



I-70 G Edwards Entrance Improvement Project Supplemental Traffic Analysis

DRAFT

A preliminary design effort for I-70 G between I-70 and US 6 in Edwards was initiated in 2003 as a cooperative effort between Eagle County and the Colorado Department of Transportation. Eagle County was responsible for funding the design effort, and CDOT was responsible for conducting a Categorical Exclusion (CAT-EX) environmental study and providing the associated clearances.

An extensive public outreach component of the project included a public open house, one-on-one meetings with adjacent property owners and businesses, and two public hearings before the Board of County Commissioners. A series of alternative concepts were developed, ranging from traffic signals at all intersections to all roundabouts, with several combinations of signals and roundabouts along the corridor. The advantages and disadvantages of each alternative were evaluated.

Midway through the evaluation process, it was determined that right-of-way constraints, environmental issues with the Eagle River crossing, and public controversy concerning the intersection at I-70 G/US 6 would likely require an Environmental Assessment. In order to keep the project at the CAT-EX level, the County and CDOT agreed to limit the design to the segment of I-70 G north of the railroad bridge.

Through the public process, and through progress meetings with County and CDOT staff, a preferred alternative was established that included roundabouts at Miller Ranch Road, the eastbound I-70 ramp terminal intersections, and at a combined intersection of the westbound I-70 ramps with Beard Creek Road and Berry Creek Road. The preliminary design was refined and F.I.R. plans were produced in March 2005.

Traffic analyses were conducted as a part of the preliminary design effort based on year 2025 traffic volume forecasts; these analyses were documented in our letter report to the County dated May 7, 2004. The preferred alternative was evaluated using SIDRA, a roundabout capacity analysis tool.

With the final design task now underway, we have updated the traffic projections to reflect year 2030 conditions, as documented in our memorandum of November 13, 2006. To better understand the traffic implications related to the design for I-70 G, recent discussions with CDOT and the County have identified the need for analyses of the following scenarios:

- ▶ **Single-Lane Roundabouts.** The current design shows two-lane roundabouts at all locations; however, there could be significant cost savings associated with providing smaller, single lane roundabouts.
- ▶ **Signalized Intersections.** Signalized intersections would also have reduced construction costs. The signalized intersection analyses have been updated based on the 2030 forecasts.
- ▶ **Two-Lane Roundabouts.** The current design has been evaluated using RODEL, a roundabout analysis/design tool, based on the updated traffic volumes.



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- ▶ **Four-Leg North Roundabout.** The preliminary plans show the north roundabout as combined intersection of the westbound I-70 ramps with Beard Creek Road and Berry Creek Road (five legs). A scenario in which the Beard Creek Road/Berry Creek Road intersection remains separate has been evaluated using RODEL for both single-lane and two-lane configurations.

The following summarizes the findings and conclusions of the supplemental traffic analysis:

Single-Lane Roundabouts

Single-lane roundabouts were analyzed with RODEL using year 2030 traffic volume projections (computer output sheets are attached). It was found that all intersections along the study segment of I-70 G would operate at LOS F during both AM and PM peak hours.

Signalized Intersections

Conventional intersections with signalized traffic control were analyzed using SYNCHRO (computer output sheets are attached). It was determined that acceptable LOS of C or better could be maintained along I-70 G; however, there would be significant queuing between the closely spaced intersections. Computerized simulations of signalized traffic operations (using SIMTRAFFIC) indicate that intersection spillback would impact upstream signals, and would create lengthy queues on the westbound I-70 off-ramp.

Two-Lane Roundabouts

Two-lane roundabouts were analyzed with RODEL using year 2030 traffic volume projections (computer output sheets are attached). It was found that all intersections along the study segment of I-70 G would operate at LOS B or better during the AM and PM peak hours. Queuing between intersections would be well within the available storage distance.

Four-Leg North Roundabout

If the Beard Creek Road/Berry Creek Road intersection remains separate from a roundabout at the westbound ramps, operations would be at LOS A during both peak hours (slightly better than the five-leg alternative). Beard Creek Road/Berry Creek Road would operate at acceptable levels, with LOS C for the STOP sign controlled left-turn movements. Queuing of westbound vehicles at the roundabout would not impact outbound movements from Berry Creek Road.

The following tables summarize the LOS and queuing results:



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Table 1. Summary of Level of Service Results

Intersection	LOS (AM/PM)		
	Single-Lane RDBT	Traffic Signal	Two-Lane RDBT
WB Ramps	F/F (1)	B/C	A/B (2),(3)
EB Ramps	F/F	A/B	A/A
Miller Ranch Road	F/F	C/C	A/A

1. F/F if 4-Leg Roundabout.
2. A/A if 4-Leg Roundabout.
3. A/C if Alternative 6.

Table 2. Summary of I-70 G Queues

Intersection	Spacing (Feet)	Maximum Probable Queue Length in Feet (AM/PM)			
		Traffic Signal		Two-Lane RDBT	
		NB	SB	NB	SB
Beard/Berry					
N WB Ramps	210	0/0	242/254	0/20	0/20
S EB Ramps	320	196/309	456/985	20/20	40/40
Miller Ranch	250	700/422	272/228	20/80	60/40

Table 3. Westbound Off-Ramp Queues

Maximum Probable Queue Length in Feet (AM/PM)	
Traffic Signal	Two-Lane RDBT
195/420	20/220



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**Single-Lane Roundabout
RODEL Analysis Output**


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*****
*
* 11:12:06          AM PEAK HOUR  SINGLE LANE NORTH (5 LEG)          4
*
*****
*
* E      (m)   4.30   4.30   4.30   4.30   4.30   * TIME PERIOD      min      60
* L'     (m)  10.00  10.00  10.00  10.00  10.00  * TIME SLICE       min      15
* V      (m)   3.70   3.70   3.70   3.70   3.70   * RESULTS PERIOD  min     15 60
* RAD    (m)  20.00  20.00  20.00  20.00  20.00  * TIME COST        $/hr   15.00
* PHI    (d)  30.00  30.00  30.00  30.00  30.00  * FLOW PERIOD      min     15 60
* DIA    (m)  40.00  40.00  40.00  40.00  40.00  * FLOW TYPE        pcu/veh  VEH
* GRAD SEP      0      0      0      0      0      * FLOW PEAK        am/op/pm  OP
*
*****
* LEG NAME *PCU *FLOWS (1st exit 2nd etc...U)*FLOF*CL* FLOW RATIO *FLOW TIME*
*          *   *
* BERRY   *1.10* 10  30  235  0  0      *1.00*50*0.75 1.125 0.75*15 30 45
* BEARD   *1.10* 20 155  0  10  0      *1.00*50*0.75 1.125 0.75*15 30 45
* ON RAMP *1.10*  0  0  0  0  0      *1.00*50*0.75 1.125 0.75*15 30 45
* SPUR    *1.10*  0 185 130 165 0      *1.00*50*0.75 1.125 0.75*15 30 45
* OFF RAMP*1.10* 55 35  0 545 0      *1.00*50*0.75 1.125 0.75*15 30 45
*
*          *   *
*          *   *
*****
*
* FLOW      veh      275    185      0    480    635
* CAPACITY  veh      404    347    364    863    596
* AVE DELAY mins    0.36    0.28    0.00    0.12    3.85
* MAX DELAY mins    0.57    0.44    0.00    0.18    6.32
* AVE QUEUE  veh      2      1      0      1      62
* MAX QUEUE  veh      3      1      0      2      90
*
*****

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*****
*
* 11:12:06          PM PEAK HOUR  SINGLE LANE NORTH (5 LEG)          5
*
*****
*
* E      (m)  4.30   4.30   4.30   4.30   4.30   * TIME PERIOD      min      60
* L'    (m) 10.00  10.00  10.00  10.00  10.00  * TIME SLICE       min      15
* V      (m)  3.70   3.70   3.70   3.70   3.70   * RESULTS PERIOD  min     15 60
* RAD    (m) 20.00  20.00  20.00  20.00  20.00  * TIME COST        $/hr   15.00
* PHI    (d) 30.00  30.00  30.00  30.00  30.00  * FLOW PERIOD      min     15 60
* DIA    (m) 40.00  40.00  40.00  40.00  40.00  * FLOW TYPE        pcu/veh  VEH
* GRAD SEP  0      0      0      0      0      * FLOW PEAK        am/op/pm  OP
*
*****
* LEG NAME *PCU *FLOWS (1st exit 2nd etc...U)*FLOF*CL* FLOW RATIO *FLOW TIME*
*          *   *
* BERRY    *1.10*  10   30  215   0   0      *1.00*50*0.75 1.125 0.75*15 30 45
* BEARD    *1.10*  15  150   0   10  0      *1.00*50*0.75 1.125 0.75*15 30 45
* ON RAMP  *1.10*   0   0    0    0  0      *1.00*50*0.75 1.125 0.75*15 30 45
* SPUR     *1.10*   0  175  115  345  0      *1.00*50*0.75 1.125 0.75*15 30 45
* OFF RAMP *1.10* 125   85   0 1005  0      *1.00*50*0.75 1.125 0.75*15 30 45
*          *   *
*          *   *
*****
*
* FLOW      veh      255   175     0   635   1215
* CAPACITY  veh      358   305   425   863   509
* AVE DELAY mins    0.48  0.37  0.00  0.22  19.91
* MAX DELAY mins    0.76  0.58  0.00  0.35  32.36
* AVE QUEUE  veh       3     1     0     3    655
* MAX QUEUE  veh       4     2     0     4    841
*
*****

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*****
*
* 11:12:06 NORTH ROUNDABOUT AM SINGLE 4 LEG 7
*
*****
*
* E (m) 4.30 4.30 4.30 4.30 * TIME PERIOD min 60
* L' (m) 10.00 10.00 10.00 10.00 * TIME SLICE min 15
* V (m) 3.70 3.70 3.70 3.70 * RESULTS PERIOD min 15 60
* RAD (m) 20.00 20.00 20.00 20.00 * TIME COST $/hr 15.00
* PHI (d) 30.00 30.00 30.00 30.00 * FLOW PERIOD min 15 60
* DIA (m) 40.00 40.00 40.00 40.00 * FLOW TYPE pcu/veh VEH
* GRAD SEP 0 0 0 0 * FLOW PEAK am/op/pm PM
*
*****
* LEG NAME *PCU *FLOWS (1st exit 2nd etc...U)*FLOF*CL* FLOW RATIO *FLOW TIME*
* * * * * * * * * * *
* SB SPUR *1.05* 50 390 0 0 *1.00*50*0.75 1.125 0.75*15 30 45
* ON RAMP *1.05* 0 0 0 0 *1.00*50*0.75 1.125 0.75*15 30 45
* NB SPUR *1.05* 0 315 165 0 *1.00*50*0.75 1.125 0.75*15 30 45
* OFF RAMP *1.05* 90 0 545 0 *1.00*50*0.75 1.125 0.75*15 30 45
* * * * * * * * * * *
* * * * * * * * * * *
* * * * * * * * * * *
*****
* FLOW veh 440 0 480 635
* CAPACITY veh 515 390 910 642 * AVDEL s 69.0
* AVE DELAY mins 0.65 0.00 0.11 2.28 * L O S F
* MAX DELAY mins 1.14 0.00 0.16 3.97 * VEH HRS 29.8
* AVE QUEUE veh 7 0 1 33 * COST $ 447.1
* MAX QUEUE veh 10 0 1 60
*
*****

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*****
*
* 11:12:06 NORTH ROUNDABOUT PM SINGLE 4 LEG 12
*
*****
*
* E (m) 4.30 4.30 4.30 4.30 * TIME PERIOD min 60 *
* L' (m) 10.00 10.00 10.00 10.00 * TIME SLICE min 15 *
* V (m) 3.70 3.70 3.70 3.70 * RESULTS PERIOD min 0 60 *
* RAD (m) 20.00 20.00 20.00 20.00 * TIME COST $/hr 15.00 *
* PHI (d) 30.00 30.00 30.00 30.00 * FLOW PERIOD min 0 60 *
* DIA (m) 40.00 40.00 40.00 40.00 * FLOW TYPE pcu/veh VEH *
* GRAD SEP 0 0 0 0 * FLOW PEAK am/op/pm PM *
*
*****
* LEG NAME *PCU *FLOWS (1st exit 2nd etc...U)*FLOF*CL* FLOW RATIO *FLOW TIME*
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* SB SPUR *1.05* 60 350 0 0 *1.00*50*0.75 1.125 0.75*15 30 45 *
* ON RAMP *1.05* 0 0 0 0 *1.00*50*0.75 1.125 0.75*15 30 45 *
* NB SPUR *1.05* 0 290 345 0 *1.00*50*0.75 1.125 0.75*15 30 45 *
* OFF RAMP *1.05* 210 0 1005 0 *1.00*50*0.75 1.125 0.75*15 30 45 *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* FLOW veh 410 0 635 1215 * * * * * * * * * * * * * * * * *
* CAPACITY veh 628 626 1213 860 * AVDEL s 295.8 *
* AVE DELAY mins 0.28 0.00 0.10 9.02 * L O S F *
* MAX DELAY mins 0.51 0.00 0.17 19.44 * VEH HRS 185.7 *
* AVE QUEUE veh 2 0 1 228 * COST $ 2785.4 *
* MAX QUEUE veh 3 0 2 361 * * * * * * * * * * * * * * * * *
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*****
*
* 11:12:06                MIDDLE ROUNDABOUT AM SINGLE LANE                5
*
*****
*
* E      (m)      5.00    5.00    5.00    5.00      * TIME PERIOD      min      60
* L'     (m)     10.00   10.00   10.00   10.00      * TIME SLICE       min      15
* V      (m)      3.00    3.00    3.00    3.00      * RESULTS PERIOD   min      0 60
* RAD    (m)     20.00   20.00   20.00   20.00      * TIME COST        $/hr   15.00
* PHI    (d)     30.00   30.00   30.00   30.00      * FLOW PERIOD      min      0 60
* DIA    (m)     40.00   40.00   40.00   40.00      * FLOW TYPE        pcu/veh   VEH
* GRAD SEP      0        0        0        0          * FLOW PEAK        am/op/pm   PM
*
*****
* LEG NAME *PCU *FLOWS (1st exit 2nd etc...U) *FLOF*CL* FLOW RATIO *FLOW TIME*
*
* SB SPUR *1.05* 0 695 240 0 *1.00*50*0.75 1.125 0.75*15 30 45
* OFF RAMP *1.05* 485 0 65 0 *1.00*50*0.75 1.125 0.75*15 30 45
* NB SPUR *1.05* 985 415 0 0 *1.00*50*0.75 1.125 0.75*15 30 45
* ON RAMP *1.05* 0 0 0 0 *1.00*50*0.75 1.125 0.75*15 30 45
*
*
*
*
*****
* FLOW      veh      935      550      1400      0
* CAPACITY  veh     1218      697      1048      1009
* AVE DELAY mins    0.26    0.97    7.78    0.00
* MAX DELAY mins    0.51    2.25   17.32    0.00
* AVE QUEUE  veh      4        9       226      0
* MAX QUEUE  veh      7       20      360      0
*
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*****
*
* 11:12:06                MIDDLE ROUNDABOUT PM SINGLE LANE                6
*
*****
*
* E      (m)      5.00   5.00   5.00   5.00      * TIME PERIOD      min      60
* L'    (m)     10.00  10.00  10.00  10.00     * TIME SLICE       min      15
* V      (m)      3.00   3.00   3.00   3.00     * RESULTS PERIOD  min      0 60
* RAD    (m)     20.00  20.00  20.00  20.00     * TIME COST        $/hr   15.00
* PHI    (d)     30.00  30.00  30.00  30.00     * FLOW PERIOD      min      0 60
* DIA    (m)     40.00  40.00  40.00  40.00     * FLOW TYPE        pcu/veh   VEH
* GRAD SEP      0      0      0      0          * FLOW PEAK        am/op/pm   PM
*
*****
* LEG NAME *PCU *FLOWS (1st exit 2nd etc...U)*FLOF*CL* FLOW RATIO *FLOW TIME*
*          *   *
* SB SPUR *1.05*  0  1195 160  0          *1.00*50*0.75 1.125 0.75*15 30 45
* OFF RAMP *1.05* 425  0  90  0          *1.00*50*0.75 1.125 0.75*15 30 45
* NB SPUR *1.05* 725 545  0  0          *1.00*50*0.75 1.125 0.75*15 30 45
* ON RAMP *1.05*  0  0  0  0          *1.00*50*0.75 1.125 0.75*15 30 45
*
*          *   *
*          *   *
*          *   *
*****
*
* FLOW      veh      1355   515   1270   0
* CAPACITY  veh      1218   555   1090   913
* AVE DELAY mins     4.13   1.86   4.99   0.00
* MAX DELAY mins     9.03   3.98  11.19   0.00
* AVE QUEUE  veh      114    18    131    0
* MAX QUEUE  veh      182    35    202    0
*
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*****
*
* 11:12:06                SOUTH ROUNDABOUT AM SINGLE LANE                11
*
*****
*
* E      (m)      5.00    5.00    5.00    5.00      * TIME PERIOD      min      60
* L'     (m)     10.00   10.00   10.00   10.00     * TIME SLICE       min      15
* V      (m)      3.00    3.00    3.00    3.00      * RESULTS PERIOD   min      0 60
* RAD    (m)     20.00   20.00   20.00   20.00     * TIME COST        $/hr    15.00
* PHI    (d)     30.00   30.00   30.00   30.00     * FLOW PERIOD      min      0 60
* DIA    (m)     40.00   40.00   40.00   40.00     * FLOW TYPE        pcu/veh   VEH
* GRAD SEP      0        0        0        0        * FLOW PEAK        am/op/pm  PM
*
*****
* LEG NAME *PCU *FLOWS (1st exit 2nd etc...U) *FLOF*CL* FLOW RATIO *FLOW TIME*
*          *   *
* SB SPUR *1.05*  80  775  325  0      *1.00*50*0.75 1.125 0.75* 0 30 45
* NORTHSTAR*1.05*  40  10  80  0      *1.00*50*0.75 1.125 0.75* 0 30 45
* NB SPUR *1.05* 245 1060  50  0      *1.00*50*0.75 1.125 0.75* 0 30 45
* MILLER RR*1.05* 260  10  215  0     *1.00*50*0.75 1.125 0.75* 0 30 45
*
*          *   *
*          *   *
*          *   *
*****
*
* FLOW      veh      1180    130    1355    485
* CAPACITY  veh      1072    548    1005    716      * AVDEL s      331.8
* AVE DELAY mins     4.40    0.13    8.91    0.27     * L O S        F
* MAX DELAY mins     8.73    0.21   18.40    0.45     * VEH HRS      290.3
* AVE QUEUE  veh      102      0      245      2        * COST $      4354.8
* MAX QUEUE  veh      158      0      354      4
*
*****

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*****
*
* 11:12:06                SOUTH ROUNDABOUT PM SINGLE LANE                12
*
*****
*
* E      (m)      5.00    5.00    5.00    5.00      * TIME PERIOD      min      60
* L'     (m)     10.00   10.00   10.00   10.00      * TIME SLICE       min      15
* V      (m)      3.00    3.00    3.00    3.00      * RESULTS PERIOD   min      0 60
* RAD    (m)     20.00   20.00   20.00   20.00      * TIME COST        $/hr   15.00
* PHI    (d)     30.00   30.00   30.00   30.00      * FLOW PERIOD      min      0 60
* DIA    (m)     40.00   40.00   40.00   40.00      * FLOW TYPE        pcu/veh   VEH
* GRAD SEP      0        0        0        0          * FLOW PEAK        am/op/pm   PM
*
*****
* LEG NAME *PCU *FLOWS (1st exit 2nd etc...U) *FLOF*CL* FLOW RATIO *FLOW TIME*
*
* SB SPUR *1.05* 85 1180 355 0 *1.00*50*0.75 1.125 0.75* 0 30 45
* NORTHSTAR*1.05* 60 10 90 0 *1.00*50*0.75 1.125 0.75* 0 30 45
* NB SPUR *1.05* 250 935 60 0 *1.00*50*0.75 1.125 0.75* 0 30 45
* MILLER RR*1.05* 245 10 240 0 *1.00*50*0.75 1.125 0.75* 0 30 45
*
*
*
*
*****
*
* FLOW      veh      1620    160    1245    495
* CAPACITY  veh      1051    530    1034    710      * AVDEL s      462.1
* AVE DELAY mins    11.71    0.15    6.41    0.30      * L O S        F
* MAX DELAY mins    23.49    0.23   13.26    0.51      * VEH HRS      451.9
* AVE QUEUE  veh      387      0       160      3          * COST $      6777.9
* MAX QUEUE  veh      571      1       229      4
*
*****

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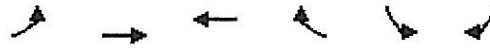

I-70 G Edwards Entrance Improvement Project
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**Signalized Intersection
SYNCHRO Analysis Output**

HCM Unsignalized Intersection Capacity Analysis
 1: Beard Creek Road & Berry Creek Road

Long Range AM
 12/11/2006



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↖	↑	↑	↗	↖	↗
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	10	175	165	240	265	10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	190	179	261	288	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	440				391	179
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	440				391	179
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				53	99
cM capacity (veh/h)	1120				607	863

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	SB 2
Volume Total	11	190	179	261	288	11
Volume Left	11	0	0	0	288	0
Volume Right	0	0	0	261	0	11
cSH	1120	1700	1700	1700	607	863
Volume to Capacity	0.01	0.11	0.11	0.15	0.47	0.01
Queue Length 95th (ft)	1	0	0	0	64	1
Control Delay (s)	8.2	0.0	0.0	0.0	16.2	9.2
Lane LOS	A				C	A
Approach Delay (s)	0.4		0.0		15.9	
Approach LOS					C	

Intersection Summary						
Average Delay			5.2			
Intersection Capacity Utilization			30.6%		ICU Level of Service	A
Analysis Period (min)			15			



Lane Group	WBL	WBR	NBL	NBT	SBT	SBR
Lane Configurations	↙↙	↙	↙	↑	↑	↙
Volume (vph)	545	90	165	315	390	50
Lane Group Flow (vph)	592	98	179	342	424	54
Turn Type	Protcustom		pm+pt		Perm	
Protected Phases	3		5	2	6	
Permitted Phases		8	2			6
Detector Phases	3	8	5	2	6	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	20.0	8.0	20.0	20.0	20.0
Total Split (s)	32.0	32.0	12.0	58.0	46.0	46.0
Total Split (%)	35.6%	35.6%	13.3%	64.4%	51.1%	51.1%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Recall Mode	Max	Max	Max	Max	Max	Max
Act Effct Green (s)	28.0	28.0	54.0	54.0	42.0	42.0
Actuated g/C Ratio	0.31	0.31	0.60	0.60	0.47	0.47
v/c Ratio	0.55	0.18	0.37	0.31	0.49	0.07
Control Delay	28.2	5.8	16.5	15.0	19.0	4.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.2	5.8	16.5	15.0	19.0	4.2
LOS	C	A	B	B	B	A
Approach Delay				15.5	17.3	
Approach LOS				B	B	
Queue Length 50th (ft)	143	0	47	111	160	0
Queue Length 95th (ft)	195	34	121	196	242	19
Internal Link Dist (ft)				1280	1440	
Turn Bay Length (ft)						
Base Capacity (vph)	1068	560	490	1118	869	768
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.55	0.18	0.37	0.31	0.49	0.07

Intersection Summary

Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
 Natural Cycle: 50
 Control Type: Pretimed
 Maximum v/c Ratio: 0.55
 Intersection Signal Delay: 19.9
 Intersection Capacity Utilization 87.9%
 Analysis Period (min) 15

Intersection LOS: B
 ICU Level of Service E

Splits and Phases: 3: WB On Ramb & I-70 G

↑ ø2		↙ ø3	
58 s		32 s	
↙ ø5	↓ ø6	↘ ø8	
12 s	46 s	32 s	







Lane Group	EBL	EBR	NBT	NBR	SBL	SBT
Lane Configurations	↶	↷	↕	↷	↶	↕
Volume (vph)	65	485	415	985	240	695
Lane Group Flow (vph)	71	527	451	1071	261	755
Turn Type	Prot	Free		Free	pm+pt	
Protected Phases	7		2		1	6
Permitted Phases		Free		Free	6	
Detector Phases	7		2		1	6
Minimum Initial (s)	4.0		4.0		4.0	4.0
Minimum Split (s)	8.0		20.0		8.0	20.0
Total Split (s)	30.0	0.0	50.0	0.0	10.0	60.0
Total Split (%)	33.3%	0.0%	55.6%	0.0%	11.1%	66.7%
Yellow Time (s)	3.5		3.5		3.5	3.5
All-Red Time (s)	0.5		0.5		0.5	0.5
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Recall Mode	Max		Max		Max	Max
Act Effct Green (s)	26.0	90.0	46.0	90.0	56.0	56.0
Actuated g/C Ratio	0.29	1.00	0.51	1.00	0.62	0.62
v/c Ratio	0.14	0.33	0.47	0.68	0.54	0.65
Control Delay	24.7	0.6	7.1	11.1	9.7	12.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.7	0.6	7.1	11.1	9.7	12.7
LOS	C	A	A	B	A	B
Approach Delay			9.9			11.9
Approach LOS			A			B
Queue Length 50th (ft)	30	0	102	544	20	314
Queue Length 95th (ft)	63	0	m122	700	63	456
Internal Link Dist (ft)			1408			1280
Turn Bay Length (ft)						
Base Capacity (vph)	511	1583	952	1583	485	1159
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.14	0.33	0.47	0.68	0.54	0.65

Intersection Summary

Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
 Natural Cycle: 40
 Control Type: Pretimed
 Maximum v/c Ratio: 0.68
 Intersection Signal Delay: 9.3
 Intersection Capacity Utilization 55.2%
 Analysis Period (min) 15
 m Volume for 95th percentile queue is metered by upstream signal.

Intersection LOS: A
 ICU Level of Service B

Splits and Phases: 6: EB Off Ramp & I-70 G

 ø1	 ø2	
10 s	50 s	
 ø6		 ø7
60 s		30 s











Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↶	↷	↶	↷	↶	↷	↷	↶	↷	↷
Volume (vph)	80	10	215	10	50	1060	245	325	775	80
Lane Group Flow (vph)	87	54	234	294	54	1152	266	353	842	87
Turn Type	pm+pt		pm+pt		pm+pt		Perm	pm+pt		Perm
Protected Phases	7	4	3	8	5	2		1	6	
Permitted Phases	4		8		2		2	6		6
Detector Phases	7	4	3	8	5	2	2	1	6	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	20.0	8.0	20.0	8.0	20.0	20.0	8.0	20.0	20.0
Total Split (s)	8.0	23.0	8.0	23.0	8.0	39.0	39.0	20.0	51.0	51.0
Total Split (%)	8.9%	25.6%	8.9%	25.6%	8.9%	43.3%	43.3%	22.2%	56.7%	56.7%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max	Max	Max
Act Effct Green (s)	23.0	19.0	23.0	19.0	39.0	35.0	35.0	55.0	47.0	47.0
Actuated g/C Ratio	0.26	0.21	0.26	0.21	0.43	0.39	0.39	0.61	0.52	0.52
v/c Ratio	0.46	0.14	0.64	0.52	0.17	0.84	0.34	0.89	0.46	0.10
Control Delay	32.8	13.1	37.4	8.3	9.9	31.7	3.8	38.6	14.3	2.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	32.8	13.1	37.4	8.3	9.9	31.7	3.8	38.6	14.3	2.8
LOS	C	B	D	A	A	C	A	D	B	A
Approach Delay		25.3		21.2		25.9			20.2	
Approach LOS		C		C		C			C	
Queue Length 50th (ft)	36	5	107	5	11	305	0	121	172	2
Queue Length 95th (ft)	73	35	175	71	25	393	47 m#272	205	m5	
Internal Link Dist (ft)		1648		2032		1377			1408	
Turn Bay Length (ft)										
Base Capacity (vph)	188	380	363	560	321	1376	778	398	1848	868
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.46	0.14	0.64	0.53	0.17	0.84	0.34	0.89	0.46	0.10

Intersection Summary

Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 48 (53%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
 Natural Cycle: 80
 Control Type: Pretimed
 Maximum v/c Ratio: 0.89
 Intersection Signal Delay: 23.0
 Intersection Capacity Utilization 81.7%
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 9: Northstar Access & I-70 G

 ø1		 ø2		 ø3		 ø4	
20 s		39 s		8 s		23 s	
 ø5		 ø6		 ø7		 ø8	
8 s		51 s		8 s		23 s	

HCM Unsignalized Intersection Capacity Analysis
 1: Beard Creek Road & Berry Creek Road

Long Range PM
 12/11/2006



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↶	↑	↑	↷	↶	↷
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	10	165	200	300	245	10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	179	217	326	266	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	543				418	217
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	543				418	217
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				54	99
cM capacity (veh/h)	1025				585	822

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	SB 2
Volume Total	11	179	217	326	266	11
Volume Left	11	0	0	0	266	0
Volume Right	0	0	0	326	0	11
cSH	1025	1700	1700	1700	585	822
Volume to Capacity	0.01	0.11	0.13	0.19	0.46	0.01
Queue Length 95th (ft)	1	0	0	0	59	1
Control Delay (s)	8.5	0.0	0.0	0.0	16.2	9.4
Lane LOS	A				C	A
Approach Delay (s)	0.5		0.0		15.9	
Approach LOS					C	

Intersection Summary						
Average Delay			4.5			
Intersection Capacity Utilization			30.8%		ICU Level of Service	A
Analysis Period (min)			15			



Lane Group	WBL	WBR	NBL	NBT	SBT	SBR
Lane Configurations	↙↙	↙	↙	↑	↑	↘
Volume (vph)	1005	210	345	290	350	60
Lane Group Flow (vph)	1092	228	375	315	380	65
Turn Type	Protcustom		pm+pt		Perm	
Protected Phases	3		5	2	6	
Permitted Phases		8	2			6
Detector Phases	3	8	5	2	6	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	20.0	8.0	20.0	20.0	20.0
Total Split (s)	36.0	36.0	16.0	54.0	38.0	38.0
Total Split (%)	40.0%	40.0%	17.8%	60.0%	42.2%	42.2%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Recall Mode	Max	Max	Max	Max	Max	Max
Act Effct Green (s)	32.0	32.0	50.0	50.0	34.0	34.0
Actuated g/C Ratio	0.36	0.36	0.56	0.56	0.38	0.38
v/c Ratio	0.89	0.32	0.76	0.30	0.54	0.10
Control Delay	38.5	4.2	40.3	24.8	25.4	5.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	38.5	4.2	40.3	24.8	25.4	5.4
LOS	D	A	D	C	C	A
Approach Delay				33.2	22.5	
Approach LOS				C	C	
Queue Length 50th (ft)	298	0	188	149	166	0
Queue Length 95th (ft)	#420	47	#309	222	254	25
Internal Link Dist (ft)				1280	1440	
Turn Bay Length (ft)						
Base Capacity (vph)	1221	710	491	1035	704	638
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.89	0.32	0.76	0.30	0.54	0.10

Intersection Summary

Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
 Natural Cycle: 60
 Control Type: Pretimed
 Maximum v/c Ratio: 0.89
 Intersection Signal Delay: 30.9
 Intersection Capacity Utilization 95.9%
 Analysis Period (min) 15
 Intersection LOS: C
 ICU Level of Service F

95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 3: WB On Ramb & I-70 G

↑ ø2		↙ ø3	
54 s		36 s	
↙ ø5	↓ ø6	↘ ø8	
16 s	38 s	36 s	







Lane Group	EBL	EBR	NBT	NBR	SBL	SBT
Lane Configurations	↶	↷	↶	↷	↶	↶
Volume (vph)	90	425	545	725	160	1195
Lane Group Flow (vph)	98	462	592	788	174	1299
Turn Type	Prot	Free		Free	pm+pt	
Protected Phases	7		2		1	6
Permitted Phases		Free		Free	6	
Detector Phases	7		2		1	6
Minimum Initial (s)	4.0		4.0		4.0	4.0
Minimum Split (s)	8.0		20.0		8.0	20.0
Total Split (s)	22.0	0.0	60.0	0.0	8.0	68.0
Total Split (%)	24.4%	0.0%	66.7%	0.0%	8.9%	75.6%
Yellow Time (s)	3.5		3.5		3.5	3.5
All-Red Time (s)	0.5		0.5		0.5	0.5
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Recall Mode	Max		Max		Max	Max
Act Effct Green (s)	18.0	90.0	56.0	90.0	64.0	64.0
Actuated g/C Ratio	0.20	1.00	0.62	1.00	0.71	0.71
v/c Ratio	0.28	0.29	0.51	0.50	0.37	0.98
Control Delay	33.0	0.5	8.3	4.6	5.7	35.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.0	0.5	8.3	4.6	5.7	35.4
LOS	C	A	A	A	A	D
Approach Delay			6.2			31.9
Approach LOS			A			C
Queue Length 50th (ft)	48	0	284	306	30	791
Queue Length 95th (ft)	92	0	m377	422	m35	m#985
Internal Link Dist (ft)			1408			1280
Turn Bay Length (ft)						
Base Capacity (vph)	354	1583	1159	1583	475	1325
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.28	0.29	0.51	0.50	0.37	0.98

Intersection Summary

Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
 Natural Cycle: 60
 Control Type: Pretimed
 Maximum v/c Ratio: 0.98
 Intersection Signal Delay: 17.3
 Intersection Capacity Utilization 76.2%
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: EB Off Ramp & I-70 G

 ø1	 ø2	
8 s	60 s	
 ø6		 ø7
68 s		22 s











Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗	↖	↗	↖	↗	↗	↖	↗	↗
Volume (vph)	90	10	240	10	60	935	250	355	1180	85
Lane Group Flow (vph)	98	76	261	277	65	1016	272	386	1283	92
Turn Type	pm+pt		pm+pt		pm+pt		Perm	pm+pt		Perm
Protected Phases	7	4	3	8	5	2		1	6	
Permitted Phases	4		8		2		2	6		6
Detector Phases	7	4	3	8	5	2	2	1	6	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	20.0	8.0	20.0	8.0	20.0	20.0	8.0	20.0	20.0
Total Split (s)	8.0	25.0	8.0	25.0	8.0	37.0	37.0	20.0	49.0	49.0
Total Split (%)	8.9%	27.8%	8.9%	27.8%	8.9%	41.1%	41.1%	22.2%	54.4%	54.4%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max	Max	Max
Act Effct Green (s)	25.0	21.0	25.0	21.0	37.0	33.0	33.0	53.0	45.0	45.0
Actuated g/C Ratio	0.28	0.23	0.28	0.23	0.41	0.37	0.37	0.59	0.50	0.50
v/c Ratio	0.43	0.18	0.68	0.48	0.37	0.78	0.36	0.97	0.72	0.11
Control Delay	29.2	10.6	37.3	7.5	16.1	30.5	4.1	35.6	13.9	1.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.2	10.6	37.3	7.5	16.1	30.5	4.1	35.6	13.9	1.4
LOS	C	B	D	A	B	C	A	D	B	A
Approach Delay		21.1		22.0		24.5			18.0	
Approach LOS		C		C		C			B	
Queue Length 50th (ft)	40	5	117	5	15	265	0	162	247	1
Queue Length 95th (ft)	77	39	189	67	31	344	49	m149	m228	m1
Internal Link Dist (ft)		1648		2032		1377			1408	
Turn Bay Length (ft)										
Base Capacity (vph)	230	429	386	576	177	1298	753	397	1770	838
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.43	0.18	0.68	0.48	0.37	0.78	0.36	0.97	0.72	0.11

Intersection Summary

Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 48 (53%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
 Natural Cycle: 80
 Control Type: Pretimed
 Maximum v/c Ratio: 0.97
 Intersection Signal Delay: 21.0
 Intersection Capacity Utilization 79.5%
 Analysis Period (min) 15
 Intersection LOS: C
 ICU Level of Service D
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 9: Northstar Access & I-70 G

 ⌀1		 ⌀2		 ⌀3		 ⌀4	
20 s		37 s		8 s		25 s	
 ⌀5		 ⌀6		 ⌀7		 ⌀8	
8 s		49 s		8 s		25 s	



I-70 G Edwards Entrance Improvement Project
Supplemental Traffic Analysis

DRAFT

**Two-Lane Roundabout
RODEL Analysis Output**


```

*****
*
* 14:12:06          AM PEAK HOUR    DUAL  LANE NORTH (5 LEG)          9
*
*****
*
* E      (m)      8.75   8.23   4.30   9.21   9.51   * TIME PERIOD      min      60
* L'     (m)      4.05  10.39  10.00   6.04  17.37  * TIME SLICE       min      15
* V      (m)      8.23   7.92   3.00   8.84   8.53   * RESULTS PERIOD   min     15 60
* RAD    (m)     16.15  17.68  20.00  29.87  45.11  * TIME COST        $/hr   15.00
* PHI    (d)     41.00  30.00  30.00  31.20  26.10  * FLOW PERIOD      min     15 60
* DIA    (m)     55.00  55.00  55.00  55.00  55.00  * FLOW TYPE        pcu/veh   VEH
* GRAD SEP      0      0      0      0      0      * FLOW PEAK        am/op/pm  OP
*
*****
* LEG NAME *PCU *FLOWS (1st exit 2nd etc...U)*FLOF*CL* FLOW RATIO *FLOW TIME*
*          *   *
* BERRY   *1.10*  10   30  235   0   0      *1.00*50*0.75  1.125  0.75*15 30 45
* BEARD   *1.10*  20  155   0   10  0      *1.00*50*0.75  1.125  0.75*15 30 45
* ON RAMP *1.10*   0    0    0    0  0      *1.00*50*0.75  1.125  0.75*15 30 45
* SPUR    *1.10*   0  185  130  165  0      *1.00*50*0.75  1.125  0.75*15 30 45
* OFF RAMP*1.10*  55   35   0  545  0      *1.00*50*0.75  1.125  0.75*15 30 45
*
*          *   *
*          *   *
*****
*
* FLOW      veh      275   185     0   480   635
* CAPACITY  veh     1065   979   345  1905  1609
* AVE DELAY mins    0.06   0.06   0.00  0.03  0.05
* MAX DELAY mins    0.09   0.09   0.00  0.04  0.07
* AVE QUEUE  veh      0     0     0     0     1
* MAX QUEUE  veh      0     0     0     0     1
*
*****

```

```

*****
*
* 14:12:06          PM PEAK HOUR    DUAL  LANE NORTH (5 LEG)          30
*
*****
*
* E      (m)      8.75   8.23   4.30   9.21   9.51   * TIME PERIOD      min      60
* L'     (m)      4.05  10.39  10.00  6.04  17.37  * TIME SLICE       min      15
* V      (m)      8.23   7.92   3.70   8.84   8.53   * RESULTS PERIOD   min     15 60
* RAD    (m)     16.15  17.68  30.00  29.87  45.11  * TIME COST        $/hr   15.00
* PHI    (d)     41.00  30.00  30.00  31.20  26.10  * FLOW PERIOD      min     15 60
* DIA    (m)     55.00  55.00  55.00  55.00  55.00  * FLOW TYPE        pcu/veh  VEH
* GRAD SEP      0      0      0      0      0      * FLOW PEAK        am/op/pm  OP
*
*****
* LEG NAME *PCU *FLOWS (1st exit 2nd etc...U) *FLOF*CL* FLOW RATIO *FLOW TIME*
*          *   *
* BERRY   *1.10*  10   30   215   0   0   *1.00*50*0.75  1.125  0.75*15 30 45
* BEARD   *1.10*  15  150   0   10   0   *1.00*50*0.75  1.125  0.75*15 30 45
* ON RAMP *1.10*   0    0    0    0   0   *1.00*50*0.75  1.125  0.75*15 30 45
* SPUR    *1.10*   0  175  115  345  0   *1.00*50*0.75  1.125  0.75*15 30 45
* OFF RAMP*1.10* 125   85   0 1005  0   *1.00*50*0.75  1.125  0.75*15 30 45
*
*          *   *
*          *   *
*****
*
* FLOW      veh      255   175   0   635   1215
* CAPACITY  veh      585   532   172  1905  1482
* AVE DELAY mins    0.17  0.16  0.00  0.04  0.28
* MAX DELAY mins    0.29  0.26  0.00  0.05  0.50
* AVE QUEUE  veh      1     1     0     1     8
* MAX QUEUE  veh      1     1     0     1    11
*
*****

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*****
*
* 13:12:06                MIDDLE ROUNDABOUT AM                5
*
*****
*
* E      (m)      9.42      9.54      9.08      9.00      * TIME PERIOD      min      60
* L'     (m)     11.55     14.66     11.77     11.00      * TIME SLICE      min      15
* V      (m)      8.53      8.53      8.22      8.22      * RESULTS PERIOD  min      0 60
* RAD    (m)     29.87     29.87     29.87     29.87      * TIME COST      $/hr    15.00
* PHI    (d)     31.20     31.50     31.50     30.00      * FLOW PERIOD    min      0 60
* DIA    (m)     54.86     54.86     54.86     54.86      * FLOW TYPE      pcu/veh    VEH
* GRAD SEP      0         0         0         0         * FLOW PEAK      am/op/pm    PM
*
*****
* LEG NAME *PCU *FLOWS (1st exit 2nd etc...U) *FLOF*CL* FLOW RATIO *FLOW TIME*
*          *   *
* SB SPUR *1.05* 0 695 240 0 *1.00*50*0.75 1.125 0.75*15 30 45
* OFF RAMP *1.05* 485 0 65 0 *1.00*50*0.75 1.125 0.75*15 30 45
* NB SPUR *1.05* 985 415 0 0 *1.00*50*0.75 1.125 0.75*15 30 45
* ON RAMP *1.05* 0 0 0 0 *1.00*50*0.75 1.125 0.75*15 30 45
*          *   *
*          *   *
*          *   *
*          *   *
*****
*
* FLOW      veh      935      550      1400      0
* CAPACITY  veh      2700     1982     2365     2224
* AVE DELAY mins     0.03     0.04     0.06     0.00
* MAX DELAY mins     0.05     0.07     0.11     0.00
* AVE QUEUE  veh      1         0         2         0
* MAX QUEUE  veh      1         1         2         0
*
*****

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*****
*
* 13:12:06                MIDDLE ROUNDABOUT PM                5
*
*****
*
* E      (m)      9.42      9.54      9.08      9.00      * TIME PERIOD      min      60
* L'     (m)     11.55     14.66     11.77     11.00     * TIME SLICE       min      15
* V      (m)      8.53      8.53      8.22      8.22      * RESULTS PERIOD   min      0 60
* RAD    (m)     29.87     29.87     29.87     29.87     * TIME COST        $/hr    15.00
* PHI    (d)     31.20     31.50     31.50     30.00     * FLOW PERIOD      min      0 60
* DIA    (m)     54.86     54.86     54.86     54.86     * FLOW TYPE        pcu/veh    VEH
* GRAD SEP      0         0         0         0         * FLOW PEAK        am/op/pm    PM
*
*****
* LEG NAME *PCU *FLOWS (1st exit 2nd etc...U) *FLOF*CL* FLOW RATIO *FLOW TIME*
*          *   *
* SB SPUR *1.05*  0 1195  160  0      *1.00*50*0.75 1.125 0.75*15 30 45
* OFF RAMP *1.05* 425   0   90  0      *1.00*50*0.75 1.125 0.75*15 30 45
* NB SPUR *1.05* 725  545   0  0      *1.00*50*0.75 1.125 0.75*15 30 45
* ON RAMP *1.05*  0   0   0  0      *1.00*50*0.75 1.125 0.75*15 30 45
*          *   *
*          *   *
*          *   *
*          *   *
*****
*
* FLOW      veh      1355      515      1270      0
* CAPACITY  veh      2700      1646      2408      2104
* AVE DELAY mins     0.04      0.05      0.05      0.00
* MAX DELAY mins     0.07      0.09      0.09      0.00
* AVE QUEUE  veh       1         0         1         0
* MAX QUEUE  veh       1         1         2         0
*
*****

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*****
*
* 13:12:06                SOUTH ROUNDABOUT AM                12
*
*****
*
* E      (m)      9.35   5.50   8.87   9.08      * TIME PERIOD      min      60
* L'     (m)     17.01   8.23   7.96  10.08     * TIME SLICE       min      15
* V      (m)      8.23   5.50   8.23   8.44     * RESULTS PERIOD   min      0 60
* RAD    (m)     28.70  44.80  31.70  26.82     * TIME COST        $/hr    15.00
* PHI    (d)     30.70  30.40  30.70  34.80     * FLOW PERIOD      min      0 60
* DIA    (m)     55.00  55.00  55.00  55.00     * FLOW TYPE        pcu/veh   VEH
* GRAD SEP      0      0      0      0         * FLOW PEAK        am/op/pm   PM
*
*****
* LEG NAME *PCU *FLOWS (1st exit 2nd etc...U)*FLOF*CL* FLOW RATIO *FLOW TIME*
*          *   *
* SB SPUR *1.05*  80  775  325  0      *1.00*50*0.75 1.125 0.75* 0 30 45
* NORTHSTAR*1.05*  40  10  80  0      *1.00*50*0.75 1.125 0.75* 0 30 45
* NB SPUR *1.05* 245 1060  50  0      *1.00*50*0.75 1.125 0.75* 0 30 45
* MILLER RR*1.05* 260  10  215  0     *1.00*50*0.75 1.125 0.75* 0 30 45
*
*          *   *
*          *   *
*          *   *
*****
*
* FLOW      veh      1180   130   1355   485
* CAPACITY  veh      2458   848   2243   1667
* AVE DELAY mins     0.05   0.08   0.07   0.05
* MAX DELAY mins     0.07   0.13   0.11   0.08
* AVE QUEUE  veh       1     0     2     0
* MAX QUEUE  veh       1     0     3     1
*
*
*****

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*****
*
* 13:12:06 SOUTH ROUNDABOUT PM 13
*
*****
*
* E (m) 9.35 5.50 8.87 9.08 * TIME PERIOD min 60
* L' (m) 17.01 8.23 7.96 10.08 * TIME SLICE min 15
* V (m) 8.23 5.50 8.23 8.44 * RESULTS PERIOD min 0 60
* RAD (m) 28.70 44.80 31.70 26.82 * TIME COST $/hr 15.00
* PHI (d) 30.70 30.40 30.70 34.80 * FLOW PERIOD min 0 60
* DIA (m) 55.00 55.00 55.00 55.00 * FLOW TYPE pcu/veh VEH
* GRAD SEP 0 0 0 0 * FLOW PEAK am/op/pm PM
*
*****
* LEG NAME *PCU *FLOWS (1st exit 2nd etc...U)*FLOF*CL* FLOW RATIO *FLOW TIME*
* * * * * * * * * * *
* SB SPUR *1.05* 85 1180 355 0 *1.00*50*0.75 1.125 0.75* 0 30 45
* NORTHSTAR*1.05* 60 10 90 0 *1.00*50*0.75 1.125 0.75* 0 30 45
* NB SPUR *1.05* 250 935 60 0 *1.00*50*0.75 1.125 0.75* 0 30 45
* MILLER RR*1.05* 245 10 240 0 *1.00*50*0.75 1.125 0.75* 0 30 45
* * * * * * * * * * *
* * * * * * * * * * *
* * * * * * * * * * *
*****
*
* FLOW veh 1620 160 1245 495
* CAPACITY veh 2430 576 2212 1747 * AVDEL s 4.4
* AVE DELAY mins 0.08 0.17 0.06 0.05 * L O S A
* MAX DELAY mins 0.13 0.29 0.10 0.07 * VEH HRS 4.3
* AVE QUEUE veh 2 0 1 0 * COST $ 64.2
* MAX QUEUE veh 4 1 2 1
*
*****

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*****
*
* 13:12:06 NORTH ROUNDABOUT AM 4 LEG 9
*
*****
*
* E (m) 8.23 4.30 9.21 9.21 * TIME PERIOD min 60
* L' (m) 10.39 10.00 6.04 6.61 * TIME SLICE min 15
* V (m) 7.92 3.70 8.84 8.53 * RESULTS PERIOD min 15 60
* RAD (m) 17.68 20.00 29.87 20.70 * TIME COST $/hr 15.00
* PHI (d) 30.00 30.00 31.20 37.00 * FLOW PERIOD min 15 60
* DIA (m) 55.00 55.00 55.00 55.00 * FLOW TYPE pcu/veh VEH
* GRAD SEP 0 0 0 0 * FLOW PEAK am/op/pm PM
*
*****
* LEG NAME *PCU *FLOWS (1st exit 2nd etc...U) *FLOF*CL* FLOW RATIO *FLOW TIME*
* * * * * * * * * * *
* SB SPUR *1.05* 50 390 0 0 *1.00*50*0.75 1.125 0.75*15 30 45
* ON RAMP *1.05* 0 0 0 0 *1.00*50*0.75 1.125 0.75*15 30 45
* NB SPUR *1.05* 0 315 165 0 *1.00*50*0.75 1.125 0.75*15 30 45
* OFF RAMP *1.05* 90 0 545 0 *1.00*50*0.75 1.125 0.75*15 30 45
* * * * * * * * * * *
* * * * * * * * * * *
* * * * * * * * * * *
*****
* FLOW veh 440 0 480 635
* CAPACITY veh 1251 436 2004 1550 * AVDEL s 2.8
* AVE DELAY mins 0.06 0.00 0.03 0.05 * L O S A
* MAX DELAY mins 0.08 0.00 0.04 0.07 * VEH HRS 1.2
* AVE QUEUE veh 1 0 0 1 * COST $ 18.0
* MAX QUEUE veh 1 0 0 1
*
*****

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*****
*
* 13:12:06 NORTH ROUNDABOUT PM 4 LEG 15
*
*****
*
* E (m) 8.23 4.30 9.21 9.21 * TIME PERIOD min 60
* L' (m) 10.39 10.00 6.04 6.61 * TIME SLICE min 15
* V (m) 7.92 3.70 8.84 8.53 * RESULTS PERIOD min 0 60
* RAD (m) 17.68 20.00 29.87 20.70 * TIME COST $/hr 15.00
* PHI (d) 30.00 30.00 31.20 37.00 * FLOW PERIOD min 0 60
* DIA (m) 55.00 55.00 55.00 55.00 * FLOW TYPE pcu/veh VEH
* GRAD SEP 0 0 0 0 * FLOW PEAK am/op/pm PM
*
*****
* LEG NAME *PCU *FLOWS (1st exit 2nd etc...U)*FLOF*CL* FLOW RATIO *FLOW TIME*
* * * * * * * * * * *
* SB SPUR *1.05* 60 350 0 0 *1.00*50*0.75 1.125 0.75*15 30 45
* ON RAMP *1.05* 0 0 0 0 *1.00*50*0.75 1.125 0.75*15 30 45
* NB SPUR *1.05* 0 290 345 0 *1.00*50*0.75 1.125 0.75*15 30 45
* OFF RAMP *1.05* 210 0 1005 0 *1.00*50*0.75 1.125 0.75*15 30 45
* * * * * * * * * * *
* * * * * * * * * * *
* * * * * * * * * * *
*****
*
* FLOW veh 410 0 635 1215
* CAPACITY veh 1377 527 2672 2070 * AVDEL s 3.5
* AVE DELAY mins 0.06 0.00 0.03 0.07 * L O S A
* MAX DELAY mins 0.11 0.00 0.04 0.13 * VEH HRS 2.2
* AVE QUEUE veh 0 0 0 2 * COST $ 32.9
* MAX QUEUE veh 1 0 0 2
*
*****

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*****
*
* 14:12:06 AM PEAK HOUR NORTH ALT 6 9
*
*****
*
* E (m) 9.21 8.23 4.30 9.36 9.36 * TIME PERIOD min 60
* L' (m) 7.86 2.68 10.00 9.33 10.97 * TIME SLICE min 15
* V (m) 7.92 8.23 3.00 8.84 8.53 * RESULTS PERIOD min 15 60
* RAD (m) 13.72 10.51 20.00 29.87 29.87 * TIME COST $/hr 15.00
* PHI (d) 43.90 37.70 30.00 31.20 30.70 * FLOW PERIOD min 15 60
* DIA (m) 55.00 55.00 55.00 55.00 55.00 * FLOW TYPE pcu/veh VEH
* GRAD SEP 0 0 0 0 0 * FLOW PEAK am/op/pm OP
*
*****
* LEG NAME *PCU *FLOWS (1st exit 2nd etc...U) *FLOF*CL* FLOW RATIO *FLOW TIME*
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* BERRY *1.10* 10 30 235 0 0 *1.00*50*0.75 1.125 0.75*15 30 45
* BEARD *1.10* 20 155 0 10 0 *1.00*50*0.75 1.125 0.75*15 30 45
* ON RAMP *1.10* 0 0 0 0 0 *1.00*50*0.75 1.125 0.75*15 30 45
* SPUR *1.10* 0 185 130 165 0 *1.00*50*0.75 1.125 0.75*15 30 45
* OFF RAMP *1.10* 55 35 0 545 0 *1.00*50*0.75 1.125 0.75*15 30 45
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* FLOW veh 275 185 0 480 635 * * * * * * * * * * * * * *
* CAPACITY veh 1067 920 345 1932 1538 * AVDEL s 2.9
* AVE DELAY mins 0.06 0.06 0.00 0.03 0.05 * L O S A
* MAX DELAY mins 0.09 0.09 0.00 0.04 0.08 * VEH HRS 1.3
* AVE QUEUE veh 0 0 0 0 1 * COST $ 18.9
* MAX QUEUE veh 0 0 0 0 1 * * * * * * * * * * * * * *
*****

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*****
*
* 14:12:06 PM PEAK HOUR NORTH ALT 6 30
*
*****
*
* E (m) 9.21 8.23 4.30 9.36 9.36 * TIME PERIOD min 60
* L' (m) 7.86 2.68 10.00 9.33 10.97 * TIME SLICE min 15
* V (m) 7.92 8.23 3.70 8.84 8.53 * RESULTS PERIOD min 15 60
* RAD (m) 13.72 10.51 30.00 29.87 29.87 * TIME COST $/hr 15.00
* PHI (d) 43.90 37.70 30.00 31.20 30.70 * FLOW PERIOD min 15 60
* DIA (m) 55.00 55.00 55.00 55.00 55.00 * FLOW TYPE pcu/veh VEH
* GRAD SEP 0 0 0 0 0 * FLOW PEAK am/op/pm OP
*
*****
* LEG NAME *PCU *FLOWS (1st exit 2nd etc...U)*FLOF*CL* FLOW RATIO *FLOW TIME*
* * * * * * * * * * * * * * * *
* BERRY *1.10* 10 30 215 0 0 *1.00*50*0.75 1.125 0.75*15 30 45
* BEARD *1.10* 15 150 0 10 0 *1.00*50*0.75 1.125 0.75*15 30 45
* ON RAMP *1.10* 0 0 0 0 0 *1.00*50*0.75 1.125 0.75*15 30 45
* SPUR *1.10* 0 175 115 345 0 *1.00*50*0.75 1.125 0.75*15 30 45
* OFF RAMP *1.10* 125 85 0 1005 0 *1.00*50*0.75 1.125 0.75*15 30 45
* * * * * * * * * * * * * * * *
* * * * * * * * * * * * * * * *
* FLOW veh 255 175 0 635 1215
* CAPACITY veh 591 500 172 1932 1415 * AVDEL s 17.3
* AVE DELAY mins 0.16 0.17 0.00 0.04 0.46 * L O S C
* MAX DELAY mins 0.27 0.28 0.00 0.05 0.87 * VEH HRS 11.0
* AVE QUEUE veh 1 1 0 0 13 * COST $ 164.4
* MAX QUEUE veh 1 1 0 1 20
* * * * * * * * * * * * * * * *
*****

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