.0	30.0	1.2000	None
West	WIS 96 (Wisconsin Ave)	100.00	30.00	3	65.0	30.0	1.2000	None

Geometry - Approach Lane Data

Lane Number	Lane Type	Lane Discip.	Basic Satn Flow tcu/h	Utilisation Ratio %	Saturation Speed mph	Capacity Adjustment %
East	WIS 96 (Wisconsin Ave)					
App. Lane 1	Normal	LT	1900	36.0	–	0.0
App. Lane 2	Normal	T	1900	33.0	–	0.0
App. Lane 3	Normal	T	1900	30.0	–	0.0
North	US 41 SB Off Ramp					
App. Lane 1	Normal	L	1900	36.0	–	0.0
App. Lane 2	Normal	L	1900	33.0	–	0.0
App. Lane 3	Normal	LT	1900	30.0	–	0.0
App. Lane 4	Continuous	R	1900	–	–	0.0
West	WIS 96 (Wisconsin Ave)					
App. Lane 1	Normal	T	1900	36.0	–	0.0
App. Lane 2	Normal	T	1900	33.0	–	0.0
App. Lane 3	Normal	T	1900	30.0	–	0.0
App. Lane 4	Slip (Giveway/Yield)	R	1900	47.0	–	0.0

Geometry - Approach & Exit Lane Data

Lane Number	Lane Width ft	Lane Length ft	Grade %	SL Type
South	US 41 SB On Ramp			
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
East	WIS 96 (Wisconsin Ave)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–
North	US 41 SB Off Ramp			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
West	WIS 96 (Wisconsin Ave)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–

Lanes are numbered from left to right in the direction of travel.

Geometry - Movement Definitions

To Approach	Movement Banned	Turn Desig.
From: East	WIS 96 (Wisconsin Ave)	
East	No	L
South	No	L
West	No	T
From: North	US 41 SB Off Ramp	
East	No	L
South	No	T
West	No	R
From: West	WIS 96 (Wisconsin Ave)	
West	No	T
East	No	T
South	No	R

HCM 2010 Roundabout Model Calibration

Location	Name	HCM 2010 Single Lane		HCM 2010 Multi-Lane Dominant Lane		HCM 2010 Multi-Lane Subdominant Lane	
		Para. A	Para. B	Para. A	Para. B	Para. A	Para. B
South	US 41 SB On Ramp	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
East	WIS 96 (Wisconsin Ave)	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
North	US 41 SB Off Ramp	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
West	WIS 96 (Wisconsin Ave)	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722

Volumes

To Approach	Total veh	HV %	Peak Flow Factor %	Vehicle Occupancy pers/veh	Flow Scale %	Growth Rate %/year
From: East	WIS 96 (Wisconsin Ave)					
East	5.0	2.00	98.0	1.20	100.00	2.00
South	650.0	2.00	98.0	1.20	100.00	2.00
West	2610.0	2.00	98.0	1.20	100.00	2.00
From: North	US 41 SB Off Ramp					
East	360.0	1.00	98.0	1.20	100.00	2.00
South	1.0	1.00	98.0	1.20	100.00	2.00
West	760.0	1.00	98.0	1.20	100.00	2.00
From: West	WIS 96 (Wisconsin Ave)					
West	5.0	2.00	98.0	1.20	100.00	2.00
East	2145.0	2.00	98.0	1.20	100.00	2.00
South	930.0	2.00	98.0	1.20	100.00	2.00

Path Data

To Approach	App. Cruise Speed mph	Exit Cruise Speed mph	App. Trav. Distance ft	Negn Speed mph	Negn Distance ft	Downst. Distance ft	Negn Radius ft
From: East	WIS 96 (Wisconsin Ave)						
East	40.0	40.0	1600.0	–	–	–	–
South	40.0	40.0	1600.0	–	–	–	–
West	40.0	40.0	1600.0	–	–	–	–
From: North	US 41 SB Off Ramp						
East	40.0	40.0	1600.0	–	–	–	–
South	40.0	40.0	1600.0	–	–	–	–
West	40.0	40.0	1600.0	–	–	–	–
From: West	WIS 96 (Wisconsin Ave)						
West	40.0	40.0	1600.0	–	–	–	–
East	40.0	40.0	1600.0	–	–	–	–
South	40.0	40.0	1600.0	–	–	–	–

Movement Data - General

Turn	Mov. ID	Queue Space LV ft	Queue Space HV ft	Vehicle Length LV ft	Vehicle Length HV ft	HVE	P.Deg. Satn	Movement Type	Movement Control
East	WIS 96 (Wisconsin Ave)								
L	1	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	6	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
North	US 41 SB Off Ramp								
L	7	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	4	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	14	25.00	45.00	17.00	36.00	2.00	–	*Cont.*	–
West	WIS 96 (Wisconsin Ave)								
T	2	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	12	25.00	45.00	17.00	36.00	2.00	–	*Slip*	*Yield*

Movement Type and Control parameters are set automaticly from Approach Control and Lane Type data in the Geometry dialog.

Gap Acceptance

Movement		Critical Gap sec	Follow-up Headway sec	Min. Departures veh/min	Exiting Flow Effect %
East	WIS 96 (Wisconsin Ave)				
	L	4.200	3.200	2.50	0
	T	4.200	3.200	2.50	0
North	US 41 SB Off Ramp				
	L	4.000	2.800	2.50	0
	T	4.000	2.800	2.50	0
West	WIS 96 (Wisconsin Ave)				
	T	4.000	2.800	2.50	0
	R	–	–	2.50	0

Model Settings - Options	
General Options	
Level of Service Method	Delay & v/c (HCM 2010)
Level of Service Target	LOS D
Performance Measure	Delay
Percentile Queue	95 %
Hours per Year	480 h
Gap Acceptance	
HV Method for Gap-Acceptance	Include HV Effect for all percentages
Gap-Acceptance Capacity	Traditional M1
HCM Delay Formula	Yes
Downstream Short Lane Model	
Minimum Downstream Utilisation Ratio	20 %
Minimum Downstream Distance	100 ft
Distance for Full Lane Utilisation	660 ft
Calibration Parameter	1.2

Model Settings - Roundabouts	
Roundabout Model Options	
Capacity Model	US HCM 2010
LOS Method	Same as Sign Control
US HCM 2010 Roundabout Model	
Include Origin-Destination Pattern Effects	No
Factor for Parameter A	1.000
Factor for Parameter B	1.000
Other Roundabout Models	
FHWA 2000	No
Use Urban Compact Roundabout	–
HCM 2000	No
NAASRA 1986	No

Model Settings - Cost Parameters	
Vehicle Operating Cost	
Cost Unit	$
Pump Price of Fuel	3.000 $/gal
Fuel Resource Cost Factor	0.700
Ratio of Running Cost to Fuel Cost	3.00
Vehicle Mass	
Light Vehicle Mass	3100.0 lb
Heavy Vehicle Mass	24000.0 lb
Heavy Vehicle Maximum Power	130 kW
Time Cost	
Average Income	23.00 $/h
Time Value Factor	0.400

Demand & Sensitivity	
Analysis Method:	None

Site Properties	
Site (Intersection) Type	Roundabout

Model Name	US HCM (Customary)
Drive Rule	Right-hand side of the road
New Zealand Rule	No
HCM Version	Yes
Units	US Customary

INTERSECTION SUMMARY

Site: US 41 SB Ramps with WIS 96-PM 3LN

US 41 SB Ramps with WIS 96 (Wisconsin Ave)
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	7618	veh/h	9142	pers/h
Percent Heavy Vehicles	1.8	%		
Degree of Saturation	1.291			
Practical Spare Capacity	-66.0	%		
Effective Intersection Capacity	3051	veh/h		
Control Delay (Total)	168.91	veh-h/h	202.69	pers-h/h
Control Delay (Average)	79.8	sec	79.8	sec
Control Delay (Worst Lane)	163.8	sec		
Control Delay (Worst Movement)	131.7	sec	131.7	sec
Geometric Delay (Average)	6.4	sec		
Stop-Line Delay (Average)	79.8	sec		
Intersection Level of Service (LOS)	LOS F			
95% Back of Queue - Vehicles (Worst Lane)	159.5	veh		
95% Back of Queue - Distance (Worst Lane)	4051.0	ft		
Total Effective Stops	11862	veh/h	14234	pers/h
Effective Stop Rate	1.56	per veh	1.56	per pers
Proportion Queued	0.79		0.79	
Performance Index	517.2		517.2	
Travel Distance (Total)	2929.6	veh-mi/h	3515.6	pers-mi/h
Travel Distance (Average)	2030	ft	2030	ft
Travel Time (Total)	255.6	veh-h/h	306.7	pers-h/h
Travel Time (Average)	120.8	sec	120.8	sec
Travel Speed	11.5	mph	11.5	mph
Cost (Total)	4273.54	$/h	4273.54	$/h
Fuel Consumption (Total)	220.7	gal/h		
Carbon Dioxide (Total)	2089.9	kg/h		
Hydrocarbons (Total)	3.894	kg/h		
Carbon Monoxide (Total)	147.42	kg/h		
NOx (Total)	4.334	kg/h		

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	3,656,817	veh/y	4,388,180	pers/y
Delay	81,075	veh-h/y	97,291	pers-h/y
Effective Stops	5,693,613	veh/y	6,832,336	pers/y
Travel Distance	1,406,227	veh-mi/y	1,687,473	pers-mi/y
Travel Time	122,671	veh-h/y	147,205	pers-h/y
Cost	2,051,297	$/y	2,051,297	$/y
Fuel Consumption	105,923	gal/y		
Carbon Dioxide	1,003,159	kg/y		
Hydrocarbons	1,869	kg/y		
Carbon Monoxide	70,762	kg/y		
NOx	2,080	kg/y		

MOVEMENT SUMMARY

Site: US 41 SB Ramps with WIS 96-PM 3LN

US 41 SB Ramps with WIS 96 (Wisconsin Ave)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
East: WIS 96 (Wisconsin Ave)											
1	L	668	2.0	1.102	77.6	LOS F	159.5	4051.0	1.00	0.22	11.7
6	T	2663	2.0	1.102	47.9	LOS F	159.5	4051.0	0.70	0.27	15.7
Approach		3332	2.0	1.102	53.9	LOS F	159.5	4051.0	0.76	0.26	14.6
North: US 41 SB Off Ramp											
7	L	367	1.0	1.026	131.7	LOS F	7.7	193.3	0.99	1.36	8.2
4	T	1	1.0	0.855	114.4	LOS F	3.1	78.4	0.98	1.23	8.8
14	R	776	1.0	0.485	0.1	X	X	X	X	0.51	33.7
Approach		1144	1.0	1.026	42.5	LOS E	7.7	193.3	0.32	0.79	16.3
West: WIS 96 (Wisconsin Ave)											
2	T	2194	2.0	1.291	125.3	LOS F	65.5	1664.0	1.00	3.22	8.3
12	R	949	2.0	2.497	110.7	LOS F	57.3	1455.4	1.00	3.20	9.0
Approach		3143	2.0	1.291	120.9	LOS F	65.5	1664.0	1.00	3.21	8.5
All Vehicles		7618	1.8	1.291	79.8	LOS F	159.5	4051.0	0.79	1.56	11.5

X: Not applicable for Continuous movement.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

LANE SUMMARY

US 41 SB Ramps with WIS 96 (Wisconsin Ave)
Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Lane Length ft	SL Type	Cap. Adj. %	Prob. Block. %
East: WIS 96 (Wisconsin Ave)																
Lane 1	668	543	0	1212	2.0	1099	1.102	100	77.6	LOS F	159.5	4051.0	1600	–	0.0	52.2
Lane 2	0	1111	0	1111	2.0	1099	1.010	92[5]	49.2	LOS F	129.9	3300.2	1600	–	0.0	34.2
Lane 3	0	1010	0	1010	2.0	1099	0.918	83[5]	30.6	LOS D	21.3	540.3	1600	–	0.0	0.0
Approach	668	2663	0	3332	2.0		1.102		53.9	LOS F	159.5	4051.0				
North: US 41 SB Off Ramp																
Lane 1	154	0	0	154	1.0	150[2]	1.026	100	140.4	LOS F	7.7	193.3	1600	–	0.0	0.0
Lane 2	112	0	0	112	1.0	119	0.941	92[5]	135.3	LOS F	4.1	104.5	1600	–	0.0	0.0
Lane 3	101	1	0	102	1.0	119	0.855	83[5]	114.4	LOS F	3.1	78.4	1600	–	0.0	0.0
Lane 4	0	0	776	776	1.0	1599	0.485	100	0.1	X	X	X	1600	–	0.0	X
Approach	367	1	776	1144	1.0		1.026		42.5	LOS E	7.7	193.3				
West: WIS 96 (Wisconsin Ave)																
Lane 1	0	798	0	798	2.0	618	1.291	100	163.8	LOS F	65.5	1664.0	1600	–	0.0	6.2
Lane 2	0	731	0	731	2.0	618	1.183	92[5]	121.3	LOS F	45.2	1147.3	1600	–	0.0	0.0
Lane 3	0	665	0	665	2.0	618	1.076	83[5]	83.6	LOS F	26.2	666.6	1600	–	0.0	0.0
Lane 4	0	0	949	949	2.0	809	1.173	100	110.7	LOS F	57.3	1455.4	1600	–	0.0	2.3
Approach	0	2194	949	3143	2.0		1.291		120.9	LOS F	65.5	1664.0				
Intersection				7618	1.8		1.291		79.8	LOS F	159.5	4051.0				

X: Not applicable for Continuous lane.

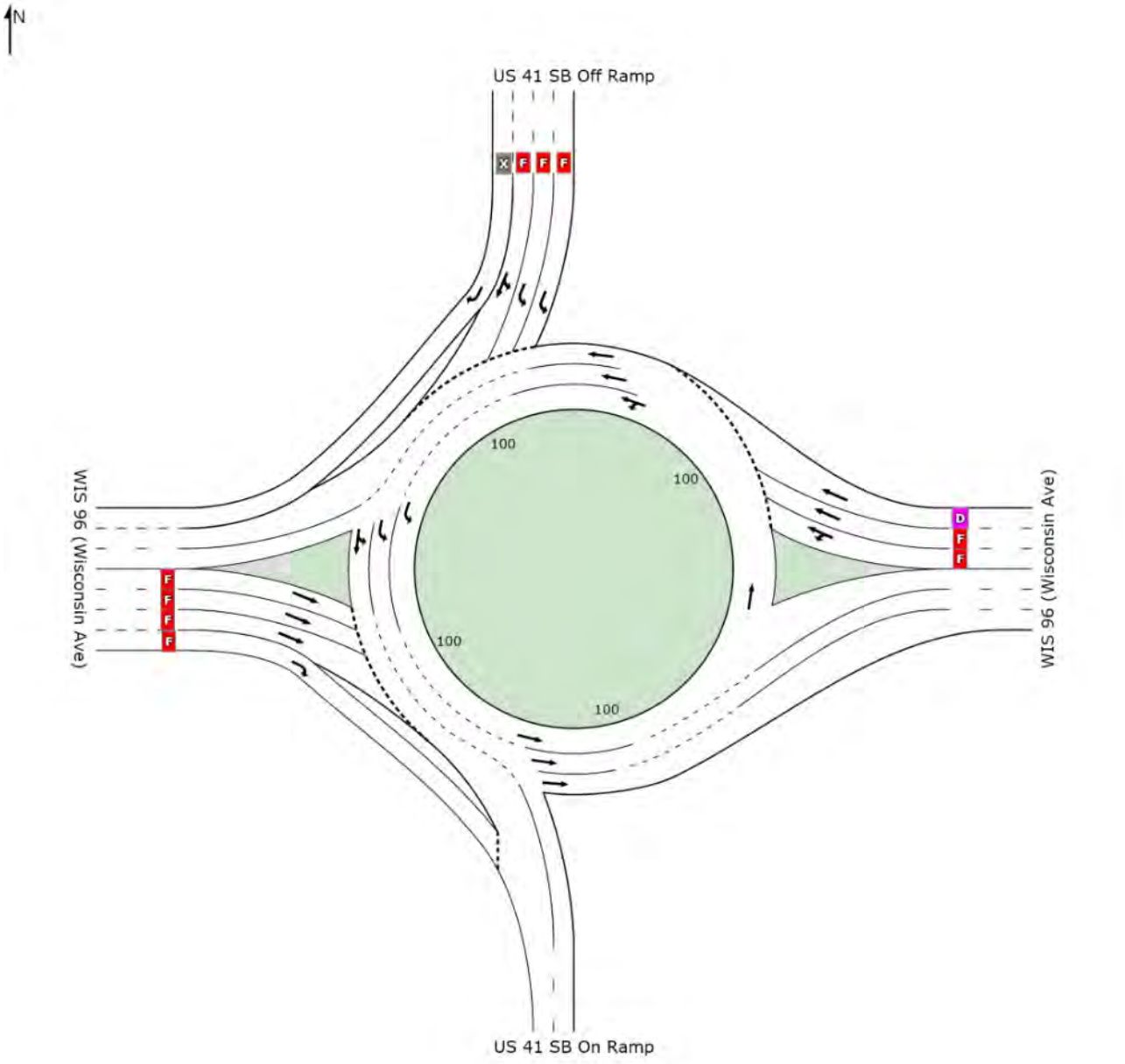
Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

2 Minimum Capacity
5 Lane underutilisation determined by program

LEVEL OF SERVICE SUMMARY

Site: US 41 SB Ramps with WIS 96-PM 3LN

US 41 SB Ramps with WIS 96 (Wisconsin Ave)
Roundabout



	South	East	North	West	Intersection
LOS	NA	F	E	F	F

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Model used. Geometric Delay not included.

US 41 with WIS 125

INPUT REPORT

US 41 SB Ramps with WIS 125 (College Ave)

Intersection Parameters	
Title	US 41 SB Ramps with WIS 125 (College Ave)
Intersection ID	1
Unit Time (for volumes)	60 minutes
Peak Flow Period (for performance)	15 minutes

Geometry - Approach Data

Location	Name	Type	No. of App. Lanes	No. of Exit Lanes	Median Width ft	Extra Bunching %
South	US 41 NB Off Ramp	One-way Approach	4	0	–	0.0
East	WIS 125 (College Ave)	Two-way	4	4	–	0.0
North	US 41 NB On Ramp	One-way Exit	0	1	–	0.0
West	WIS 125 (College Ave)	Two-way	3	3	–	0.0

Geometry - Roundabout Data

Location	Name	Island Diameter ft	Circ. Width ft	Circ. Lanes	Entry Radius ft	Entry Angle degrees	Env. Factor	Entry/Circ. Flow Adjust.
South	US 41 NB Off Ramp	100.00	30.00	3	65.0	30.0	1.2000	None
East	WIS 125 (College Ave)	100.00	30.00	3	65.0	30.0	1.2000	None
North	US 41 NB On Ramp	100.00	30.00	3	65.0	30.0	1.2000	None
West	WIS 125 (College Ave)	100.00	30.00	1	65.0	30.0	1.2000	None

Geometry - Approach Lane Data

Lane Number	Lane Type	Lane Discip.	Basic Satn Flow tcu/h	Utilisation Ratio %	Saturation Speed mph	Capacity Adjustment %
South	US 41 NB Off Ramp					
App. Lane 1	Normal	L	1900	36.0	–	0.0
App. Lane 2	Normal	L	1900	33.0	–	0.0
App. Lane 3	Normal	LT	1900	30.0	–	0.0
App. Lane 4	Continuous	R	1900	–	–	0.0
East	WIS 125 (College Ave)					
App. Lane 1	Normal	T	1900	47.0	–	0.0
App. Lane 2	Normal	T	1900	47.0	–	0.0
App. Lane 3	Normal	T	1900	53.0	–	0.0
App. Lane 4	Slip (Giveway/Yield)	R	1900	–	–	0.0
West	WIS 125 (College Ave)					
App. Lane 1	Normal	LT	1900	47.0	–	0.0
App. Lane 2	Normal	T	1900	47.0	–	0.0
App. Lane 3	Normal	T	1900	53.0	–	0.0

Geometry - Approach & Exit Lane Data

Lane Number	Lane Width ft	Lane Length ft	Grade %	SL Type
South	US 41 NB Off Ramp			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
East	WIS 125 (College Ave)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–
Exit Lane 4	13.00	1600.0	0.00	–
North	US 41 NB On Ramp			
Exit Lane 1	13.00	1600.0	0.00	–
West	WIS 125 (College Ave)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–

Lanes are numbered from left to right in the direction of travel.

Geometry - Movement Definitions

To Approach	Movement Banned	Turn Desig.
From: South	US 41 NB Off Ramp	
West	No	L
North	No	T
East	No	R
From: East	WIS 125 (College Ave)	
East	No	T
West	No	T
North	No	R
From: West	WIS 125 (College Ave)	
West	No	L
North	No	L
East	No	T

HCM 2010 Roundabout Model Calibration

Location	Name	HCM 2010 Single Lane		HCM 2010 Multi-Lane Dominant Lane		HCM 2010 Multi-Lane Subdominant Lane	
		Para. A	Para. B	Para. A	Para. B	Para. A	Para. B
South	US 41 NB Off Ramp	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
East	WIS 125 (College Ave)	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
North	US 41 NB On Ramp	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
West	WIS 125 (College Ave)	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722

Volumes

To Approach	Total veh	HV %	Peak Flow Factor %	Vehicle Occupancy pers/veh	Flow Scale %	Growth Rate %/year
From: South	US 41 NB Off Ramp					
West	650.0	2.00	86.0	1.20	100.00	2.00
North	1.0	2.00	86.0	1.20	100.00	2.00
East	730.0	2.00	86.0	1.20	100.00	2.00
From: East	WIS 125 (College Ave)					
East	5.0	2.00	86.0	1.20	100.00	2.00
West	1130.0	2.00	86.0	1.20	100.00	2.00
North	220.0	2.00	86.0	1.20	100.00	2.00
From: West	WIS 125 (College Ave)					
West	5.0	1.00	86.0	1.20	100.00	2.00
North	230.0	1.00	86.0	1.20	100.00	2.00
East	815.0	1.00	86.0	1.20	100.00	2.00

Path Data

To Approach	App. Cruise Speed mph	Exit Cruise Speed mph	App. Trav. Distance ft	Negn Speed mph	Negn Distance ft	Downst. Distance ft	Negn Radius ft
From: South	US 41 NB Off Ramp						
West	40.0	40.0	1600.0	–	–	–	–
North	40.0	40.0	1600.0	–	–	–	–
East	40.0	40.0	1600.0	–	–	–	–
From: East	WIS 125 (College Ave)						
East	40.0	40.0	1600.0	–	–	–	–
West	40.0	40.0	1600.0	–	–	–	–
North	40.0	40.0	1600.0	–	–	–	–
From: West	WIS 125 (College Ave)						
West	40.0	40.0	1600.0	–	–	–	–
North	40.0	40.0	1600.0	–	–	–	–
East	40.0	40.0	1600.0	–	–	–	–

Movement Data - General

Turn	Mov. ID	Queue Space LV ft	Queue Space HV ft	Vehicle Length LV ft	Vehicle Length HV ft	HVE	P.Deg. Satn	Movement Type	Movement Control
South	US 41 NB Off Ramp								
L	3	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	8	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	18	25.00	45.00	17.00	36.00	2.00	–	*Cont.*	–
East	WIS 125 (College Ave)								
T	6	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	16	25.00	45.00	17.00	36.00	2.00	–	*Slip*	*Yield*
West	WIS 125 (College Ave)								
L	5	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	2	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–

Movement Type and Control parameters are set automaticly from Approach Control and Lane Type data in the Geometry dialog.

Gap Acceptance

Movement		Critical Gap sec	Follow-up Headway sec	Min. Departures veh/min	Exiting Flow Effect %
South	US 41 NB Off Ramp				
L		4.000	2.800	2.50	0
T		4.000	2.800	2.50	0
East	WIS 125 (College Ave)				
T		4.000	2.800	2.50	0
R		4.000	2.800	2.50	0
West	WIS 125 (College Ave)				
L		4.200	3.200	2.50	0
T		4.200	3.200	2.50	0

Model Settings - Options	
General Options	
Level of Service Method	Delay & v/c (HCM 2010)
Level of Service Target	LOS D
Performance Measure	Delay
Percentile Queue	95 %
Hours per Year	480 h
Gap Acceptance	
HV Method for Gap-Acceptance	Include HV Effect for all percentages
Gap-Acceptance Capacity	Traditional M1
HCM Delay Formula	Yes
Downstream Short Lane Model	
Minimum Downstream Utilisation Ratio	20 %
Minimum Downstream Distance	100 ft
Distance for Full Lane Utilisation	660 ft
Calibration Parameter	1.2

Model Settings - Roundabouts	
Roundabout Model Options	
Capacity Model	US HCM 2010
LOS Method	Same as Sign Control
US HCM 2010 Roundabout Model	
Include Origin-Destination Pattern Effects	No
Factor for Parameter A	1.000
Factor for Parameter B	1.000
Other Roundabout Models	
FHWA 2000	No
Use Urban Compact Roundabout	–
HCM 2000	No
NAASRA 1986	No

Model Settings - Cost Parameters	
Vehicle Operating Cost	
Cost Unit	$
Pump Price of Fuel	3.000 $/gal
Fuel Resource Cost Factor	0.700
Ratio of Running Cost to Fuel Cost	3.00
Vehicle Mass	
Light Vehicle Mass	3100.0 lb
Heavy Vehicle Mass	24000.0 lb
Heavy Vehicle Maximum Power	130 kW
Time Cost	
Average Income	23.00 $/h
Time Value Factor	0.400

Demand & Sensitivity	
Analysis Method:	None

Site Properties	
Site (Intersection) Type	Roundabout

Model Name	US HCM (Customary)
Drive Rule	Right-hand side of the road
New Zealand Rule	No
HCM Version	Yes
Units	US Customary

INTERSECTION SUMMARY

Site: US 41 NB Ramps with WIS 125 - AM 3LN

US 41 SB Ramps with WIS 125 (College Ave)
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	4402	veh/h	5283	pers/h
Percent Heavy Vehicles	1.7	%		
Degree of Saturation	0.805			
Practical Spare Capacity	5.6	%		
Effective Intersection Capacity	5470	veh/h		
Control Delay (Total)	15.71	veh-h/h	18.85	pers-h/h
Control Delay (Average)	12.8	sec	12.8	sec
Control Delay (Worst Lane)	30.5	sec		
Control Delay (Worst Movement)	25.9	sec	25.9	sec
Geometric Delay (Average)	7.1	sec		
Stop-Line Delay (Average)	12.8	sec		
Intersection Level of Service (LOS)	LOS B			
95% Back of Queue - Vehicles (Worst Lane)	5.3	veh		
95% Back of Queue - Distance (Worst Lane)	133.5	ft		
Total Effective Stops	3325	veh/h	3990	pers/h
Effective Stop Rate	0.76	per veh	0.76	per pers
Proportion Queued	0.40		0.40	
Performance Index	86.3		86.3	
Travel Distance (Total)	1705.0	veh-mi/h	2046.0	pers-mi/h
Travel Distance (Average)	2045	ft	2045	ft
Travel Time (Total)	67.0	veh-h/h	80.3	pers-h/h
Travel Time (Average)	54.8	sec	54.8	sec
Travel Speed	25.5	mph	25.5	mph
Cost (Total)	1301.26	$/h	1301.26	$/h
Fuel Consumption (Total)	88.7	gal/h		
Carbon Dioxide (Total)	839.9	kg/h		
Hydrocarbons (Total)	1.405	kg/h		
Carbon Monoxide (Total)	64.25	kg/h		
NOx (Total)	2.008	kg/h		

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	2,113,116	veh/y	2,535,740	pers/y
Delay	7,539	veh-h/y	9,046	pers-h/y
Effective Stops	1,595,994	veh/y	1,915,193	pers/y
Travel Distance	818,407	veh-mi/y	982,088	pers-mi/y
Travel Time	32,139	veh-h/y	38,567	pers-h/y
Cost	624,607	$/y	624,607	$/y
Fuel Consumption	42,570	gal/y		
Carbon Dioxide	403,146	kg/y		
Hydrocarbons	675	kg/y		
Carbon Monoxide	30,840	kg/y		
NOx	964	kg/y		

MOVEMENT SUMMARY

Site: US 41 NB Ramps with WIS 125 - AM 3LN

US 41 SB Ramps with WIS 125 (College Ave)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: US 41 NB Off Ramp											
3	L	756	2.0	0.534	16.1	LOS C	2.1	54.2	0.74	0.99	22.6
8	T	1	2.0	0.445	14.7	LOS B	1.6	41.2	0.72	0.87	24.6
18	R	849	2.0	0.535	0.1	X	X	X	X	0.51	33.7
Approach		1606	2.0	0.535	7.7	LOS A	2.1	54.2	0.35	0.74	27.2
East: WIS 125 (College Ave)											
6	T	1320	2.0	0.805	25.9	LOS D	5.3	133.5	0.81	1.05	21.0
16	R	256	2.0	0.247	5.8	LOS A	0.8	21.3	0.34	0.60	29.5
Approach		1576	2.0	0.805	22.7	LOS C	5.3	133.5	0.73	0.98	22.0
West: WIS 125 (College Ave)											
5	L	273	1.0	0.352	6.8	LOS A	1.3	32.6	0.04	0.77	26.4
2	T	948	1.0	0.397	7.0	LOS A	1.6	39.4	0.04	0.42	29.5
Approach		1221	1.0	0.397	7.0	LOS A	1.6	39.4	0.04	0.50	28.7
All Vehicles		4402	1.7	0.805	12.8	LOS B	5.3	133.5	0.40	0.76	25.5

X: Not applicable for Continuous movement.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

LANE SUMMARY

Site: US 41 NB Ramps with WIS 125 - AM 3LN

US 41 SB Ramps with WIS 125 (College Ave)
Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Lane Length ft	SL Type	Cap. Adj. %	Prob. Block. %
South: US 41 NB Off Ramp																
Lane 1	275	0	0	275	2.0	515	0.534	100	17.4	LOS C	2.1	54.2	1600	–	0.0	0.0
Lane 2	252	0	0	252	2.0	515	0.490	92[5]	16.0	LOS C	1.9	47.4	1600	–	0.0	0.0
Lane 3	228	1	0	229	2.0	515	0.445	83[5]	14.7	LOS B	1.6	41.2	1600	–	0.0	0.0
Lane 4	0	0	849	849	2.0	1588	0.535	100	0.1	X	X	X	1600	–	0.0	X
Approach	756	1	849	1606	2.0		0.535		7.7	LOS A	2.1	54.2				
East: WIS 125 (College Ave)																
Lane 1	0	422	0	422	2.0	591	0.714	89[5]	23.4	LOS C	3.9	98.4	1600	–	0.0	0.0
Lane 2	0	422	0	422	2.0	591	0.714	89[5]	23.4	LOS C	3.9	98.4	1600	–	0.0	0.0
Lane 3	0	476	0	476	2.0	591	0.805	100	30.5	LOS D	5.3	133.5	1600	–	0.0	0.0
Lane 4	0	0	256	256	2.0	1036	0.247	100	5.8	LOS A	0.8	21.3	1600	–	0.0	0.0
Approach	0	1320	256	1576	2.0		0.805		22.7	LOS C	5.3	133.5				
West: WIS 125 (College Ave)																
Lane 1	273	117	0	390	1.0	1109	0.352	89[5]	6.8	LOS A	1.3	32.6	1600	–	0.0	0.0
Lane 2	0	390	0	390	1.0	1109	0.352	89[5]	6.8	LOS A	1.3	32.6	1600	–	0.0	0.0
Lane 3	0	440	0	440	1.0	1109	0.397	100	7.3	LOS A	1.6	39.4	1600	–	0.0	0.0
Approach	273	948	0	1221	1.0		0.397		7.0	LOS A	1.6	39.4				
Intersection				4402	1.7		0.805		12.8	LOS B	5.3	133.5				

X: Not applicable for Continuous lane.

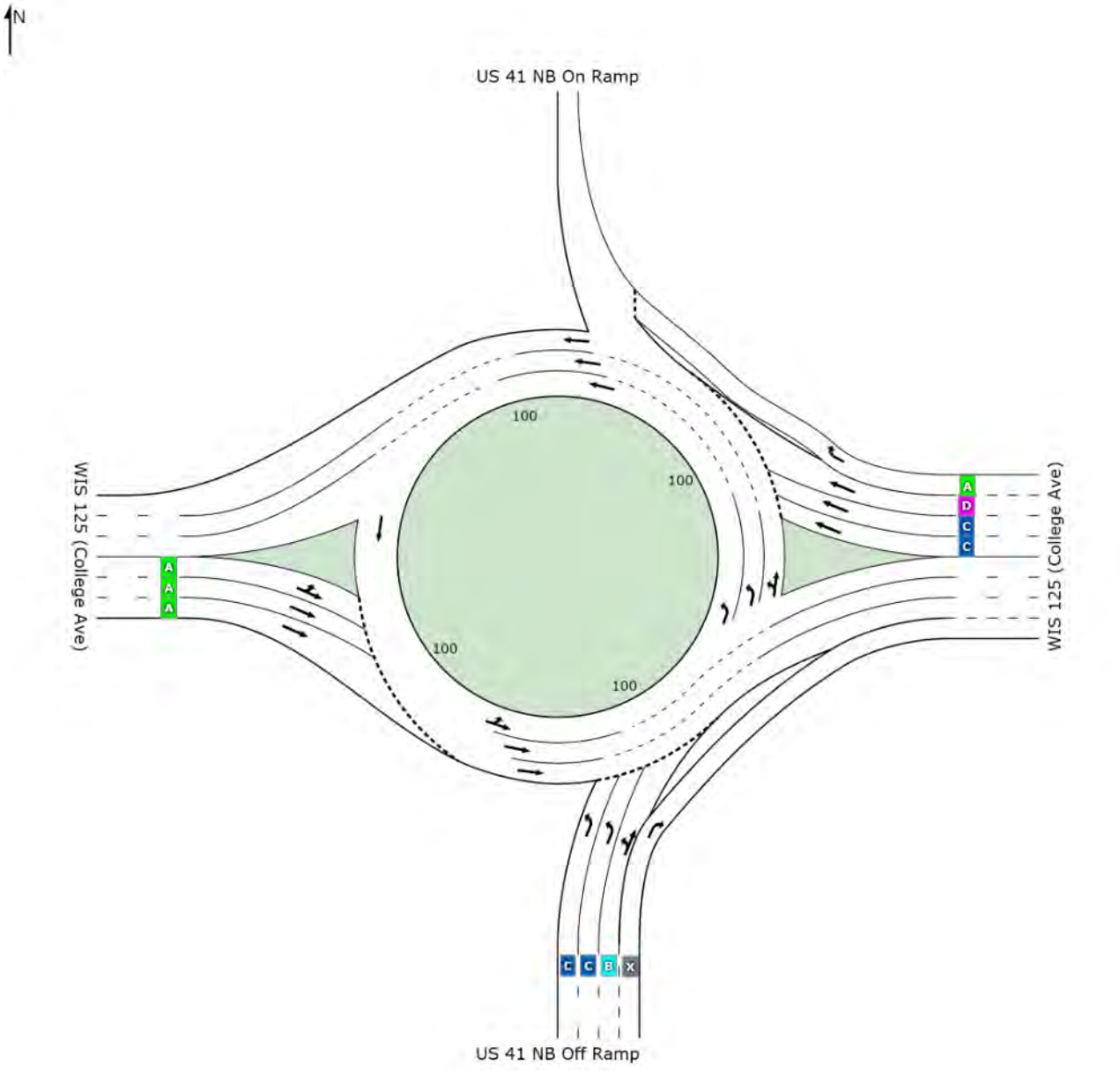
Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

5 Lane underutilisation determined by program

LEVEL OF SERVICE SUMMARY

Site: US 41 NB Ramps with WIS 125 - AM 3LN

US 41 SB Ramps with WIS 125 (College Ave)
Roundabout



	South	East	North	West	Intersection
LOS	A	C	NA	A	B

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Model used. Geometric Delay not included.

INPUT REPORT

US 41 SB Ramps with WIS 125 (College Ave)

Intersection Parameters	
Title	US 41 SB Ramps with WIS 125 (College Ave)
Intersection ID	1
Unit Time (for volumes)	60 minutes
Peak Flow Period (for performance)	15 minutes

Geometry - Approach Data

Location	Name	Type	No. of App. Lanes	No. of Exit Lanes	Median Width ft	Extra Bunching %
South	US 41 NB Off Ramp	One-way Approach	4	0	–	0.0
East	WIS 125 (College Ave)	Two-way	4	4	–	0.0
North	US 41 NB On Ramp	One-way Exit	0	1	–	0.0
West	WIS 125 (College Ave)	Two-way	3	3	–	0.0

Geometry - Roundabout Data

Location	Name	Island Diameter ft	Circ. Width ft	Circ. Lanes	Entry Radius ft	Entry Angle degrees	Env. Factor	Entry/Circ. Flow Adjust.
South	US 41 NB Off Ramp	100.00	30.00	3	65.0	30.0	1.2000	None
East	WIS 125 (College Ave)	100.00	30.00	3	65.0	30.0	1.2000	None
North	US 41 NB On Ramp	100.00	30.00	3	65.0	30.0	1.2000	None
West	WIS 125 (College Ave)	100.00	30.00	1	65.0	30.0	1.2000	None

Geometry - Approach Lane Data

Lane Number	Lane Type	Lane Discip.	Basic Satn Flow tcu/h	Utilisation Ratio %	Saturation Speed mph	Capacity Adjustment %
South	US 41 NB Off Ramp					
App. Lane 1	Normal	L	1900	36.0	–	0.0
App. Lane 2	Normal	L	1900	33.0	–	0.0
App. Lane 3	Normal	LT	1900	30.0	–	0.0
App. Lane 4	Continuous	R	1900	–	–	0.0
East	WIS 125 (College Ave)					
App. Lane 1	Normal	T	1900	36.0	–	0.0
App. Lane 2	Normal	T	1900	33.0	–	0.0
App. Lane 3	Normal	T	1900	30.0	–	0.0
App. Lane 4	Slip (Giveway/Yield)	R	1900	–	–	0.0
West	WIS 125 (College Ave)					
App. Lane 1	Normal	LT	1900	47.0	–	0.0
App. Lane 2	Normal	T	1900	47.0	–	0.0
App. Lane 3	Normal	T	1900	53.0	–	0.0

Geometry - Approach & Exit Lane Data

Lane Number	Lane Width ft	Lane Length ft	Grade %	SL Type
South	US 41 NB Off Ramp			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
East	WIS 125 (College Ave)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–
Exit Lane 4	13.00	1600.0	0.00	–
North	US 41 NB On Ramp			
Exit Lane 1	13.00	1600.0	0.00	–
West	WIS 125 (College Ave)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–

Lanes are numbered from left to right in the direction of travel.

Geometry - Movement Definitions

To Approach	Movement Banned	Turn Desig.
From: South	US 41 NB Off Ramp	
West	No	L
North	No	T
East	No	R
From: East	WIS 125 (College Ave)	
East	No	T
West	No	T
North	No	R
From: West	WIS 125 (College Ave)	
West	No	L
North	No	L
East	No	T

HCM 2010 Roundabout Model Calibration

Location	Name	HCM 2010 Single Lane		HCM 2010 Multi-Lane Dominant Lane		HCM 2010 Multi-Lane Subdominant Lane	
		Para. A	Para. B	Para. A	Para. B	Para. A	Para. B
South	US 41 NB Off Ramp	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
East	WIS 125 (College Ave)	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
North	US 41 NB On Ramp	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
West	WIS 125 (College Ave)	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722

Volumes

To Approach	Total veh	HV %	Peak Flow Factor %	Vehicle Occupancy pers/veh	Flow Scale %	Growth Rate %/year
From: South	US 41 NB Off Ramp					
West	1035.0	2.00	97.0	1.20	100.00	2.00
North	1.0	2.00	97.0	1.20	100.00	2.00
East	805.0	2.00	97.0	1.20	100.00	2.00
From: East	WIS 125 (College Ave)					
East	5.0	2.00	97.0	1.20	100.00	2.00
West	1885.0	2.00	97.0	1.20	100.00	2.00
North	215.0	2.00	97.0	1.20	100.00	2.00
From: West	WIS 125 (College Ave)					
West	5.0	1.00	97.0	1.20	100.00	2.00
North	475.0	1.00	97.0	1.20	100.00	2.00
East	1705.0	1.00	97.0	1.20	100.00	2.00

Path Data

To Approach	App. Cruise Speed mph	Exit Cruise Speed mph	App. Trav. Distance ft	Negn Speed mph	Negn Distance ft	Downst. Distance ft	Negn Radius ft
From: South	US 41 NB Off Ramp						
West	40.0	40.0	1600.0	–	–	–	–
North	40.0	40.0	1600.0	–	–	–	–
East	40.0	40.0	1600.0	–	–	–	–
From: East	WIS 125 (College Ave)						
East	40.0	40.0	1600.0	–	–	–	–
West	40.0	40.0	1600.0	–	–	–	–
North	40.0	40.0	1600.0	–	–	–	–
From: West	WIS 125 (College Ave)						
West	40.0	40.0	1600.0	–	–	–	–
North	40.0	40.0	1600.0	–	–	–	–
East	40.0	40.0	1600.0	–	–	–	–

Movement Data - General

Turn	Mov. ID	Queue Space LV ft	Queue Space HV ft	Vehicle Length LV ft	Vehicle Length HV ft	HVE	P.Deg. Satn	Movement Type	Movement Control
South	US 41 NB Off Ramp								
L	3	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	8	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	18	25.00	45.00	17.00	36.00	2.00	–	*Cont.*	–
East	WIS 125 (College Ave)								
T	6	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	16	25.00	45.00	17.00	36.00	2.00	–	*Slip*	*Yield*
West	WIS 125 (College Ave)								
L	5	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	2	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–

Movement Type and Control parameters are set automaticly from Approach Control and Lane Type data in the Geometry dialog.

Gap Acceptance

Movement		Critical Gap sec	Follow-up Headway sec	Min. Departures veh/min	Exiting Flow Effect %
South	US 41 NB Off Ramp				
L		4.000	2.800	2.50	0
T		4.000	2.800	2.50	0
East	WIS 125 (College Ave)				
T		4.000	2.800	2.50	0
R		4.000	2.800	2.50	0
West	WIS 125 (College Ave)				
L		4.200	3.200	2.50	0
T		4.200	3.200	2.50	0

Model Settings - Options	
General Options	
Level of Service Method	Delay & v/c (HCM 2010)
Level of Service Target	LOS D
Performance Measure	Delay
Percentile Queue	95 %
Hours per Year	480 h
Gap Acceptance	
HV Method for Gap-Acceptance	Include HV Effect for all percentages
Gap-Acceptance Capacity	Traditional M1
HCM Delay Formula	Yes
Downstream Short Lane Model	
Minimum Downstream Utilisation Ratio	20 %
Minimum Downstream Distance	100 ft
Distance for Full Lane Utilisation	660 ft
Calibration Parameter	1.2

Model Settings - Roundabouts	
Roundabout Model Options	
Capacity Model	US HCM 2010
LOS Method	Same as Sign Control
US HCM 2010 Roundabout Model	
Include Origin-Destination Pattern Effects	No
Factor for Parameter A	1.000
Factor for Parameter B	1.000
Other Roundabout Models	
FHWA 2000	No
Use Urban Compact Roundabout	–
HCM 2000	No
NAASRA 1986	No

Model Settings - Cost Parameters	
Vehicle Operating Cost	
Cost Unit	$
Pump Price of Fuel	3.000 $/gal
Fuel Resource Cost Factor	0.700
Ratio of Running Cost to Fuel Cost	3.00
Vehicle Mass	
Light Vehicle Mass	3100.0 lb
Heavy Vehicle Mass	24000.0 lb
Heavy Vehicle Maximum Power	130 kW
Time Cost	
Average Income	23.00 $/h
Time Value Factor	0.400

Demand & Sensitivity	
Analysis Method:	None

Site Properties	
Site (Intersection) Type	Roundabout

Model Name	US HCM (Customary)
Drive Rule	Right-hand side of the road
New Zealand Rule	No
HCM Version	Yes
Units	US Customary

INTERSECTION SUMMARY

Site: US 41 NB Ramps with WIS 125 - PM 3LN

US 41 SB Ramps with WIS 125 (College Ave)
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	6321	veh/h	7585	pers/h
Percent Heavy Vehicles	1.6	%		
Degree of Saturation	1.598			
Practical Spare Capacity	-46.8	%		
Effective Intersection Capacity	3955	veh/h		
Control Delay (Total)	177.50	veh-h/h	213.00	pers-h/h
Control Delay (Average)	101.1	sec	101.1	sec
Control Delay (Worst Lane)	324.0	sec		
Control Delay (Worst Movement)	272.4	sec	272.4	sec
Geometric Delay (Average)	7.1	sec		
Stop-Line Delay (Average)	101.1	sec		
Intersection Level of Service (LOS)	LOS F			
95% Back of Queue - Vehicles (Worst Lane)	69.0	veh		
95% Back of Queue - Distance (Worst Lane)	1752.6	ft		
Total Effective Stops	12184	veh/h	14621	pers/h
Effective Stop Rate	1.93	per veh	1.93	per pers
Proportion Queued	0.52		0.52	
Performance Index	423.4		423.4	
Travel Distance (Total)	2451.8	veh-mi/h	2942.1	pers-mi/h
Travel Distance (Average)	2048	ft	2048	ft
Travel Time (Total)	251.2	veh-h/h	301.4	pers-h/h
Travel Time (Average)	143.1	sec	143.1	sec
Travel Speed	9.8	mph	9.8	mph
Cost (Total)	4017.84	$/h	4017.84	$/h
Fuel Consumption (Total)	192.8	gal/h		
Carbon Dioxide (Total)	1826.1	kg/h		
Hydrocarbons (Total)	3.451	kg/h		
Carbon Monoxide (Total)	116.93	kg/h		
NOx (Total)	3.525	kg/h		

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	3,033,897	veh/y	3,640,676	pers/y
Delay	85,199	veh-h/y	102,239	pers-h/y
Effective Stops	5,848,293	veh/y	7,017,952	pers/y
Travel Distance	1,176,843	veh-mi/y	1,412,211	pers-mi/y
Travel Time	120,563	veh-h/y	144,676	pers-h/y
Cost	1,928,564	$/y	1,928,564	$/y
Fuel Consumption	92,554	gal/y		
Carbon Dioxide	876,508	kg/y		
Hydrocarbons	1,657	kg/y		
Carbon Monoxide	56,125	kg/y		
NOx	1,692	kg/y		

MOVEMENT SUMMARY

Site: US 41 NB Ramps with WIS 125 - PM 3LN

US 41 SB Ramps with WIS 125 (College Ave)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: US 41 NB Off Ramp											
3	L	1067	2.0	1.598	272.4	LOS F	51.2	1299.5	1.00	3.25	4.6
8	T	1	2.0	1.332	214.7	LOS F	30.6	776.1	1.00	2.82	5.4
18	R	830	2.0	0.523	0.1	X	X	X	X	0.51	33.7
Approach		1898	2.0	1.598	153.3	LOS F	51.2	1299.5	0.56	2.05	7.2
East: WIS 125 (College Ave)											
6	T	1948	2.0	1.380	162.5	LOS F	69.0	1752.6	1.00	3.61	6.8
16	R	222	2.0	0.251	6.7	LOS A	0.8	21.0	0.45	0.71	29.0
Approach		2170	2.0	1.380	146.6	LOS F	69.0	1752.6	0.94	3.31	7.4
West: WIS 125 (College Ave)											
5	L	495	1.0	0.649	12.3	LOS B	4.3	109.0	0.06	0.76	24.1
2	T	1758	1.0	0.731	13.6	LOS B	6.3	159.1	0.07	0.41	25.9
Approach		2253	1.0	0.731	13.3	LOS B	6.3	159.1	0.07	0.49	25.4
All Vehicles		6321	1.6	1.598	101.1	LOS F	69.0	1752.6	0.52	1.93	9.8

X: Not applicable for Continuous movement.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

LANE SUMMARY

Site: US 41 NB Ramps with WIS 125 - PM 3LN

US 41 SB Ramps with WIS 125 (College Ave)
Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Lane Length ft	SL Type	Cap. Adj. %	Prob. Block. %
South: US 41 NB Off Ramp																
Lane 1	388	0	0	388	2.0	243	1.598	100	324.0	LOS F	51.2	1299.5	1600	–	0.0	0.0
Lane 2	356	0	0	356	2.0	243	1.465	92[5]	268.3	LOS F	40.8	1036.6	1600	–	0.0	0.0
Lane 3	323	1	0	324	2.0	243	1.332	83[5]	214.7	LOS F	30.6	776.1	1600	–	0.0	0.0
Lane 4	0	0	830	830	2.0	1588	0.523	100	0.1	X	X	X	1600	–	0.0	X
Approach	1067	1	830	1898	2.0		1.598		153.3	LOS F	51.2	1299.5				
East: WIS 125 (College Ave)																
Lane 1	0	709	0	709	2.0	513	1.380	100	205.7	LOS F	69.0	1752.6	1600	–	0.0	7.8
Lane 2	0	649	0	649	2.0	513	1.265	92[5]	158.6	LOS F	50.6	1285.4	1600	–	0.0	0.0
Lane 3	0	590	0	590	2.0	513	1.150	83[5]	114.9	LOS F	32.8	832.5	1600	–	0.0	0.0
Lane 4	0	0	222	222	2.0	881	0.251	100	6.7	LOS A	0.8	21.0	1600	–	0.0	0.0
Approach	0	1948	222	2170	2.0		1.380		146.6	LOS F	69.0	1752.6				
West: WIS 125 (College Ave)																
Lane 1	495	225	0	720	1.0	1111	0.649	89[5]	12.3	LOS B	4.3	109.0	1600	–	0.0	0.0
Lane 2	0	720	0	720	1.0	1111	0.649	89[5]	12.3	LOS B	4.3	109.0	1600	–	0.0	0.0
Lane 3	0	812	0	812	1.0	1111	0.731	100	15.2	LOS C	6.3	159.1	1600	–	0.0	0.0
Approach	495	1758	0	2253	1.0		0.731		13.3	LOS B	6.3	159.1				
Intersection				6321	1.6		1.598		101.1	LOS F	69.0	1752.6				

X: Not applicable for Continuous lane.

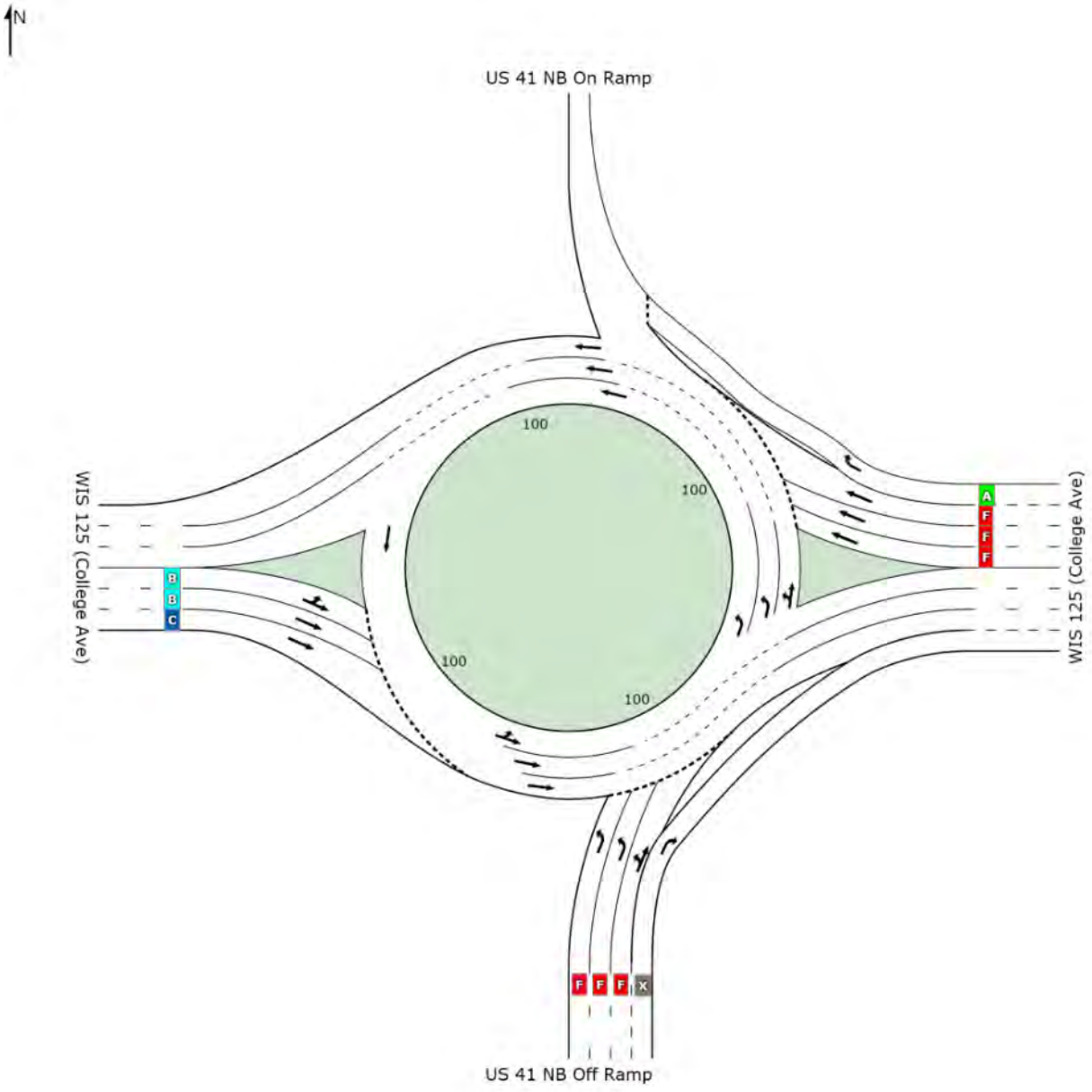
Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

5 Lane underutilisation determined by program

LEVEL OF SERVICE SUMMARY

Site: US 41 NB Ramps with WIS 125 - PM 3LN

US 41 SB Ramps with WIS 125 (College Ave)
Roundabout



	South	East	North	West	Intersection
LOS	F	F	NA	B	F

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Model used. Geometric Delay not included.

INPUT REPORT

US 41 SB Ramps with WIS 125 (College Ave)

Intersection Parameters	
Title	US 41 SB Ramps with WIS 125 (College Ave)
Intersection ID	1
Unit Time (for volumes)	60 minutes
Peak Flow Period (for performance)	15 minutes

Geometry - Approach Data

Location	Name	Type	No. of App. Lanes	No. of Exit Lanes	Median Width ft	Extra Bunching %
South	US 41 SB On Ramp	One-way Exit	0	2	–	0.0
East	WIS 125 (College Ave)	Two-way	3	3	–	0.0
North	US 41 SB Off Ramp	One-way Approach	4	0	–	0.0
West	WIS 125 (College Ave)	Two-way	4	4	–	0.0

Geometry - Roundabout Data

Location	Name	Island Diameter ft	Circ. Width ft	Circ. Lanes	Entry Radius ft	Entry Angle degrees	Env. Factor	Entry/Circ. Flow Adjust.
South	US 41 SB On Ramp	100.00	30.00	3	65.0	30.0	1.2000	None
East	WIS 125 (College Ave)	100.00	30.00	1	65.0	30.0	1.2000	None
North	US 41 SB Off Ramp	100.00	30.00	3	65.0	30.0	1.2000	None
West	WIS 125 (College Ave)	100.00	30.00	3	65.0	30.0	1.2000	None

Geometry - Approach Lane Data

Lane Number	Lane Type	Lane Discip.	Basic Satn Flow tcu/h	Utilisation Ratio %	Saturation Speed mph	Capacity Adjustment %
East	WIS 125 (College Ave)					
App. Lane 1	Normal	LT	1900	36.0	–	0.0
App. Lane 2	Normal	T	1900	33.0	–	0.0
App. Lane 3	Normal	T	1900	30.0	–	0.0
North	US 41 SB Off Ramp					
App. Lane 1	Normal	L	1900	36.0	–	0.0
App. Lane 2	Normal	L	1900	33.0	–	0.0
App. Lane 3	Normal	LT	1900	30.0	–	0.0
App. Lane 4	Continuous	R	1900	–	–	0.0
West	WIS 125 (College Ave)					
App. Lane 1	Normal	T	1900	36.0	–	0.0
App. Lane 2	Normal	T	1900	33.0	–	0.0
App. Lane 3	Normal	T	1900	30.0	–	0.0
App. Lane 4	Continuous	R	1900	–	–	0.0

Geometry - Approach & Exit Lane Data

Lane Number	Lane Width ft	Lane Length ft	Grade %	SL Type
South	US 41 SB On Ramp			
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
East	WIS 125 (College Ave)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–
North	US 41 SB Off Ramp			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
West	WIS 125 (College Ave)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–
Exit Lane 4	13.00	1600.0	0.00	–

Lanes are numbered from left to right in the direction of travel.

Geometry - Movement Definitions

To Approach	Movement Banned	Turn Desig.
From: East	WIS 125 (College Ave)	
East	No	L
South	No	L
West	No	T
From: North	US 41 SB Off Ramp	
East	No	L
South	No	T
West	No	R
From: West	WIS 125 (College Ave)	
West	No	T
East	No	T
South	No	R

HCM 2010 Roundabout Model Calibration

Location	Name	HCM 2010 Single Lane		HCM 2010 Multi-Lane Dominant Lane		HCM 2010 Multi-Lane Subdominant Lane	
		Para. A	Para. B	Para. A	Para. B	Para. A	Para. B
South	US 41 SB On Ramp	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
East	WIS 125 (College Ave)	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
North	US 41 SB Off Ramp	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
West	WIS 125 (College Ave)	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722

Volumes

To Approach	Total veh	HV %	Peak Flow Factor %	Vehicle Occupancy pers/veh	Flow Scale %	Growth Rate %/year
From: East	WIS 125 (College Ave)					
East	5.0	2.00	86.0	1.20	100.00	2.00
South	405.0	2.00	86.0	1.20	100.00	2.00
West	1375.0	2.00	86.0	1.20	100.00	2.00
From: North	US 41 SB Off Ramp					
East	263.0	2.00	86.0	1.20	100.00	2.00
South	1.0	2.00	86.0	1.20	100.00	2.00
West	595.0	2.00	86.0	1.20	100.00	2.00
From: West	WIS 125 (College Ave)					
West	5.0	2.00	86.0	1.20	100.00	2.00
East	785.0	2.00	86.0	1.20	100.00	2.00
South	440.0	2.00	86.0	1.20	100.00	2.00

Path Data

To Approach	App. Cruise Speed mph	Exit Cruise Speed mph	App. Trav. Distance ft	Negn Speed mph	Negn Distance ft	Downst. Distance ft	Negn Radius ft
From: East	WIS 125 (College Ave)						
East	40.0	40.0	1600.0	–	–	–	–
South	40.0	40.0	1600.0	–	–	–	–
West	40.0	40.0	1600.0	–	–	–	–
From: North	US 41 SB Off Ramp						
East	40.0	40.0	1600.0	–	–	–	–
South	40.0	40.0	1600.0	–	–	–	–
West	40.0	40.0	1600.0	–	–	–	–
From: West	WIS 125 (College Ave)						
West	40.0	40.0	1600.0	–	–	–	–
East	40.0	40.0	1600.0	–	–	–	–
South	40.0	40.0	1600.0	–	–	–	–

Movement Data - General

Turn	Mov. ID	Queue Space LV ft	Queue Space HV ft	Vehicle Length LV ft	Vehicle Length HV ft	HVE	P.Deg. Satn	Movement Type	Movement Control
East	WIS 125 (College Ave)								
L	1	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	6	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
North	US 41 SB Off Ramp								
L	7	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	4	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	14	25.00	45.00	17.00	36.00	2.00	–	*Cont.*	–
West	WIS 125 (College Ave)								
T	2	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	12	25.00	45.00	17.00	36.00	2.00	–	*Cont.*	–

Movement Type and Control parameters are set automaticly from Approach Control and Lane Type data in the Geometry dialog.

Gap Acceptance

Movement		Critical Gap sec	Follow-up Headway sec	Min. Departures veh/min	Exiting Flow Effect %
East	WIS 125 (College Ave)				
	L	4.200	3.200	2.50	0
	T	4.200	3.200	2.50	0
North	US 41 SB Off Ramp				
	L	4.000	2.800	2.50	0
	T	4.000	2.800	2.50	0
West	WIS 125 (College Ave)				
	T	4.000	2.800	2.50	0

Model Settings - Options	
General Options	
Level of Service Method	Delay & v/c (HCM 2010)
Level of Service Target	LOS D
Performance Measure	Delay
Percentile Queue	95 %
Hours per Year	480 h
Gap Acceptance	
HV Method for Gap-Acceptance	Include HV Effect for all percentages
Gap-Acceptance Capacity	Traditional M1
HCM Delay Formula	Yes
Downstream Short Lane Model	
Minimum Downstream Utilisation Ratio	20 %
Minimum Downstream Distance	100 ft
Distance for Full Lane Utilisation	660 ft
Calibration Parameter	1.2

Model Settings - Roundabouts	
Roundabout Model Options	
Capacity Model	US HCM 2010
LOS Method	Same as Sign Control
US HCM 2010 Roundabout Model	
Include Origin-Destination Pattern Effects	No
Factor for Parameter A	1.000
Factor for Parameter B	1.000
Other Roundabout Models	
FHWA 2000	No
Use Urban Compact Roundabout	–
HCM 2000	No
NAASRA 1986	No

Model Settings - Cost Parameters	
Vehicle Operating Cost	
Cost Unit	$
Pump Price of Fuel	3.000 $/gal
Fuel Resource Cost Factor	0.700
Ratio of Running Cost to Fuel Cost	3.00
Vehicle Mass	
Light Vehicle Mass	3100.0 lb
Heavy Vehicle Mass	24000.0 lb
Heavy Vehicle Maximum Power	130 kW
Time Cost	
Average Income	23.00 $/h
Time Value Factor	0.400

Demand & Sensitivity	
Analysis Method:	None

Site Properties	
Site (Intersection) Type	Roundabout

Model Name	US HCM (Customary)
Drive Rule	Right-hand side of the road
New Zealand Rule	No
HCM Version	Yes
Units	US Customary

INTERSECTION SUMMARY

US 41 SB Ramps with WIS 125 (College Ave)
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	4505	veh/h	5406	pers/h
Percent Heavy Vehicles	2.0	%		
Degree of Saturation	0.687			
Practical Spare Capacity	23.7	%		
Effective Intersection Capacity	6555	veh/h		
Control Delay (Total)	11.78	veh-h/h	14.13	pers-h/h
Control Delay (Average)	9.4	sec	9.4	sec
Control Delay (Worst Lane)	24.2	sec		
Control Delay (Worst Movement)	23.0	sec	23.0	sec
Geometric Delay (Average)	6.7	sec		
Stop-Line Delay (Average)	9.4	sec		
Intersection Level of Service (LOS)	LOS A			
95% Back of Queue - Vehicles (Worst Lane)	5.0	veh		
95% Back of Queue - Distance (Worst Lane)	126.1	ft		
Total Effective Stops	2693	veh/h	3232	pers/h
Effective Stop Rate	0.60	per veh	0.60	per pers
Proportion Queued	0.22		0.22	
Performance Index	78.4		78.4	
Travel Distance (Total)	1736.7	veh-mi/h	2084.1	pers-mi/h
Travel Distance (Average)	2036	ft	2036	ft
Travel Time (Total)	63.5	veh-h/h	76.2	pers-h/h
Travel Time (Average)	50.8	sec	50.8	sec
Travel Speed	27.3	mph	27.3	mph
Cost (Total)	1250.65	$/h	1250.65	$/h
Fuel Consumption (Total)	86.8	gal/h		
Carbon Dioxide (Total)	821.9	kg/h		
Hydrocarbons (Total)	1.345	kg/h		
Carbon Monoxide (Total)	61.13	kg/h		
NOx (Total)	1.957	kg/h		

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	2,162,233	veh/y	2,594,679	pers/y
Delay	5,653	veh-h/y	6,783	pers-h/y
Effective Stops	1,292,812	veh/y	1,551,375	pers/y
Travel Distance	833,637	veh-mi/y	1,000,364	pers-mi/y
Travel Time	30,487	veh-h/y	36,585	pers-h/y
Cost	600,313	$/y	600,313	$/y
Fuel Consumption	41,657	gal/y		
Carbon Dioxide	394,534	kg/y		
Hydrocarbons	646	kg/y		
Carbon Monoxide	29,343	kg/y		
NOx	940	kg/y		

MOVEMENT SUMMARY

Site: US 41 SB Ramps with WIS 125 - AM 3LN

US 41 SB Ramps with WIS 125 (College Ave)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
East: WIS 125 (College Ave)											
1	L	477	2.0	0.687	13.6	LOS B	5.0	126.1	0.08	0.76	23.6
6	T	1599	2.0	0.687	11.6	LOS B	5.0	126.1	0.07	0.41	26.9
Approach		2076	2.0	0.687	12.0	LOS B	5.0	126.1	0.07	0.49	26.0
North: US 41 SB Off Ramp											
7	L	306	2.0	0.410	23.0	LOS C	1.2	31.6	0.85	1.01	20.5
4	T	1	2.0	0.342	21.7	LOS C	1.0	25.3	0.85	0.94	21.8
14	R	692	2.0	0.436	0.1	X	X	X	X	0.51	33.8
Approach		999	2.0	0.436	7.1	LOS A	1.2	31.6	0.26	0.66	27.9
West: WIS 125 (College Ave)											
2	T	919	2.0	0.472	11.1	LOS B	2.0	49.8	0.61	0.81	27.1
12	R	512	2.0	0.322	0.1	X	X	X	X	0.51	33.8
Approach		1430	2.0	0.472	7.2	LOS A	2.0	49.8	0.39	0.71	29.2
All Vehicles		4505	2.0	0.687	9.4	LOS A	5.0	126.1	0.22	0.60	27.3

X: Not applicable for Continuous movement.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

LANE SUMMARY

Site: US 41 SB Ramps with WIS 125 - AM 3LN

US 41 SB Ramps with WIS 125 (College Ave)
Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Lane Length ft	SL Type	Cap. Adj. %	Prob. Block. %
East: WIS 125 (College Ave)																
Lane 1	477	278	0	755	2.0	1098	0.687	100	13.6	LOS B	5.0	126.1	1600	–	0.0	0.0
Lane 2	0	692	0	692	2.0	1098	0.630	92[5]	11.8	LOS B	3.9	98.8	1600	–	0.0	0.0
Lane 3	0	629	0	629	2.0	1098	0.573	83[5]	10.4	LOS B	3.1	78.4	1600	–	0.0	0.0
Approach	477	1599	0	2076	2.0		0.687		12.0	LOS B	5.0	126.1				
North: US 41 SB Off Ramp																
Lane 1	112	0	0	112	2.0	272	0.410	100	24.2	LOS C	1.2	31.6	1600	–	0.0	0.0
Lane 2	102	0	0	102	2.0	272	0.376	92[5]	22.9	LOS C	1.1	28.4	1600	–	0.0	0.0
Lane 3	92	1	0	93	2.0	272	0.342	83[5]	21.7	LOS C	1.0	25.3	1600	–	0.0	0.0
Lane 4	0	0	692	692	2.0	1588	0.436	100	0.1	X	X	X	1600	–	0.0	X
Approach	306	1	692	999	2.0		0.436		7.1	LOS A	1.2	31.6				
West: WIS 125 (College Ave)																
Lane 1	0	334	0	334	2.0	708	0.472	100	11.9	LOS B	2.0	49.8	1600	–	0.0	0.0
Lane 2	0	306	0	306	2.0	708	0.433	92[5]	11.1	LOS B	1.7	43.3	1600	–	0.0	0.0
Lane 3	0	278	0	278	2.0	708	0.393	83[5]	10.3	LOS B	1.5	37.3	1600	–	0.0	0.0
Lane 4	0	0	512	512	2.0	1588	0.322	100	0.1	X	X	X	1600	–	0.0	X
Approach	0	919	512	1430	2.0		0.472		7.2	LOS A	2.0	49.8				
Intersection				4505	2.0		0.687		9.4	LOS A	5.0	126.1				

X: Not applicable for Continuous lane.

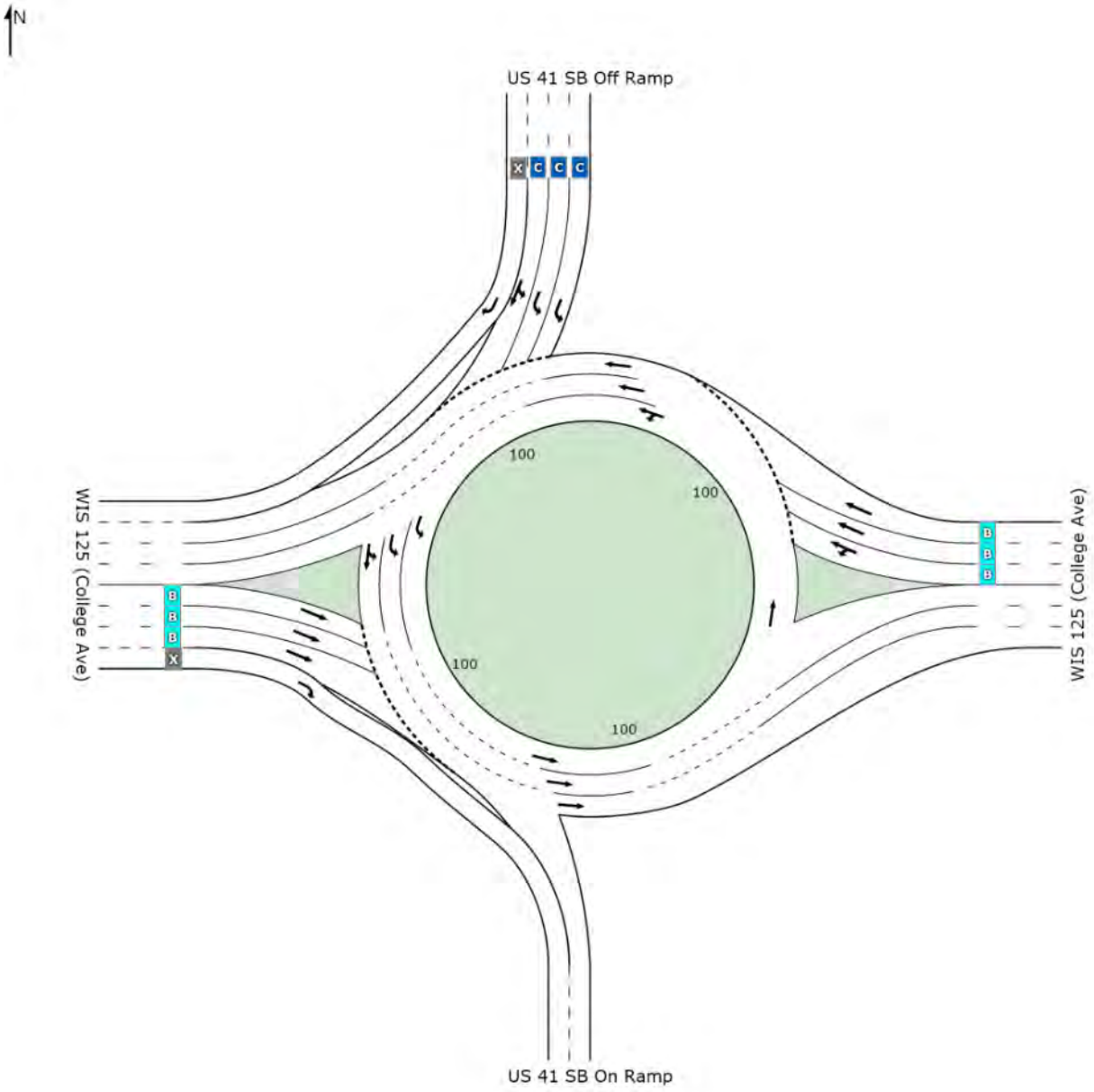
Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

5 Lane underutilisation determined by program

LEVEL OF SERVICE SUMMARY

Site: US 41 SB Ramps with WIS 125 - AM 3LN

US 41 SB Ramps with WIS 125 (College Ave)
Roundabout



	South	East	North	West	Intersection
LOS	NA	B	A	A	A

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Model used. Geometric Delay not included.

INPUT REPORT

US 41 SB Ramps with WIS 125 (College Ave)

Intersection Parameters	
Title	US 41 SB Ramps with WIS 125 (College Ave)
Intersection ID	1
Unit Time (for volumes)	60 minutes
Peak Flow Period (for performance)	15 minutes

Geometry - Approach Data

Location	Name	Type	No. of App. Lanes	No. of Exit Lanes	Median Width ft	Extra Bunching %
South	US 41 SB On Ramp	One-way Exit	0	2	–	0.0
East	WIS 125 (College Ave)	Two-way	3	3	–	0.0
North	US 41 SB Off Ramp	One-way Approach	4	0	–	0.0
West	WIS 125 (College Ave)	Two-way	4	4	–	0.0

Geometry - Roundabout Data

Location	Name	Island Diameter ft	Circ. Width ft	Circ. Lanes	Entry Radius ft	Entry Angle degrees	Env. Factor	Entry/Circ. Flow Adjust.
South	US 41 SB On Ramp	100.00	30.00	3	65.0	30.0	1.2000	None
East	WIS 125 (College Ave)	100.00	30.00	1	65.0	30.0	1.2000	None
North	US 41 SB Off Ramp	100.00	30.00	3	65.0	30.0	1.2000	None
West	WIS 125 (College Ave)	100.00	30.00	3	65.0	30.0	1.2000	None

Geometry - Approach Lane Data

Lane Number	Lane Type	Lane Discip.	Basic Satn Flow tcu/h	Utilisation Ratio %	Saturation Speed mph	Capacity Adjustment %
East	WIS 125 (College Ave)					
App. Lane 1	Normal	LT	1900	36.0	–	0.0
App. Lane 2	Normal	T	1900	33.0	–	0.0
App. Lane 3	Normal	T	1900	30.0	–	0.0
North	US 41 SB Off Ramp					
App. Lane 1	Normal	L	1900	36.0	–	0.0
App. Lane 2	Normal	L	1900	33.0	–	0.0
App. Lane 3	Normal	LT	1900	30.0	–	0.0
App. Lane 4	Continuous	R	1900	–	–	0.0
West	WIS 125 (College Ave)					
App. Lane 1	Normal	T	1900	36.0	–	0.0
App. Lane 2	Normal	T	1900	33.0	–	0.0
App. Lane 3	Normal	T	1900	30.0	–	0.0
App. Lane 4	Continuous	R	1900	–	–	0.0

Geometry - Approach & Exit Lane Data

Lane Number	Lane Width ft	Lane Length ft	Grade %	SL Type
South	US 41 SB On Ramp			
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
East	WIS 125 (College Ave)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–
North	US 41 SB Off Ramp			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
West	WIS 125 (College Ave)			
App. Lane 1	13.00	1600.0	0.00	–
App. Lane 2	13.00	1600.0	0.00	–
App. Lane 3	13.00	1600.0	0.00	–
App. Lane 4	13.00	1600.0	0.00	–
Exit Lane 1	13.00	1600.0	0.00	–
Exit Lane 2	13.00	1600.0	0.00	–
Exit Lane 3	13.00	1600.0	0.00	–
Exit Lane 4	13.00	1600.0	0.00	–

Lanes are numbered from left to right in the direction of travel.

Geometry - Movement Definitions

To Approach	Movement Banned	Turn Desig.
From: East	WIS 125 (College Ave)	
East	No	L
South	No	L
West	No	T
From: North	US 41 SB Off Ramp	
East	No	L
South	No	T
West	No	R
From: West	WIS 125 (College Ave)	
West	No	T
East	No	T
South	No	R

HCM 2010 Roundabout Model Calibration

Location	Name	HCM 2010 Single Lane		HCM 2010 Multi-Lane Dominant Lane		HCM 2010 Multi-Lane Subdominant Lane	
		Para. A	Para. B	Para. A	Para. B	Para. A	Para. B
South	US 41 SB On Ramp	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
East	WIS 125 (College Ave)	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
North	US 41 SB Off Ramp	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722
West	WIS 125 (College Ave)	1130.0	0.001000	1286.0	0.000722	1286.0	0.000722

Volumes

To Approach	Total veh	HV %	Peak Flow Factor %	Vehicle Occupancy pers/veh	Flow Scale %	Growth Rate %/year
From: East	WIS 125 (College Ave)					
East	5.0	1.00	96.0	1.20	100.00	2.00
South	895.0	1.00	96.0	1.20	100.00	2.00
West	2025.0	1.00	96.0	1.20	100.00	2.00
From: North	US 41 SB Off Ramp					
East	230.0	3.00	96.0	1.20	100.00	2.00
South	1.0	3.00	96.0	1.20	100.00	2.00
West	420.0	3.00	96.0	1.20	100.00	2.00
From: West	WIS 125 (College Ave)					
West	5.0	2.00	96.0	1.20	100.00	2.00
East	1950.0	2.00	96.0	1.20	100.00	2.00
South	1250.0	2.00	96.0	1.20	100.00	2.00

Path Data

To Approach	App. Cruise Speed mph	Exit Cruise Speed mph	App. Trav. Distance ft	Negn Speed mph	Negn Distance ft	Downst. Distance ft	Negn Radius ft
From: East	WIS 125 (College Ave)						
East	40.0	40.0	1600.0	–	–	–	–
South	40.0	40.0	1600.0	–	–	–	–
West	40.0	40.0	1600.0	–	–	–	–
From: North	US 41 SB Off Ramp						
East	40.0	40.0	1600.0	–	–	–	–
South	40.0	40.0	1600.0	–	–	–	–
West	40.0	40.0	1600.0	–	–	–	–
From: West	WIS 125 (College Ave)						
West	40.0	40.0	1600.0	–	–	–	–
East	40.0	40.0	1600.0	–	–	–	–
South	40.0	40.0	1600.0	–	–	–	–

Movement Data - General

Turn	Mov. ID	Queue Space LV ft	Queue Space HV ft	Vehicle Length LV ft	Vehicle Length HV ft	HVE	P.Deg. Satn	Movement Type	Movement Control
East	WIS 125 (College Ave)								
L	1	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	6	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
North	US 41 SB Off Ramp								
L	7	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
T	4	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	14	25.00	45.00	17.00	36.00	2.00	–	*Cont.*	–
West	WIS 125 (College Ave)								
T	2	25.00	45.00	17.00	36.00	2.00	–	*Normal*	–
R	12	25.00	45.00	17.00	36.00	2.00	–	*Cont.*	–

Movement Type and Control parameters are set automaticly from Approach Control and Lane Type data in the Geometry dialog.

Gap Acceptance

Movement		Critical Gap sec	Follow-up Headway sec	Min. Departures veh/min	Exiting Flow Effect %
East	WIS 125 (College Ave)				
	L	4.200	3.200	2.50	0
	T	4.200	3.200	2.50	0
North	US 41 SB Off Ramp				
	L	4.000	2.800	2.50	0
	T	4.000	2.800	2.50	0
West	WIS 125 (College Ave)				
	T	4.000	2.800	2.50	0

Model Settings - Options	
General Options	
Level of Service Method	Delay & v/c (HCM 2010)
Level of Service Target	LOS D
Performance Measure	Delay
Percentile Queue	95 %
Hours per Year	480 h
Gap Acceptance	
HV Method for Gap-Acceptance	Include HV Effect for all percentages
Gap-Acceptance Capacity	Traditional M1
HCM Delay Formula	Yes
Downstream Short Lane Model	
Minimum Downstream Utilisation Ratio	20 %
Minimum Downstream Distance	100 ft
Distance for Full Lane Utilisation	660 ft
Calibration Parameter	1.2

Model Settings - Roundabouts	
Roundabout Model Options	
Capacity Model	US HCM 2010
LOS Method	Same as Sign Control
US HCM 2010 Roundabout Model	
Include Origin-Destination Pattern Effects	No
Factor for Parameter A	1.000
Factor for Parameter B	1.000
Other Roundabout Models	
FHWA 2000	No
Use Urban Compact Roundabout	–
HCM 2000	No
NAASRA 1986	No

Model Settings - Cost Parameters	
Vehicle Operating Cost	
Cost Unit	$
Pump Price of Fuel	3.000 $/gal
Fuel Resource Cost Factor	0.700
Ratio of Running Cost to Fuel Cost	3.00
Vehicle Mass	
Light Vehicle Mass	3100.0 lb
Heavy Vehicle Mass	24000.0 lb
Heavy Vehicle Maximum Power	130 kW
Time Cost	
Average Income	23.00 $/h
Time Value Factor	0.400

Demand & Sensitivity	
Analysis Method:	None

Site Properties	
Site (Intersection) Type	Roundabout

Model Name	US HCM (Customary)
Drive Rule	Right-hand side of the road
New Zealand Rule	No
HCM Version	Yes
Units	US Customary

INTERSECTION SUMMARY

US 41 SB Ramps with WIS 125 (College Ave)
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	7064	veh/h	8476	pers/h
Percent Heavy Vehicles	1.7	%		
Degree of Saturation	1.392			
Practical Spare Capacity	-38.9	%		
Effective Intersection Capacity	5073	veh/h		
Control Delay (Total)	126.16	veh-h/h	151.39	pers-h/h
Control Delay (Average)	64.3	sec	64.3	sec
Control Delay (Worst Lane)	209.7	sec		
Control Delay (Worst Movement)	165.8	sec	165.8	sec
Geometric Delay (Average)	6.6	sec		
Stop-Line Delay (Average)	64.3	sec		
Intersection Level of Service (LOS)	LOS F			
95% Back of Queue - Vehicles (Worst Lane)	127.7	veh		
95% Back of Queue - Distance (Worst Lane)	3219.3	ft		
Total Effective Stops	9709	veh/h	11651	pers/h
Effective Stop Rate	1.37	per veh	1.37	per pers
Proportion Queued	0.53		0.53	
Performance Index	380.7		380.7	
Travel Distance (Total)	2719.7	veh-mi/h	3263.6	pers-mi/h
Travel Distance (Average)	2033	ft	2033	ft
Travel Time (Total)	207.0	veh-h/h	248.4	pers-h/h
Travel Time (Average)	105.5	sec	105.5	sec
Travel Speed	13.1	mph	13.1	mph
Cost (Total)	3481.18	$/h	3481.18	$/h
Fuel Consumption (Total)	185.2	gal/h		
Carbon Dioxide (Total)	1753.6	kg/h		
Hydrocarbons (Total)	3.198	kg/h		
Carbon Monoxide (Total)	120.92	kg/h		
NOx (Total)	3.666	kg/h		

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	3,390,500	veh/y	4,068,600	pers/y
Delay	60,557	veh-h/y	72,668	pers-h/y
Effective Stops	4,660,208	veh/y	5,592,250	pers/y
Travel Distance	1,305,455	veh-mi/y	1,566,546	pers-mi/y
Travel Time	99,358	veh-h/y	119,229	pers-h/y
Cost	1,670,968	$/y	1,670,968	$/y
Fuel Consumption	88,884	gal/y		
Carbon Dioxide	841,730	kg/y		
Hydrocarbons	1,535	kg/y		
Carbon Monoxide	58,042	kg/y		
NOx	1,760	kg/y		

MOVEMENT SUMMARY

Site: US 41 SB Ramps with WIS 125 - PM 3LN

US 41 SB Ramps with WIS 125 (College Ave)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
East: WIS 125 (College Ave)											
1	L	937	1.0	0.998	45.9	LOS E	127.7	3219.3	1.00	0.19	15.6
6	T	2109	1.0	0.998	27.3	LOS D	127.7	3219.3	0.24	0.37	20.5
Approach		3047	1.0	0.998	33.0	LOS D	127.7	3219.3	0.48	0.32	18.6
North: US 41 SB Off Ramp											
7	L	240	3.0	0.649	63.5	LOS F	1.9	49.4	0.95	1.09	13.1
4	T	1	3.0	0.541	57.1	LOS F	1.5	38.8	0.95	1.05	13.9
14	R	438	3.0	0.277	0.0	X	X	X	X	0.51	33.8
Approach		678	3.0	0.649	22.6	LOS C	1.9	49.4	0.34	0.72	21.3
West: WIS 125 (College Ave)											
2	T	2036	2.0	1.392	165.8	LOS F	73.4	1865.0	1.00	3.73	6.7
12	R	1302	2.0	0.820	0.5	X	X	X	X	0.51	33.5
Approach		3339	2.0	1.392	101.4	LOS F	73.4	1865.0	0.61	2.47	9.7
All Vehicles		7064	1.7	1.392	64.3	LOS F	127.7	3219.3	0.53	1.37	13.1

X: Not applicable for Continuous movement.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

LANE SUMMARY

Site: US 41 SB Ramps with WIS 125 - PM 3LN

US 41 SB Ramps with WIS 125 (College Ave)
Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Lane Length ft	SL Type	Cap. Adj. %	Prob. Block. %
East: WIS 125 (College Ave)																
Lane 1	937	170	0	1108	1.0	1111	0.998	100	45.9	LOS E	127.7	3219.3	1600	–	0.0	32.7
Lane 2	0	1016	0	1016	1.0	1111	0.915	92[5]	29.9	LOS D	22.6	568.9	1600	–	0.0	0.0
Lane 3	0	923	0	923	1.0	1111	0.831	83[5]	21.0	LOS C	11.1	280.5	1600	–	0.0	0.0
Approach	937	2109	0	3047	1.0		0.998		33.0	LOS D	127.7	3219.3				
North: US 41 SB Off Ramp																
Lane 1	87	0	0	87	3.0	135	0.649	100	69.4	LOS F	1.9	49.4	1600	–	0.0	0.0
Lane 2	80	0	0	80	3.0	135	0.595	92[5]	62.8	LOS F	1.7	43.8	1600	–	0.0	0.0
Lane 3	72	1	0	73	3.0	135	0.541	83[5]	57.1	LOS F	1.5	38.8	1600	–	0.0	0.0
Lane 4	0	0	438	438	3.0	1577	0.277	100	0.0	X	X	X	1600	–	0.0	X
Approach	240	1	438	678	3.0		0.649		22.6	LOS C	1.9	49.4				
West: WIS 125 (College Ave)																
Lane 1	0	741	0	741	2.0	532	1.392	100	209.7	LOS F	73.4	1865.0	1600	–	0.0	9.7
Lane 2	0	679	0	679	2.0	532	1.276	92[5]	162.0	LOS F	54.2	1375.9	1600	–	0.0	0.7
Lane 3	0	617	0	617	2.0	532	1.160	83[5]	117.3	LOS F	35.4	900.3	1600	–	0.0	0.0
Lane 4	0	0	1302	1302	2.0	1588	0.820	100	0.5	X	X	X	1600	–	0.0	X
Approach	0	2036	1302	3339	2.0		1.392		101.4	LOS F	73.4	1865.0				
Intersection				7064	1.7		1.392		64.3	LOS F	127.7	3219.3				

X: Not applicable for Continuous lane.

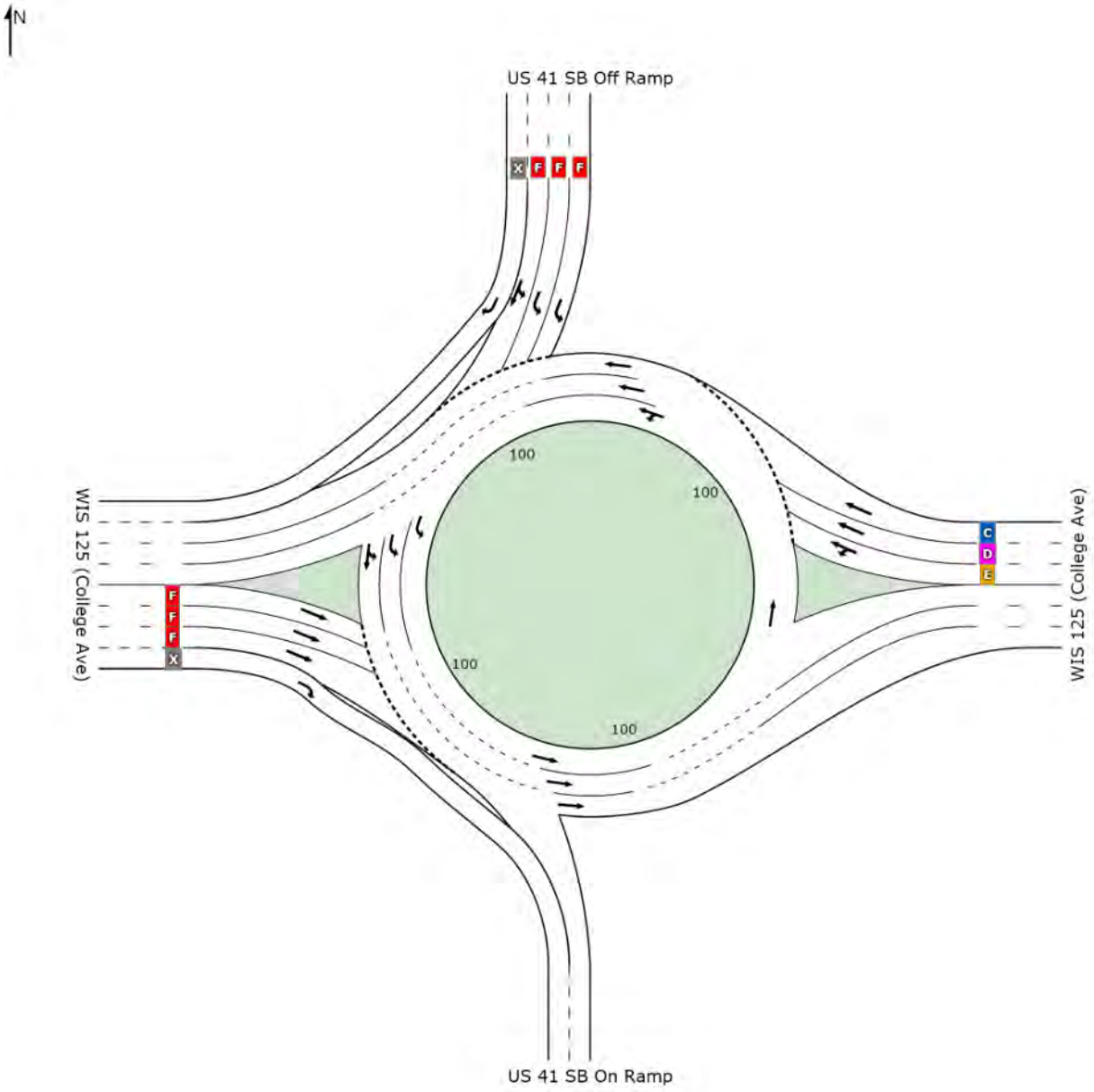
Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

5 Lane underutilisation determined by program

LEVEL OF SERVICE SUMMARY

Site: US 41 SB Ramps with WIS 125 - PM 3LN

US 41 SB Ramps with WIS 125 (College Ave)
Roundabout



	South	East	North	West	Intersection
LOS	NA	D	C	F	F

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Model used. Geometric Delay not included.

APPENDIX B

RODEL Software Analysis Output

WIS 441 with County CE

20:8:12 YR 2038 WIS441-SB/CTHCE-3ln-SB/EB byp* 62

E	(m)	3.65	10.95	10.95	10.95	
L'	(m)	25.00	25.00	25.00	25.00	
V	(m)	3.65	10.95	7.30	10.95	
RAD	(m)	20.00	20.00	20.00	20.00	
PHI	(d)	25.00	25.00	25.00	25.00	
DIA	(m)	60.00	60.00	60.00	60.00	
GRAD SEP		0	0	0	0	

TIME PERIOD min	90
TIME SLICE min	15
RESULTS PERIOD min	15 75
TIME COST $/hr	15.00
FLOW PERIOD min	15 75
FLOW TYPE pcu/veh	VEH
FLOW PEAK am/op/pm	AM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB ---	1.01	000 000 000 0	1.00	85	0.75 0.996 0.75	15 45 75
WB CTH CE	1.01	000 825 845 5	1.00	85	0.75 0.996 0.75	15 45 75
SB 441 OFF	1.01	000 005 485 0	1.00	85	0.75 0.996 0.75	15 45 75
EB CTH CE	1.01	000 825 000 5	1.00	85	0.75 0.996 0.75	15 45 75

FLOW	veh	0	1675	490	830	
CAPACITY	veh	299	3133	1455	1995	
AVE DELAY	secs	0.0	2.4	3.7	3.1	
MAX DELAY	secs	0.0	3.1	4.9	4.0	
AVE QUEUE	veh	0.0	1.2	0.5	0.7	
MAX QUEUE	veh	0.0	1.3	0.6	0.9	

AVEDEL s	2.8
LOS SIG	A
LOS UNSIG	A
VEHIC HRS	2.3
COST $	35

20:8:12 YR 2038 WIS441-SB/CTHCE-3ln-SB/EB byp* 63

E	(m)	3.65	10.95	10.95	10.95	
L'	(m)	25.00	25.00	25.00	25.00	
V	(m)	3.65	10.95	7.30	10.95	
RAD	(m)	20.00	20.00	20.00	20.00	
PHI	(d)	25.00	25.00	25.00	25.00	
DIA	(m)	60.00	60.00	60.00	60.00	
GRAD SEP		0	0	0	0	

TIME PERIOD	min 90
TIME SLICE	min 15
RESULTS PERIOD	min 15 75
TIME COST	$/hr 15.00
FLOW PERIOD	min 15 75
FLOW TYPE	pcu/veh VEH
FLOW PEAK	am/op/pm AM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB ---	1.01	000 000 000 0	1.00	50	0.75 0.996 0.75	15 45 75
WB CTH CE	1.01	000 825 845 5	1.00	50	0.75 0.996 0.75	15 45 75
SB 441 OFF	1.01	000 005 485 0	1.00	50	0.75 0.996 0.75	15 45 75
EB CTH CE	1.01	000 825 000 5	1.00	50	0.75 0.996 0.75	15 45 75

FLOW	veh	0	1675	490	830	
CAPACITY	veh	504	3338	1660	2200	
AVE DELAY	secs	0.0	2.1	3.1	2.6	
MAX DELAY	secs	0.0	2.7	4.0	3.4	
AVE QUEUE	veh	0.0	1.0	0.4	0.6	
MAX QUEUE	veh	0.0	1.2	0.5	0.7	

AVEDEL s	2.4
LOS SIG	A
LOS UNSIG	A
VEHIC HRS	2.0
COST $	30

20:8:12 YR 2038 WIS441-SB/CTHCE-3ln-SB/EB byp* 64

E	(m)	3.65	10.95	10.95	10.95	
L'	(m)	25.00	25.00	25.00	25.00	
V	(m)	3.65	10.95	7.30	10.95	
RAD	(m)	20.00	20.00	20.00	20.00	
PHI	(d)	25.00	25.00	25.00	25.00	
DIA	(m)	60.00	60.00	60.00	60.00	
GRAD SEP		0	0	0	0	

TIME PERIOD	min 90
TIME SLICE	min 15
RESULTS PERIOD	min 15 75
TIME COST	$/hr 15.00
FLOW PERIOD	min 15 75
FLOW TYPE	pcu/veh VEH
FLOW PEAK	am/op/pm PM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB ---	1.01	000 000 000 0	1.00	85	0.75 0.996 0.75	15 45 75
WB CTH CE	1.01	000 910 560 5	1.00	85	0.75 0.996 0.75	15 45 75
SB 441 OFF	1.01	000 005 1350 0	1.00	85	0.75 0.996 0.75	15 45 75
EB CTH CE	1.01	000 1455 000 5	1.00	85	0.75 0.996 0.75	15 45 75

FLOW	veh	0	1475	1355	1460	
CAPACITY	veh	0	3133	1614	1503	
AVE DELAY	secs	0.0	2.1	19.7	99.4	
MAX DELAY	secs	0.0	2.7	37.0	207.1	
AVE QUEUE	veh	0.0	0.9	7.6	44.8	
MAX QUEUE	veh	0.0	1.0	13.4	89.9	

AVEDEL	s 40.8
LOS SIG	D
LOS UNSIG	E
VEHIC HRS	48.6
COST	$ 730

20:8:12 YR 2038 WIS441-SB/CTHCE-3ln-SB/EB byp* 65

E	(m)	3.65	10.95	10.95	10.95	
L'	(m)	25.00	25.00	25.00	25.00	
V	(m)	3.65	10.95	7.30	10.95	
RAD	(m)	20.00	20.00	20.00	20.00	
PHI	(d)	25.00	25.00	25.00	25.00	
DIA	(m)	60.00	60.00	60.00	60.00	
GRAD SEP		0	0	0	0	

TIME PERIOD	min 90
TIME SLICE	min 15
RESULTS PERIOD	min 15 75
TIME COST	$/hr 15.00
FLOW PERIOD	min 15 75
FLOW TYPE	pcu/veh VEH
FLOW PEAK	am/op/pm PM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB ---	1.01	000 000 000 0	1.00	50	0.75 0.996 0.75	15 45 75
WB CTH CE	1.01	000 910 560 5	1.00	50	0.75 0.996 0.75	15 45 75
SB 441 OFF	1.01	000 005 1350 0	1.00	50	0.75 0.996 0.75	15 45 75
EB CTH CE	1.01	000 1455 000 5	1.00	50	0.75 0.996 0.75	15 45 75

FLOW	veh	0	1475	1355	1460	
CAPACITY	veh	0	3338	1818	1707	
AVE DELAY	secs	0.0	1.9	8.7	25.7	
MAX DELAY	secs	0.0	2.4	13.9	53.1	
AVE QUEUE	veh	0.0	0.8	3.4	10.6	
MAX QUEUE	veh	0.0	0.9	4.9	21.1	

AVEDEL	s 12.1
LOS SIG	B
LOS UNSIG	B
VEHIC HRS	14.5
COST	$ 217

20:8:12 YR 2038 WIS441-NB/CTHCE-3ln-NB/WBbyp* 73

E	(m)	10.95	10.95	3.65	10.95	
L'	(m)	25.00	25.00	25.00	25.00	
V	(m)	10.95	7.30	3.65	10.95	
RAD	(m)	20.00	20.00	20.00	20.00	
PHI	(d)	25.00	25.00	25.00	25.00	
DIA	(m)	60.00	60.00	60.00	60.00	
GRAD SEP		0	0	0	0	

TIME PERIOD	min 90
TIME SLICE	min 15
RESULTS PERIOD	min 15 75
TIME COST	$/hr 15.00
FLOW PERIOD	min 15 75
FLOW TYPE	pcu/veh VEH
FLOW PEAK	am/op/pm AM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB 441 OFF	1.01	000 005 145 0	1.00	85	0.75 1.123 0.75	15 45 75
WB CTH CE	1.01	000 1520 000 5	1.00	85	0.75 1.123 0.75	15 45 75
SB ---	1.01	000 000 000 0	1.00	85	0.75 1.123 0.75	15 45 75
EB CTH CE	1.01	000 950 365 5	1.00	85	0.75 1.123 0.75	15 45 75

FLOW	veh	150	1525	0	1320	
CAPACITY	veh	2008	2372	135	3133	
AVE DELAY	secs	1.9	4.4	0.0	2.0	
MAX DELAY	secs	2.5	6.7	0.0	2.6	
AVE QUEUE	veh	0.1	1.9	0.0	0.7	
MAX QUEUE	veh	0.1	2.5	0.0	0.9	

AVEDEL	s 3.2
LOS SIG	A
LOS UNSIG	A
VEHIC HRS	2.7
COST	$ 40

20:8:12 YR 2038 WIS441-NB/CTHCE-3ln-NB/WBbyp* 74

E	(m)	10.95	10.95	3.65	10.95	
L'	(m)	25.00	25.00	25.00	25.00	
V	(m)	10.95	7.30	3.65	10.95	
RAD	(m)	20.00	20.00	20.00	20.00	
PHI	(d)	25.00	25.00	25.00	25.00	
DIA	(m)	60.00	60.00	60.00	60.00	
GRAD SEP		0	0	0	0	

TIME PERIOD	min 90
TIME SLICE	min 15
RESULTS PERIOD	min 15 75
TIME COST	$/hr 15.00
FLOW PERIOD	min 15 75
FLOW TYPE	pcu/veh VEH
FLOW PEAK	am/op/pm AM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB 441 OFF	1.01	000 005 145 0	1.00	50	0.75 1.123 0.75	15 45 75
WB CTH CE	1.01	000 1520 000 5	1.00	50	0.75 1.123 0.75	15 45 75
SB ---	1.01	000 000 000 0	1.00	50	0.75 1.123 0.75	15 45 75
EB CTH CE	1.01	000 950 365 5	1.00	50	0.75 1.123 0.75	15 45 75

FLOW	veh	150	1525	0	1320	
CAPACITY	veh	2213	2577	340	3338	
AVE DELAY	secs	1.7	3.5	0.0	1.8	
MAX DELAY	secs	2.3	5.1	0.0	2.3	
AVE QUEUE	veh	0.1	1.5	0.0	0.7	
MAX QUEUE	veh	0.1	1.9	0.0	0.8	

AVEDEL s	2.6
LOS SIG	A
LOS UNSIG	A
VEHIC HRS	2.2
COST $	33

20:8:12 YR 2038 WIS441-NB/CTHCE-3ln-NB/WBbyp* 75

E	(m)	10.95	10.95	3.65	10.95	
L'	(m)	25.00	25.00	25.00	25.00	
V	(m)	10.95	7.30	3.65	10.95	
RAD	(m)	20.00	20.00	20.00	20.00	
PHI	(d)	25.00	25.00	25.00	25.00	
DIA	(m)	60.00	60.00	60.00	60.00	
GRAD SEP		0	0	0	0	

TIME PERIOD	min 90
TIME SLICE	min 15
RESULTS PERIOD	min 15 75
TIME COST	$/hr 15.00
FLOW PERIOD	min 15 75
FLOW TYPE	pcu/veh VEH
FLOW PEAK	am/op/pm PM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB 441 OFF	1.01	000 005 215 0	1.00	85	0.75 1.123 0.75	15 45 75
WB CTH CE	1.01	000 1255 000 5	1.00	85	0.75 1.123 0.75	15 45 75
SB ---	1.01	000 000 000 0	1.00	85	0.75 1.123 0.75	15 45 75
EB CTH CE	1.01	000 2445 360 5	1.00	85	0.75 1.123 0.75	15 45 75

FLOW	veh	220	1260	0	2810	
CAPACITY	veh	741	2321	226	3133	
AVE DELAY	secs	8.4	3.4	0.0	19.5	
MAX DELAY	secs	15.2	4.9	0.0	41.6	
AVE QUEUE	veh	0.5	1.2	0.0	15.5	
MAX QUEUE	veh	0.8	1.5	0.0	30.4	

AVEDEL	s 14.2
LOS SIG	B
LOS UNSIG	B
VEHIC HRS	16.9
COST	$ 254

20:8:12 YR 2038 WIS441-NB/CTHCE-3ln-NB/WBbyp* 76

E (m)	10.95	10.95	3.65	10.95
L' (m)	25.00	25.00	25.00	25.00
V (m)	10.95	7.30	3.65	10.95
RAD (m)	20.00	20.00	20.00	20.00
PHI (d)	25.00	25.00	25.00	25.00
DIA (m)	60.00	60.00	60.00	60.00
GRAD SEP	0	0	0	0

TIME PERIOD min	90
TIME SLICE min	15
RESULTS PERIOD min	15 75
TIME COST $/hr	15.00
FLOW PERIOD min	15 75
FLOW TYPE pcu/veh	VEH
FLOW PEAK am/op/pm	PM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB 441 OFF	1.01	000 005 215 0	1.00	50	0.75 1.123 0.75	15 45 75
WB CTH CE	1.01	000 1255 000 5	1.00	50	0.75 1.123 0.75	15 45 75
SB ---	1.01	000 000 000 0	1.00	50	0.75 1.123 0.75	15 45 75
EB CTH CE	1.01	000 2445 360 5	1.00	50	0.75 1.123 0.75	15 45 75

FLOW	veh	220	1260	0	2810
CAPACITY	veh	945	2525	430	3338
AVE DELAY	secs	5.6	2.8	0.0	8.9
MAX DELAY	secs	9.3	4.0	0.0	16.1
AVE QUEUE	veh	0.4	1.0	0.0	7.1
MAX QUEUE	veh	0.5	1.3	0.0	11.5

AVEDEL s	6.9
LOS SIG	A
LOS UNSIG	A
VEHIC HRS	8.2
COST $	124

US 41 with County E

20:8:12		YR 2038 US41-SB/CTHE-3ln-WBbyp*					62

E	(m)	10.95	10.95	10.95	4.00	TIME PERIOD min	90
L'	(m)	25.00	25.00	25.00	25.00	TIME SLICE min	15
V	(m)	10.95	7.30	7.30	3.65	RESULTS PERIOD min	15 75
RAD	(m)	20.00	20.00	20.00	20.00	TIME COST $/hr	15.00
PHI	(d)	25.00	25.00	25.00	25.00	FLOW PERIOD min	15 75
DIA	(m)	60.00	60.00	60.00	60.00	FLOW TYPE pcu/veh	VEH
GRAD SEP		0	0	0	0	FLOW PEAK am/op/pm	AM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB CTH E	1.01	000 1415 175 5	1.00	85	0.75 1.465 0.75	15 45 75
WB 41 OFF	1.02	000 005 550 0	1.00	85	0.75 1.465 0.75	15 45 75
SB CTH E	1.02	510 1200 000 5	1.00	85	0.75 1.465 0.75	15 45 75
EB ---	1.02	000 000 000 0	1.00	85	0.75 1.465 0.75	15 45 75

FLOW	veh	1595	555	1715	0	AVEDEL s	9.5
CAPACITY	veh	3133	1504	2176	157	LOS SIG	A
AVE DELAY	secs	2.4	4.3	17.9	0.0	LOS UNSIG	A
MAX DELAY	secs	3.9	7.7	41.2	0.0		
AVE QUEUE	veh	1.1	0.7	8.6	0.0	VEHIC HRS	10.2
MAX QUEUE	veh	1.5	1.0	17.1	0.0	COST $	154

20:8:12 YR 2038 US41-SB/CTHE-3ln-WBbyp* 63

E	(m)	10.95	10.95	10.95	4.00	
L'	(m)	25.00	25.00	25.00	25.00	
V	(m)	10.95	7.30	7.30	3.65	
RAD	(m)	20.00	20.00	20.00	20.00	
PHI	(d)	25.00	25.00	25.00	25.00	
DIA	(m)	60.00	60.00	60.00	60.00	
GRAD SEP		0	0	0	0	

TIME PERIOD	min 90
TIME SLICE	min 15
RESULTS PERIOD	min 15 75
TIME COST	$/hr 15.00
FLOW PERIOD	min 15 75
FLOW TYPE	pcu/veh VEH
FLOW PEAK	am/op/pm AM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB CTH E	1.01	000 1415 175 5	1.00	50	0.75 1.465 0.75	15 45 75
WB 41 OFF	1.02	000 005 550 0	1.00	50	0.75 1.465 0.75	15 45 75
SB CTH E	1.02	510 1200 000 5	1.00	50	0.75 1.465 0.75	15 45 75
EB ---	1.02	000 000 000 0	1.00	50	0.75 1.465 0.75	15 45 75

FLOW	veh	1595	555	1715	0	
CAPACITY	veh	3338	1707	2379	360	
AVE DELAY	secs	2.1	3.4	8.1	0.0	
MAX DELAY	secs	3.4	5.9	16.6	0.0	
AVE QUEUE	veh	1.0	0.5	3.9	0.0	
MAX QUEUE	veh	1.3	0.8	6.7	0.0	

AVEDEL s	4.9
LOS SIG	A
LOS UNSIG	A
VEHIC HRS	5.3
COST $	80

20:8:12		YR 2038 US41-SB/CTHE-3ln-WBbyp*					64

E	(m)	10.95	10.95	10.95	4.00	TIME PERIOD min	90
L'	(m)	25.00	25.00	25.00	25.00	TIME SLICE min	15
V	(m)	10.95	7.30	7.30	3.65	RESULTS PERIOD min	15 75
RAD	(m)	20.00	20.00	20.00	20.00	TIME COST $/hr	15.00
PHI	(d)	25.00	25.00	25.00	25.00	FLOW PERIOD min	15 75
DIA	(m)	60.00	60.00	60.00	60.00	FLOW TYPE pcu/veh	VEH
GRAD SEP		0	0	0	0	FLOW PEAK am/op/pm	PM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB CTH E	1.01	000 2080 345 5	1.00	85	0.75 1.123 0.75	15 45 75
WB 41 OFF	1.01	000 005 490 0	1.00	85	0.75 1.123 0.75	15 45 75
SB CTH E	1.02	515 1350 000 5	1.00	85	0.75 1.123 0.75	15 45 75
EB ---	1.01	000 000 000 0	1.00	85	0.75 1.123 0.75	15 45 75

FLOW	veh	2430	495	1870	0	AVEDEL s	17.7
CAPACITY	veh	3133	860	2095	118	LOS SIG	B
AVE DELAY	secs	5.7	16.4	33.7	0.0	LOS UNSIG	C
MAX DELAY	secs	9.3	32.0	76.7	0.0		
AVE QUEUE	veh	4.0	2.3	17.8	0.0	VEHIC HRS	23.6
MAX QUEUE	veh	5.7	4.1	38.8	0.0	COST $	354

20:8:12 YR 2038 US41-SB/CTHE-3ln-WBbyp* 65

E	(m)	10.95	10.95	10.95	4.00	
L'	(m)	25.00	25.00	25.00	25.00	
V	(m)	10.95	7.30	7.30	3.65	
RAD	(m)	20.00	20.00	20.00	20.00	
PHI	(d)	25.00	25.00	25.00	25.00	
DIA	(m)	60.00	60.00	60.00	60.00	
GRAD SEP		0	0	0	0	

TIME PERIOD	min 90
TIME SLICE	min 15
RESULTS PERIOD	min 15 75
TIME COST	$/hr 15.00
FLOW PERIOD	min 15 75
FLOW TYPE	pcu/veh VEH
FLOW PEAK	am/op/pm PM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB CTH E	1.01	000 2080 345 5	1.00	50	0.75 1.123 0.75	15 45 75
WB 41 OFF	1.01	000 005 490 0	1.00	50	0.75 1.123 0.75	15 45 75
SB CTH E	1.02	515 1350 000 5	1.00	50	0.75 1.123 0.75	15 45 75
EB ---	1.01	000 000 000 0	1.00	50	0.75 1.123 0.75	15 45 75

FLOW	veh	2430	495	1870	0	
CAPACITY	veh	3338	1065	2297	323	
AVE DELAY	secs	4.2	7.7	11.7	0.0	
MAX DELAY	secs	6.5	13.1	22.0	0.0	
AVE QUEUE	veh	2.9	1.1	6.2	0.0	
MAX QUEUE	veh	4.0	1.6	10.5	0.0	

AVEDEL	s 7.5
LOS SIG	A
LOS UNSIG	A
VEHIC HRS	10.0
COST	$ 149

E	(m)	10.95	4.00	10.95	10.95	
L'	(m)	25.00	25.00	25.00	25.00	
V	(m)	10.95	3.65	10.95	7.30	
RAD	(m)	20.00	20.00	20.00	20.00	
PHI	(d)	25.00	25.00	25.00	25.00	
DIA	(m)	60.00	60.00	60.00	60.00	
GRAD SEP		0	0	0	0	

TIME PERIOD	min 90
TIME SLICE	min 15
RESULTS PERIOD	min 15 75
TIME COST	$/hr 15.00
FLOW PERIOD	min 15 75
FLOW TYPE	pcu/veh VEH
FLOW PEAK	am/op/pm AM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB CTH E	1.01	000 975 000 5	1.00	85	0.75 1.170 0.75	15 45 75
WB ---	1.01	000 000 000 0	1.00	85	0.75 1.170 0.75	15 45 75
SB CTH E	1.01	000 1395 355 5	1.00	85	0.75 1.170 0.75	15 45 75
EB 41 OFF	1.02	000 005 615 0	1.00	85	0.75 1.170 0.75	15 45 75

FLOW	veh	980	0	1755	620	
CAPACITY	veh	2297	241	3133	1379	
AVE DELAY	secs	2.8	0.0	2.6	5.1	
MAX DELAY	secs	4.0	0.0	3.8	8.2	
AVE QUEUE	veh	0.8	0.0	1.3	0.9	
MAX QUEUE	veh	1.0	0.0	1.6	1.3	

AVEDEL	s 3.1
LOS SIG	A
LOS UNSIG	A
VEHIC HRS	2.9
COST	$ 44

20:8:12 YR 2038 US41-NB/CTHE-3ln-NB/EBbyp* 45

E	(m)	10.95	4.00	10.95	10.95	TIME PERIOD	min 90
L'	(m)	25.00	25.00	25.00	25.00	TIME SLICE	min 15
V	(m)	10.95	3.65	10.95	7.30	RESULTS PERIOD	min 15 75
RAD	(m)	20.00	20.00	20.00	20.00	TIME COST	$/hr 15.00
PHI	(d)	25.00	25.00	25.00	25.00	FLOW PERIOD	min 15 75
DIA	(m)	60.00	60.00	60.00	60.00	FLOW TYPE	pcu/veh VEH
GRAD SEP		0	0	0	0	FLOW PEAK	am/op/pm AM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB CTH E	1.01	000 975 000 5	1.00	50	0.75 1.170 0.75	15 45 75
WB ---	1.01	000 000 000 0	1.00	50	0.75 1.170 0.75	15 45 75
SB CTH E	1.01	000 1395 355 5	1.00	50	0.75 1.170 0.75	15 45 75
EB 41 OFF	1.02	000 005 615 0	1.00	50	0.75 1.170 0.75	15 45 75

FLOW	veh	980	0	1755	620	AVEDEL s	2.6
CAPACITY	veh	2502	445	3338	1582	LOS SIG	A
AVE DELAY	secs	2.4	0.0	2.3	3.9	LOS UNSIG	A
MAX DELAY	secs	3.4	0.0	3.2	6.0		
AVE QUEUE	veh	0.7	0.0	1.1	0.7	VEHIC HRS	2.4
MAX QUEUE	veh	0.8	0.0	1.4	0.9	COST $	36

E	(m)	10.95	4.00	10.95	10.95	
L'	(m)	25.00	25.00	25.00	25.00	
V	(m)	10.95	3.65	10.95	7.30	
RAD	(m)	20.00	20.00	20.00	20.00	
PHI	(d)	25.00	25.00	25.00	25.00	
DIA	(m)	60.00	60.00	60.00	60.00	
GRAD SEP		0	0	0	0	

TIME PERIOD	min 90
TIME SLICE	min 15
RESULTS PERIOD	min 15 75
TIME COST	$/hr 15.00
FLOW PERIOD	min 15 75
FLOW TYPE	pcu/veh VEH
FLOW PEAK	am/op/pm PM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB CTH E	1.01	000 1620 000 5	1.00	85	0.75 0.924 0.75	15 45 75
WB ---	1.01	000 000 000 0	1.00	85	0.75 0.924 0.75	15 45 75
SB CTH E	1.01	000 1220 615 5	1.00	85	0.75 0.924 0.75	15 45 75
EB 41 OFF	1.01	000 005 805 0	1.00	85	0.75 0.924 0.75	15 45 75

FLOW	veh	1625	0	1840	810	
CAPACITY	veh	1919	0	3133	1325	
AVE DELAY	secs	14.1	0.0	2.7	7.1	
MAX DELAY	secs	23.3	0.0	3.3	9.9	
AVE QUEUE	veh	6.6	0.0	1.4	1.7	
MAX QUEUE	veh	10.1	0.0	1.6	2.1	

AVEDEL	s 7.9
LOS SIG	A
LOS UNSIG	A
VEHIC HRS	9.4
COST	$ 141

20:8:12 YR 2038 US41-NB/CTHE-3ln-NB/EBbyp* 49

E (m)	10.95	4.00	10.95	10.95
L' (m)	25.00	25.00	25.00	25.00
V (m)	10.95	3.65	10.95	7.30
RAD (m)	20.00	20.00	20.00	20.00
PHI (d)	25.00	25.00	25.00	25.00
DIA (m)	60.00	60.00	60.00	60.00
GRAD SEP	0	0	0	0

TIME PERIOD min	90
TIME SLICE min	15
RESULTS PERIOD min	15 75
TIME COST $/hr	15.00
FLOW PERIOD min	15 75
FLOW TYPE pcu/veh	VEH
FLOW PEAK am/op/pm	PM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB CTH E	1.01	000 1620 000 5	1.00	50	0.75 0.924 0.75	15 45 75
WB ---	1.01	000 000 000 0	1.00	50	0.75 0.924 0.75	15 45 75
SB CTH E	1.01	000 1220 615 5	1.00	50	0.75 0.924 0.75	15 45 75
EB 41 OFF	1.01	000 005 805 0	1.00	50	0.75 0.924 0.75	15 45 75

FLOW	veh	1625	0	1840	810
CAPACITY	veh	2124	53	3338	1530
AVE DELAY	secs	7.5	0.0	2.4	5.0
MAX DELAY	secs	11.0	0.0	2.8	6.6
AVE QUEUE	veh	3.5	0.0	1.2	1.2
MAX QUEUE	veh	4.7	0.0	1.4	1.4

AVEDEL s	4.8
LOS SIG	A
LOS UNSIG	A
VEHIC HRS	5.7
COST $	86

WIS 441 with County OO

20:8:12 YR 2038 WIS441-SB/CTHOO-3ln-SB/EBbyp* 65

E	(m)	4.00	10.95	7.30	7.30	
L'	(m)	25.00	25.00	25.00	25.00	
V	(m)	3.65	10.95	7.30	3.65	
RAD	(m)	20.00	20.00	20.00	20.00	
PHI	(d)	25.00	25.00	25.00	25.00	
DIA	(m)	60.00	60.00	60.00	60.00	
GRAD SEP		0	0	0	0	

TIME PERIOD	min	90	
TIME SLICE	min	15	
RESULTS PERIOD	min	15	75
TIME COST	$/hr	15.00	
FLOW PERIOD	min	15	75
FLOW TYPE	pcu/veh	VEH	
FLOW PEAK	am/op/pm	AM	

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB ---	1.01	000 000 000 0	1.00	85	0.75 0.924 0.75	15 45 75
WB CTH OO	1.01	000 1915 620 5	1.00	85	0.75 0.924 0.75	15 45 75
SB 441 OFF	1.08	000 005 130 0	1.00	85	0.75 0.924 0.75	15 45 75
EB CTH OO	1.04	000 350 000 5	1.00	85	0.75 0.924 0.75	15 45 75

FLOW	veh	0	2540	135	355	
CAPACITY	veh	767	3133	329	1176	
AVE DELAY	secs	0.0	6.1	22.0	4.3	
MAX DELAY	secs	0.0	8.4	35.3	5.1	
AVE QUEUE	veh	0.0	4.5	0.8	0.4	
MAX QUEUE	veh	0.0	5.6	1.3	0.5	

AVEDEL	s	6.6
LOS SIG		A
LOS UNSIG		A
VEHIC HRS		5.6
COST	$	83

20:8:12 YR 2038 WIS441-SB/CTHOO-3ln-SB/EBbyp* 66

E	(m)	4.00	10.95	7.30	7.30	
L'	(m)	25.00	25.00	25.00	25.00	
V	(m)	3.65	10.95	7.30	3.65	
RAD	(m)	20.00	20.00	20.00	20.00	
PHI	(d)	25.00	25.00	25.00	25.00	
DIA	(m)	60.00	60.00	60.00	60.00	
GRAD SEP		0	0	0	0	

TIME PERIOD	min 90
TIME SLICE	min 15
RESULTS PERIOD	min 15 75
TIME COST	$/hr 15.00
FLOW PERIOD	min 15 75
FLOW TYPE	pcu/veh VEH
FLOW PEAK	am/op/pm AM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB ---	1.01	000 000 000 0	1.00	50	0.75 0.924 0.75	15 45 75
WB CTH OO	1.01	000 1915 620 5	1.00	50	0.75 0.924 0.75	15 45 75
SB 441 OFF	1.08	000 005 130 0	1.00	50	0.75 0.924 0.75	15 45 75
EB CTH OO	1.04	000 350 000 5	1.00	50	0.75 0.924 0.75	15 45 75

FLOW	veh	0	2540	135	355	AVEDEL s	4.6
CAPACITY	veh	972	3338	520	1375	LOS SIG	A
AVE DELAY	secs	0.0	4.5	9.6	3.5	LOS UNSIG	A
MAX DELAY	secs	0.0	5.9	13.2	4.1		
AVE QUEUE	veh	0.0	3.3	0.4	0.3	VEHIC HRS	3.9
MAX QUEUE	veh	0.0	4.0	0.5	0.4	COST $	58

20:8:12 YR 2038 WIS441-SB/CTHOO-3ln-SB/EBbyp* 67

E	(m)	4.00	10.95	7.30	7.30	
L'	(m)	25.00	25.00	25.00	25.00	
V	(m)	3.65	10.95	7.30	3.65	
RAD	(m)	20.00	20.00	20.00	20.00	
PHI	(d)	25.00	25.00	25.00	25.00	
DIA	(m)	60.00	60.00	60.00	60.00	
GRAD SEP		0	0	0	0	

TIME PERIOD	min 90
TIME SLICE	min 15
RESULTS PERIOD	min 15 75
TIME COST	$/hr 15.00
FLOW PERIOD	min 15 75
FLOW TYPE	pcu/veh VEH
FLOW PEAK	am/op/pm PM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB ---	1.01	000 000 000 0	1.00	85	0.75 0.830 0.75	15 45 75
WB CTH OO	1.02	000 1055 485 5	1.00	85	0.75 0.830 0.75	15 45 75
SB 441 OFF	1.06	000 005 090 0	1.00	85	0.75 0.830 0.75	15 45 75
EB CTH OO	1.01	000 1140 000 5	1.00	85	0.75 0.830 0.75	15 45 75

FLOW	veh	0	1545	95	1145	
CAPACITY	veh	415	3102	948	1315	
AVE DELAY	secs	0.0	2.3	4.2	19.7	
MAX DELAY	secs	0.0	2.5	4.6	25.4	
AVE QUEUE	veh	0.0	1.0	0.1	6.5	
MAX QUEUE	veh	0.0	1.0	0.1	7.9	

AVEDEL s	9.5
LOS SIG	A
LOS UNSIG	A
VEHIC HRS	7.3
COST $	110

20:8:12 YR 2038 WIS441-SB/CTHOO-3ln-SB/EBbyp* 68

E	(m)	4.00	10.95	7.30	7.30	
L'	(m)	25.00	25.00	25.00	25.00	
V	(m)	3.65	10.95	7.30	3.65	
RAD	(m)	20.00	20.00	20.00	20.00	
PHI	(d)	25.00	25.00	25.00	25.00	
DIA	(m)	60.00	60.00	60.00	60.00	
GRAD SEP		0	0	0	0	

TIME PERIOD	min 90
TIME SLICE	min 15
RESULTS PERIOD	min 15 75
TIME COST	$/hr 15.00
FLOW PERIOD	min 15 75
FLOW TYPE	pcu/veh VEH
FLOW PEAK	am/op/pm PM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB ---	1.01	000 000 000 0	1.00	50	0.75 0.830 0.75	15 45 75
WB CTH OO	1.02	000 1055 485 5	1.00	50	0.75 0.830 0.75	15 45 75
SB 441 OFF	1.06	000 005 090 0	1.00	50	0.75 0.830 0.75	15 45 75
EB CTH OO	1.01	000 1140 000 5	1.00	50	0.75 0.830 0.75	15 45 75

FLOW	veh	0	1545	95	1145	
CAPACITY	veh	619	3305	1143	1520	
AVE DELAY	secs	0.0	2.0	3.4	9.3	
MAX DELAY	secs	0.0	2.2	3.7	11.0	
AVE QUEUE	veh	0.0	0.9	0.1	3.0	
MAX QUEUE	veh	0.0	0.9	0.1	3.4	

AVEDEL	s 5.1
LOS SIG	A
LOS UNSIG	A
VEHIC HRS	3.9
COST	$ 59

20:8:12 YR 2038 WIS441-NB/CTHOO-3ln-NB/WB byp* 57

E	(m)	7.30	10.95	4.00	7.30	
L'	(m)	25.00	25.00	25.00	25.00	
V	(m)	3.65	7.30	3.65	7.30	
RAD	(m)	20.00	20.00	20.00	20.00	
PHI	(d)	25.00	25.00	25.00	25.00	
DIA	(m)	60.00	60.00	60.00	60.00	
GRAD SEP		0	0	0	0	

TIME PERIOD	min 90
TIME SLICE	min 15
RESULTS PERIOD	min 15 75
TIME COST	$/hr 15.00
FLOW PERIOD	min 15 75
FLOW TYPE	pcu/veh VEH
FLOW PEAK	am/op/pm AM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB 441 OFF	1.01	000 005 1100 0	1.00	85	0.75 0.891 0.75	15 45 75
WB CTH OO	1.02	000 1435 000 5	1.00	85	0.75 0.891 0.75	15 45 75
SB ---	1.01	000 000 000 0	1.00	85	0.75 0.891 0.75	15 45 75
EB CTH OO	1.06	000 435 050 5	1.00	85	0.75 0.891 0.75	15 45 75

FLOW	veh	1105	1440	0	490	
CAPACITY	veh	1359	1846	0	1924	
AVE DELAY	secs	13.9	8.9	0.0	2.5	
MAX DELAY	secs	18.9	12.3	0.0	2.8	
AVE QUEUE	veh	4.4	3.7	0.0	0.3	
MAX QUEUE	veh	5.6	4.7	0.0	0.4	

AVEDEL s	9.7
LOS SIG	A
LOS UNSIG	A
VEHIC HRS	8.1
COST $	122

20:8:12 YR 2038 WIS441-NB/CTHOO-3ln-NB/WB byp* 58

E	(m)	7.30	10.95	4.00	7.30	
L'	(m)	25.00	25.00	25.00	25.00	
V	(m)	3.65	7.30	3.65	7.30	
RAD	(m)	20.00	20.00	20.00	20.00	
PHI	(d)	25.00	25.00	25.00	25.00	
DIA	(m)	60.00	60.00	60.00	60.00	
GRAD SEP		0	0	0	0	

TIME PERIOD	min 90
TIME SLICE	min 15
RESULTS PERIOD	min 15 75
TIME COST	$/hr 15.00
FLOW PERIOD	min 15 75
FLOW TYPE	pcu/veh VEH
FLOW PEAK	am/op/pm AM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB 441 OFF	1.01	000 005 1100 0	1.00	50	0.75 0.891 0.75	15 45 75
WB CTH OO	1.02	000 1435 000 5	1.00	50	0.75 0.891 0.75	15 45 75
SB ---	1.01	000 000 000 0	1.00	50	0.75 0.891 0.75	15 45 75
EB CTH OO	1.06	000 435 050 5	1.00	50	0.75 0.891 0.75	15 45 75

FLOW	veh	1105	1440	0	490	
CAPACITY	veh	1564	2049	20	2120	
AVE DELAY	secs	7.7	5.9	0.0	2.2	
MAX DELAY	secs	9.6	7.6	0.0	2.4	
AVE QUEUE	veh	2.4	2.4	0.0	0.3	
MAX QUEUE	veh	2.8	2.9	0.0	0.3	

AVEDEL s	5.9
LOS SIG	A
LOS UNSIG	A
VEHIC HRS	5.0
COST $	75

20:8:12 YR 2038 WIS441-NB/CTHOO-3ln-NB/WB byp* 59

E	(m)	7.30	10.95	4.00	7.30	
L'	(m)	25.00	25.00	25.00	25.00	
V	(m)	3.65	7.30	3.65	7.30	
RAD	(m)	20.00	20.00	20.00	20.00	
PHI	(d)	25.00	25.00	25.00	25.00	
DIA	(m)	60.00	60.00	60.00	60.00	
GRAD SEP		0	0	0	0	

TIME PERIOD	min 90
TIME SLICE	min 15
RESULTS PERIOD	min 15 75
TIME COST	$/hr 15.00
FLOW PERIOD	min 15 75
FLOW TYPE	pcu/veh VEH
FLOW PEAK	am/op/pm PM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB 441 OFF	1.03	000 005 475 0	1.00	85	0.75 0.891 0.75	15 45 75
WB CTH OO	1.02	000 1435 000 5	1.00	85	0.75 0.891 0.75	15 45 75
SB ---	1.01	000 000 000 0	1.00	85	0.75 0.891 0.75	15 45 75
EB CTH OO	1.01	000 1075 155 5	1.00	85	0.75 0.891 0.75	15 45 75

FLOW	veh	480	1440	0	1235	
CAPACITY	veh	913	2247	79	2020	
AVE DELAY	secs	8.2	4.4	0.0	4.5	
MAX DELAY	secs	10.1	5.4	0.0	5.3	
AVE QUEUE	veh	1.1	1.8	0.0	1.6	
MAX QUEUE	veh	1.3	2.1	0.0	1.7	

AVEDEL s	5.0
LOS SIG	A
LOS UNSIG	A
VEHIC HRS	4.4
COST $	66

20:8:12 YR 2038 WIS441-NB/CTHOO-3ln-NB/WB byp* 60

E	(m)	7.30	10.95	4.00	7.30	
L'	(m)	25.00	25.00	25.00	25.00	
V	(m)	3.65	7.30	3.65	7.30	
RAD	(m)	20.00	20.00	20.00	20.00	
PHI	(d)	25.00	25.00	25.00	25.00	
DIA	(m)	60.00	60.00	60.00	60.00	
GRAD SEP		0	0	0	0	

TIME PERIOD	min 90
TIME SLICE	min 15
RESULTS PERIOD	min 15 75
TIME COST	$/hr 15.00
FLOW PERIOD	min 15 75
FLOW TYPE	pcu/veh VEH
FLOW PEAK	am/op/pm PM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB 441 OFF	1.03	000 005 475 0	1.00	50	0.75 0.891 0.75	15 45 75
WB CTH OO	1.02	000 1435 000 5	1.00	50	0.75 0.891 0.75	15 45 75
SB ---	1.01	000 000 000 0	1.00	50	0.75 0.891 0.75	15 45 75
EB CTH OO	1.01	000 1075 155 5	1.00	50	0.75 0.891 0.75	15 45 75

FLOW	veh	480	1440	0	1235	
CAPACITY	veh	1114	2450	283	2225	
AVE DELAY	secs	5.6	3.5	0.0	3.6	
MAX DELAY	secs	6.7	4.2	0.0	4.2	
AVE QUEUE	veh	0.8	1.4	0.0	1.2	
MAX QUEUE	veh	0.9	1.6	0.0	1.4	

AVEDEL s	3.9
LOS SIG	A
LOS UNSIG	A
VEHIC HRS	3.4
COST $	51

20:8:12 YR 2038 WIS441-NB/CTHOO-3ln-NBSemi* 58

E (m)	7.30	10.95	3.65	7.30
L' (m)	25.00	25.00	25.00	25.00
V (m)	3.65	7.30	3.65	3.65
RAD (m)	20.00	20.00	20.00	20.00
PHI (d)	25.00	25.00	25.00	25.00
DIA (m)	60.00	60.00	60.00	60.00
GRAD SEP	0	0	0	0

TIME PERIOD min	90
TIME SLICE min	15
RESULTS PERIOD min	15 75
TIME COST $/hr	15.00
FLOW PERIOD min	15 75
FLOW TYPE pcu/veh	VEH
FLOW PEAK am/op/pm	AM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB 441 OFF	1.01	545 000 000 0	1.00	85	0.75 0.891 0.75	15 45 75
WB CTH OO	1.02	000 000 000 5	1.00	85	0.75 0.891 0.75	15 45 75
SB ---	1.01	000 000 000 0	1.00	85	0.75 0.891 0.75	15 45 75
EB CTH OO	1.06	000 435 050 0	1.00	85	0.75 0.891 0.75	15 45 75

FLOW	veh	545	5	0	485	
CAPACITY	veh	1363	2714	907	1587	
AVE DELAY	secs	4.3	1.3	0.0	3.2	
MAX DELAY	secs	5.0	1.4	0.0	3.6	
AVE QUEUE	veh	0.7	0.0	0.0	0.4	
MAX QUEUE	veh	0.7	0.0	0.0	0.5	

AVEDEL s	3.8
LOS SIG	A
LOS UNSIG	A
VEHIC HRS	1.1
COST $	16

E	(m)	7.30	10.95	3.65	7.30	
L'	(m)	25.00	25.00	25.00	25.00	
V	(m)	3.65	7.30	3.65	3.65	
RAD	(m)	20.00	20.00	20.00	20.00	
PHI	(d)	25.00	25.00	25.00	25.00	
DIA	(m)	60.00	60.00	60.00	60.00	
GRAD SEP		0	0	0	0	

TIME PERIOD	min	90	
TIME SLICE	min	15	
RESULTS PERIOD	min	15	75
TIME COST	$/hr	15.00	
FLOW PERIOD	min	15	75
FLOW TYPE	pcu/veh	VEH	
FLOW PEAK	am/op/pm	AM	

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB 441 OFF	1.01	545 000 000 0	1.00	50	0.75 0.891 0.75	15 45 75
WB CTH OO	1.02	000 000 000 5	1.00	50	0.75 0.891 0.75	15 45 75
SB ---	1.01	000 000 000 0	1.00	50	0.75 0.891 0.75	15 45 75
EB CTH OO	1.06	000 435 050 0	1.00	50	0.75 0.891 0.75	15 45 75

FLOW	veh	545	5	0	485	
CAPACITY	veh	1567	2917	1112	1782	
AVE DELAY	secs	3.5	1.2	0.0	2.7	
MAX DELAY	secs	4.0	1.3	0.0	3.1	
AVE QUEUE	veh	0.5	0.0	0.0	0.4	
MAX QUEUE	veh	0.6	0.0	0.0	0.4	

AVEDEL	s	3.1
LOS SIG		A
LOS UNSIG		A
VEHIC HRS		0.9
COST	$	13

20:8:12 YR 2038 WIS441-NB/CTHOO-3ln-NBSemi* 60

E	(m)	7.30	10.95	3.65	7.30	
L'	(m)	25.00	25.00	25.00	25.00	
V	(m)	3.65	7.30	3.65	3.65	
RAD	(m)	20.00	20.00	20.00	20.00	
PHI	(d)	25.00	25.00	25.00	25.00	
DIA	(m)	60.00	60.00	60.00	60.00	
GRAD SEP		0	0	0	0	

TIME PERIOD	min 90
TIME SLICE	min 15
RESULTS PERIOD	min 15 75
TIME COST	$/hr 15.00
FLOW PERIOD	min 15 75
FLOW TYPE	pcu/veh VEH
FLOW PEAK	am/op/pm PM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB 441 OFF	1.03	825 000 000 0	1.00	85	0.75 0.891 0.75	15 45 75
WB CTH OO	1.02	000 000 000 5	1.00	85	0.75 0.891 0.75	15 45 75
SB ---	1.01	000 000 000 0	1.00	85	0.75 0.891 0.75	15 45 75
EB CTH OO	1.01	000 1075 155 0	1.00	85	0.75 0.891 0.75	15 45 75

FLOW	veh	825	5	0	1230	
CAPACITY	veh	916	2634	907	1665	
AVE DELAY	secs	39.4	1.4	0.0	8.1	
MAX DELAY	secs	67.2	1.5	0.0	10.0	
AVE QUEUE	veh	9.4	0.0	0.0	2.8	
MAX QUEUE	veh	15.5	0.0	0.0	3.3	

AVEDEL s	20.6
LOS SIG	C
LOS UNSIG	C
VEHIC HRS	11.8
COST $	177

E	(m)	7.30	10.95	3.65	7.30	
L'	(m)	25.00	25.00	25.00	25.00	
V	(m)	3.65	7.30	3.65	3.65	
RAD	(m)	20.00	20.00	20.00	20.00	
PHI	(d)	25.00	25.00	25.00	25.00	
DIA	(m)	60.00	60.00	60.00	60.00	
GRAD SEP		0	0	0	0	

TIME PERIOD	min	90	
TIME SLICE	min	15	
RESULTS PERIOD	min	15	75
TIME COST	$/hr	15.00	
FLOW PERIOD	min	15	75
FLOW TYPE	pcu/veh	VEH	
FLOW PEAK	am/op/pm	PM	

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB 441 OFF	1.03	825 000 000 0	1.00	50	0.75 0.891 0.75	15 45 75
WB CTH OO	1.02	000 000 000 5	1.00	50	0.75 0.891 0.75	15 45 75
SB ---	1.01	000 000 000 0	1.00	50	0.75 0.891 0.75	15 45 75
EB CTH OO	1.01	000 1075 155 0	1.00	50	0.75 0.891 0.75	15 45 75

FLOW	veh	825	5	0	1230	AVEDEL s	8.2
CAPACITY	veh	1117	2837	1112	1870	LOS SIG	A
AVE DELAY	secs	12.3	1.3	0.0	5.5	LOS UNSIG	A
MAX DELAY	secs	16.6	1.4	0.0	6.6		
AVE QUEUE	veh	2.9	0.0	0.0	1.9	VEHIC HRS	4.7
MAX QUEUE	veh	3.7	0.0	0.0	2.2	COST $	70

E	(m)	7.31	3.65	3.65	7.30	
L'	(m)	25.00	25.00	25.00	25.00	
V	(m)	3.65	3.65	3.65	7.30	
RAD	(m)	20.00	20.00	20.00	20.00	
PHI	(d)	25.00	25.00	25.00	25.00	
DIA	(m)	60.00	60.00	60.00	60.00	
GRAD SEP		0	0	0	0	

TIME PERIOD	min 90
TIME SLICE	min 15
RESULTS PERIOD	min 15 75
TIME COST	$/hr 15.00
FLOW PERIOD	min 15 75
FLOW TYPE	pcu/veh VEH
FLOW PEAK	am/op/pm AM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB 441 OFF	1.01	000 005 1100 0	1.00	85	0.75 0.891 0.75	15 45 75
WB CTH OO	1.02	115 000 000 0	1.00	85	0.75 0.891 0.75	15 45 75
SB ---	1.01	000 000 000 0	1.00	85	0.75 0.891 0.75	15 45 75
EB CTH OO	1.06	000 000 050 0	1.00	85	0.75 0.891 0.75	15 45 75

FLOW	veh	1105	115	0	50	
CAPACITY	veh	1639	371	401	1928	
AVE DELAY	secs	6.6	13.8	0.0	1.9	
MAX DELAY	secs	8.0	16.9	0.0	2.1	
AVE QUEUE	veh	2.1	0.5	0.0	0.0	
MAX QUEUE	veh	2.3	0.5	0.0	0.0	

AVEDEL s	7.1
LOS SIG	A
LOS UNSIG	A
VEHIC HRS	2.5
COST $	37

20:8:12 YR 2038 WIS441-NB/CTHOO-3ln-WBSemi* 62

E	(m)	7.31	3.65	3.65	7.30	
L'	(m)	25.00	25.00	25.00	25.00	
V	(m)	3.65	3.65	3.65	7.30	
RAD	(m)	20.00	20.00	20.00	20.00	
PHI	(d)	25.00	25.00	25.00	25.00	
DIA	(m)	60.00	60.00	60.00	60.00	
GRAD SEP		0	0	0	0	

TIME PERIOD	min 90
TIME SLICE	min 15
RESULTS PERIOD	min 15 75
TIME COST	$/hr 15.00
FLOW PERIOD	min 15 75
FLOW TYPE	pcu/veh VEH
FLOW PEAK	am/op/pm AM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB 441 OFF	1.01	000 005 1100 0	1.00	50	0.75 0.891 0.75	15 45 75
WB CTH OO	1.02	115 000 000 0	1.00	50	0.75 0.891 0.75	15 45 75
SB ---	1.01	000 000 000 0	1.00	50	0.75 0.891 0.75	15 45 75
EB CTH OO	1.06	000 000 050 0	1.00	50	0.75 0.891 0.75	15 45 75

FLOW	veh	1105	115	0	50	
CAPACITY	veh	1843	574	606	2123	
AVE DELAY	secs	4.8	7.7	0.0	1.7	
MAX DELAY	secs	5.6	9.0	0.0	1.9	
AVE QUEUE	veh	1.5	0.3	0.0	0.0	
MAX QUEUE	veh	1.7	0.3	0.0	0.0	

AVEDEL s	4.9
LOS SIG	A
LOS UNSIG	A
VEHIC HRS	1.7
COST $	26

20:8:12 YR 2038 WIS441-NB/CTHOO-3ln-WBSemi* 64

E	(m)	7.31	3.65	3.65	7.30	
L'	(m)	25.00	25.00	25.00	25.00	
V	(m)	3.65	3.65	3.65	7.30	
RAD	(m)	20.00	20.00	20.00	20.00	
PHI	(d)	25.00	25.00	25.00	25.00	
DIA	(m)	60.00	60.00	60.00	60.00	
GRAD SEP		0	0	0	0	

TIME PERIOD	min	90	
TIME SLICE	min	15	
RESULTS PERIOD	min	15	75
TIME COST	$/hr	15.00	
FLOW PERIOD	min	15	75
FLOW TYPE	pcu/veh	VEH	
FLOW PEAK	am/op/pm	PM	

LEG NAME	PCU	TURNS (1st exit, 2nd..U)				FLOF	CL	FLOW RATIO			FLOW TIME		
NB 441 OFF	1.03	000	005	475	0	1.00	85	0.75	0.891	0.75	15	45	75
WB CTH OO	1.02	120	000	000	5	1.00	85	0.75	0.891	0.75	15	45	75
SB ---	1.01	000	000	000	0	1.00	85	0.75	0.891	0.75	15	45	75
EB CTH OO	1.01	000	000	155	0	1.00	85	0.75	0.891	0.75	15	45	75

FLOW	veh	480	125	0	155	AVEDEL	s	3.7
CAPACITY	veh	1544	605	683	2020	LOS SIG		A
AVE DELAY	secs	3.3	7.4	0.0	1.9	LOS UNSIG		A
MAX DELAY	secs	3.8	8.4	0.0	2.1			
AVE QUEUE	veh	0.5	0.3	0.0	0.1	VEHIC HRS		0.8
MAX QUEUE	veh	0.5	0.3	0.0	0.1	COST	$	12

20:8:12 YR 2038 WIS441-NB/CTHOO-3ln-WBSemi* 65

E	(m)	7.31	3.65	3.65	7.30	
L'	(m)	25.00	25.00	25.00	25.00	
V	(m)	3.65	3.65	3.65	7.30	
RAD	(m)	20.00	20.00	20.00	20.00	
PHI	(d)	25.00	25.00	25.00	25.00	
DIA	(m)	60.00	60.00	60.00	60.00	
GRAD SEP		0	0	0	0	

TIME PERIOD	min 90
TIME SLICE	min 15
RESULTS PERIOD	min 15 75
TIME COST	$/hr 15.00
FLOW PERIOD	min 15 75
FLOW TYPE	pcu/veh VEH
FLOW PEAK	am/op/pm PM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB 441 OFF	1.03	000 005 475 0	1.00	50	0.75 0.891 0.75	15 45 75
WB CTH OO	1.02	120 000 000 5	1.00	50	0.75 0.891 0.75	15 45 75
SB ---	1.01	000 000 000 0	1.00	50	0.75 0.891 0.75	15 45 75
EB CTH OO	1.01	000 000 155 0	1.00	50	0.75 0.891 0.75	15 45 75

FLOW	veh	480	125	0	155	
CAPACITY	veh	1745	808	888	2225	
AVE DELAY	secs	2.8	5.2	0.0	1.7	
MAX DELAY	secs	3.2	5.9	0.0	1.9	
AVE QUEUE	veh	0.4	0.2	0.0	0.1	
MAX QUEUE	veh	0.4	0.2	0.0	0.1	

AVEDEL s	3.0
LOS SIG	A
LOS UNSIG	A
VEHIC HRS	0.6
COST $	9

US 41 with WIS 125

20:8:12 YR 2038 US41-SB/WIS125-3ln-SB/EBbyp* 52

E	(m)	3.65	10.95	10.95	10.95	
L'	(m)	25.00	25.00	25.00	25.00	
V	(m)	3.65	10.95	10.95	10.95	
RAD	(m)	20.00	20.00	20.00	20.00	
PHI	(d)	25.00	25.00	25.00	25.00	
DIA	(m)	60.00	60.00	60.00	60.00	
GRAD SEP		0	0	0	0	

TIME PERIOD	min 90
TIME SLICE	min 15
RESULTS PERIOD	min 15 75
TIME COST	$/hr 15.00
FLOW PERIOD	min 15 75
FLOW TYPE	pcu/veh VEH
FLOW PEAK	am/op/pm AM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB ---	1.01	000 000 000 0	1.00	85	0.75 1.276 0.75	15 45 75
WB WIS 125	1.02	000 1375 405 5	1.00	85	0.75 1.276 0.75	15 45 75
SB 41 OFF	1.02	000 005 265 0	1.00	85	0.75 1.276 0.75	15 45 75
EB WIS 125	1.02	000 785 000 5	1.00	85	0.75 1.276 0.75	15 45 75

FLOW	veh	0	1785	270	790	
CAPACITY	veh	415	3102	1582	2527	
AVE DELAY	secs	0.0	2.8	2.8	2.1	
MAX DELAY	secs	0.0	4.3	4.3	3.0	
AVE QUEUE	veh	0.0	1.4	0.2	0.5	
MAX QUEUE	veh	0.0	1.9	0.3	0.6	

AVEDEL	s 2.6
LOS SIG	A
LOS UNSIG	A
VEHIC HRS	2.0
COST	$ 31

20:8:12 YR 2038 US41-SB/WIS125-3ln-SB/EBbyp* 53

E	(m)	3.65	10.95	10.95	10.95	TIME PERIOD min	90
L'	(m)	25.00	25.00	25.00	25.00	TIME SLICE min	15
V	(m)	3.65	10.95	10.95	10.95	RESULTS PERIOD min	15 75
RAD	(m)	20.00	20.00	20.00	20.00	TIME COST $/hr	15.00
PHI	(d)	25.00	25.00	25.00	25.00	FLOW PERIOD min	15 75
DIA	(m)	60.00	60.00	60.00	60.00	FLOW TYPE pcu/veh	VEH
GRAD SEP		0	0	0	0	FLOW PEAK am/op/pm	AM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB ---	1.01	000 000 000 0	1.00	50	0.75 1.276 0.75	15 45 75
WB WIS 125	1.02	000 1375 405 5	1.00	50	0.75 1.276 0.75	15 45 75
SB 41 OFF	1.02	000 005 265 0	1.00	50	0.75 1.276 0.75	15 45 75
EB WIS 125	1.02	000 785 000 5	1.00	50	0.75 1.276 0.75	15 45 75

FLOW	veh	0	1785	270	790	AVEDEL s	2.2
CAPACITY	veh	619	3305	1784	2730	LOS SIG	A
AVE DELAY	secs	0.0	2.4	2.4	1.8	LOS UNSIG	A
MAX DELAY	secs	0.0	3.6	3.7	2.7		
AVE QUEUE	veh	0.0	1.2	0.2	0.4	VEHIC HRS	1.8
MAX QUEUE	veh	0.0	1.6	0.2	0.5	COST $	27

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|                                                                             |
|  20:8:12          YR 2038 US41-SB/WIS125-3ln-SB/EBbyp*              54  |
|                                                                             |
|-----------------------------------------------------------------------------|
|                                                       |                     |
| E    (m)    3.65  10.95  10.95  10.95                  | TIME PERIOD     min    90  |
| L'   (m)   25.00  25.00  25.00  25.00                  | TIME SLICE      min    15  |
| V    (m)    3.65  10.95  10.95  10.95                  | RESULTS PERIOD  min 15 75  |
| RAD  (m)   20.00  20.00  20.00  20.00                  | TIME COST      $/hr 15.00  |
| PHI  (d)   25.00  25.00  25.00  25.00                  | FLOW PERIOD     min 15 75  |
| DIA  (m)   60.00  60.00  60.00  60.00                  | FLOW TYPE   pcu/veh   VEH  |
| GRAD SEP       0      0      0      0                  | FLOW PEAK  am/op/pm    PM  |
|                                                       |                     |
|-----------------------------------------------------------------------------|
| LEG NAME |PCU | TURNS (1st exit, 2nd..U)    |FLOF|CL|  FLOW RATIO    |FLOW TIME|
|          |    |                             |    |  |                |         |
|NB ---    |1.01|  000  000  000  0           |1.00|85|0.75 0.859 0.75|15 45 75 |
|WB WIS 125|1.01|  000 2025  895  5           |1.00|85|0.75 0.859 0.75|15 45 75 |
|SB 41 OFF |1.03|  000  005  230  0           |1.00|85|0.75 0.859 0.75|15 45 75 |
|EB WIS 125|1.02|  000 1950  000  5           |1.00|85|0.75 0.859 0.75|15 45 75 |
|          |    |                             |    |  |                |         |
|          |    |                             |    |  |                |         |
|          |    |                             |    |  |                |         |
|-----------------------------------------------------------------------------|
|                                                             |               |
| FLOW         veh       0   2925    235   1955                | AVEDEL  s  17.0 |
| CAPACITY     veh       0   3133    633   2146                | LOS   SIG     B |
| AVE DELAY  secs     0.0   16.6    9.0   18.7                | LOS UNSIG     C |
| MAX DELAY  secs     0.0   25.6   12.1   29.5                |               |
| AVE QUEUE   veh     0.0   14.1    0.6   10.6                | VEHIC HRS  24.2 |
| MAX QUEUE   veh     0.0   20.4    0.8   15.8                | COST    $   363 |
|                                                             |               |
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20:8:12 YR 2038 US41-SB/WIS125-3ln-SB/EBbyp* 55

E	(m)	3.65	10.95	10.95	10.95	
L'	(m)	25.00	25.00	25.00	25.00	
V	(m)	3.65	10.95	10.95	10.95	
RAD	(m)	20.00	20.00	20.00	20.00	
PHI	(d)	25.00	25.00	25.00	25.00	
DIA	(m)	60.00	60.00	60.00	60.00	
GRAD SEP		0	0	0	0	

TIME PERIOD	min 90
TIME SLICE	min 15
RESULTS PERIOD	min 15 75
TIME COST	$/hr 15.00
FLOW PERIOD	min 15 75
FLOW TYPE	pcu/veh VEH
FLOW PEAK	am/op/pm PM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB ---	1.01	000 000 000 0	1.00	50	0.75 0.859 0.75	15 45 75
WB WIS 125	1.01	000 2025 895 5	1.00	50	0.75 0.859 0.75	15 45 75
SB 41 OFF	1.03	000 005 230 0	1.00	50	0.75 0.859 0.75	15 45 75
EB WIS 125	1.02	000 1950 000 5	1.00	50	0.75 0.859 0.75	15 45 75

FLOW	veh	0	2925	235	1955	
CAPACITY	veh	92	3338	831	2348	
AVE DELAY	secs	0.0	8.6	6.0	9.1	
MAX DELAY	secs	0.0	11.5	7.5	12.4	
AVE QUEUE	veh	0.0	7.2	0.4	5.1	
MAX QUEUE	veh	0.0	9.1	0.5	6.5	

AVEDEL	s 8.7
LOS SIG	A
LOS UNSIG	A
VEHIC HRS	12.3
COST	$ 184

20:8:12 YR 2038 US41-NB/WIS125-3ln-NB/WBbyp* 36

E	(m)	10.95	10.95	3.65	10.95	TIME PERIOD min	90
L'	(m)	25.00	25.00	25.00	25.00	TIME SLICE min	15
V	(m)	10.95	10.95	3.65	10.95	RESULTS PERIOD min	15 75
RAD	(m)	20.00	20.00	20.00	20.00	TIME COST $/hr	15.00
PHI	(d)	25.00	25.00	25.00	25.00	FLOW PERIOD min	15 75
DIA	(m)	60.00	60.00	60.00	60.00	FLOW TYPE pcu/veh	VEH
GRAD SEP		0	0	0	0	FLOW PEAK am/op/pm	AM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB 41 OFF	1.01	000 005 650 0	1.00	85	0.75 1.276 0.75	15 45 75
WB WIS 125	1.02	000 1130 000 5	1.00	85	0.75 1.276 0.75	15 45 75
SB ---	1.02	000 000 000 0	1.00	85	0.75 1.276 0.75	15 45 75
EB WIS 125	1.02	000 815 230 5	1.00	85	0.75 1.276 0.75	15 45 75

FLOW	veh	655	1135	0	1050	AVEDEL s	2.4
CAPACITY	veh	2229	2354	92	3102	LOS SIG	A
AVE DELAY	secs	2.3	3.1	0.0	1.7	LOS UNSIG	A
MAX DELAY	secs	3.4	4.8	0.0	2.4		
AVE QUEUE	veh	0.4	1.0	0.0	0.5	VEHIC HRS	1.9
MAX QUEUE	veh	0.5	1.3	0.0	0.6	COST $	28

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E	(m)	10.95	10.95	3.65	10.95	TIME PERIOD min	90
L'	(m)	25.00	25.00	25.00	25.00	TIME SLICE min	15
V	(m)	10.95	10.95	3.65	10.95	RESULTS PERIOD min	15 75
RAD	(m)	20.00	20.00	20.00	20.00	TIME COST $/hr	15.00
PHI	(d)	25.00	25.00	25.00	25.00	FLOW PERIOD min	15 75
DIA	(m)	60.00	60.00	60.00	60.00	FLOW TYPE pcu/veh	VEH
GRAD SEP		0	0	0	0	FLOW PEAK am/op/pm	AM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB 41 OFF	1.01	000 005 650 0	1.00	50	0.75 1.276 0.75	15 45 75
WB WIS 125	1.02	000 1130 000 5	1.00	50	0.75 1.276 0.75	15 45 75
SB ---	1.02	000 000 000 0	1.00	50	0.75 1.276 0.75	15 45 75
EB WIS 125	1.02	000 815 230 5	1.00	50	0.75 1.276 0.75	15 45 75

FLOW	veh	655	1135	0	1050	AVEDEL s	2.1
CAPACITY	veh	2434	2557	279	3305	LOS SIG	A
AVE DELAY	secs	2.0	2.6	0.0	1.6	LOS UNSIG	A
MAX DELAY	secs	3.0	4.0	0.0	2.2		
AVE QUEUE	veh	0.4	0.8	0.0	0.5	VEHIC HRS	1.6
MAX QUEUE	veh	0.5	1.1	0.0	0.6	COST $	25

20:8:12 YR 2038 US41-NB/WIS125-3ln-NB/WBbyp* 38

E	(m)	10.95	10.95	3.65	10.95	TIME PERIOD	min 90
L'	(m)	25.00	25.00	25.00	25.00	TIME SLICE	min 15
V	(m)	10.95	10.95	3.65	10.95	RESULTS PERIOD	min 15 75
RAD	(m)	20.00	20.00	20.00	20.00	TIME COST	$/hr 15.00
PHI	(d)	25.00	25.00	25.00	25.00	FLOW PERIOD	min 15 75
DIA	(m)	60.00	60.00	60.00	60.00	FLOW TYPE	pcu/veh VEH
GRAD SEP		0	0	0	0	FLOW PEAK	am/op/pm PM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB 41 OFF	1.02	000 005 1035 0	1.00	85	0.75 0.830 0.75	15 45 75
WB WIS 125	1.02	000 1885 000 5	1.00	85	0.75 0.830 0.75	15 45 75
SB ---	1.01	000 000 000 0	1.00	85	0.75 0.830 0.75	15 45 75
EB WIS 125	1.01	000 1705 475 5	1.00	85	0.75 0.830 0.75	15 45 75

FLOW	veh	1040	1890	0	2185	AVEDEL	s 46.8
CAPACITY	veh	1259	1817	0	3133	LOS SIG	D
AVE DELAY	secs	16.5	113.3	0.0	3.7	LOS UNSIG	E
MAX DELAY	secs	23.2	200.7	0.0	4.2		
AVE QUEUE	veh	4.9	71.1	0.0	2.3	VEHIC HRS	66.5
MAX QUEUE	veh	6.6	102.7	0.0	2.5	COST	$ 997

E (m)	10.95	10.95	3.65	10.95
L' (m)	25.00	25.00	25.00	25.00
V (m)	10.95	10.95	3.65	10.95
RAD (m)	20.00	20.00	20.00	20.00
PHI (d)	25.00	25.00	25.00	25.00
DIA (m)	60.00	60.00	60.00	60.00
GRAD SEP	0	0	0	0

TIME PERIOD	min 90
TIME SLICE	min 15
RESULTS PERIOD	min 15 75
TIME COST	$/hr 15.00
FLOW PERIOD	min 15 75
FLOW TYPE	pcu/veh VEH
FLOW PEAK	am/op/pm PM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB 41 OFF	1.02	000 005 1035 0	1.00	50	0.75 0.830 0.75	15 45 75
WB WIS 125	1.02	000 1885 000 5	1.00	50	0.75 0.830 0.75	15 45 75
SB ---	1.01	000 000 000 0	1.00	50	0.75 0.830 0.75	15 45 75
EB WIS 125	1.01	000 1705 475 5	1.00	50	0.75 0.830 0.75	15 45 75

FLOW	veh	1040	1890	0	2185
CAPACITY	veh	1462	2019	0	3338
AVE DELAY	secs	8.4	25.6	0.0	3.1
MAX DELAY	secs	10.6	40.9	0.0	3.4
AVE QUEUE	veh	2.5	14.1	0.0	1.9
MAX QUEUE	veh	3.0	21.4	0.0	2.0

AVEDEL s	12.5
LOS SIG	B
LOS UNSIG	B
VEHIC HRS	17.7
COST $	266

US 41 with WIS 47

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E	(m)	7.30	7.30	7.30	4.00	
L'	(m)	25.00	25.00	25.00	25.00	
V	(m)	7.30	7.30	7.30	3.65	
RAD	(m)	20.00	20.00	20.00	20.00	
PHI	(d)	25.00	25.00	25.00	25.00	
DIA	(m)	50.00	50.00	50.00	50.00	
GRAD SEP		0	0	0	0	

TIME PERIOD	min 90
TIME SLICE	min 15
RESULTS PERIOD	min 15 75
TIME COST	$/hr 15.00
FLOW PERIOD	min 15 75
FLOW TYPE	pcu/veh VEH
FLOW PEAK	am/op/pm AM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB WIS 47	1.01	000 780 355 5	1.00	85	0.75 1.122 0.75	15 45 75
WB 41 OFF	1.02	000 005 620 0	1.00	85	0.75 1.122 0.75	15 45 75
SB WIS 47	1.02	000 1115 000 5	1.00	85	0.75 1.122 0.75	15 45 75
EB ---	1.02	000 000 000 0	1.00	85	0.75 1.122 0.75	15 45 75

FLOW	veh	1140	625	1120	0	
CAPACITY	veh	2019	1190	1299	88	
AVE DELAY	secs	4.1	6.7	38.3	0.0	
MAX DELAY	secs	5.7	10.3	83.1	0.0	
AVE QUEUE	veh	1.3	1.2	12.1	0.0	
MAX QUEUE	veh	1.6	1.6	25.3	0.0	

AVEDEL s	17.9
LOS SIG	B
LOS UNSIG	C
VEHIC HRS	14.4
COST $	215

20:8:12 YR 2038 US41-SB/WIS 47-3ln-SB/WBbyp* 66

E	(m)	7.30	7.30	7.30	4.00	
L'	(m)	25.00	25.00	25.00	25.00	
V	(m)	7.30	7.30	7.30	3.65	
RAD	(m)	20.00	20.00	20.00	20.00	
PHI	(d)	25.00	25.00	25.00	25.00	
DIA	(m)	50.00	50.00	50.00	50.00	
GRAD SEP		0	0	0	0	

TIME PERIOD	min 90
TIME SLICE	min 15
RESULTS PERIOD	min 15 75
TIME COST	$/hr 15.00
FLOW PERIOD	min 15 75
FLOW TYPE	pcu/veh VEH
FLOW PEAK	am/op/pm AM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB WIS 47	1.01	000 780 355 5	1.00	50	0.75 1.122 0.75	15 45 75
WB 41 OFF	1.02	000 005 620 0	1.00	50	0.75 1.122 0.75	15 45 75
SB WIS 47	1.02	000 1115 000 5	1.00	50	0.75 1.122 0.75	15 45 75
EB ---	1.02	000 000 000 0	1.00	50	0.75 1.122 0.75	15 45 75

FLOW	veh	1140	625	1120	0	AVEDEL	s 6.8
CAPACITY	veh	2224	1393	1502	290	LOS SIG	A
AVE DELAY	secs	3.3	4.8	11.6	0.0	LOS UNSIG	A
MAX DELAY	secs	4.5	7.0	20.4	0.0		
AVE QUEUE	veh	1.1	0.9	3.7	0.0	VEHIC HRS	5.5
MAX QUEUE	veh	1.3	1.1	5.8	0.0	COST $	82

20:8:12 YR 2038 US41-SB/WIS 47-3ln-SB/WBbyp* 64

E	(m)	7.30	7.30	7.30	4.00	
L'	(m)	25.00	25.00	25.00	25.00	
V	(m)	7.30	7.30	7.30	3.65	
RAD	(m)	20.00	20.00	20.00	20.00	
PHI	(d)	25.00	25.00	25.00	25.00	
DIA	(m)	50.00	50.00	50.00	50.00	
GRAD SEP		0	0	0	0	

TIME PERIOD	min 90
TIME SLICE	min 15
RESULTS PERIOD	min 15 75
TIME COST	$/hr 15.00
FLOW PERIOD	min 15 75
FLOW TYPE	pcu/veh VEH
FLOW PEAK	am/op/pm PM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB WIS 47	1.01	000 1330 225 5	1.00	85	0.75 1.036 0.75	15 45 75
WB 41 OFF	1.02	000 005 695 0	1.00	85	0.75 1.036 0.75	15 45 75
SB WIS 47	1.02	000 905 000 5	1.00	85	0.75 1.036 0.75	15 45 75
EB ---	1.02	000 000 000 0	1.00	85	0.75 1.036 0.75	15 45 75

FLOW	veh	1560	700	910	0	
CAPACITY	veh	2019	892	1338	158	
AVE DELAY	secs	8.1	29.1	8.7	0.0	
MAX DELAY	secs	12.2	57.0	13.2	0.0	
AVE QUEUE	veh	3.6	5.8	2.3	0.0	
MAX QUEUE	veh	4.9	10.7	3.1	0.0	

AVEDEL	s 12.9
LOS SIG	B
LOS UNSIG	B
VEHIC HRS	11.4
COST	$ 171

20:8:12 YR 2038 US41-SB/WIS 47-3ln-SB/WBbyp* 65

E	(m)	7.30	7.30	7.30	4.00	
L'	(m)	25.00	25.00	25.00	25.00	
V	(m)	7.30	7.30	7.30	3.65	
RAD	(m)	20.00	20.00	20.00	20.00	
PHI	(d)	25.00	25.00	25.00	25.00	
DIA	(m)	50.00	50.00	50.00	50.00	
GRAD SEP		0	0	0	0	

TIME PERIOD	min	90									
TIME SLICE	min	15									
RESULTS PERIOD	min	15	75								
TIME COST	$/hr	15.00									
FLOW PERIOD	min	15	75								
FLOW TYPE	pcu/veh	VEH									
FLOW PEAK	am/op/pm	PM									

LEG NAME	PCU	TURNS (1st exit, 2nd..U)				FLOF	CL	FLOW RATIO			FLOW TIME		
NB WIS 47	1.01	000	1330	225	5	1.00	50	0.75	1.036	0.75	15	45	75
WB 41 OFF	1.02	000	005	695	0	1.00	50	0.75	1.036	0.75	15	45	75
SB WIS 47	1.02	000	905	000	5	1.00	50	0.75	1.036	0.75	15	45	75
EB ---	1.02	000	000	000	0	1.00	50	0.75	1.036	0.75	15	45	75

FLOW	veh	1560	700	910	0
CAPACITY	veh	2224	1094	1541	361
AVE DELAY	secs	5.5	10.2	5.8	0.0
MAX DELAY	secs	7.7	16.3	8.3	0.0
AVE QUEUE	veh	2.4	2.0	1.5	0.0
MAX QUEUE	veh	3.1	2.9	1.9	0.0

AVEDEL	s	6.6
LOS SIG		A
LOS UNSIG		A
VEHIC HRS		5.8
COST	$	87

20:8:12 YR 2038 US41-SB/WIS 47-3ln-WB Semi* 57

E (m)	7.30	7.30	7.30	4.00
L' (m)	25.00	25.00	25.00	25.00
V (m)	7.30	3.65	7.30	3.65
RAD (m)	20.00	20.00	20.00	20.00
PHI (d)	25.00	25.00	25.00	25.00
DIA (m)	50.00	50.00	50.00	50.00
GRAD SEP	0	0	0	0

TIME PERIOD min	90
TIME SLICE min	15
RESULTS PERIOD min	15 75
TIME COST $/hr	15.00
FLOW PERIOD min	15 75
FLOW TYPE pcu/veh	VEH
FLOW PEAK am/op/pm	AM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB WIS 47	1.01	000 780 355 0	1.00	85	0.75 1.122 0.75	15 45 75
WB 41 OFF	1.02	305 000 000 0	1.00	85	0.75 1.122 0.75	15 45 75
SB WIS 47	1.02	000 000 000 5	1.00	85	0.75 1.122 0.75	15 45 75
EB ---	1.02	000 000 000 0	1.00	85	0.75 1.122 0.75	15 45 75

FLOW	veh	1135	305	5	0	
CAPACITY	veh	2019	918	1751	999	
AVE DELAY	secs	4.0	5.9	2.0	0.0	
MAX DELAY	secs	5.7	8.6	2.6	0.0	
AVE QUEUE	veh	1.3	0.5	0.0	0.0	
MAX QUEUE	veh	1.6	0.7	0.0	0.0	

AVEDEL s	4.4
LOS SIG	A
LOS UNSIG	A
VEHIC HRS	1.8
COST $	27

20:8:12 YR 2038 US41-SB/WIS 47-3ln-WB Semi* 58

E (m)	7.30	7.30	7.30	4.00	TIME PERIOD min	90
L' (m)	25.00	25.00	25.00	25.00	TIME SLICE min	15
V (m)	7.30	3.65	7.30	3.65	RESULTS PERIOD min	15 75
RAD (m)	20.00	20.00	20.00	20.00	TIME COST $/hr	15.00
PHI (d)	25.00	25.00	25.00	25.00	FLOW PERIOD min	15 75
DIA (m)	50.00	50.00	50.00	50.00	FLOW TYPE pcu/veh	VEH
GRAD SEP	0	0	0	0	FLOW PEAK am/op/pm	AM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB WIS 47	1.01	000 780 355 0	1.00	50	0.75 1.122 0.75	15 45 75
WB 41 OFF	1.02	305 000 000 0	1.00	50	0.75 1.122 0.75	15 45 75
SB WIS 47	1.02	000 000 000 5	1.00	50	0.75 1.122 0.75	15 45 75
EB ---	1.02	000 000 000 0	1.00	50	0.75 1.122 0.75	15 45 75

FLOW	veh	1135	305	5	0	AVEDEL s 3.5
CAPACITY	veh	2224	1121	1954	1202	LOS SIG A
AVE DELAY	secs	3.3	4.4	1.8	0.0	LOS UNSIG A
MAX DELAY	secs	4.5	6.1	2.3	0.0	
AVE QUEUE	veh	1.1	0.4	0.0	0.0	VEHIC HRS 1.4
MAX QUEUE	veh	1.3	0.5	0.0	0.0	COST $ 21

20:8:12 YR 2038 US41-SB/WIS 47-3ln-WB Semi* 59

E (m)	7.30	7.30	7.30	4.00
L' (m)	25.00	25.00	25.00	25.00
V (m)	7.30	3.65	7.30	3.65
RAD (m)	20.00	20.00	20.00	20.00
PHI (d)	25.00	25.00	25.00	25.00
DIA (m)	50.00	50.00	50.00	50.00
GRAD SEP	0	0	0	0

TIME PERIOD min	90
TIME SLICE min	15
RESULTS PERIOD min	15 75
TIME COST $/hr	15.00
FLOW PERIOD min	15 75
FLOW TYPE pcu/veh	VEH
FLOW PEAK am/op/pm	PM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB WIS 47	1.01	000 1330 225 5	1.00	85	0.75 1.036 0.75	15 45 75
WB 41 OFF	1.02	255 000 000 0	1.00	85	0.75 1.036 0.75	15 45 75
SB WIS 47	1.02	000 000 000 0	1.00	85	0.75 1.036 0.75	15 45 75
EB ---	1.02	000 000 000 0	1.00	85	0.75 1.036 0.75	15 45 75

FLOW	veh	1560	255	0	0	
CAPACITY	veh	2023	649	1840	999	
AVE DELAY	secs	8.0	9.5	0.0	0.0	
MAX DELAY	secs	12.1	14.2	0.0	0.0	
AVE QUEUE	veh	3.6	0.7	0.0	0.0	
MAX QUEUE	veh	4.8	0.9	0.0	0.0	

AVEDEL s	8.3
LOS SIG	A
LOS UNSIG	A
VEHIC HRS	4.2
COST $	62

20:8:12 YR 2038 US41-SB/WIS 47-3ln-WB Semi* 60

E (m)	7.30	7.30	7.30	4.00	TIME PERIOD min	90
L' (m)	25.00	25.00	25.00	25.00	TIME SLICE min	15
V (m)	7.30	3.65	7.30	3.65	RESULTS PERIOD min	15 75
RAD (m)	20.00	20.00	20.00	20.00	TIME COST $/hr	15.00
PHI (d)	25.00	25.00	25.00	25.00	FLOW PERIOD min	15 75
DIA (m)	50.00	50.00	50.00	50.00	FLOW TYPE pcu/veh	VEH
GRAD SEP	0	0	0	0	FLOW PEAK am/op/pm	PM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB WIS 47	1.01	000 1330 225 5	1.00	50	0.75 1.036 0.75	15 45 75
WB 41 OFF	1.02	255 000 000 0	1.00	50	0.75 1.036 0.75	15 45 75
SB WIS 47	1.02	000 000 000 0	1.00	50	0.75 1.036 0.75	15 45 75
EB ---	1.02	000 000 000 0	1.00	50	0.75 1.036 0.75	15 45 75

FLOW	veh	1560	255	0	0	AVEDEL s 5.5
CAPACITY	veh	2228	851	2043	1202	LOS SIG A
AVE DELAY	secs	5.4	6.1	0.0	0.0	LOS UNSIG A
MAX DELAY	secs	7.7	8.5	0.0	0.0	
AVE QUEUE	veh	2.4	0.4	0.0	0.0	VEHIC HRS 2.8
MAX QUEUE	veh	3.1	0.6	0.0	0.0	COST $ 42

20:8:12 YR 2038 US41-NB/WIS 47-3ln-NB/EB byp* 60

E (m)	7.30	4.00	7.30	7.30
L' (m)	25.00	25.00	25.00	25.00
V (m)	3.65	3.65	7.30	7.30
RAD (m)	20.00	20.00	20.00	20.00
PHI (d)	25.00	25.00	25.00	25.00
DIA (m)	50.00	50.00	50.00	50.00
GRAD SEP	0	0	0	0

TIME PERIOD min	90
TIME SLICE min	15
RESULTS PERIOD min	15 75
TIME COST $/hr	15.00
FLOW PERIOD min	15 75
FLOW TYPE pcu/veh	VEH
FLOW PEAK am/op/pm	PM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB WIS 47	1.02	000 840 000 5	1.00	85	0.75 0.959 0.75	15 45 75
WB ---	1.02	000 000 000 0	1.00	85	0.75 0.959 0.75	15 45 75
SB WIS 47	1.01	000 1245 355 5	1.00	85	0.75 0.959 0.75	15 45 75
EB 41 OFF	1.02	000 005 715 0	1.00	85	0.75 0.959 0.75	15 45 75

FLOW	veh	845	0	1605	720
CAPACITY	veh	954	183	2019	860
AVE DELAY	secs	36.2	0.0	8.7	35.9
MAX DELAY	secs	67.3	0.0	12.3	68.7
AVE QUEUE	veh	8.9	0.0	4.0	7.4
MAX QUEUE	veh	15.6	0.0	5.2	13.7

AVEDEL s	22.2
LOS SIG	C
LOS UNSIG	C
VEHIC HRS	19.6
COST $	294

20:8:12 YR 2038 US41-NB/WIS 47-3ln-NB/EB byp* 61

E (m)	7.30	4.00	7.30	7.30
L' (m)	25.00	25.00	25.00	25.00
V (m)	3.65	3.65	7.30	7.30
RAD (m)	20.00	20.00	20.00	20.00
PHI (d)	25.00	25.00	25.00	25.00
DIA (m)	50.00	50.00	50.00	50.00
GRAD SEP	0	0	0	0

TIME PERIOD min	90
TIME SLICE min	15
RESULTS PERIOD min	15 75
TIME COST $/hr	15.00
FLOW PERIOD min	15 75
FLOW TYPE pcu/veh	VEH
FLOW PEAK am/op/pm	PM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB WIS 47	1.02	000 840 000 5	1.00	50	0.75 0.959 0.75	15 45 75
WB ---	1.02	000 000 000 0	1.00	50	0.75 0.959 0.75	15 45 75
SB WIS 47	1.01	000 1245 355 5	1.00	50	0.75 0.959 0.75	15 45 75
EB 41 OFF	1.02	000 005 715 0	1.00	50	0.75 0.959 0.75	15 45 75

FLOW	veh	845	0	1605	720
CAPACITY	veh	1156	384	2224	1062
AVE DELAY	secs	12.0	0.0	5.8	11.3
MAX DELAY	secs	17.8	0.0	7.7	17.0
AVE QUEUE	veh	2.9	0.0	2.6	2.3
MAX QUEUE	veh	4.0	0.0	3.2	3.2

AVEDEL s	8.7
LOS SIG	A
LOS UNSIG	A
VEHIC HRS	7.6
COST $	115

20:8:12 YR 2038 US41-NB/WIS 47-3ln-NB/EB byp* 62

E	(m)	7.30	4.00	7.30	7.30	
L'	(m)	25.00	25.00	25.00	25.00	
V	(m)	3.65	3.65	7.30	7.30	
RAD	(m)	20.00	20.00	20.00	20.00	
PHI	(d)	25.00	25.00	25.00	25.00	
DIA	(m)	50.00	50.00	50.00	50.00	
GRAD SEP		0	0	0	0	

TIME PERIOD	min 90
TIME SLICE	min 15
RESULTS PERIOD	min 15 75
TIME COST	$/hr 15.00
FLOW PERIOD	min 15 75
FLOW TYPE	pcu/veh VEH
FLOW PEAK	am/op/pm AM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB WIS 47	1.02	000 710 000 5	1.00	85	0.75 1.078 0.75	15 45 75
WB ---	1.02	000 000 000 0	1.00	85	0.75 1.078 0.75	15 45 75
SB WIS 47	1.01	000 1400 335 5	1.00	85	0.75 1.078 0.75	15 45 75
EB 41 OFF	1.01	000 005 430 0	1.00	85	0.75 1.078 0.75	15 45 75

FLOW	veh	715	0	1740	435	
CAPACITY	veh	1154	401	2019	772	
AVE DELAY	secs	8.4	0.0	15.7	12.5	
MAX DELAY	secs	12.7	0.0	28.4	21.6	
AVE QUEUE	veh	1.7	0.0	7.8	1.6	
MAX QUEUE	veh	2.3	0.0	12.8	2.4	

AVEDEL	s 13.4
LOS SIG	B
LOS UNSIG	B
VEHIC HRS	10.8
COST	$ 162

20:8:12 YR 2038 US41-NB/WIS 47-3ln-NB/EB byp* 63

E (m)	7.30	4.00	7.30	7.30
L' (m)	25.00	25.00	25.00	25.00
V (m)	3.65	3.65	7.30	7.30
RAD (m)	20.00	20.00	20.00	20.00
PHI (d)	25.00	25.00	25.00	25.00
DIA (m)	50.00	50.00	50.00	50.00
GRAD SEP	0	0	0	0

TIME PERIOD min	90
TIME SLICE min	15
RESULTS PERIOD min	15 75
TIME COST $/hr	15.00
FLOW PERIOD min	15 75
FLOW TYPE pcu/veh	VEH
FLOW PEAK am/op/pm	AM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB WIS 47	1.02	000 710 000 5	1.00	50	0.75 1.078 0.75	15 45 75
WB ---	1.02	000 000 000 0	1.00	50	0.75 1.078 0.75	15 45 75
SB WIS 47	1.01	000 1400 335 5	1.00	50	0.75 1.078 0.75	15 45 75
EB 41 OFF	1.01	000 005 430 0	1.00	50	0.75 1.078 0.75	15 45 75

FLOW	veh	715	0	1740	435
CAPACITY	veh	1356	604	2224	976
AVE DELAY	secs	5.6	0.0	8.0	7.1
MAX DELAY	secs	8.0	0.0	12.6	10.9
AVE QUEUE	veh	1.2	0.0	4.0	0.9
MAX QUEUE	veh	1.5	0.0	5.6	1.2

AVEDEL s	7.3
LOS SIG	A
LOS UNSIG	A
VEHIC HRS	5.8
COST $	87

20:8:12 YR 2038 US41-NB/WIS 47-3ln-EBSemi* 79

E (m)	7.30	7.30	7.30	7.30
L' (m)	25.00	25.00	25.00	25.00
V (m)	7.30	3.65	7.30	3.65
RAD (m)	20.00	20.00	20.00	20.00
PHI (d)	25.00	25.00	25.00	25.00
DIA (m)	50.00	50.00	50.00	50.00
GRAD SEP	0	0	0	0

TIME PERIOD min	90
TIME SLICE min	15
RESULTS PERIOD min	15 75
TIME COST $/hr	15.00
FLOW PERIOD min	15 75
FLOW TYPE pcu/veh	VEH
FLOW PEAK am/op/pm	AM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB WIS 47	1.02	000 000 000 5	1.00	85	0.75 1.078 0.75	15 45 75
WB ---	1.02	000 000 000 0	1.00	85	0.75 1.078 0.75	15 45 75
SB WIS 47	1.01	000 1400 335 0	1.00	85	0.75 1.078 0.75	15 45 75
EB 41 OFF	1.01	175 000 000 0	1.00	85	0.75 1.078 0.75	15 45 75

FLOW	veh	5	0	1735	175
CAPACITY	veh	1765	1649	2019	539
AVE DELAY	secs	2.0	0.0	15.3	10.6
MAX DELAY	secs	2.5	0.0	27.6	16.9
AVE QUEUE	veh	0.0	0.0	7.6	0.5
MAX QUEUE	veh	0.0	0.0	12.3	0.8

AVEDEL s	14.9
LOS SIG	B
LOS UNSIG	B
VEHIC HRS	7.9
COST $	119

20:8:12 YR 2038 US41-NB/WIS 47-3ln-EBSemi* 80

E (m)	7.30	7.30	7.30	7.30
L' (m)	25.00	25.00	25.00	25.00
V (m)	7.30	3.65	7.30	3.65
RAD (m)	20.00	20.00	20.00	20.00
PHI (d)	25.00	25.00	25.00	25.00
DIA (m)	50.00	50.00	50.00	50.00
GRAD SEP	0	0	0	0

TIME PERIOD min	90
TIME SLICE min	15
RESULTS PERIOD min	15 75
TIME COST $/hr	15.00
FLOW PERIOD min	15 75
FLOW TYPE pcu/veh	VEH
FLOW PEAK am/op/pm	AM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB WIS 47	1.02	000 000 000 5	1.00	50	0.75 1.078 0.75	15 45 75
WB ---	1.02	000 000 000 0	1.00	50	0.75 1.078 0.75	15 45 75
SB WIS 47	1.01	000 1400 335 0	1.00	50	0.75 1.078 0.75	15 45 75
EB 41 OFF	1.01	175 000 000 0	1.00	50	0.75 1.078 0.75	15 45 75

FLOW veh	5	0	1735	175
CAPACITY veh	1968	1852	2224	743
AVE DELAY secs	1.8	0.0	7.9	6.5
MAX DELAY secs	2.2	0.0	12.4	9.5
AVE QUEUE veh	0.0	0.0	3.9	0.3
MAX QUEUE veh	0.0	0.0	5.5	0.4

AVEDEL s	7.7
LOS SIG	A
LOS UNSIG	A
VEHIC HRS	4.1
COST $	62

20:8:12 YR 2038 US41-NB/WIS 47-3ln-EBSemi* 81

E (m)	7.30	7.30	7.30	7.30
L' (m)	25.00	25.00	25.00	25.00
V (m)	7.30	3.65	7.30	3.65
RAD (m)	20.00	20.00	20.00	20.00
PHI (d)	25.00	25.00	25.00	25.00
DIA (m)	50.00	50.00	50.00	50.00
GRAD SEP	0	0	0	0

TIME PERIOD min	90
TIME SLICE min	15
RESULTS PERIOD min	15 75
TIME COST $/hr	15.00
FLOW PERIOD min	15 75
FLOW TYPE pcu/veh	VEH
FLOW PEAK am/op/pm	PM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB WIS 47	1.02	000 000 000 5	1.00	85	0.75 0.959 0.75	15 45 75
WB ---	1.02	000 000 000 0	1.00	85	0.75 0.959 0.75	15 45 75
SB WIS 47	1.01	000 1245 355 0	1.00	85	0.75 0.959 0.75	15 45 75
EB 41 OFF	1.02	395 000 000 0	1.00	85	0.75 0.959 0.75	15 45 75

FLOW	veh	5	0	1600	395	
CAPACITY	veh	1751	1649	2019	620	
AVE DELAY	secs	2.0	0.0	8.6	17.6	
MAX DELAY	secs	2.3	0.0	12.2	27.5	
AVE QUEUE	veh	0.0	0.0	4.0	2.0	
MAX QUEUE	veh	0.0	0.0	5.1	2.9	

AVEDEL s	10.4
LOS SIG	B
LOS UNSIG	B
VEHIC HRS	5.8
COST $	86

20:8:12 YR 2038 US41-NB/WIS 47-3ln-EBSemi* 82

E (m)	7.30	7.30	7.30	7.30
L' (m)	25.00	25.00	25.00	25.00
V (m)	7.30	3.65	7.30	3.65
RAD (m)	20.00	20.00	20.00	20.00
PHI (d)	25.00	25.00	25.00	25.00
DIA (m)	50.00	50.00	50.00	50.00
GRAD SEP	0	0	0	0

TIME PERIOD min	90
TIME SLICE min	15
RESULTS PERIOD min	15 75
TIME COST $/hr	15.00
FLOW PERIOD min	15 75
FLOW TYPE pcu/veh	VEH
FLOW PEAK am/op/pm	PM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB WIS 47	1.02	000 000 000 5	1.00	50	0.75 0.959 0.75	15 45 75
WB ---	1.02	000 000 000 0	1.00	50	0.75 0.959 0.75	15 45 75
SB WIS 47	1.01	000 1245 355 0	1.00	50	0.75 0.959 0.75	15 45 75
EB 41 OFF	1.02	395 000 000 0	1.00	50	0.75 0.959 0.75	15 45 75

FLOW	veh	5	0	1600	395
CAPACITY	veh	1954	1852	2224	822
AVE DELAY	secs	1.8	0.0	5.7	8.5
MAX DELAY	secs	2.1	0.0	7.6	11.8
AVE QUEUE	veh	0.0	0.0	2.6	1.0
MAX QUEUE	veh	0.0	0.0	3.2	1.2

AVEDEL s	6.3
LOS SIG	A
LOS UNSIG	A
VEHIC HRS	3.5
COST $	52

US 41 with WIS 96

20:8:12 YR 2038 US41-SB/WIS96-3ln-SB/EBbyp* 48

E	(m)	3.65	10.95	10.95	10.95	
L'	(m)	25.00	25.00	25.00	25.00	
V	(m)	3.65	10.95	10.95	10.95	
RAD	(m)	20.00	20.00	20.00	20.00	
PHI	(d)	25.00	25.00	25.00	25.00	
DIA	(m)	60.00	60.00	60.00	60.00	
GRAD SEP		0	0	0	0	

TIME PERIOD	min 90
TIME SLICE	min 15
RESULTS PERIOD	min 15 75
TIME COST	$/hr 15.00
FLOW PERIOD	min 15 75
FLOW TYPE	pcu/veh VEH
FLOW PEAK	am/op/pm AM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB ---	1.01	000 000 000 0	1.00	85	0.75 1.892 0.75	15 45 75
WB WIS 96	1.02	000 1185 370 5	1.00	85	0.75 1.892 0.75	15 45 75
SB 41 OFF	1.02	000 005 345 0	1.00	85	0.75 1.892 0.75	15 45 75
EB WIS 96	1.02	000 940 000 5	1.00	85	0.75 1.892 0.75	15 45 75

FLOW	veh	0	1560	350	945	
CAPACITY	veh	305	3102	1773	2489	
AVE DELAY	secs	0.0	2.5	2.8	2.5	
MAX DELAY	secs	0.0	4.8	5.5	4.8	
AVE QUEUE	veh	0.0	1.1	0.3	0.7	
MAX QUEUE	veh	0.0	1.6	0.4	1.0	

AVEDEL	s 2.5
LOS SIG	A
LOS UNSIG	A
VEHIC HRS	2.0
COST	$ 30

E	(m)	3.65	10.95	10.95	10.95	
L'	(m)	25.00	25.00	25.00	25.00	
V	(m)	3.65	10.95	10.95	10.95	
RAD	(m)	20.00	20.00	20.00	20.00	
PHI	(d)	25.00	25.00	25.00	25.00	
DIA	(m)	60.00	60.00	60.00	60.00	
GRAD SEP		0	0	0	0	

TIME PERIOD	min 90
TIME SLICE	min 15
RESULTS PERIOD	min 15 75
TIME COST	$/hr 15.00
FLOW PERIOD	min 15 75
FLOW TYPE	pcu/veh VEH
FLOW PEAK	am/op/pm AM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB ---	1.01	000 000 000 0	1.00	50	0.75 1.892 0.75	15 45 75
WB WIS 96	1.02	000 1185 370 5	1.00	50	0.75 1.892 0.75	15 45 75
SB 41 OFF	1.02	000 005 345 0	1.00	50	0.75 1.892 0.75	15 45 75
EB WIS 96	1.02	000 940 000 5	1.00	50	0.75 1.892 0.75	15 45 75

FLOW	veh	0	1560	350	945	
CAPACITY	veh	510	3305	1976	2692	
AVE DELAY	secs	0.0	2.2	2.4	2.2	
MAX DELAY	secs	0.0	4.1	4.6	4.1	
AVE QUEUE	veh	0.0	1.0	0.2	0.6	
MAX QUEUE	veh	0.0	1.4	0.3	0.8	

AVEDEL s	2.2
LOS SIG	A
LOS UNSIG	A
VEHIC HRS	1.7
COST $	26

20:8:12 YR 2038 US41-SB/WIS96-3ln-SB/EBbyp* 50

E	(m)	3.65	10.95	10.95	10.95	
L'	(m)	25.00	25.00	25.00	25.00	
V	(m)	3.65	10.95	10.95	10.95	
RAD	(m)	20.00	20.00	20.00	20.00	
PHI	(d)	25.00	25.00	25.00	25.00	
DIA	(m)	60.00	60.00	60.00	60.00	
GRAD SEP		0	0	0	0	

TIME PERIOD	min 90
TIME SLICE	min 15
RESULTS PERIOD	min 15 75
TIME COST	$/hr 15.00
FLOW PERIOD	min 15 75
FLOW TYPE	pcu/veh VEH
FLOW PEAK	am/op/pm PM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB ---	1.01	000 000 000 0	1.00	85	0.75 0.802 0.75	15 45 75
WB WIS 96	1.02	000 2610 650 5	1.00	85	0.75 0.802 0.75	15 45 75
SB 41 OFF	1.01	000 005 360 0	1.00	85	0.75 0.802 0.75	15 45 75
EB WIS 96	1.02	000 2145 000 5	1.00	85	0.75 0.802 0.75	15 45 75

FLOW	veh	0	3265	365	2150	
CAPACITY	veh	0	3102	470	2271	
AVE DELAY	secs	0.0	128.2	30.1	24.2	
MAX DELAY	secs	0.0	232.0	36.3	32.6	
AVE QUEUE	veh	0.0	137.5	3.3	15.5	
MAX QUEUE	veh	0.0	199.6	3.6	19.3	

AVEDEL	s 83.3
LOS SIG	F
LOS UNSIG	F
VEHIC HRS	133.7
COST	$ 2006

20:8:12 YR 2038 US41-SB/WIS96-3ln-SB/EBbyp* 51

E	(m)	3.65	10.95	10.95	10.95	
L'	(m)	25.00	25.00	25.00	25.00	
V	(m)	3.65	10.95	10.95	10.95	
RAD	(m)	20.00	20.00	20.00	20.00	
PHI	(d)	25.00	25.00	25.00	25.00	
DIA	(m)	60.00	60.00	60.00	60.00	
GRAD SEP		0	0	0	0	

TIME PERIOD	min 90
TIME SLICE	min 15
RESULTS PERIOD	min 15 75
TIME COST	$/hr 15.00
FLOW PERIOD	min 15 75
FLOW TYPE	pcu/veh VEH
FLOW PEAK	am/op/pm PM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB ---	1.01	000 000 000 0	1.00	50	0.75 0.802 0.75	15 45 75
WB WIS 96	1.02	000 2610 650 5	1.00	50	0.75 0.802 0.75	15 45 75
SB 41 OFF	1.01	000 005 360 0	1.00	50	0.75 0.802 0.75	15 45 75
EB WIS 96	1.02	000 2145 000 5	1.00	50	0.75 0.802 0.75	15 45 75

FLOW	veh	0	3265	365	2150	
CAPACITY	veh	0	3305	557	2450	
AVE DELAY	secs	0.0	37.6	17.7	11.3	
MAX DELAY	secs	0.0	55.4	22.9	13.8	
AVE QUEUE	veh	0.0	38.2	1.9	7.0	
MAX QUEUE	veh	0.0	49.6	2.3	8.1	

AVEDEL	s 26.6
LOS SIG	C
LOS UNSIG	D
VEHIC HRS	42.6
COST	$ 640

20:8:12 YR 2038 US41-NB/WIS96-3ln-NB/WBbyp* 62

E	(m)	10.95	10.95	3.65	10.95	
L'	(m)	25.00	25.00	25.00	25.00	
V	(m)	10.95	10.95	3.65	10.95	
RAD	(m)	20.00	20.00	20.00	20.00	
PHI	(d)	25.00	25.00	25.00	25.00	
DIA	(m)	60.00	60.00	60.00	60.00	
GRAD SEP		0	0	0	0	

TIME PERIOD	min 90
TIME SLICE	min 15
RESULTS PERIOD	min 15 75
TIME COST	$/hr 15.00
FLOW PERIOD	min 15 75
FLOW TYPE	pcu/veh VEH
FLOW PEAK	am/op/pm AM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB 41 OFF	1.02	000 005 450 0	1.00	85	0.75 1.616 0.75	15 45 75
WB WIS 96	1.02	000 1105 000 5	1.00	85	0.75 1.616 0.75	15 45 75
SB ---	1.01	000 000 000 0	1.00	85	0.75 1.616 0.75	15 45 75
EB WIS 96	1.02	000 1055 230 5	1.00	85	0.75 1.616 0.75	15 45 75

FLOW	veh	455	1110	0	1290	
CAPACITY	veh	2003	2518	179	3102	
AVE DELAY	secs	2.4	2.7	0.0	2.0	
MAX DELAY	secs	4.2	4.8	0.0	3.4	
AVE QUEUE	veh	0.3	0.9	0.0	0.7	
MAX QUEUE	veh	0.4	1.2	0.0	1.0	

AVEDEL	s 2.3
LOS SIG	A
LOS UNSIG	A
VEHIC HRS	1.9
COST	$ 28

E	(m)	10.95	10.95	3.65	10.95	
L'	(m)	25.00	25.00	25.00	25.00	
V	(m)	10.95	10.95	3.65	10.95	
RAD	(m)	20.00	20.00	20.00	20.00	
PHI	(d)	25.00	25.00	25.00	25.00	
DIA	(m)	60.00	60.00	60.00	60.00	
GRAD SEP		0	0	0	0	

TIME PERIOD	min 90
TIME SLICE	min 15
RESULTS PERIOD	min 15 75
TIME COST	$/hr 15.00
FLOW PERIOD	min 15 75
FLOW TYPE	pcu/veh VEH
FLOW PEAK	am/op/pm AM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB 41 OFF	1.02	000 005 450 0	1.00	50	0.75 1.616 0.75	15 45 75
WB WIS 96	1.02	000 1105 000 5	1.00	50	0.75 1.616 0.75	15 45 75
SB ---	1.01	000 000 000 0	1.00	50	0.75 1.616 0.75	15 45 75
EB WIS 96	1.02	000 1055 230 5	1.00	50	0.75 1.616 0.75	15 45 75

FLOW	veh	455	1110	0	1290	
CAPACITY	veh	2206	2721	384	3305	
AVE DELAY	secs	2.1	2.3	0.0	1.8	
MAX DELAY	secs	3.6	4.1	0.0	3.0	
AVE QUEUE	veh	0.3	0.7	0.0	0.7	
MAX QUEUE	veh	0.4	1.0	0.0	0.9	

AVEDEL s	2.0
LOS SIG	A
LOS UNSIG	A
VEHIC HRS	1.6
COST $	24

E	(m)	10.95	10.95	3.65	10.95	
L'	(m)	25.00	25.00	25.00	25.00	
V	(m)	10.95	10.95	3.65	10.95	
RAD	(m)	20.00	20.00	20.00	20.00	
PHI	(d)	25.00	25.00	25.00	25.00	
DIA	(m)	60.00	60.00	60.00	60.00	
GRAD SEP		0	0	0	0	

TIME PERIOD	min 90
TIME SLICE	min 15
RESULTS PERIOD	min 15 75
TIME COST	$/hr 15.00
FLOW PERIOD	min 15 75
FLOW TYPE	pcu/veh VEH
FLOW PEAK	am/op/pm PM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB 41 OFF	1.02	000 005 715 0	1.00	85	0.75 0.802 0.75	15 45 75
WB WIS 96	1.02	000 2545 000 5	1.00	85	0.75 0.802 0.75	15 45 75
SB ---	1.01	000 000 000 0	1.00	85	0.75 0.802 0.75	15 45 75
EB WIS 96	1.02	000 1750 760 5	1.00	85	0.75 0.802 0.75	15 45 75

FLOW	veh	720	2550	0	2515	
CAPACITY	veh	961	1842	0	3103	
AVE DELAY	secs	14.5	689.7	0.0	5.9	
MAX DELAY	secs	18.3	1601.4	0.0	6.7	
AVE QUEUE	veh	3.0	577.0	0.0	4.2	
MAX QUEUE	veh	3.6	843.2	0.0	4.6	

AVEDEL	s 308.4
LOS SIG	F
LOS UNSIG	F
VEHIC HRS	495.6
COST	$ 7433

20:8:12 YR 2038 US41-NB/WIS96-3ln-NB/WBbyp* 65

E (m)	10.95	10.95	3.65	10.95
L' (m)	25.00	25.00	25.00	25.00
V (m)	10.95	10.95	3.65	10.95
RAD (m)	20.00	20.00	20.00	20.00
PHI (d)	25.00	25.00	25.00	25.00
DIA (m)	60.00	60.00	60.00	60.00
GRAD SEP	0	0	0	0

TIME PERIOD	min 90
TIME SLICE	min 15
RESULTS PERIOD	min 15 75
TIME COST	$/hr 15.00
FLOW PERIOD	min 15 75
FLOW TYPE	pcu/veh VEH
FLOW PEAK	am/op/pm PM

LEG NAME	PCU	TURNS (1st exit, 2nd..U)	FLOF	CL	FLOW RATIO	FLOW TIME
NB 41 OFF	1.02	000 005 715 0	1.00	50	0.75 0.802 0.75	15 45 75
WB WIS 96	1.02	000 2545 000 5	1.00	50	0.75 0.802 0.75	15 45 75
SB ---	1.01	000 000 000 0	1.00	50	0.75 0.802 0.75	15 45 75
EB WIS 96	1.02	000 1750 760 5	1.00	50	0.75 0.802 0.75	15 45 75

FLOW	veh	720	2550	0	2515
CAPACITY	veh	1164	2045	0	3306
AVE DELAY	secs	7.9	480.3	0.0	4.5
MAX DELAY	secs	9.3	1017.1	0.0	4.9
AVE QUEUE	veh	1.6	403.5	0.0	3.2
MAX QUEUE	veh	1.8	593.3	0.0	3.4

AVEDEL	s 214.7
LOS SIG	F
LOS UNSIG	F
VEHIC HRS	344.9
COST	$ 5174