

**TECHNICAL APPENDIX**  
**FOR THE**  
**PROPOSED BLACK HILLS CENTER**  
**RAPID CITY, SOUTH DAKOTA**

**MAY 24, 2010**

**Prepared For:**

**THF Realty**  
**2127 Innerbelt Business Center Drive**  
**Saint Louis, Missouri 63114**

**Prepared By:**

**Crawford, Bunte, Brammeier**  
**1830 Craig Park Court**  
**Suite 209**  
**St. Louis, Missouri 63146**



**CBB Job Number 5-10**

## **2010 No Build (Base) Operating Conditions**

### **Weekday PM Peak Hour Primary Study Intersections**

Lanes, Volumes, Timings  
5: Catron & 5th St

2010 No Build PM Peak  
4/26/2010



| Lane Group              | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR  | SBL   | SBT   | SBR   |
|-------------------------|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|-------|-------|
| Lane Configurations     |       |       |       |       |       |       |       |       |      |       |       |       |
| Volume (vph)            | 80    | 230   | 0     | 0     | 400   | 80    | 0     | 1     | 0    | 110   | 0     | 150   |
| Ideal Flow (vphpl)      | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800 | 1800  | 1800  | 1800  |
| Grade (%)               |       | -3%   |       |       | 2%    |       |       | 0%    |      |       | 0%    |       |
| Storage Length (ft)     | 450   |       | 450   | 400   |       | 450   | 200   |       | 0    | 200   |       | 0     |
| Storage Lanes           | 1     |       | 1     | 1     |       | 1     | 1     |       | 0    | 1     |       | 1     |
| Taper Length (ft)       | 25    |       | 25    | 25    |       | 25    | 25    |       | 25   | 25    |       | 25    |
| Lane Util. Factor       | 1.00  | 0.95  | 1.00  | 1.00  | 0.95  | 1.00  | 1.00  | 0.95  | 0.95 | 1.00  | 1.00  | 1.00  |
| Frt                     |       |       |       |       |       | 0.850 |       |       |      |       |       | 0.850 |
| Flt Protected           | 0.950 |       |       |       |       |       |       |       |      | 0.950 |       |       |
| Satd. Flow (prot)       | 1702  | 3403  | 1791  | 1747  | 3319  | 1485  | 1765  | 3353  | 0    | 1676  | 1765  | 1500  |
| Flt Permitted           | 0.358 |       |       |       |       |       |       |       |      | 0.615 |       |       |
| Satd. Flow (perm)       | 641   | 3403  | 1791  | 1747  | 3319  | 1485  | 1765  | 3353  | 0    | 1085  | 1765  | 1500  |
| Right Turn on Red       |       |       | Yes   |       |       | Yes   |       |       | Yes  |       |       | Yes   |
| Satd. Flow (RTOR)       |       |       |       |       |       | 87    |       |       |      |       |       | 439   |
| Link Speed (mph)        |       | 60    |       |       | 60    |       |       | 30    |      |       |       | 45    |
| Link Distance (ft)      |       | 2300  |       |       | 6259  |       |       | 549   |      |       |       | 650   |
| Travel Time (s)         |       | 26.1  |       |       | 71.1  |       |       | 12.5  |      |       |       | 9.8   |
| Peak Hour Factor        | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92 | 0.92  | 0.92  | 0.92  |
| Adj. Flow (vph)         | 87    | 250   | 0     | 0     | 435   | 87    | 0     | 1     | 0    | 120   | 0     | 163   |
| Shared Lane Traffic (%) |       |       |       |       |       |       |       |       |      |       |       |       |
| Lane Group Flow (vph)   | 87    | 250   | 0     | 0     | 435   | 87    | 0     | 1     | 0    | 120   | 0     | 163   |
| Turn Type               | pm+pt |       | Perm  | pm+pt |       | Perm  | pm+pt |       |      | pm+pt |       | Perm  |
| Protected Phases        | 7     | 4     |       | 3     | 8     |       | 5     | 2     |      | 1     | 6     |       |
| Permitted Phases        | 4     |       | 4     | 8     |       | 8     | 2     |       |      | 6     |       | 6     |
| Detector Phase          | 7     | 4     | 4     | 3     | 8     | 8     | 5     | 2     |      | 1     | 6     | 6     |
| Switch Phase            |       |       |       |       |       |       |       |       |      |       |       |       |
| Minimum Initial (s)     | 4.0   | 12.0  | 12.0  | 4.0   | 12.0  | 12.0  | 4.0   | 7.0   |      | 4.0   | 12.0  | 12.0  |
| Minimum Split (s)       | 10.0  | 31.3  | 31.3  | 10.0  | 30.7  | 30.7  | 10.0  | 30.0  |      | 10.0  | 30.0  | 30.0  |
| Total Split (s)         | 20.0  | 43.0  | 43.0  | 10.0  | 33.0  | 33.0  | 10.0  | 33.0  | 0.0  | 14.0  | 37.0  | 37.0  |
| Total Split (%)         | 20.0% | 43.0% | 43.0% | 10.0% | 33.0% | 33.0% | 10.0% | 33.0% | 0.0% | 14.0% | 37.0% | 37.0% |
| Maximum Green (s)       | 14.0  | 36.0  | 36.0  | 4.0   | 26.6  | 26.6  | 4.5   | 27.5  |      | 8.5   | 31.5  | 31.5  |
| Yellow Time (s)         | 4.5   | 5.8   | 5.8   | 4.5   | 5.2   | 5.2   | 4.0   | 4.0   |      | 4.0   | 4.0   | 4.0   |
| All-Red Time (s)        | 1.5   | 1.2   | 1.2   | 1.5   | 1.2   | 1.2   | 1.5   | 1.5   |      | 1.5   | 1.5   | 1.5   |
| Lost Time Adjust (s)    | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0  | 0.0   | 0.0   | 0.0   |
| Total Lost Time (s)     | 6.0   | 7.0   | 7.0   | 6.0   | 6.4   | 6.4   | 5.5   | 5.5   | 4.0  | 5.5   | 5.5   | 5.5   |
| Lead/Lag                | Lead  | Lag   | Lag   | Lead  | Lag   | Lag   | Lead  | Lag   |      | Lead  | Lag   | Lag   |
| Lead-Lag Optimize?      | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   |      | Yes   | Yes   | Yes   |
| Vehicle Extension (s)   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   |      | 3.0   | 3.0   | 3.0   |
| Recall Mode             | None  | None  | None  | None  | None  | None  | None  | None  |      | None  | None  | None  |
| Walk Time (s)           |       | 7.0   | 7.0   |       | 7.0   | 7.0   |       | 7.0   |      |       | 7.0   | 7.0   |
| Flash Dont Walk (s)     |       | 17.0  | 17.0  |       | 17.0  | 17.0  |       | 17.0  |      |       | 17.0  | 17.0  |
| Pedestrian Calls (#/hr) |       | 0     | 0     |       | 0     | 0     |       | 0     |      |       | 0     | 0     |
| Act Effect Green (s)    | 26.5  | 28.8  |       |       | 19.0  | 19.0  |       | 8.4   |      | 12.8  |       | 15.7  |
| Actuated g/C Ratio      | 0.56  | 0.61  |       |       | 0.40  | 0.40  |       | 0.18  |      | 0.27  |       | 0.33  |
| v/c Ratio               | 0.16  | 0.12  |       |       | 0.33  | 0.13  |       | 0.00  |      | 0.28  |       | 0.21  |
| Control Delay           | 7.6   | 7.2   |       |       | 17.6  | 5.8   |       | 24.0  |      | 18.6  |       | 0.6   |
| Queue Delay             | 0.0   | 0.0   |       |       | 0.0   | 0.0   |       | 0.0   |      | 0.0   |       | 0.0   |
| Total Delay             | 7.6   | 7.2   |       |       | 17.6  | 5.8   |       | 24.0  |      | 18.6  |       | 0.6   |

Lanes, Volumes, Timings  
5: Catron & 5th St

2010 No Build PM Peak

4/26/2010



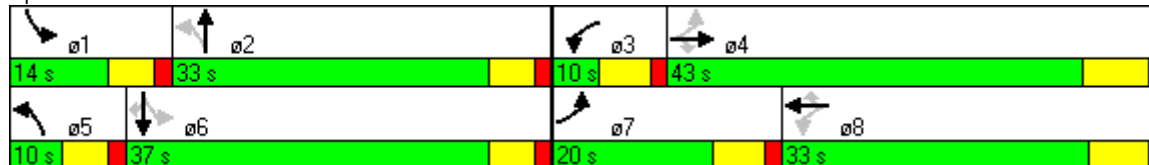
| Lane Group              | EBL  | EBT  | EBR | WBL | WBT  | WBR  | NBL | NBT  | NBR | SBL  | SBT | SBR  |
|-------------------------|------|------|-----|-----|------|------|-----|------|-----|------|-----|------|
| LOS                     | A    | A    |     |     | B    | A    |     | C    |     | B    |     | A    |
| Approach Delay          |      | 7.3  |     |     | 15.6 |      |     | 24.0 |     |      |     |      |
| Approach LOS            |      | A    |     |     | B    |      |     | C    |     |      |     |      |
| Queue Length 50th (ft)  | 11   | 18   |     |     | 57   | 0    |     | 0    |     | 28   |     | 0    |
| Queue Length 95th (ft)  | 37   | 45   |     |     | 122  | 30   |     | 2    |     | 74   |     | 0    |
| Internal Link Dist (ft) |      | 2220 |     |     | 6179 |      |     | 469  |     |      | 570 |      |
| Turn Bay Length (ft)    | 450  |      |     |     |      | 450  |     |      |     | 200  |     |      |
| Base Capacity (vph)     | 744  | 2511 |     |     | 1983 | 922  |     | 2048 |     | 473  |     | 1150 |
| Starvation Cap Reductn  | 0    | 0    |     |     | 0    | 0    |     | 0    |     | 0    |     | 0    |
| Spillback Cap Reductn   | 0    | 0    |     |     | 0    | 0    |     | 0    |     | 0    |     | 0    |
| Storage Cap Reductn     | 0    | 0    |     |     | 0    | 0    |     | 0    |     | 0    |     | 0    |
| Reduced v/c Ratio       | 0.12 | 0.10 |     |     | 0.22 | 0.09 |     | 0.00 |     | 0.25 |     | 0.14 |

Intersection Summary

Area Type: Other  
 Cycle Length: 100  
 Actuated Cycle Length: 47.4  
 Natural Cycle: 85  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.33  
 Intersection Signal Delay: 11.3  
 Intersection Capacity Utilization 44.4%  
 Analysis Period (min) 15

Intersection LOS: B  
 ICU Level of Service A

Splits and Phases: 5: Catron & 5th St



# HCM Unsignalized Intersection Capacity Analysis

## 3: Catron & Black Hills

2010 No Build PM Peak  
4/26/2010

























| Movement               | EBL  | EBT  | WBT  | WBR  | SBL  | SBR  |
|------------------------|------|------|------|------|------|------|
| Lane Configurations    |      |      |      |      |      |      |
| Volume (veh/h)         | 15   | 300  | 545  | 5    | 10   | 5    |
| Sign Control           |      | Free | Free |      | Stop |      |
| Grade                  |      | -4%  | 4%   |      | 0%   |      |
| Peak Hour Factor       | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 16   | 326  | 592  | 5    | 11   | 5    |
| Pedestrians            |      |      |      |      |      |      |
| Lane Width (ft)        |      |      |      |      |      |      |
| Walking Speed (ft/s)   |      |      |      |      |      |      |
| Percent Blockage       |      |      |      |      |      |      |
| Right turn flare (veh) |      |      |      |      |      |      |
| Median type            |      | None | None |      |      |      |
| Median storage (veh)   |      |      |      |      |      |      |
| Upstream signal (ft)   |      |      |      |      |      |      |
| pX, platoon unblocked  |      |      |      |      |      |      |
| vC, conflicting volume | 598  |      |      |      | 788  | 296  |
| vC1, stage 1 conf vol  |      |      |      |      |      |      |
| vC2, stage 2 conf vol  |      |      |      |      |      |      |
| vCu, unblocked vol     | 598  |      |      |      | 788  | 296  |
| tC, single (s)         | 4.1  |      |      |      | 6.8  | 6.9  |
| tC, 2 stage (s)        |      |      |      |      |      |      |
| tF (s)                 | 2.2  |      |      |      | 3.5  | 3.3  |
| p0 queue free %        | 98   |      |      |      | 97   | 99   |
| cM capacity (veh/h)    | 975  |      |      |      | 323  | 700  |

| Direction, Lane #      | EB 1 | EB 2 | EB 3 | WB 1 | WB 2 | WB 3 | SB 1 | SB 2 |
|------------------------|------|------|------|------|------|------|------|------|
| Volume Total           | 16   | 163  | 163  | 296  | 296  | 5    | 11   | 5    |
| Volume Left            | 16   | 0    | 0    | 0    | 0    | 0    | 11   | 0    |
| Volume Right           | 0    | 0    | 0    | 0    | 0    | 5    | 0    | 5    |
| cSH                    | 975  | 1700 | 1700 | 1700 | 1700 | 1700 | 323  | 700  |
| Volume to Capacity     | 0.02 | 0.10 | 0.10 | 0.17 | 0.17 | 0.00 | 0.03 | 0.01 |
| Queue Length 95th (ft) | 1    | 0    | 0    | 0    | 0    | 0    | 3    | 1    |
| Control Delay (s)      | 8.8  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 16.5 | 10.2 |
| Lane LOS               | A    |      |      |      |      |      | C    | B    |
| Approach Delay (s)     | 0.4  |      |      | 0.0  |      |      | 14.4 |      |
| Approach LOS           |      |      |      |      |      |      | B    |      |

| Intersection Summary              |       |     |                        |
|-----------------------------------|-------|-----|------------------------|
| Average Delay                     |       | 0.4 |                        |
| Intersection Capacity Utilization | 25.9% |     | ICU Level of Service A |
| Analysis Period (min)             |       | 15  |                        |

HCM Unsignalized Intersection Capacity Analysis  
 9: Stumer & 5th St

2010 No Build PM Peak  
 4/26/2010

|                                   |  |  |  |  |  |  |   |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement                          | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations               |  |  |  |  |  |   |  |  |   |  |  |  |
| Volume (veh/h)                    | 5   | 0   | 0   | 5   | 0   | 1   | 1   | 160   | 1   | 1   | 255   | 5   |
| Sign Control                      |   | Stop  |   |   | Stop  |   |   | Free  |   |   | Free  |   |
| Grade                             |   | 0%  |   |   | 0%  |   |   | 0%  |   |   | 0%  |   |
| Peak Hour Factor                  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  |
| Hourly flow rate (vph)            | 5   | 0   | 0   | 5   | 0   | 1   | 1   | 174   | 1   | 1   | 277   | 5   |
| Pedestrians                       |   |   |   |   |   |   |   |   |   |   |   |   |
| Lane Width (ft)                   |   |   |   |   |   |   |   |   |   |   |   |   |
| Walking Speed (ft/s)              |   |   |   |   |   |   |   |   |   |   |   |   |
| Percent Blockage                  |   |   |   |   |   |   |   |   |   |   |   |   |
| Right turn flare (veh)            |   |   | 6   |   |   |   |   |   |   |   |   |   |
| Median type                       |   |   |   |   |   |   |   | None  |   |   | None  |   |
| Median storage (veh)              |   |   |   |   |   |   |   |   |   |   |   |   |
| Upstream signal (ft)              |   |   |   |   |   |   |   | 650   |   |   |   |   |
| pX, platoon unblocked             |   |   |   |   |   |   |   |   |   |   |   |   |
| vC, conflicting volume            | 370   | 457   | 139   | 317   | 461   | 88  | 283   |   |   | 175   |   |   |
| vC1, stage 1 conf vol             |   |   |   |   |   |   |   |   |   |   |   |   |
| vC2, stage 2 conf vol             |   |   |   |   |   |   |   |   |   |   |   |   |
| vCu, unblocked vol                | 370   | 457   | 139   | 317   | 461   | 88  | 283   |   |   | 175   |   |   |
| tC, single (s)                    | 7.5   | 6.5   | 6.9   | 7.5   | 6.5   | 6.9   | 4.1   |   |   | 4.1   |   |   |
| tC, 2 stage (s)                   |   |   |   |   |   |   |   |   |   |   |   |   |
| tF (s)                            | 3.5   | 4.0   | 3.3   | 3.5   | 4.0   | 3.3   | 2.2   |   |   | 2.2   |   |   |
| p0 queue free %                   | 99  | 100   | 100   | 99  | 100   | 100   | 100   |   |   | 100   |   |   |
| cM capacity (veh/h)               | 561   | 498   | 884   | 611   | 495   | 953   | 1277  |   |   | 1399  |   |   |
| Direction, Lane #                 | EB 1  | EB 2  | WB 1  | WB 2  | NB 1  | NB 2  | NB 3  | SB 1  | SB 2  | SB 3  | SB 4  |   |
| Volume Total                      | 5   | 0   | 5   | 1   | 1   | 116   | 59  | 1   | 139   | 139   | 5   |   |
| Volume Left                       | 5   | 0   | 5   | 0   | 1   | 0   | 0   | 1   | 0   | 0   | 0   |   |
| Volume Right                      | 0   | 0   | 0   | 1   | 0   | 0   | 1   | 0   | 0   | 0   | 5   |   |
| cSH                               | 561   | 1700  | 611   | 953   | 1277  | 1700  | 1700  | 1399  | 1700  | 1700  | 1700  |   |
| Volume to Capacity                | 0.01  | 0.00  | 0.01  | 0.00  | 0.00  | 0.07  | 0.03  | 0.00  | 0.08  | 0.08  | 0.00  |   |
| Queue Length 95th (ft)            | 1   | 0   | 1   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |   |
| Control Delay (s)                 | 11.5  | 0.0   | 10.9  | 8.8   | 7.8   | 0.0   | 0.0   | 7.6   | 0.0   | 0.0   | 0.0   |   |
| Lane LOS                          | B   | A   | B   | A   | A   |   |   | A   |   |   |   |   |
| Approach Delay (s)                | 11.5  |   | 10.6  |   | 0.0   |   |   | 0.0   |   |   |   |   |
| Approach LOS                      | B   |   | B   |   |   |   |   |   |   |   |   |   |
| Intersection Summary              |   |   |   |   |   |   |   |   |   |   |   |   |
| Average Delay                     |   |   | 0.3   |   |   |   |   |   |   |   |   |   |
| Intersection Capacity Utilization |   |   | 20.0%   |   | ICU Level of Service  |   |   |   | A   |   |   |   |
| Analysis Period (min)             |   |   | 15  |   |   |   |   |   |   |   |   |   |

HCM Unsignalized Intersection Capacity Analysis  
 13: Parkview & 5th St

2010 No Build PM Peak  
 4/26/2010



| Movement               | WBL  | WBR  | NBT  | NBR  | SBL  | SBT  |
|------------------------|------|------|------|------|------|------|
| Lane Configurations    | ↰    | ↱    | ↕↔   |      | ↰    | ↕↕   |
| Volume (veh/h)         | 15   | 5    | 140  | 25   | 10   | 245  |
| Sign Control           | Stop |      | Free |      |      | Free |
| Grade                  | 0%   |      | 0%   |      |      | 0%   |
| Peak Hour Factor       | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 16   | 5    | 152  | 27   | 11   | 266  |
| Pedestrians            |      |      |      |      |      |      |
| Lane Width (ft)        |      |      |      |      |      |      |
| Walking Speed (ft/s)   |      |      |      |      |      |      |
| Percent Blockage       |      |      |      |      |      |      |
| Right turn flare (veh) |      |      |      |      |      |      |
| Median type            |      |      | None |      |      | None |
| Median storage (veh)   |      |      |      |      |      |      |
| Upstream signal (ft)   |      |      | 1234 |      |      |      |
| pX, platoon unblocked  |      |      |      |      |      |      |
| vC, conflicting volume | 321  | 90   |      |      | 179  |      |
| vC1, stage 1 conf vol  |      |      |      |      |      |      |
| vC2, stage 2 conf vol  |      |      |      |      |      |      |
| vCu, unblocked vol     | 321  | 90   |      |      | 179  |      |
| tC, single (s)         | 6.8  | 6.9  |      |      | 4.1  |      |
| tC, 2 stage (s)        |      |      |      |      |      |      |
| tF (s)                 | 3.5  | 3.3  |      |      | 2.2  |      |
| p0 queue free %        | 97   | 99   |      |      | 99   |      |
| cM capacity (veh/h)    | 643  | 950  |      |      | 1394 |      |

| Direction, Lane #      | WB 1 | WB 2 | NB 1 | NB 2 | SB 1 | SB 2 | SB 3 |
|------------------------|------|------|------|------|------|------|------|
| Volume Total           | 16   | 5    | 101  | 78   | 11   | 133  | 133  |
| Volume Left            | 16   | 0    | 0    | 0    | 11   | 0    | 0    |
| Volume Right           | 0    | 5    | 0    | 27   | 0    | 0    | 0    |
| cSH                    | 643  | 950  | 1700 | 1700 | 1394 | 1700 | 1700 |
| Volume to Capacity     | 0.03 | 0.01 | 0.06 | 0.05 | 0.01 | 0.08 | 0.08 |
| Queue Length 95th (ft) | 2    | 0    | 0    | 0    | 1    | 0    | 0    |
| Control Delay (s)      | 10.7 | 8.8  | 0.0  | 0.0  | 7.6  | 0.0  | 0.0  |
| Lane LOS               | B    | A    |      |      | A    |      |      |
| Approach Delay (s)     | 10.3 |      | 0.0  |      | 0.3  |      |      |
| Approach LOS           | B    |      |      |      |      |      |      |

| Intersection Summary              |       |     |                        |
|-----------------------------------|-------|-----|------------------------|
| Average Delay                     |       | 0.6 |                        |
| Intersection Capacity Utilization | 18.8% |     | ICU Level of Service A |
| Analysis Period (min)             | 15    |     |                        |

HCM Unsignalized Intersection Capacity Analysis  
 12: Enchanted Pines & 5th St

2010 No Build PM Peak  
 4/26/2010



| Movement               | EBL  | EBR  | NBL  | NBT  | SBT  | SBR  |
|------------------------|------|------|------|------|------|------|
| Lane Configurations    |      |      |      |      |      |      |
| Volume (veh/h)         | 45   | 10   | 5    | 140  | 245  | 70   |
| Sign Control           | Stop |      |      | Free | Free |      |
| Grade                  | 0%   |      |      | 0%   | 0%   |      |
| Peak Hour Factor       | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 49   | 11   | 5    | 152  | 266  | 76   |
| Pedestrians            |      |      |      |      |      |      |
| Lane Width (ft)        |      |      |      |      |      |      |
| Walking Speed (ft/s)   |      |      |      |      |      |      |
| Percent Blockage       |      |      |      |      |      |      |
| Right turn flare (veh) |      |      |      |      |      |      |
| Median type            |      |      |      | None | None |      |
| Median storage (veh)   |      |      |      |      |      |      |
| Upstream signal (ft)   |      |      |      |      |      |      |
| pX, platoon unblocked  |      |      |      |      |      |      |
| vC, conflicting volume | 391  | 171  | 342  |      |      |      |
| vC1, stage 1 conf vol  |      |      |      |      |      |      |
| vC2, stage 2 conf vol  |      |      |      |      |      |      |
| vCu, unblocked vol     | 391  | 171  | 342  |      |      |      |
| tC, single (s)         | 6.8  | 6.9  | 4.1  |      |      |      |
| tC, 2 stage (s)        |      |      |      |      |      |      |
| tF (s)                 | 3.5  | 3.3  | 2.2  |      |      |      |
| p0 queue free %        | 92   | 99   | 100  |      |      |      |
| cM capacity (veh/h)    | 583  | 843  | 1213 |      |      |      |







| Direction, Lane #      | EB 1 | NB 1 | NB 2 | NB 3 | SB 1 | SB 2 |
|------------------------|------|------|------|------|------|------|
| Volume Total           | 60   | 5    | 76   | 76   | 178  | 165  |
| Volume Left            | 49   | 5    | 0    | 0    | 0    | 0    |
| Volume Right           | 11   | 0    | 0    | 0    | 0    | 76   |
| cSH                    | 617  | 1213 | 1700 | 1700 | 1700 | 1700 |
| Volume to Capacity     | 0.10 | 0.00 | 0.04 | 0.04 | 0.10 | 0.10 |
| Queue Length 95th (ft) | 8    | 0    | 0    | 0    | 0    | 0    |
| Control Delay (s)      | 11.5 | 8.0  | 0.0  | 0.0  | 0.0  | 0.0  |
| Lane LOS               | B    | A    |      |      |      |      |
| Approach Delay (s)     | 11.5 | 0.3  | 0.0  |      |      |      |
| Approach LOS           | B    |      |      |      |      |      |

| Intersection Summary              |  |  |       |                      |   |  |
|-----------------------------------|--|--|-------|----------------------|---|--|
| Average Delay                     |  |  | 1.3   |                      |   |  |
| Intersection Capacity Utilization |  |  | 19.5% | ICU Level of Service | A |  |
| Analysis Period (min)             |  |  | 15    |                      |   |  |



















HCM Unsignalized Intersection Capacity Analysis  
 8: Stumer & Black Hills

2010 No Build PM Peak  
 4/26/2010

|                                   |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement                          | EBT   | EBR   | WBL   | WBT   | NBL   | NBR   |
| Lane Configurations               | ↑   | ↑   | ↑   | ↑   | ↑   | ↑   |
| Sign Control                      | Stop  |   |   | Stop  | Stop  |   |
| Volume (vph)                      | 2   | 10  | 1   | 5   | 10  | 5   |
| Peak Hour Factor                  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  |
| Hourly flow rate (vph)            | 2   | 11  | 1   | 5   | 11  | 5   |
| Direction, Lane #                 | EB 1  | EB 2  | WB 1  | WB 2  | NB 1  | NB 2  |
| Volume Total (vph)                | 2   | 11  | 1   | 5   | 11  | 5   |
| Volume Left (vph)                 | 0   | 0   | 1   | 0   | 11  | 0   |
| Volume Right (vph)                | 0   | 11  | 0   | 0   | 0   | 5   |
| Hadj (s)                          | 0.03  | -0.67   | 0.53  | 0.03  | 0.53  | -0.67   |
| Departure Headway (s)             | 4.6   | 3.9   | 5.1   | 4.6   | 5.1   | 3.9   |
| Degree Utilization, x             | 0.00  | 0.01  | 0.00  | 0.01  | 0.02  | 0.01  |
| Capacity (veh/h)                  | 778   | 921   | 703   | 771   | 696   | 921   |
| Control Delay (s)                 | 6.4   | 5.7   | 6.9   | 6.4   | 7.0   | 5.7   |
| Approach Delay (s)                | 5.8   |   | 6.5   |   | 6.5   |   |
| Approach LOS                      | A   |   | A   |   | A   |   |
| Intersection Summary              |   |   |   |   |   |   |
| Delay                             |   |   | 6.3   |   |   |   |
| HCM Level of Service              |   |   | A   |   |   |   |
| Intersection Capacity Utilization |   |   | 13.3%   | ICU Level of Service  | A   |   |
| Analysis Period (min)             |   |   | 15  |   |   |   |

















HCM Unsignalized Intersection Capacity Analysis  
 15: Stumer & Enchantment

2010 No Build PM Peak  
 4/26/2010

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement                          | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL  | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations               |   |  |   |   |  |   |  |  |   |   |  |   |
| Volume (veh/h)                    | 7   | 2   | 1   | 5   | 2   | 10  | 0  | 30  | 5   | 10  | 45  | 5   |
| Sign Control                      |   | Stop  |   |   | Stop  |   |  | Free  |   |   | Free  |   |
| Grade                             |   | 0%  |   |   | 0%  |   |  | 0%  |   |   | 0%  |   |
| Peak Hour Factor                  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92   | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  |
| Hourly flow rate (vph)            | 8   | 2   | 1   | 5   | 2   | 11  | 0  | 33  | 5   | 11  | 49  | 5   |
| Pedestrians                       |   |   |   |   |   |   |  |   |   |   |   |   |
| Lane Width (ft)                   |   |   |   |   |   |   |  |   |   |   |   |   |
| Walking Speed (ft/s)              |   |   |   |   |   |   |  |   |   |   |   |   |
| Percent Blockage                  |   |   |   |   |   |   |  |   |   |   |   |   |
| Right turn flare (veh)            |   |   |   |   |   |   |  |   |   |   |   |   |
| Median type                       |   |   |   |   |   |   |  | None  |   |   | None  |   |
| Median storage (veh)              |   |   |   |   |   |   |  |   |   |   |   |   |
| Upstream signal (ft)              |   |   |   |   |   |   |  |   |   |   |   |   |
| pX, platoon unblocked             |   |   |   |   |   |   |  |   |   |   |   |   |
| vC, conflicting volume            | 121   | 111   | 52  | 111   | 111   | 35  | 54   |   |   | 38  |   |   |
| vC1, stage 1 conf vol             |   |   |   |   |   |   |  |   |   |   |   |   |
| vC2, stage 2 conf vol             |   |   |   |   |   |   |  |   |   |   |   |   |
| vCu, unblocked vol                | 121   | 111   | 52  | 111   | 111   | 35  | 54   |   |   | 38  |   |   |
| tC, single (s)                    | 7.1   | 6.5   | 6.2   | 7.1   | 6.5   | 6.2   | 4.1  |   |   | 4.1   |   |   |
| tC, 2 stage (s)                   |   |   |   |   |   |   |  |   |   |   |   |   |
| tF (s)                            | 3.5   | 4.0   | 3.3   | 3.5   | 4.0   | 3.3   | 2.2  |   |   | 2.2   |   |   |
| p0 queue free %                   | 99  | 100   | 100   | 99  | 100   | 99  | 100  |   |   | 99  |   |   |
| cM capacity (veh/h)               | 839   | 773   | 1016  | 860   | 773   | 1037  | 1551   |   |   | 1572  |   |   |
| <b>Direction, Lane #</b>          | <b>EB 1</b>   | <b>WB 1</b>   | <b>NB 1</b>   | <b>SB 1</b>   |   |   |  |   |   |   |   |   |
| Volume Total                      | 11  | 18  | 38  | 65  |   |   |  |   |   |   |   |   |
| Volume Left                       | 8   | 5   | 0   | 11  |   |   |  |   |   |   |   |   |
| Volume Right                      | 1   | 11  | 5   | 5   |   |   |  |   |   |   |   |   |
| cSH                               | 840   | 942   | 1551  | 1572  |   |   |  |   |   |   |   |   |
| Volume to Capacity                | 0.01  | 0.02  | 0.00  | 0.01  |   |   |  |   |   |   |   |   |
| Queue Length 95th (ft)            | 1   | 1   | 0   | 1   |   |   |  |   |   |   |   |   |
| Control Delay (s)                 | 9.3   | 8.9   | 0.0   | 1.3   |   |   |  |   |   |   |   |   |
| Lane LOS                          | A   | A   |   | A   |   |   |  |   |   |   |   |   |
| Approach Delay (s)                | 9.3   | 8.9   | 0.0   | 1.3   |   |   |  |   |   |   |   |   |
| Approach LOS                      | A   | A   |   |   |   |   |  |   |   |   |   |   |
| <b>Intersection Summary</b>       |   |   |   |   |   |   |  |   |   |   |   |   |
| Average Delay                     |   |   | 2.6   |   |   |   |  |   |   |   |   |   |
| Intersection Capacity Utilization |   |   | 20.1%   |   | ICU Level of Service  |   |  |   | A   |   |   |   |
| Analysis Period (min)             |   |   | 15  |   |   |   |  |   |   |   |   |   |

HCM Unsignalized Intersection Capacity Analysis  
 16: Enchanted Pines & Enchantment

2010 No Build PM Peak  
 4/26/2010

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement                          | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL  | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations               |   |  |   |   |  |   |  |  |   |   |  |   |
| Volume (veh/h)                    | 0   | 10  | 0   | 60  | 10  | 0   | 0  | 0   | 45  | 1   | 0   | 0   |
| Sign Control                      |   | Free  |   |   | Free  |   |  | Stop  |   |   | Stop  |   |
| Grade                             |   | 0%  |   |   | 0%  |   |  | 0%  |   |   | 0%  |   |
| Peak Hour Factor                  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92   | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  |
| Hourly flow rate (vph)            | 0   | 11  | 0   | 65  | 11  | 0   | 0  | 0   | 49  | 1   | 0   | 0   |
| Pedestrians                       |   |   |   |   |   |   |  |   |   |   |   |   |
| Lane Width (ft)                   |   |   |   |   |   |   |  |   |   |   |   |   |
| Walking Speed (ft/s)              |   |   |   |   |   |   |  |   |   |   |   |   |
| Percent Blockage                  |   |   |   |   |   |   |  |   |   |   |   |   |
| Right turn flare (veh)            |   |   |   |   |   |   |  |   |   |   |   |   |
| Median type                       |   | None  |   |   | None  |   |  |   |   |   |   |   |
| Median storage (veh)              |   |   |   |   |   |   |  |   |   |   |   |   |
| Upstream signal (ft)              |   |   |   |   |   |   |  |   |   |   |   |   |
| pX, platoon unblocked             |   |   |   |   |   |   |  |   |   |   |   |   |
| vC, conflicting volume            | 11  |   |   | 11  |   |   | 152  | 152   | 11  | 201   | 152   | 11  |
| vC1, stage 1 conf vol             |   |   |   |   |   |   |  |   |   |   |   |   |
| vC2, stage 2 conf vol             |   |   |   |   |   |   |  |   |   |   |   |   |
| vCu, unblocked vol                | 11  |   |   | 11  |   |   | 152  | 152   | 11  | 201   | 152   | 11  |
| tC, single (s)                    | 4.1   |   |   | 4.1   |   |   | 7.1  | 6.5   | 6.2   | 7.1   | 6.5   | 6.2   |
| tC, 2 stage (s)                   |   |   |   |   |   |   |  |   |   |   |   |   |
| tF (s)                            | 2.2   |   |   | 2.2   |   |   | 3.5  | 4.0   | 3.3   | 3.5   | 4.0   | 3.3   |
| p0 queue free %                   | 100   |   |   | 96  |   |   | 100  | 100   | 95  | 100   | 100   | 100   |
| cM capacity (veh/h)               | 1608  |   |   | 1608  |   |   | 790  | 710   | 1070  | 700   | 710   | 1070  |
| <b>Direction, Lane #</b>          | <b>EB 1</b>   | <b>WB 1</b>   | <b>NB 1</b>   | <b>SB 1</b>   |   |   |  |   |   |   |   |   |
| Volume Total                      | 11  | 76  | 49  | 1   |   |   |  |   |   |   |   |   |
| Volume Left                       | 0   | 65  | 0   | 1   |   |   |  |   |   |   |   |   |
| Volume Right                      | 0   | 0   | 49  | 0   |   |   |  |   |   |   |   |   |
| cSH                               | 1608  | 1608  | 1070  | 700   |   |   |  |   |   |   |   |   |
| Volume to Capacity                | 0.00  | 0.04  | 0.05  | 0.00  |   |   |  |   |   |   |   |   |
| Queue Length 95th (ft)            | 0   | 3   | 4   | 0   |   |   |  |   |   |   |   |   |
| Control Delay (s)                 | 0.0   | 6.3   | 8.5   | 10.1  |   |   |  |   |   |   |   |   |
| Lane LOS                          |   | A   | A   | B   |   |   |  |   |   |   |   |   |
| Approach Delay (s)                | 0.0   | 6.3   | 8.5   | 10.1  |   |   |  |   |   |   |   |   |
| Approach LOS                      |   |   | A   | B   |   |   |  |   |   |   |   |   |
| <b>Intersection Summary</b>       |   |   |   |   |   |   |  |   |   |   |   |   |
| Average Delay                     |   |   | 6.6   |   |   |   |  |   |   |   |   |   |
| Intersection Capacity Utilization |   |   | 20.7%   |   | ICU Level of Service  |   |  |   | A   |   |   |   |
| Analysis Period (min)             |   |   | 15  |   |   |   |  |   |   |   |   |   |

## **2010 No Build (Base) Operating Conditions**

### **Weekday PM Peak Hour Perimeter Study Intersections**

Lanes, Volumes, Timings  
20: Minnesota & 5th St

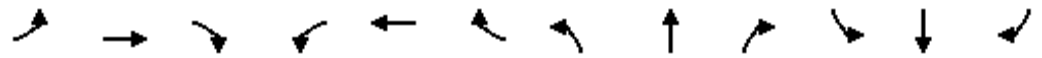
2010 No Build PM Peak  
Black Hills TIS



| Lane Group              | EBL   | EBT   | EBR  | WBL   | WBT   | WBR  | NBL   | NBT   | NBR   | SBL   | SBT   | SBR  |
|-------------------------|-------|-------|------|-------|-------|------|-------|-------|-------|-------|-------|------|
| Lane Configurations     | ↖     | ↗     |      | ↖     | ↗     |      | ↖     | ↕     | ↗     | ↖     | ↗     |      |
| Volume (vph)            | 35    | 20    | 20   | 45    | 20    | 125  | 15    | 175   | 35    | 170   | 305   | 50   |
| Ideal Flow (vphpl)      | 1800  | 1800  | 1800 | 1800  | 1800  | 1800 | 1800  | 1800  | 1800  | 1800  | 1800  | 1800 |
| Storage Length (ft)     | 100   |       | 0    | 150   |       | 0    | 300   |       | 300   | 125   |       | 0    |
| Storage Lanes           | 1     |       | 0    | 1     |       | 0    | 1     |       | 1     | 1     |       | 0    |
| Taper Length (ft)       | 25    |       | 25   | 25    |       | 25   | 25    |       | 25    | 25    |       | 25   |
| Lane Util. Factor       | 1.00  | 1.00  | 1.00 | 1.00  | 1.00  | 1.00 | 1.00  | 0.95  | 1.00  | 1.00  | 0.95  | 0.95 |
| Frt                     |       | 0.925 |      |       | 0.871 |      |       |       | 0.850 |       | 0.979 |      |
| Flt Protected           | 0.950 |       |      | 0.950 |       |      | 0.950 |       |       | 0.950 |       |      |
| Satd. Flow (prot)       | 1676  | 1632  | 0    | 1676  | 1537  | 0    | 1676  | 3353  | 1500  | 1676  | 3283  | 0    |
| Flt Permitted           | 0.657 |       |      | 0.524 |       |      | 0.523 |       |       | 0.478 |       |      |
| Satd. Flow (perm)       | 1159  | 1632  | 0    | 925   | 1537  | 0    | 923   | 3353  | 1500  | 844   | 3283  | 0    |
| Right Turn on Red       |       |       | Yes  |       |       | Yes  |       |       | Yes   |       |       | Yes  |
| Satd. Flow (RTOR)       |       | 22    |      |       | 136   |      |       |       | 38    |       |       | 21   |
| Link Speed (mph)        |       | 35    |      |       | 35    |      |       | 45    |       |       |       | 45   |
| Link Distance (ft)      |       | 1080  |      |       | 1107  |      |       | 2181  |       |       |       | 552  |
| Travel Time (s)         |       | 21.0  |      |       | 21.6  |      |       | 33.0  |       |       |       | 8.4  |
| Peak Hour Factor        | 0.92  | 0.92  | 0.92 | 0.92  | 0.92  | 0.92 | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92 |
| Adj. Flow (vph)         | 38    | 22    | 22   | 49    | 22    | 136  | 16    | 190   | 38    | 185   | 332   | 54   |
| Shared Lane Traffic (%) |       |       |      |       |       |      |       |       |       |       |       |      |
| Lane Group Flow (vph)   | 38    | 44    | 0    | 49    | 158   | 0    | 16    | 190   | 38    | 185   | 386   | 0    |
| Turn Type               | pm+pt |       |      | pm+pt |       |      | pm+pt |       | Perm  | pm+pt |       |      |
| Protected Phases        | 7     | 4     |      | 3     | 8     |      | 5     | 2     |       | 1     | 6     |      |
| Permitted Phases        | 4     |       |      | 8     |       |      | 2     |       | 2     | 6     |       |      |
| Detector Phase          | 7     | 4     |      | 3     | 8     |      | 5     | 2     | 2     | 1     | 6     |      |
| Switch Phase            |       |       |      |       |       |      |       |       |       |       |       |      |
| Minimum Initial (s)     | 4.0   | 12.0  |      | 4.0   | 12.0  |      | 4.0   | 12.0  | 12.0  | 4.0   | 12.0  |      |
| Minimum Split (s)       | 10.0  | 30.0  |      | 10.0  | 30.0  |      | 10.0  | 30.0  | 30.0  | 10.0  | 30.0  |      |
| Total Split (s)         | 12.0  | 33.0  | 0.0  | 12.0  | 33.0  | 0.0  | 11.0  | 35.0  | 35.0  | 20.0  | 44.0  | 0.0  |
| Total Split (%)         | 12.0% | 33.0% | 0.0% | 12.0% | 33.0% | 0.0% | 11.0% | 35.0% | 35.0% | 20.0% | 44.0% | 0.0% |
| Maximum Green (s)       | 6.0   | 27.0  |      | 6.0   | 27.0  |      | 5.0   | 29.0  | 29.0  | 14.0  | 38.0  |      |
| Yellow Time (s)         | 4.5   | 4.5   |      | 4.5   | 4.5   |      | 4.5   | 4.5   | 4.5   | 4.5   | 4.5   |      |
| All-Red Time (s)        | 1.5   | 1.5   |      | 1.5   | 1.5   |      | 1.5   | 1.5   | 1.5   | 1.5   | 1.5   |      |
| Lost Time Adjust (s)    | 0.0   | 0.0   | 0.0  | 0.0   | 0.0   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0  |
| Total Lost Time (s)     | 6.0   | 6.0   | 4.0  | 6.0   | 6.0   | 4.0  | 6.0   | 6.0   | 6.0   | 6.0   | 6.0   | 4.0  |
| Lead/Lag                | Lead  | Lag   |      | Lead  | Lag   |      | Lead  | Lag   | Lag   | Lead  | Lag   |      |
| Lead-Lag Optimize?      | Yes   | Yes   |      | Yes   | Yes   |      | Yes   | Yes   | Yes   | Yes   | Yes   |      |
| Vehicle Extension (s)   | 3.0   | 3.0   |      | 3.0   | 3.0   |      | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   |      |
| Recall Mode             | None  | None  |      | None  | None  |      | None  | None  | None  | None  | None  |      |
| Walk Time (s)           |       | 7.0   |      |       | 7.0   |      |       | 7.0   | 7.0   |       | 7.0   |      |
| Flash Dont Walk (s)     |       | 17.0  |      |       | 17.0  |      |       | 17.0  | 17.0  |       | 17.0  |      |
| Pedestrian Calls (#/hr) |       | 0     |      |       | 0     |      |       | 0     | 0     |       | 0     |      |
| Act Effect Green (s)    | 11.4  | 13.0  |      | 12.7  | 13.0  |      | 18.4  | 13.0  | 13.0  | 29.3  | 29.6  |      |
| Actuated g/C Ratio      | 0.22  | 0.25  |      | 0.24  | 0.25  |      | 0.35  | 0.25  | 0.25  | 0.55  | 0.56  |      |
| v/c Ratio               | 0.12  | 0.11  |      | 0.15  | 0.33  |      | 0.04  | 0.23  | 0.10  | 0.30  | 0.21  |      |
| Control Delay           | 16.4  | 15.1  |      | 15.8  | 9.2   |      | 10.9  | 21.4  | 9.7   | 10.8  | 11.0  |      |
| Queue Delay             | 0.0   | 0.0   |      | 0.0   | 0.0   |      | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |      |
| Total Delay             | 16.4  | 15.1  |      | 15.8  | 9.2   |      | 10.9  | 21.4  | 9.7   | 10.8  | 11.0  |      |
| LOS                     | B     | B     |      | B     | A     |      | B     | C     | A     | B     | B     |      |

Lanes, Volumes, Timings  
20: Minnesota & 5th St

2010 No Build PM Peak  
Black Hills TIS

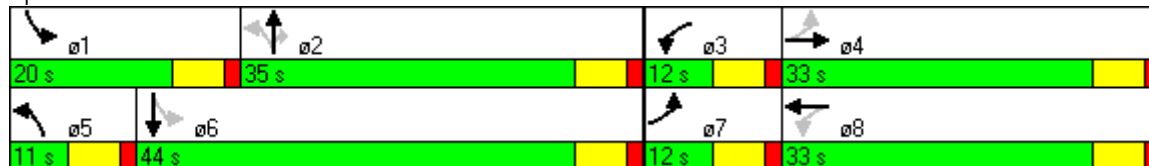


| Lane Group              | EBL  | EBT  | EBR | WBL  | WBT  | WBR | NBL  | NBT  | NBR  | SBL  | SBT | SBR  |
|-------------------------|------|------|-----|------|------|-----|------|------|------|------|-----|------|
| Approach Delay          |      | 15.7 |     |      | 10.7 |     |      | 18.9 |      |      |     | 10.9 |
| Approach LOS            |      | B    |     |      | B    |     |      | B    |      |      |     | B    |
| Queue Length 50th (ft)  | 11   | 5    |     | 12   | 5    |     | 2    | 24   | 0    | 26   |     | 26   |
| Queue Length 95th (ft)  | 28   | 32   |     | 33   | 53   |     | 13   | 63   | 22   | 80   |     | 97   |
| Internal Link Dist (ft) |      | 1000 |     |      | 1027 |     |      | 2101 |      |      |     | 472  |
| Turn Bay Length (ft)    | 100  |      |     | 150  |      |     | 300  |      | 300  | 125  |     |      |
| Base Capacity (vph)     | 318  | 911  |     | 334  | 909  |     | 398  | 1988 | 905  | 706  |     | 2400 |
| Starvation Cap Reductn  | 0    | 0    |     | 0    | 0    |     | 0    | 0    | 0    | 0    |     | 0    |
| Spillback Cap Reductn   | 0    | 0    |     | 0    | 0    |     | 0    | 0    | 0    | 0    |     | 0    |
| Storage Cap Reductn     | 0    | 0    |     | 0    | 0    |     | 0    | 0    | 0    | 0    |     | 0    |
| Reduced v/c Ratio       | 0.12 | 0.05 |     | 0.15 | 0.17 |     | 0.04 | 0.10 | 0.04 | 0.26 |     | 0.16 |

Intersection Summary

























|                                    |                        |
|------------------------------------|------------------------|
| Area Type:                         | Other                  |
| Cycle Length:                      | 100                    |
| Actuated Cycle Length:             | 52.9                   |
| Natural Cycle:                     | 80                     |
| Control Type:                      | Actuated-Uncoordinated |
| Maximum v/c Ratio:                 | 0.33                   |
| Intersection Signal Delay:         | 13.0                   |
| Intersection LOS:                  | B                      |
| Intersection Capacity Utilization: | 53.3%                  |
| ICU Level of Service:              | A                      |
| Analysis Period (min):             | 15                     |

Splits and Phases: 20: Minnesota & 5th St



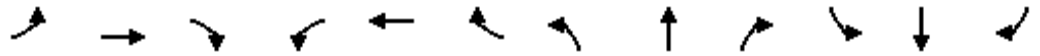
Lanes, Volumes, Timings  
33: Catron & Hwy 16

2010 No Build PM Peak  
Black Hills TIS

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Group              | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations     |  |  |  |  |  |  |  |  |  |  |  |  |
| Volume (vph)            | 105   | 125   | 70  | 195   | 315   | 25  | 90  | 205   | 115   | 60  | 265   | 265   |
| Ideal Flow (vphpl)      | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Storage Length (ft)     | 300   |   | 150   | 300   |   | 175   | 500   |   | 1000  | 500   |   | 500   |
| Storage Lanes           | 1   |   | 1   | 1   |   | 1   | 1   |   | 1   | 1   |   | 1   |
| Taper Length (ft)       | 25  |   | 25  | 25  |   | 25  | 25  |   | 25  | 25  |   | 25  |
| Lane Util. Factor       | 1.00  | 1.00  | 1.00  | 1.00  | 0.95  | 1.00  | 1.00  | 0.95  | 1.00  | 1.00  | 0.95  | 1.00  |
| Frt                     |   |   | 0.850   |   |   | 0.850   |   |   | 0.850   |   |   | 0.850   |
| Flt Protected           | 0.950   |   |   | 0.950   |   |   | 0.950   |   |   | 0.950   |   |   |
| Satd. Flow (prot)       | 1676  | 1765  | 1500  | 1676  | 3353  | 1500  | 1676  | 3353  | 1500  | 1676  | 3353  | 1500  |
| Flt Permitted           | 0.546   |   |   | 0.522   |   |   | 0.950   |   |   | 0.950   |   |   |
| Satd. Flow (perm)       | 964   | 1765  | 1500  | 921   | 3353  | 1500  | 1676  | 3353  | 1500  | 1676  | 3353  | 1500  |
| Right Turn on Red       |   |   | Yes   |   |   | Yes   |   |   | Yes   |   |   | Yes   |
| Satd. Flow (RTOR)       |   |   | 76  |   |   | 27  |   |   | 125   |   |   | 288   |
| Link Speed (mph)        |   | 45  |   |   | 60  |   |   | 55  |   |   | 55  |   |
| Link Distance (ft)      |   | 1599  |   |   | 7967  |   |   | 1608  |   |   | 7136  |   |
| Travel Time (s)         |   | 24.2  |   |   | 90.5  |   |   | 19.9  |   |   | 88.5  |   |
| Peak Hour Factor        | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  |
| Adj. Flow (vph)         | 114   | 136   | 76  | 212   | 342   | 27  | 98  | 223   | 125   | 65  | 288   | 288   |
| Shared Lane Traffic (%) |   |   |   |   |   |   |   |   |   |   |   |   |
| Lane Group Flow (vph)   | 114   | 136   | 76  | 212   | 342   | 27  | 98  | 223   | 125   | 65  | 288   | 288   |
| Turn Type               | pm+pt   |   | Perm  | pm+pt   |   | Perm  | Prot  |   | Perm  | Prot  |   | Perm  |
| Protected Phases        | 7   | 4   |   | 3   | 8   |   | 5   | 2   |   | 1   | 6   |   |
| Permitted Phases        | 4   |   | 4   | 8   |   | 8   |   |   | 2   |   |   | 6   |
| Detector Phase          | 7   | 4   | 4   | 3   | 8   | 8   | 5   | 2   | 2   | 1   | 6   | 6   |
| Switch Phase            |   |   |   |   |   |   |   |   |   |   |   |   |
| Minimum Initial (s)     | 4.0   | 12.0  | 12.0  | 4.0   | 12.0  | 12.0  | 4.0   | 12.0  | 12.0  | 4.0   | 12.0  | 12.0  |
| Minimum Split (s)       | 10.0  | 18.0  | 18.0  | 10.0  | 18.0  | 18.0  | 10.0  | 18.0  | 18.0  | 10.0  | 18.0  | 18.0  |
| Total Split (s)         | 17.0  | 23.0  | 23.0  | 22.0  | 28.0  | 28.0  | 20.0  | 37.0  | 37.0  | 18.0  | 35.0  | 35.0  |
| Total Split (%)         | 17.0%   | 23.0%   | 23.0%   | 22.0%   | 28.0%   | 28.0%   | 20.0%   | 37.0%   | 37.0%   | 18.0%   | 35.0%   | 35.0%   |
| Maximum Green (s)       | 11.0  | 17.0  | 17.0  | 16.0  | 22.0  | 22.0  | 14.0  | 31.0  | 31.0  | 12.0  | 29.0  | 29.0  |
| Yellow Time (s)         | 4.5   | 4.5   | 4.5   | 4.5   | 4.5   | 4.5   | 4.5   | 4.5   | 4.5   | 4.5   | 4.5   | 4.5   |
| All-Red Time (s)        | 1.5   | 1.5   | 1.5   | 1.5   | 1.5   | 1.5   | 1.5   | 1.5   | 1.5   | 1.5   | 1.5   | 1.5   |
| Lost Time Adjust (s)    | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Total Lost Time (s)     | 6.0   | 6.0   | 6.0   | 6.0   | 6.0   | 6.0   | 6.0   | 6.0   | 6.0   | 6.0   | 6.0   | 6.0   |
| Lead/Lag                | Lead  | Lag   | Lag   | Lead  | Lag   | Lag   | Lead  | Lag   | Lag   | Lead  | Lag   | Lag   |
| Lead-Lag Optimize?      | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   |
| Vehicle Extension (s)   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   |
| Recall Mode             | None  | Min   | Min   | None  | Min   | Min   | None  | Min   | Min   | None  | Min   | Min   |
| Act Effect Green (s)    | 21.8  | 13.3  | 13.3  | 28.6  | 19.4  | 19.4  | 9.6   | 17.6  | 17.6  | 8.3   | 13.8  | 13.8  |
| Actuated g/C Ratio      | 0.31  | 0.19  | 0.19  | 0.41  | 0.28  | 0.28  | 0.14  | 0.25  | 0.25  | 0.12  | 0.20  | 0.20  |
| v/c Ratio               | 0.29  | 0.40  | 0.22  | 0.42  | 0.37  | 0.06  | 0.42  | 0.26  | 0.26  | 0.32  | 0.43  | 0.54  |
| Control Delay           | 16.5  | 32.4  | 9.6   | 17.1  | 25.5  | 10.8  | 36.3  | 24.6  | 7.4   | 35.9  | 29.0  | 8.3   |
| Queue Delay             | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Total Delay             | 16.5  | 32.4  | 9.6   | 17.1  | 25.5  | 10.8  | 36.3  | 24.6  | 7.4   | 35.9  | 29.0  | 8.3   |
| LOS                     | B   | C   | A   | B   | C   | B   | D   | C   | A   | D   | C   | A   |
| Approach Delay          |   | 21.5  |   |   | 21.8  |   |   | 22.4  |   |   | 20.4  |   |
| Approach LOS            |   | C   |   |   | C   |   |   | C   |   |   | C   |   |
| Queue Length 50th (ft)  | 28  | 52  | 0   | 56  | 66  | 0   | 38  | 43  | 0   | 26  | 58  | 0   |

Lanes, Volumes, Timings  
 33: Catron & Hwy 16

2010 No Build PM Peak  
 Black Hills TIS

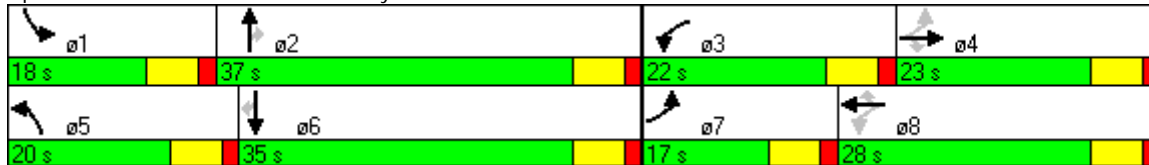


| Lane Group              | EBL  | EBT  | EBR  | WBL  | WBT  | WBR  | NBL  | NBT  | NBR  | SBL  | SBT  | SBR  |
|-------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Queue Length 95th (ft)  | 70   | 122  | 36   | 125  | 125  | 21   | 97   | 86   | 43   | 72   | 112  | 65   |
| Internal Link Dist (ft) |      | 1519 |      |      | 7887 |      |      | 1528 |      |      | 7056 |      |
| Turn Bay Length (ft)    | 300  |      | 150  | 300  |      | 175  | 500  |      | 1000 | 500  |      | 500  |
| Base Capacity (vph)     | 460  | 449  | 438  | 587  | 1144 | 530  | 351  | 1555 | 763  | 301  | 1454 | 814  |
| Starvation Cap Reductn  | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Spillback Cap Reductn   | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Storage Cap Reductn     | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Reduced v/c Ratio       | 0.25 | 0.30 | 0.17 | 0.36 | 0.30 | 0.05 | 0.28 | 0.14 | 0.16 | 0.22 | 0.20 | 0.35 |

Intersection Summary

|                                    |                        |
|------------------------------------|------------------------|
| Area Type:                         | Other                  |
| Cycle Length:                      | 100                    |
| Actuated Cycle Length:             | 69.4                   |
| Natural Cycle:                     | 60                     |
| Control Type:                      | Actuated-Uncoordinated |
| Maximum v/c Ratio:                 | 0.54                   |
| Intersection Signal Delay:         | 21.4                   |
| Intersection LOS:                  | C                      |
| Intersection Capacity Utilization: | 56.7%                  |
| ICU Level of Service:              | B                      |
| Analysis Period (min):             | 15                     |





















Splits and Phases: 33: Catron & Hwy 16





Lanes, Volumes, Timings  
36: Catron & Cambell

2010 No Build PM Peak  
Black Hills TIS

|                         |  |  |  |  |  |  |   |  |  |  |  |  |
|-------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Group              | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations     |  |  |   |  |  |   |  |   |  |  |   |  |
| Volume (vph)            | 125   | 200   | 75  | 65  | 245   | 170   | 40  | 0   | 50  | 135   | 0   | 245   |
| Ideal Flow (vphpl)      | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Storage Length (ft)     | 500   |   | 0   | 325   |   | 0   | 250   |   | 0   | 200   |   | 0   |
| Storage Lanes           | 2   |   | 0   | 2   |   | 0   | 1   |   | 1   | 1   |   | 1   |
| Taper Length (ft)       | 25  |   | 25  | 25  |   | 25  | 25  |   | 25  | 25  |   | 25  |
| Lane Util. Factor       | 0.97  | 0.95  | 0.95  | 0.97  | 0.95  | 0.95  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Frt                     |   | 0.959   |   |   | 0.938   |   |   |   | 0.850   |   |   | 0.850   |
| Flt Protected           | 0.950   |   |   | 0.950   |   |   | 0.950   |   |   | 0.950   |   |   |
| Satd. Flow (prot)       | 3252  | 3215  | 0   | 3252  | 3145  | 0   | 1676  | 0   | 1500  | 1676  | 0   | 1500  |
| Flt Permitted           | 0.950   |   |   | 0.950   |   |   | 0.950   |   |   | 0.950   |   |   |
| Satd. Flow (perm)       | 3252  | 3215  | 0   | 3252  | 3145  | 0   | 1676  | 0   | 1500  | 1676  | 0   | 1500  |
| Right Turn on Red       |   |   | Yes   |   |   | Yes   |   |   | Yes   |   |   | Yes   |
| Satd. Flow (RTOR)       |   | 59  |   |   | 180   |   |   |   | 54  |   |   | 266   |
| Link Speed (mph)        |   | 60  |   |   | 60  |   |   | 30  |   |   |   | 30  |
| Link Distance (ft)      |   | 6259  |   |   | 1790  |   |   | 1477  |   |   | 2203  |   |
| Travel Time (s)         |   | 71.1  |   |   | 20.3  |   |   | 33.6  |   |   | 50.1  |   |
| Peak Hour Factor        | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  |
| Adj. Flow (vph)         | 136   | 217   | 82  | 71  | 266   | 185   | 43  | 0   | 54  | 147   | 0   | 266   |
| Shared Lane Traffic (%) |   |   |   |   |   |   |   |   |   |   |   |   |
| Lane Group Flow (vph)   | 136   | 299   | 0   | 71  | 451   | 0   | 43  | 0   | 54  | 147   | 0   | 266   |
| Turn Type               | Prot  |   |   | Prot  |   |   | custom  |   | custom  | custom  |   | custom  |
| Protected Phases        | 7   | 4   |   | 3   | 8   |   |   |   |   |   |   |   |
| Permitted Phases        |   |   |   |   |   |   | 2   |   | 2   | 6   |   | 6   |
| Detector Phase          | 7   | 4   |   | 3   | 8   |   | 2   |   | 2   | 6   |   | 6   |
| Switch Phase            |   |   |   |   |   |   |   |   |   |   |   |   |
| Minimum Initial (s)     | 7.0   | 12.0  |   | 7.0   | 12.0  |   | 7.0   |   | 7.0   | 7.0   |   | 7.0   |
| Minimum Split (s)       | 13.0  | 18.0  |   | 13.0  | 18.0  |   | 13.0  |   | 13.0  | 13.0  |   | 13.0  |
| Total Split (s)         | 20.0  | 39.0  | 0.0   | 17.0  | 36.0  | 0.0   | 44.0  | 0.0   | 44.0  | 44.0  | 0.0   | 44.0  |
| Total Split (%)         | 20.0%   | 39.0%   | 0.0%  | 17.0%   | 36.0%   | 0.0%  | 44.0%   | 0.0%  | 44.0%   | 44.0%   | 0.0%  | 44.0%   |
| Maximum Green (s)       | 14.0  | 33.0  |   | 11.0  | 30.0  |   | 38.0  |   | 38.0  | 38.0  |   | 38.0  |
| Yellow Time (s)         | 4.5   | 4.5   |   | 4.5   | 4.5   |   | 4.5   |   | 4.5   | 4.5   |   | 4.5   |
| All-Red Time (s)        | 1.5   | 1.5   |   | 1.5   | 1.5   |   | 1.5   |   | 1.5   | 1.5   |   | 1.5   |
| Lost Time Adjust (s)    | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Total Lost Time (s)     | 6.0   | 6.0   | 4.0   | 6.0   | 6.0   | 4.0   | 6.0   | 4.0   | 6.0   | 6.0   | 4.0   | 6.0   |
| Lead/Lag                | Lead  | Lag   |   | Lead  | Lag   |   |   |   |   |   |   |   |
| Lead-Lag Optimize?      | Yes   | Yes   |   | Yes   | Yes   |   |   |   |   |   |   |   |
| Vehicle Extension (s)   | 3.0   | 3.0   |   | 3.0   | 3.0   |   | 3.0   |   | 3.0   | 3.0   |   | 3.0   |
| Recall Mode             | None  | Min   |   | None  | Min   |   | None  |   | None  | None  |   | None  |
| Act Effect Green (s)    | 8.0   | 16.2  |   | 7.5   | 13.0  |   | 10.1  |   | 10.1  | 10.1  |   | 10.1  |
| Actuated g/C Ratio      | 0.17  | 0.35  |   | 0.16  | 0.28  |   | 0.22  |   | 0.22  | 0.22  |   | 0.22  |
| v/c Ratio               | 0.24  | 0.26  |   | 0.13  | 0.44  |   | 0.12  |   | 0.15  | 0.40  |   | 0.50  |
| Control Delay           | 20.2  | 11.4  |   | 20.4  | 11.0  |   | 16.7  |   | 6.8   | 20.6  |   | 6.4   |
| Queue Delay             | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   |   | 0.0   | 0.0   |   | 0.0   |
| Total Delay             | 20.2  | 11.4  |   | 20.4  | 11.0  |   | 16.7  |   | 6.8   | 20.6  |   | 6.4   |
| LOS                     | C   | B   |   | C   | B   |   | B   |   | A   | C   |   | A   |
| Approach Delay          |   | 14.2  |   |   | 12.3  |   |   |   |   |   |   |   |
| Approach LOS            |   | B   |   |   | B   |   |   |   |   |   |   |   |
| Queue Length 50th (ft)  | 17  | 26  |   | 8   | 31  |   | 10  |   | 0   | 35  |   | 0   |

Lanes, Volumes, Timings  
36: Catron & Cambell

2010 No Build PM Peak  
Black Hills TIS

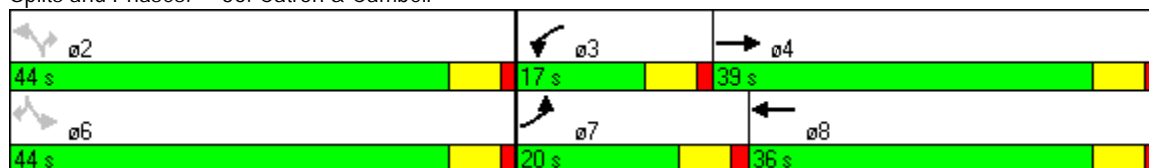


| Lane Group              | EBL  | EBT  | EBR | WBL  | WBT  | WBR | NBL  | NBT  | NBR  | SBL  | SBT  | SBR  |
|-------------------------|------|------|-----|------|------|-----|------|------|------|------|------|------|
| Queue Length 95th (ft)  | 42   | 60   |     | 26   | 75   |     | 32   |      | 22   | 83   |      | 47   |
| Internal Link Dist (ft) |      | 6179 |     |      | 1710 |     |      | 1397 |      |      | 2123 |      |
| Turn Bay Length (ft)    | 500  |      |     | 325  |      |     | 250  |      |      | 200  |      |      |
| Base Capacity (vph)     | 1031 | 2377 |     | 810  | 2195 |     | 1367 |      | 1233 | 1367 |      | 1272 |
| Starvation Cap Reductn  | 0    | 0    |     | 0    | 0    |     | 0    |      | 0    | 0    |      | 0    |
| Spillback Cap Reductn   | 0    | 0    |     | 0    | 0    |     | 0    |      | 0    | 0    |      | 0    |
| Storage Cap Reductn     | 0    | 0    |     | 0    | 0    |     | 0    |      | 0    | 0    |      | 0    |
| Reduced v/c Ratio       | 0.13 | 0.13 |     | 0.09 | 0.21 |     | 0.03 |      | 0.04 | 0.11 |      | 0.21 |

Intersection Summary

|                                   |                        |
|-----------------------------------|------------------------|
| Area Type:                        | Other                  |
| Cycle Length:                     | 100                    |
| Actuated Cycle Length:            | 46.1                   |
| Natural Cycle:                    | 45                     |
| Control Type:                     | Actuated-Uncoordinated |
| Maximum v/c Ratio:                | 0.50                   |
| Intersection Signal Delay:        | 12.5                   |
| Intersection LOS:                 | B                      |
| Intersection Capacity Utilization | 45.6%                  |
| ICU Level of Service              | A                      |
| Analysis Period (min)             | 15                     |

Splits and Phases: 36: Catron & Cambell

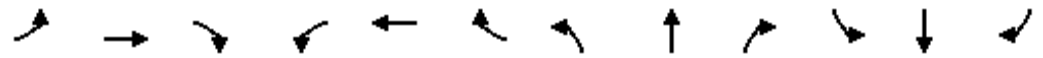


## **2010 No Build (Base) Operating Conditions**

### **Saturday Midday Peak Hour Primary Study Intersections**

Lanes, Volumes, Timings  
5: Catron & 5th St

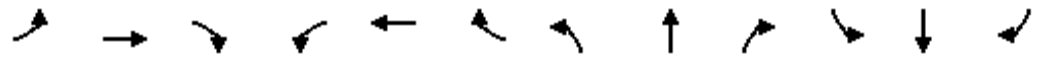
2010 No Build Saturday Peak  
Black Hills TIS



| Lane Group              | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR  | SBL   | SBT   | SBR   |
|-------------------------|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|-------|-------|
| Lane Configurations     |       |       |       |       |       |       |       |       |      |       |       |       |
| Volume (vph)            | 55    | 190   | 0     | 0     | 185   | 40    | 0     | 1     | 0    | 35    | 0     | 60    |
| Ideal Flow (vphpl)      | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800 | 1800  | 1800  | 1800  |
| Grade (%)               |       | -3%   |       |       | 2%    |       |       | 0%    |      |       |       | 0%    |
| Storage Length (ft)     | 450   |       | 450   | 400   |       | 450   | 200   |       | 0    | 200   |       | 0     |
| Storage Lanes           | 1     |       | 1     | 1     |       | 1     | 1     |       | 0    | 1     |       | 1     |
| Taper Length (ft)       | 25    |       | 25    | 25    |       | 25    | 25    |       | 25   | 25    |       | 25    |
| Lane Util. Factor       | 1.00  | 0.95  | 1.00  | 1.00  | 0.95  | 1.00  | 1.00  | 0.95  | 0.95 | 1.00  | 1.00  | 1.00  |
| Frt                     |       |       |       |       |       | 0.850 |       |       |      |       |       | 0.850 |
| Flt Protected           | 0.950 |       |       |       |       |       |       |       |      | 0.950 |       |       |
| Satd. Flow (prot)       | 1702  | 3403  | 1791  | 1747  | 3319  | 1485  | 1765  | 3353  | 0    | 1676  | 1765  | 1500  |
| Flt Permitted           | 0.386 |       |       |       |       |       |       |       |      | 0.500 |       |       |
| Satd. Flow (perm)       | 691   | 3403  | 1791  | 1747  | 3319  | 1485  | 1765  | 3353  | 0    | 882   | 1765  | 1500  |
| Right Turn on Red       |       |       | Yes   |       |       | Yes   |       |       | Yes  |       |       | Yes   |
| Satd. Flow (RTOR)       |       |       |       |       |       | 43    |       |       |      |       |       | 648   |
| Link Speed (mph)        |       | 60    |       |       | 60    |       |       | 30    |      |       |       | 45    |
| Link Distance (ft)      |       | 2300  |       |       | 6259  |       |       | 549   |      |       |       | 650   |
| Travel Time (s)         |       | 26.1  |       |       | 71.1  |       |       | 12.5  |      |       |       | 9.8   |
| Peak Hour Factor        | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92 | 0.92  | 0.92  | 0.92  |
| Adj. Flow (vph)         | 60    | 207   | 0     | 0     | 201   | 43    | 0     | 1     | 0    | 38    | 0     | 65    |
| Shared Lane Traffic (%) |       |       |       |       |       |       |       |       |      |       |       |       |
| Lane Group Flow (vph)   | 60    | 207   | 0     | 0     | 201   | 43    | 0     | 1     | 0    | 38    | 0     | 65    |
| Turn Type               | pm+pt |       | Perm  | pm+pt |       | Perm  | pm+pt |       |      | pm+pt |       | Perm  |
| Protected Phases        | 7     | 4     |       | 3     | 8     |       | 5     | 2     |      | 1     | 6     |       |
| Permitted Phases        | 4     |       | 4     | 8     |       | 8     | 2     |       |      | 6     |       | 6     |
| Detector Phase          | 7     | 4     | 4     | 3     | 8     | 8     | 5     | 2     |      | 1     | 6     | 6     |
| Switch Phase            |       |       |       |       |       |       |       |       |      |       |       |       |
| Minimum Initial (s)     | 4.0   | 12.0  | 12.0  | 4.0   | 12.0  | 12.0  | 4.0   | 7.0   |      | 4.0   | 12.0  | 12.0  |
| Minimum Split (s)       | 10.0  | 31.3  | 31.3  | 10.0  | 30.7  | 30.7  | 10.0  | 30.0  |      | 10.0  | 30.0  | 30.0  |
| Total Split (s)         | 21.0  | 45.0  | 45.0  | 10.0  | 34.0  | 34.0  | 10.0  | 33.0  | 0.0  | 12.0  | 35.0  | 35.0  |
| Total Split (%)         | 21.0% | 45.0% | 45.0% | 10.0% | 34.0% | 34.0% | 10.0% | 33.0% | 0.0% | 12.0% | 35.0% | 35.0% |
| Maximum Green (s)       | 15.0  | 38.0  | 38.0  | 4.0   | 27.6  | 27.6  | 4.5   | 27.5  |      | 6.5   | 29.5  | 29.5  |
| Yellow Time (s)         | 4.5   | 5.8   | 5.8   | 4.5   | 5.2   | 5.2   | 4.0   | 4.0   |      | 4.0   | 4.0   | 4.0   |
| All-Red Time (s)        | 1.5   | 1.2   | 1.2   | 1.5   | 1.2   | 1.2   | 1.5   | 1.5   |      | 1.5   | 1.5   | 1.5   |
| Lost Time Adjust (s)    | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0  | 0.0   | 0.0   | 0.0   |
| Total Lost Time (s)     | 6.0   | 7.0   | 7.0   | 6.0   | 6.4   | 6.4   | 5.5   | 5.5   | 4.0  | 5.5   | 5.5   | 5.5   |
| Lead/Lag                | Lead  | Lag   | Lag   | Lead  | Lag   | Lag   | Lead  | Lag   |      | Lead  | Lag   | Lag   |
| Lead-Lag Optimize?      | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   |      | Yes   | Yes   | Yes   |
| Vehicle Extension (s)   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   |      | 3.0   | 3.0   | 3.0   |
| Recall Mode             | None  | None  | None  | None  | None  | None  | None  | None  |      | None  | None  | None  |
| Walk Time (s)           |       | 7.0   | 7.0   |       | 7.0   | 7.0   |       | 7.0   |      |       | 7.0   | 7.0   |
| Flash Dont Walk (s)     |       | 17.0  | 17.0  |       | 17.0  | 17.0  |       | 17.0  |      |       | 17.0  | 17.0  |
| Pedestrian Calls (#/hr) |       | 0     | 0     |       | 0     | 0     |       | 0     |      |       | 0     | 0     |
| Act Effect Green (s)    | 19.6  | 25.9  |       |       | 18.2  | 18.2  |       | 9.8   |      | 10.0  |       | 16.5  |
| Actuated g/C Ratio      | 0.57  | 0.75  |       |       | 0.53  | 0.53  |       | 0.28  |      | 0.29  |       | 0.48  |
| v/c Ratio               | 0.09  | 0.08  |       |       | 0.11  | 0.05  |       | 0.00  |      | 0.09  |       | 0.06  |
| Control Delay           | 6.1   | 5.3   |       |       | 12.8  | 7.2   |       | 19.0  |      | 13.5  |       | 0.1   |
| Queue Delay             | 0.0   | 0.0   |       |       | 0.0   | 0.0   |       | 0.0   |      | 0.0   |       | 0.0   |
| Total Delay             | 6.1   | 5.3   |       |       | 12.8  | 7.2   |       | 19.0  |      | 13.5  |       | 0.1   |

Lanes, Volumes, Timings  
5: Catron & 5th St

2010 No Build Saturday Peak  
Black Hills TIS

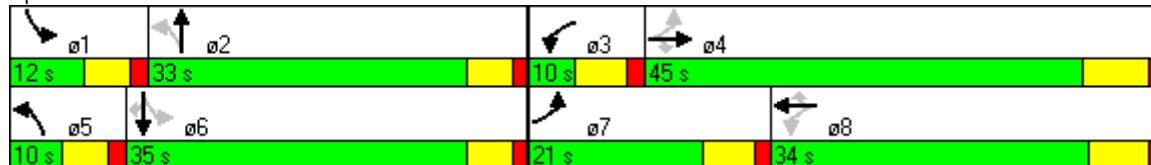


| Lane Group              | EBL  | EBT  | EBR | WBL | WBT  | WBR  | NBL | NBT  | NBR | SBL  | SBT | SBR  |
|-------------------------|------|------|-----|-----|------|------|-----|------|-----|------|-----|------|
| LOS                     | A    | A    |     |     | B    | A    |     | B    |     | B    |     | A    |
| Approach Delay          |      | 5.4  |     |     | 11.8 |      |     | 19.0 |     |      |     |      |
| Approach LOS            |      | A    |     |     | B    |      |     | B    |     |      |     |      |
| Queue Length 50th (ft)  | 0    | 0    |     |     | 10   | 0    |     | 0    |     | 5    |     | 0    |
| Queue Length 95th (ft)  | 27   | 36   |     |     | 56   | 21   |     | 2    |     | 26   |     | 0    |
| Internal Link Dist (ft) |      | 2220 |     |     | 6179 |      |     | 469  |     |      | 570 |      |
| Turn Bay Length (ft)    | 450  |      |     |     |      | 450  |     |      |     | 200  |     |      |
| Base Capacity (vph)     | 1070 | 3015 |     |     | 2606 | 1175 |     | 2628 |     | 471  |     | 1340 |
| Starvation Cap Reductn  | 0    | 0    |     |     | 0    | 0    |     | 0    |     | 0    |     | 0    |
| Spillback Cap Reductn   | 0    | 0    |     |     | 0    | 0    |     | 0    |     | 0    |     | 0    |
| Storage Cap Reductn     | 0    | 0    |     |     | 0    | 0    |     | 0    |     | 0    |     | 0    |
| Reduced v/c Ratio       | 0.06 | 0.07 |     |     | 0.08 | 0.04 |     | 0.00 |     | 0.08 |     | 0.05 |

Intersection Summary

|                                    |                        |
|------------------------------------|------------------------|
| Area Type:                         | Other                  |
| Cycle Length:                      | 100                    |
| Actuated Cycle Length:             | 34.4                   |
| Natural Cycle:                     | 85                     |
| Control Type:                      | Actuated-Uncoordinated |
| Maximum v/c Ratio:                 | 0.11                   |
| Intersection Signal Delay:         | 7.9                    |
| Intersection LOS:                  | A                      |
| Intersection Capacity Utilization: | 38.8%                  |
| ICU Level of Service:              | A                      |
| Analysis Period (min):             | 15                     |

Splits and Phases: 5: Catron & 5th St



HCM Unsignalized Intersection Capacity Analysis  
3: Catron & Black Hills

2010 No Build Saturday Peak  
Black Hills TIS



| Movement               | EBL  | EBT  | WBT  | WBR  | SBL  | SBR  |
|------------------------|------|------|------|------|------|------|
| Lane Configurations    |      |      |      |      |      |      |
| Volume (veh/h)         | 5    | 240  | 240  | 5    | 5    | 1    |
| Sign Control           |      | Free | Free |      | Stop |      |
| Grade                  |      | -4%  | 4%   |      | 0%   |      |
| Peak Hour Factor       | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 5    | 261  | 261  | 5    | 5    | 1    |
| Pedestrians            |      |      |      |      |      |      |
| Lane Width (ft)        |      |      |      |      |      |      |
| Walking Speed (ft/s)   |      |      |      |      |      |      |
| Percent Blockage       |      |      |      |      |      |      |
| Right turn flare (veh) |      |      |      |      |      |      |
| Median type            |      | None | None |      |      |      |
| Median storage (veh)   |      |      |      |      |      |      |
| Upstream signal (ft)   |      |      |      |      |      |      |
| pX, platoon unblocked  |      |      |      |      |      |      |
| vC, conflicting volume | 266  |      |      |      | 402  | 130  |
| vC1, stage 1 conf vol  |      |      |      |      |      |      |
| vC2, stage 2 conf vol  |      |      |      |      |      |      |
| vCu, unblocked vol     | 266  |      |      |      | 402  | 130  |
| tC, single (s)         | 4.1  |      |      |      | 6.8  | 6.9  |
| tC, 2 stage (s)        |      |      |      |      |      |      |
| tF (s)                 | 2.2  |      |      |      | 3.5  | 3.3  |
| p0 queue free %        | 100  |      |      |      | 99   | 100  |
| cM capacity (veh/h)    | 1295 |      |      |      | 574  | 895  |























| Direction, Lane #      | EB 1 | EB 2 | EB 3 | WB 1 | WB 2 | WB 3 | SB 1 | SB 2 |
|------------------------|------|------|------|------|------|------|------|------|
| Volume Total           | 5    | 130  | 130  | 130  | 130  | 5    | 5    | 1    |
| Volume Left            | 5    | 0    | 0    | 0    | 0    | 0    | 5    | 0    |
| Volume Right           | 0    | 0    | 0    | 0    | 0    | 5    | 0    | 1    |
| cSH                    | 1295 | 1700 | 1700 | 1700 | 1700 | 1700 | 574  | 895  |
| Volume to Capacity     | 0.00 | 0.08 | 0.08 | 0.08 | 0.08 | 0.00 | 0.01 | 0.00 |
| Queue Length 95th (ft) | 0    | 0    | 0    | 0    | 0    | 0    | 1    | 0    |
| Control Delay (s)      | 7.8  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 11.3 | 9.0  |
| Lane LOS               | A    |      |      |      |      |      | B    | A    |
| Approach Delay (s)     | 0.2  |      |      | 0.0  |      |      | 11.0 |      |
| Approach LOS           |      |      |      |      |      |      | B    |      |

| Intersection Summary              |  |       |                        |
|-----------------------------------|--|-------|------------------------|
| Average Delay                     |  | 0.2   |                        |
| Intersection Capacity Utilization |  | 17.0% | ICU Level of Service A |
| Analysis Period (min)             |  | 15    |                        |

# HCM Unsignalized Intersection Capacity Analysis

## 9: Stumer & 5th St

2010 No Build Saturday Peak  
Black Hills TIS

|                                   |  |  |  |  |  |  |   |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement                          | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations               |  |  |  |  |  |   |  |  |   |  |  |  |
| Volume (veh/h)                    | 5   | 0   | 0   | 1   | 0   | 5   | 5   | 90  | 0   | 5   | 90  | 1   |
| Sign Control                      |   | Stop  |   |   | Stop  |   |   | Free  |   |   | Free  |   |
| Grade                             |   | 0%  |   |   | 0%  |   |   | 0%  |   |   | 0%  |   |
| Peak Hour Factor                  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  |
| Hourly flow rate (vph)            | 5   | 0   | 0   | 1   | 0   | 5   | 5   | 98  | 0   | 5   | 98  | 1   |
| Pedestrians                       |   |   |   |   |   |   |   |   |   |   |   |   |
| Lane Width (ft)                   |   |   |   |   |   |   |   |   |   |   |   |   |
| Walking Speed (ft/s)              |   |   |   |   |   |   |   |   |   |   |   |   |
| Percent Blockage                  |   |   |   |   |   |   |   |   |   |   |   |   |
| Right turn flare (veh)            |   |   | 6   |   |   |   |   |   |   |   |   |   |
| Median type                       |   |   |   |   |   |   |   | None  |   |   | None  |   |
| Median storage (veh)              |   |   |   |   |   |   |   |   |   |   |   |   |
| Upstream signal (ft)              |   |   |   |   |   |   |   | 650   |   |   |   |   |
| pX, platoon unblocked             |   |   |   |   |   |   |   |   |   |   |   |   |
| vC, conflicting volume            | 174   | 217   | 49  | 168   | 218   | 49  | 99  |   |   | 98  |   |   |
| vC1, stage 1 conf vol             |   |   |   |   |   |   |   |   |   |   |   |   |
| vC2, stage 2 conf vol             |   |   |   |   |   |   |   |   |   |   |   |   |
| vCu, unblocked vol                | 174   | 217   | 49  | 168   | 218   | 49  | 99  |   |   | 98  |   |   |
| tC, single (s)                    | 7.5   | 6.5   | 6.9   | 7.5   | 6.5   | 6.9   | 4.1   |   |   | 4.1   |   |   |
| tC, 2 stage (s)                   |   |   |   |   |   |   |   |   |   |   |   |   |
| tF (s)                            | 3.5   | 4.0   | 3.3   | 3.5   | 4.0   | 3.3   | 2.2   |   |   | 2.2   |   |   |
| p0 queue free %                   | 99  | 100   | 100   | 100   | 100   | 99  | 100   |   |   | 100   |   |   |
| cM capacity (veh/h)               | 764   | 675   | 1009  | 775   | 674   | 1009  | 1492  |   |   | 1493  |   |   |
| Direction, Lane #                 | EB 1  | EB 2  | WB 1  | WB 2  | NB 1  | NB 2  | NB 3  | SB 1  | SB 2  | SB 3  | SB 4  |   |
| Volume Total                      | 5   | 0   | 1   | 5   | 5   | 65  | 33  | 5   | 49  | 49  | 1   |   |
| Volume Left                       | 5   | 0   | 1   | 0   | 5   | 0   | 0   | 5   | 0   | 0   | 0   |   |
| Volume Right                      | 0   | 0   | 0   | 5   | 0   | 0   | 0   | 0   | 0   | 0   | 1   |   |
| cSH                               | 764   | 1700  | 775   | 1009  | 1492  | 1700  | 1700  | 1493  | 1700  | 1700  | 1700  |   |
| Volume to Capacity                | 0.01  | 0.00  | 0.00  | 0.01  | 0.00  | 0.04  | 0.02  | 0.00  | 0.03  | 0.03  | 0.00  |   |
| Queue Length 95th (ft)            | 1   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |   |
| Control Delay (s)                 | 9.7   | 0.0   | 9.7   | 8.6   | 7.4   | 0.0   | 0.0   | 7.4   | 0.0   | 0.0   | 0.0   |   |
| Lane LOS                          | A   | A   | A   | A   | A   |   |   | A   |   |   |   |   |
| Approach Delay (s)                | 9.7   |   | 8.8   |   | 0.4   |   |   | 0.4   |   |   |   |   |
| Approach LOS                      | A   |   | A   |   |   |   |   |   |   |   |   |   |
| Intersection Summary              |   |   |   |   |   |   |   |   |   |   |   |   |
| Average Delay                     |   |   | 0.9   |   |   |   |   |   |   |   |   |   |
| Intersection Capacity Utilization |   |   | 20.0%   |   | ICU Level of Service  |   |   |   | A   |   |   |   |
| Analysis Period (min)             |   |   | 15  |   |   |   |   |   |   |   |   |   |

HCM Unsignalized Intersection Capacity Analysis  
 13: Parkview & 5th St

2010 No Build Saturday Peak  
 Black Hills TIS



| Movement               | WBL  | WBR  | NBT  | NBR  | SBL  | SBT  |
|------------------------|------|------|------|------|------|------|
| Lane Configurations    | ↰    | ↱    | ↕↱   |      | ↰    | ↕↕   |
| Volume (veh/h)         | 15   | 10   | 80   | 20   | 5    | 80   |
| Sign Control           | Stop |      | Free |      |      | Free |
| Grade                  | 0%   |      | 0%   |      |      | 0%   |
| Peak Hour Factor       | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 16   | 11   | 87   | 22   | 5    | 87   |
| Pedestrians            |      |      |      |      |      |      |
| Lane Width (ft)        |      |      |      |      |      |      |
| Walking Speed (ft/s)   |      |      |      |      |      |      |
| Percent Blockage       |      |      |      |      |      |      |
| Right turn flare (veh) |      |      |      |      |      |      |
| Median type            |      |      | None |      |      | None |
| Median storage (veh)   |      |      |      |      |      |      |
| Upstream signal (ft)   |      |      | 1234 |      |      |      |
| pX, platoon unblocked  |      |      |      |      |      |      |
| vC, conflicting volume | 152  | 54   |      |      | 109  |      |
| vC1, stage 1 conf vol  |      |      |      |      |      |      |
| vC2, stage 2 conf vol  |      |      |      |      |      |      |
| vCu, unblocked vol     | 152  | 54   |      |      | 109  |      |
| tC, single (s)         | 6.8  | 6.9  |      |      | 4.1  |      |
| tC, 2 stage (s)        |      |      |      |      |      |      |
| tF (s)                 | 3.5  | 3.3  |      |      | 2.2  |      |
| p0 queue free %        | 98   | 99   |      |      | 100  |      |
| cM capacity (veh/h)    | 821  | 1001 |      |      | 1480 |      |

| Direction, Lane #      | WB 1 | WB 2 | NB 1 | NB 2 | SB 1 | SB 2 | SB 3 |
|------------------------|------|------|------|------|------|------|------|
| Volume Total           | 16   | 11   | 58   | 51   | 5    | 43   | 43   |
| Volume Left            | 16   | 0    | 0    | 0    | 5    | 0    | 0    |
| Volume Right           | 0    | 11   | 0    | 22   | 0    | 0    | 0    |
| cSH                    | 821  | 1001 | 1700 | 1700 | 1480 | 1700 | 1700 |
| Volume to Capacity     | 0.02 | 0.01 | 0.03 | 0.03 | 0.00 | 0.03 | 0.03 |
| Queue Length 95th (ft) | 2    | 1    | 0    | 0    | 0    | 0    | 0    |
| Control Delay (s)      | 9.5  | 8.6  | 0.0  | 0.0  | 7.4  | 0.0  | 0.0  |
| Lane LOS               | A    | A    |      |      | A    |      |      |
| Approach Delay (s)     | 9.1  |      | 0.0  |      | 0.4  |      |      |
| Approach LOS           | A    |      |      |      |      |      |      |

| Intersection Summary              |       |     |                        |
|-----------------------------------|-------|-----|------------------------|
| Average Delay                     |       | 1.3 |                        |
| Intersection Capacity Utilization | 14.4% |     | ICU Level of Service A |
| Analysis Period (min)             |       | 15  |                        |



HCM Unsignalized Intersection Capacity Analysis  
 12: Enchanted Pines & 5th St

2010 No Build Saturday Peak  
 Black Hills TIS









| Movement               | EBL  | EBR  | NBL  | NBT  | SBT  | SBR  |
|------------------------|------|------|------|------|------|------|
| Lane Configurations    |      |      |      |      |      |      |
| Volume (veh/h)         | 30   | 5    | 5    | 85   | 80   | 30   |
| Sign Control           | Stop |      |      | Free | Free |      |
| Grade                  | 0%   |      |      | 0%   | 0%   |      |
| Peak Hour Factor       | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 33   | 5    | 5    | 92   | 87   | 33   |
| Pedestrians            |      |      |      |      |      |      |
| Lane Width (ft)        |      |      |      |      |      |      |
| Walking Speed (ft/s)   |      |      |      |      |      |      |
| Percent Blockage       |      |      |      |      |      |      |
| Right turn flare (veh) |      |      |      |      |      |      |
| Median type            |      |      |      | None | None |      |
| Median storage (veh)   |      |      |      |      |      |      |
| Upstream signal (ft)   |      |      |      |      |      |      |
| pX, platoon unblocked  |      |      |      |      |      |      |
| vC, conflicting volume | 160  | 60   | 120  |      |      |      |
| vC1, stage 1 conf vol  |      |      |      |      |      |      |
| vC2, stage 2 conf vol  |      |      |      |      |      |      |
| vCu, unblocked vol     | 160  | 60   | 120  |      |      |      |
| tC, single (s)         | 6.8  | 6.9  | 4.1  |      |      |      |
| tC, 2 stage (s)        |      |      |      |      |      |      |
| tF (s)                 | 3.5  | 3.3  | 2.2  |      |      |      |
| p0 queue free %        | 96   | 99   | 100  |      |      |      |
| cM capacity (veh/h)    | 812  | 993  | 1466 |      |      |      |

| Direction, Lane #      | EB 1 | NB 1 | NB 2 | NB 3 | SB 1 | SB 2 |
|------------------------|------|------|------|------|------|------|
| Volume Total           | 38   | 5    | 46   | 46   | 58   | 62   |
| Volume Left            | 33   | 5    | 0    | 0    | 0    | 0    |
| Volume Right           | 5    | 0    | 0    | 0    | 0    | 33   |
| cSH                    | 834  | 1466 | 1700 | 1700 | 1700 | 1700 |
| Volume to Capacity     | 0.05 | 0.00 | 0.03 | 0.03 | 0.03 | 0.04 |
| Queue Length 95th (ft) | 4    | 0    | 0    | 0    | 0    | 0    |
| Control Delay (s)      | 9.5  | 7.5  | 0.0  | 0.0  | 0.0  | 0.0  |
| Lane LOS               | A    | A    |      |      |      |      |
| Approach Delay (s)     | 9.5  | 0.4  |      |      | 0.0  |      |
| Approach LOS           | A    |      |      |      |      |      |

| Intersection Summary              |  |  |       |                      |  |   |
|-----------------------------------|--|--|-------|----------------------|--|---|
| Average Delay                     |  |  | 1.6   |                      |  |   |
| Intersection Capacity Utilization |  |  | 14.4% | ICU Level of Service |  | A |
| Analysis Period (min)             |  |  | 15    |                      |  |   |

















HCM Unsignalized Intersection Capacity Analysis  
8: Stumer & Black Hills

2010 No Build Saturday Peak  
Black Hills TIS

|                                   |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|
| Movement                          | EBT   | EBR   | WBL   | WBT   | NBL   | NBR   |
| Lane Configurations               | ↑   | ↑   | ↑   | ↑   | ↑   | ↑   |
| Sign Control                      | Stop  |   |   | Stop  | Stop  |   |
| Volume (vph)                      | 2   | 5   | 1   | 5   | 5   | 5   |
| Peak Hour Factor                  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  |
| Hourly flow rate (vph)            | 2   | 5   | 1   | 5   | 5   | 5   |
| Direction, Lane #                 | EB 1  | EB 2  | WB 1  | WB 2  | NB 1  | NB 2  |
| Volume Total (vph)                | 2   | 5   | 1   | 5   | 5   | 5   |
| Volume Left (vph)                 | 0   | 0   | 1   | 0   | 5   | 0   |
| Volume Right (vph)                | 0   | 5   | 0   | 0   | 0   | 5   |
| Hadj (s)                          | 0.03  | -0.67   | 0.53  | 0.03  | 0.53  | -0.67   |
| Departure Headway (s)             | 4.6   | 3.9   | 5.1   | 4.6   | 5.1   | 3.9   |
| Degree Utilization, x             | 0.00  | 0.01  | 0.00  | 0.01  | 0.01  | 0.01  |
| Capacity (veh/h)                  | 781   | 926   | 706   | 775   | 698   | 925   |
| Control Delay (s)                 | 6.4   | 5.7   | 6.9   | 6.4   | 6.9   | 5.7   |
| Approach Delay (s)                | 5.9   |   | 6.5   |   | 6.3   |   |
| Approach LOS                      | A   |   | A   |   | A   |   |
| Intersection Summary              |   |   |   |   |   |   |
| Delay                             |   |   | 6.2   |   |   |   |
| HCM Level of Service              |   |   | A   |   |   |   |
| Intersection Capacity Utilization |   |   | 13.3%   |   | ICU Level of Service  | A   |
| Analysis Period (min)             |   |   | 15  |   |   |   |

















HCM Unsignalized Intersection Capacity Analysis  
 15: Stumer & Enchantment

2010 No Build Saturday Peak  
 Black Hills TIS

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement                          | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL  | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations               |   |  |   |   |  |   |  |  |   |   |  |   |
| Volume (veh/h)                    | 5   | 1   | 1   | 5   | 1   | 10  | 0  | 20  | 5   | 2   | 25  | 5   |
| Sign Control                      |   | Stop  |   |   | Stop  |   |  | Free  |   |   | Free  |   |
| Grade                             |   | 0%  |   |   | 0%  |   |  | 0%  |   |   | 0%  |   |
| Peak Hour Factor                  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92   | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  |
| Hourly flow rate (vph)            | 5   | 1   | 1   | 5   | 1   | 11  | 0  | 22  | 5   | 2   | 27  | 5   |
| Pedestrians                       |   |   |   |   |   |   |  |   |   |   |   |   |
| Lane Width (ft)                   |   |   |   |   |   |   |  |   |   |   |   |   |
| Walking Speed (ft/s)              |   |   |   |   |   |   |  |   |   |   |   |   |
| Percent Blockage                  |   |   |   |   |   |   |  |   |   |   |   |   |
| Right turn flare (veh)            |   |   |   |   |   |   |  |   |   |   |   |   |
| Median type                       |   |   |   |   |   |   |  | None  |   |   | None  |   |
| Median storage (veh)              |   |   |   |   |   |   |  |   |   |   |   |   |
| Upstream signal (ft)              |   |   |   |   |   |   |  |   |   |   |   |   |
| pX, platoon unblocked             |   |   |   |   |   |   |  |   |   |   |   |   |
| vC, conflicting volume            | 70  | 61  | 30  | 60  | 61  | 24  | 33   |   |   | 27  |   |   |
| vC1, stage 1 conf vol             |   |   |   |   |   |   |  |   |   |   |   |   |
| vC2, stage 2 conf vol             |   |   |   |   |   |   |  |   |   |   |   |   |
| vCu, unblocked vol                | 70  | 61  | 30  | 60  | 61  | 24  | 33   |   |   | 27  |   |   |
| tC, single (s)                    | 7.1   | 6.5   | 6.2   | 7.1   | 6.5   | 6.2   | 4.1  |   |   | 4.1   |   |   |
| tC, 2 stage (s)                   |   |   |   |   |   |   |  |   |   |   |   |   |
| tF (s)                            | 3.5   | 4.0   | 3.3   | 3.5   | 4.0   | 3.3   | 2.2  |   |   | 2.2   |   |   |
| p0 queue free %                   | 99  | 100   | 100   | 99  | 100   | 99  | 100  |   |   | 100   |   |   |
| cM capacity (veh/h)               | 910   | 828   | 1045  | 932   | 828   | 1052  | 1579   |   |   | 1587  |   |   |
| <b>Direction, Lane #</b>          | <b>EB 1</b>   | <b>WB 1</b>   | <b>NB 1</b>   | <b>SB 1</b>   |   |   |  |   |   |   |   |   |
| Volume Total                      | 8   | 17  | 27  | 35  |   |   |  |   |   |   |   |   |
| Volume Left                       | 5   | 5   | 0   | 2   |   |   |  |   |   |   |   |   |
| Volume Right                      | 1   | 11  | 5   | 5   |   |   |  |   |   |   |   |   |
| cSH                               | 914   | 995   | 1579  | 1587  |   |   |  |   |   |   |   |   |
| Volume to Capacity                | 0.01  | 0.02  | 0.00  | 0.00  |   |   |  |   |   |   |   |   |
| Queue Length 95th (ft)            | 1   | 1   | 0   | 0   |   |   |  |   |   |   |   |   |
| Control Delay (s)                 | 9.0   | 8.7   | 0.0   | 0.5   |   |   |  |   |   |   |   |   |
| Lane LOS                          | A   | A   |   | A   |   |   |  |   |   |   |   |   |
| Approach Delay (s)                | 9.0   | 8.7   | 0.0   | 0.5   |   |   |  |   |   |   |   |   |
| Approach LOS                      | A   | A   |   |   |   |   |  |   |   |   |   |   |
| <b>Intersection Summary</b>       |   |   |   |   |   |   |  |   |   |   |   |   |
| Average Delay                     |   |   | 2.7   |   |   |   |  |   |   |   |   |   |
| Intersection Capacity Utilization |   |   | 13.5%   |   | ICU Level of Service  |   |  |   |   | A   |   |   |
| Analysis Period (min)             |   |   | 15  |   |   |   |  |   |   |   |   |   |

HCM Unsignalized Intersection Capacity Analysis  
 16: Enchanted Pines & Enchantment

2010 No Build Saturday Peak  
 Black Hills TIS

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement                          | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL  | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations               |   |  |   |   |  |   |  |  |   |   |  |   |
| Volume (veh/h)                    | 0   | 5   | 0   | 30  | 5   | 0   | 0  | 0   | 35  | 1   | 0   | 0   |
| Sign Control                      |   | Free  |   |   | Free  |   |  | Stop  |   |   | Stop  |   |
| Grade                             |   | 0%  |   |   | 0%  |   |  | 0%  |   |   | 0%  |   |
| Peak Hour Factor                  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92   | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  |
| Hourly flow rate (vph)            | 0   | 5   | 0   | 33  | 5   | 0   | 0  | 0   | 38  | 1   | 0   | 0   |
| Pedestrians                       |   |   |   |   |   |   |  |   |   |   |   |   |
| Lane Width (ft)                   |   |   |   |   |   |   |  |   |   |   |   |   |
| Walking Speed (ft/s)              |   |   |   |   |   |   |  |   |   |   |   |   |
| Percent Blockage                  |   |   |   |   |   |   |  |   |   |   |   |   |
| Right turn flare (veh)            |   |   |   |   |   |   |  |   |   |   |   |   |
| Median type                       |   | None  |   |   | None  |   |  |   |   |   |   |   |
| Median storage (veh)              |   |   |   |   |   |   |  |   |   |   |   |   |
| Upstream signal (ft)              |   |   |   |   |   |   |  |   |   |   |   |   |
| pX, platoon unblocked             |   |   |   |   |   |   |  |   |   |   |   |   |
| vC, conflicting volume            | 5   |   |   | 5   |   |   | 76   | 76  | 5   | 114   | 76  | 5   |
| vC1, stage 1 conf vol             |   |   |   |   |   |   |  |   |   |   |   |   |
| vC2, stage 2 conf vol             |   |   |   |   |   |   |  |   |   |   |   |   |
| vCu, unblocked vol                | 5   |   |   | 5   |   |   | 76   | 76  | 5   | 114   | 76  | 5   |
| tC, single (s)                    | 4.1   |   |   | 4.1   |   |   | 7.1  | 6.5   | 6.2   | 7.1   | 6.5   | 6.2   |
| tC, 2 stage (s)                   |   |   |   |   |   |   |  |   |   |   |   |   |
| tF (s)                            | 2.2   |   |   | 2.2   |   |   | 3.5  | 4.0   | 3.3   | 3.5   | 4.0   | 3.3   |
| p0 queue free %                   | 100   |   |   | 98  |   |   | 100  | 100   | 96  | 100   | 100   | 100   |
| cM capacity (veh/h)               | 1616  |   |   | 1616  |   |   | 899  | 798   | 1078  | 820   | 798   | 1078  |
| <b>Direction, Lane #</b>          | <b>EB 1</b>   | <b>WB 1</b>   | <b>NB 1</b>   | <b>SB 1</b>   |   |   |  |   |   |   |   |   |
| Volume Total                      | 5   | 38  | 38  | 1   |   |   |  |   |   |   |   |   |
| Volume Left                       | 0   | 33  | 0   | 1   |   |   |  |   |   |   |   |   |
| Volume Right                      | 0   | 0   | 38  | 0   |   |   |  |   |   |   |   |   |
| cSH                               | 1616  | 1616  | 1078  | 820   |   |   |  |   |   |   |   |   |
| Volume to Capacity                | 0.00  | 0.02  | 0.04  | 0.00  |   |   |  |   |   |   |   |   |
| Queue Length 95th (ft)            | 0   | 2   | 3   | 0   |   |   |  |   |   |   |   |   |
| Control Delay (s)                 | 0.0   | 6.3   | 8.5   | 9.4   |   |   |  |   |   |   |   |   |
| Lane LOS                          |   | A   | A   | A   |   |   |  |   |   |   |   |   |
| Approach Delay (s)                | 0.0   | 6.3   | 8.5   | 9.4   |   |   |  |   |   |   |   |   |
| Approach LOS                      |   |   | A   | A   |   |   |  |   |   |   |   |   |
| <b>Intersection Summary</b>       |   |   |   |   |   |   |  |   |   |   |   |   |
| Average Delay                     |   |   | 6.9   |   |   |   |  |   |   |   |   |   |
| Intersection Capacity Utilization |   |   | 18.7%   |   | ICU Level of Service  |   |  |   | A   |   |   |   |
| Analysis Period (min)             |   |   | 15  |   |   |   |  |   |   |   |   |   |

## **2010 Build Operating Conditions**

### **Weekday PM Peak Hour Primary Study Intersections**

Lanes, Volumes, Timings  
5: Catron & 5th St

Black Hills TIS  
2010 Build PM Peak



| Lane Group              | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR  | SBL   | SBT   | SBR   |
|-------------------------|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|-------|-------|
| Lane Configurations     | ↖↗    | ↕     | ↖     | ↖     | ↕     | ↖     | ↖     | ↕↗    |      | ↖↗    | ↕     | ↖     |
| Volume (vph)            | 195   | 290   | 1     | 1     | 475   | 330   | 1     | 1     | 1    | 385   | 1     | 260   |
| Ideal Flow (vphpl)      | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800 | 1800  | 1800  | 1800  |
| Grade (%)               |       | -3%   |       |       | 2%    |       |       | 0%    |      |       | 0%    |       |
| Storage Length (ft)     | 450   |       | 450   | 400   |       | 450   | 200   |       | 0    | 200   |       | 0     |
| Storage Lanes           | 2     |       | 1     | 1     |       | 1     | 1     |       | 0    | 2     |       | 1     |
| Taper Length (ft)       | 25    |       | 25    | 25    |       | 25    | 25    |       | 25   | 25    |       | 25    |
| Lane Util. Factor       | 0.97  | 0.95  | 1.00  | 1.00  | 0.95  | 1.00  | 1.00  | 0.95  | 0.95 | 0.97  | 1.00  | 1.00  |
| Frt                     |       |       | 0.850 |       |       | 0.850 |       | 0.925 |      |       |       | 0.850 |
| Flt Protected           | 0.950 |       |       | 0.950 |       |       | 0.950 |       |      | 0.950 |       |       |
| Satd. Flow (prot)       | 3301  | 3403  | 1523  | 1660  | 3319  | 1485  | 1676  | 3101  | 0    | 3252  | 1765  | 1500  |
| Flt Permitted           | 0.950 |       |       | 0.950 |       |       |       |       |      | 0.950 |       |       |
| Satd. Flow (perm)       | 3301  | 3403  | 1523  | 1660  | 3319  | 1485  | 1765  | 3101  | 0    | 3252  | 1765  | 1500  |
| Right Turn on Red       |       |       | Yes   |       |       | Yes   |       |       | Yes  |       |       | Yes   |
| Satd. Flow (RTOR)       |       |       | 1     |       |       | 359   |       | 316   |      |       |       | 283   |
| Link Speed (mph)        |       | 60    |       |       | 60    |       |       | 30    |      |       |       | 45    |
| Link Distance (ft)      |       | 2300  |       |       | 6259  |       |       | 549   |      |       |       | 650   |
| Travel Time (s)         |       | 26.1  |       |       | 71.1  |       |       | 12.5  |      |       |       | 9.8   |
| Peak Hour Factor        | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92 | 0.92  | 0.92  | 0.92  |
| Adj. Flow (vph)         | 212   | 315   | 1     | 1     | 516   | 359   | 1     | 1     | 1    | 418   | 1     | 283   |
| Shared Lane Traffic (%) |       |       |       |       |       |       |       |       |      |       |       |       |
| Lane Group Flow (vph)   | 212   | 315   | 1     | 1     | 516   | 359   | 1     | 2     | 0    | 418   | 1     | 283   |
| Turn Type               | Prot  |       | Perm  | Prot  |       | Perm  | pm+pt |       |      | Prot  |       | Perm  |
| Protected Phases        | 7     | 4     |       | 3     | 8     |       | 5     | 2     |      | 1     | 6     |       |
| Permitted Phases        |       |       | 4     |       |       | 8     | 2     |       |      |       |       | 6     |
| Detector Phase          | 7     | 4     | 4     | 3     | 8     | 8     | 5     | 2     |      | 1     | 6     | 6     |
| Switch Phase            |       |       |       |       |       |       |       |       |      |       |       |       |
| Minimum Initial (s)     | 4.0   | 12.0  | 12.0  | 4.0   | 12.0  | 12.0  | 4.0   | 7.0   |      | 4.0   | 12.0  | 12.0  |
| Minimum Split (s)       | 10.0  | 31.3  | 31.3  | 10.0  | 30.7  | 30.7  | 10.0  | 30.0  |      | 10.0  | 30.0  | 30.0  |
| Total Split (s)         | 18.0  | 42.0  | 42.0  | 10.0  | 34.0  | 34.0  | 10.0  | 16.0  | 0.0  | 32.0  | 38.0  | 38.0  |
| Total Split (%)         | 18.0% | 42.0% | 42.0% | 10.0% | 34.0% | 34.0% | 10.0% | 16.0% | 0.0% | 32.0% | 38.0% | 38.0% |
| Maximum Green (s)       | 12.0  | 35.0  | 35.0  | 4.0   | 27.6  | 27.6  | 4.5   | 10.5  |      | 26.5  | 32.5  | 32.5  |
| Yellow Time (s)         | 4.5   | 5.8   | 5.8   | 4.5   | 5.2   | 5.2   | 4.0   | 4.0   |      | 4.0   | 4.0   | 4.0   |
| All-Red Time (s)        | 1.5   | 1.2   | 1.2   | 1.5   | 1.2   | 1.2   | 1.5   | 1.5   |      | 1.5   | 1.5   | 1.5   |
| Lost Time Adjust (s)    | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0  | 0.0   | 0.0   | 0.0   |
| Total Lost Time (s)     | 6.0   | 7.0   | 7.0   | 6.0   | 6.4   | 6.4   | 5.5   | 5.5   | 4.0  | 5.5   | 5.5   | 5.5   |
| Lead/Lag                | Lag   | Lag   | Lag   | Lead  | Lead  | Lead  | Lead  | Lag   |      | Lead  | Lag   | Lag   |
| Lead-Lag Optimize?      | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   |      | Yes   | Yes   | Yes   |
| Vehicle Extension (s)   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   |      | 3.0   | 3.0   | 3.0   |
| Recall Mode             | None  | C-Max | C-Max | None  | C-Max | C-Max | None  | None  |      | Max   | Max   | Max   |
| Walk Time (s)           |       | 7.0   | 7.0   |       | 7.0   | 7.0   |       | 7.0   |      |       | 7.0   | 7.0   |
| Flash Dont Walk (s)     |       | 17.0  | 17.0  |       | 17.0  | 17.0  |       | 17.0  |      |       | 17.0  | 17.0  |
| Pedestrian Calls (#/hr) |       | 0     | 0     |       | 0     | 0     |       | 0     |      |       | 0     | 0     |
| Act Effect Green (s)    | 12.0  | 51.0  | 51.0  | 4.0   | 35.6  | 35.6  | 6.6   | 7.7   |      | 31.3  | 32.5  | 32.5  |
| Actuated g/C Ratio      | 0.12  | 0.51  | 0.51  | 0.04  | 0.36  | 0.36  | 0.07  | 0.08  |      | 0.31  | 0.32  | 0.32  |
| v/c Ratio               | 0.54  | 0.18  | 0.00  | 0.02  | 0.44  | 0.47  | 0.01  | 0.00  |      | 0.41  | 0.00  | 0.42  |
| Control Delay           | 44.8  | 12.3  | 11.0  | 47.0  | 26.8  | 5.2   | 30.0  | 0.0   |      | 19.8  | 13.0  | 4.5   |
| Queue Delay             | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |      | 0.0   | 0.0   | 0.0   |
| Total Delay             | 44.8  | 12.3  | 11.0  | 47.0  | 26.8  | 5.2   | 30.0  | 0.0   |      | 19.8  | 13.0  | 4.5   |

Lanes, Volumes, Timings  
5: Catron & 5th St

Black Hills TIS  
2010 Build PM Peak

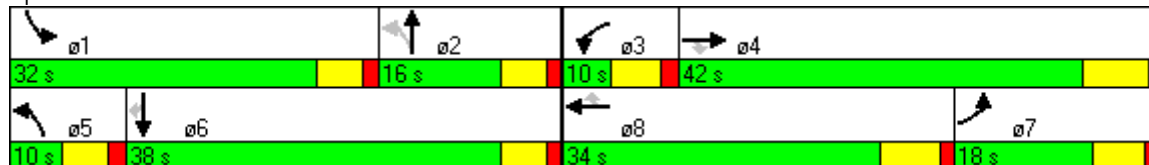


| Lane Group              | EBL  | EBT  | EBR  | WBL  | WBT  | WBR  | NBL  | NBT  | NBR | SBL  | SBT  | SBR  |
|-------------------------|------|------|------|------|------|------|------|------|-----|------|------|------|
| LOS                     | D    | B    | B    | D    | C    | A    | C    | A    |     | B    | B    | A    |
| Approach Delay          |      | 25.3 |      |      | 18.0 |      |      | 10.0 |     |      | 13.7 |      |
| Approach LOS            |      | C    |      |      | B    |      |      | A    |     |      | B    |      |
| Queue Length 50th (ft)  | 68   | 43   | 0    | 1    | 125  | 0    | 1    | 0    |     | 91   | 0    | 0    |
| Queue Length 95th (ft)  | 106  | 70   | m1   | 6    | 202  | 69   | 4    | 0    |     | 80   | m1   | 123  |
| Internal Link Dist (ft) |      | 2220 |      |      | 6179 |      |      | 469  |     |      | 570  |      |
| Turn Bay Length (ft)    | 450  |      | 450  | 400  |      | 450  | 200  |      |     | 200  |      |      |
| Base Capacity (vph)     | 396  | 1736 | 777  | 66   | 1182 | 760  | 112  | 608  |     | 1018 | 574  | 679  |
| Starvation Cap Reductn  | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |     | 0    | 0    | 0    |
| Spillback Cap Reductn   | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |     | 0    | 0    | 0    |
| Storage Cap Reductn     | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |     | 0    | 0    | 0    |
| Reduced v/c Ratio       | 0.54 | 0.18 | 0.00 | 0.02 | 0.44 | 0.47 | 0.01 | 0.00 |     | 0.41 | 0.00 | 0.42 |

Intersection Summary

Area Type: Other  
 Cycle Length: 100  
 Actuated Cycle Length: 100  
 Offset: 70 (70%), Referenced to phase 4:EBT and 8:WBT, Start of Green  
 Natural Cycle: 85  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.54  
 Intersection Signal Delay: 18.4  
 Intersection LOS: B  
 Intersection Capacity Utilization 52.9%  
 ICU Level of Service A  
 Analysis Period (min) 15  
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Catron & 5th St



Lanes, Volumes, Timings  
3: Catron & Black Hills

2010 Build PM Peak  
Black Hills TIS



| Lane Group              | EBL   | EBT   | WBT   | WBR   | SBL   | SBR   |
|-------------------------|-------|-------|-------|-------|-------|-------|
| Lane Configurations     |       |       |       |       |       |       |
| Volume (vph)            | 425   | 405   | 655   | 80    | 80    | 425   |
| Ideal Flow (vphpl)      | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Grade (%)               |       | -4%   | 4%    |       | 0%    |       |
| Storage Length (ft)     | 450   |       |       | 300   | 100   | 0     |
| Storage Lanes           | 1     |       |       | 1     | 1     | 1     |
| Taper Length (ft)       | 25    |       |       | 25    | 25    | 25    |
| Lane Util. Factor       | 1.00  | 0.95  | 0.95  | 1.00  | 1.00  | 1.00  |
| Frt                     |       |       |       | 0.850 |       | 0.850 |
| Flt Protected           | 0.950 |       |       |       | 0.950 |       |
| Satd. Flow (prot)       | 1710  | 3420  | 3286  | 1470  | 1676  | 1500  |
| Flt Permitted           | 0.950 |       |       |       | 0.950 |       |
| Satd. Flow (perm)       | 1710  | 3420  | 3286  | 1470  | 1676  | 1500  |
| Right Turn on Red       |       |       |       | Yes   |       | Yes   |
| Satd. Flow (RTOR)       |       |       |       | 87    |       | 462   |
| Link Speed (mph)        |       | 60    | 60    |       | 25    |       |
| Link Distance (ft)      |       | 1456  | 2300  |       | 402   |       |
| Travel Time (s)         |       | 16.5  | 26.1  |       | 11.0  |       |
| Peak Hour Factor        | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  |
| Adj. Flow (vph)         | 462   | 440   | 712   | 87    | 87    | 462   |
| Shared Lane Traffic (%) |       |       |       |       |       |       |
| Lane Group Flow (vph)   | 462   | 440   | 712   | 87    | 87    | 462   |
| Turn Type               | Prot  |       |       | Perm  |       | Perm  |
| Protected Phases        | 7     | 4     | 8     |       | 6     |       |
| Permitted Phases        |       |       |       | 8     |       | 6     |
| Detector Phase          | 7     | 4     | 8     | 8     | 6     | 6     |
| Switch Phase            |       |       |       |       |       |       |
| Minimum Initial (s)     | 7.0   | 12.0  | 12.0  | 12.0  | 7.0   | 7.0   |
| Minimum Split (s)       | 13.0  | 19.5  | 30.4  | 30.4  | 13.0  | 13.0  |
| Total Split (s)         | 42.0  | 74.0  | 32.0  | 32.0  | 26.0  | 26.0  |
| Total Split (%)         | 42.0% | 74.0% | 32.0% | 32.0% | 26.0% | 26.0% |
| Maximum Green (s)       | 36.0  | 66.8  | 25.9  | 25.9  | 20.5  | 20.5  |
| Yellow Time (s)         | 4.5   | 6.0   | 4.9   | 4.9   | 4.0   | 4.0   |
| All-Red Time (s)        | 1.5   | 1.2   | 1.2   | 1.2   | 1.5   | 1.5   |
| Lost Time Adjust (s)    | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Total Lost Time (s)     | 6.0   | 7.2   | 6.1   | 6.1   | 5.5   | 5.5   |
| Lead/Lag                | Lead  |       | Lag   | Lag   |       |       |
| Lead-Lag Optimize?      | Yes   |       | Yes   | Yes   |       |       |
| Vehicle Extension (s)   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   |
| Recall Mode             | None  | C-Max | C-Max | C-Max | None  | None  |
| Walk Time (s)           |       |       | 7.0   | 7.0   |       |       |
| Flash Dont Walk (s)     |       |       | 17.0  | 17.0  |       |       |
| Pedestrian Calls (#/hr) |       |       | 0     | 0     |       |       |
| Act Effect Green (s)    | 31.2  | 75.5  | 39.4  | 39.4  | 11.8  | 11.8  |
| Actuated g/C Ratio      | 0.31  | 0.76  | 0.39  | 0.39  | 0.12  | 0.12  |
| v/c Ratio               | 0.87  | 0.17  | 0.55  | 0.14  | 0.44  | 0.79  |
| Control Delay           | 49.2  | 4.1   | 14.6  | 1.8   | 46.2  | 14.5  |
| Queue Delay             | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Total Delay             | 49.2  | 4.1   | 14.6  | 1.8   | 46.2  | 14.5  |



Lanes, Volumes, Timings  
3: Catron & Black Hills



| Lane Group              | EBL  | EBT  | WBT  | WBR  | SBL  | SBR  |
|-------------------------|------|------|------|------|------|------|
| LOS                     | D    | A    | B    | A    | D    | B    |
| Approach Delay          |      | 27.2 | 13.2 |      | 19.5 |      |
| Approach LOS            |      | C    | B    |      | B    |      |
| Queue Length 50th (ft)  | 271  | 31   | 77   | 1    | 53   | 9    |
| Queue Length 95th (ft)  | 379  | 70   | #320 | 7    | 94   | 107  |
| Internal Link Dist (ft) |      | 1376 | 2220 |      | 322  |      |
| Turn Bay Length (ft)    | 450  |      |      | 300  | 100  |      |
| Base Capacity (vph)     | 616  | 2582 | 1295 | 632  | 344  | 675  |
| 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       | 0.75 | 0.17 | 0.55 | 0.14 | 0.25 | 0.68 |

Intersection Summary

Area Type: Other  
 Cycle Length: 100  
 Actuated Cycle Length: 100  
 Offset: 86 (86%), Referenced to phase 4:EBT and 8:WBT, Start of Green  
 Natural Cycle: 70  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.87  
 Intersection Signal Delay: 20.4  
 Intersection LOS: C  
 Intersection Capacity Utilization 64.5%  
 ICU Level of Service C  
 Analysis Period (min) 15  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

Splits and Phases: 3: Catron & Black Hills



Lanes, Volumes, Timings  
9: Stumer & 5th St

2010 Build PM Peak  
Black Hills TIS



| Lane Group                | EBL   | EBT   | EBR   | WBL   | WBT   | WBR  | NBL   | NBT   | NBR  | SBL   | SBT   | SBR   |
|---------------------------|-------|-------|-------|-------|-------|------|-------|-------|------|-------|-------|-------|
| Lane Configurations       |       |       |       |       |       |      |       |       |      |       |       |       |
| Volume (vph)              | 300   | 35    | 210   | 10    | 30    | 5    | 280   | 245   | 1    | 5     | 390   | 280   |
| Ideal Flow (vphpl)        | 1800  | 1800  | 1800  | 1800  | 1800  | 1800 | 1800  | 1800  | 1800 | 1800  | 1800  | 1800  |
| Storage Length (ft)       | 120   |       | 150   | 100   |       | 0    | 200   |       | 0    | 150   |       | 150   |
| Storage Lanes             | 2     |       | 1     | 1     |       | 0    | 1     |       | 0    | 1     |       | 1     |
| Taper Length (ft)         | 25    |       | 25    | 25    |       | 25   | 25    |       | 25   | 25    |       | 25    |
| Lane Util. Factor         | 0.97  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00 | 1.00  | 0.95  | 0.95 | 1.00  | 0.95  | 1.00  |
| Fr <sub>t</sub>           |       |       | 0.850 |       | 0.980 |      |       | 0.999 |      |       |       | 0.850 |
| Fl <sub>t</sub> Protected | 0.950 |       |       | 0.950 |       |      | 0.950 |       |      | 0.950 |       |       |
| Satd. Flow (prot)         | 3252  | 1765  | 1500  | 1676  | 1729  | 0    | 1676  | 3350  | 0    | 1676  | 3353  | 1500  |
| Fl <sub>t</sub> Permitted | 0.950 |       |       | 0.732 |       |      | 0.426 |       |      | 0.587 |       |       |
| Satd. Flow (perm)         | 3252  | 1765  | 1500  | 1292  | 1729  | 0    | 752   | 3350  | 0    | 1036  | 3353  | 1500  |
| Right Turn on Red         |       |       | Yes   |       |       | Yes  |       |       | Yes  |       |       | Yes   |
| Satd. Flow (RTOR)         |       |       | 228   |       | 5     |      |       |       |      |       |       | 304   |
| Link Speed (mph)          |       | 25    |       |       | 25    |      |       | 45    |      |       |       | 45    |
| Link Distance (ft)        |       | 473   |       |       | 610   |      |       | 650   |      |       |       | 584   |
| Travel Time (s)           |       | 12.9  |       |       | 16.6  |      |       | 9.8   |      |       |       | 8.8   |
| Peak Hour Factor          | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92 | 0.92  | 0.92  | 0.92 | 0.92  | 0.92  | 0.92  |
| Adj. Flow (vph)           | 326   | 38    | 228   | 11    | 33    | 5    | 304   | 266   | 1    | 5     | 424   | 304   |
| Shared Lane Traffic (%)   |       |       |       |       |       |      |       |       |      |       |       |       |
| Lane Group Flow (vph)     | 326   | 38    | 228   | 11    | 38    | 0    | 304   | 267   | 0    | 5     | 424   | 304   |
| Turn Type                 | Prot  |       | Perm  | pm+pt |       |      | pm+pt |       |      | pm+pt |       | Perm  |
| Protected Phases          | 7     | 4     |       | 3     | 8     |      | 5     | 2     |      | 1     | 6     |       |
| Permitted Phases          |       |       | 4     | 8     |       |      | 2     |       |      | 6     |       | 6     |
| Detector Phase            | 7     | 4     | 4     | 3     | 8     |      | 5     | 2     |      | 1     | 6     | 6     |
| Switch Phase              |       |       |       |       |       |      |       |       |      |       |       |       |
| 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)         | 10.0  | 30.0  | 30.0  | 10.0  | 30.0  |      | 10.0  | 24.0  |      | 10.0  | 28.0  | 28.0  |
| Total Split (s)           | 19.0  | 39.0  | 39.0  | 10.0  | 30.0  | 0.0  | 22.0  | 41.0  | 0.0  | 10.0  | 29.0  | 29.0  |
| Total Split (%)           | 19.0% | 39.0% | 39.0% | 10.0% | 30.0% | 0.0% | 22.0% | 41.0% | 0.0% | 10.0% | 29.0% | 29.0% |
| Maximum Green (s)         | 13.5  | 33.5  | 33.5  | 4.5   | 24.5  |      | 16.5  | 35.5  |      | 4.5   | 23.5  | 23.5  |
| Yellow Time (s)           | 4.0   | 4.0   | 4.0   | 4.0   | 4.0   |      | 4.0   | 4.0   |      | 4.0   | 4.0   | 4.0   |
| All-Red Time (s)          | 1.5   | 1.5   | 1.5   | 1.5   | 1.5   |      | 1.5   | 1.5   |      | 1.5   | 1.5   | 1.5   |
| Lost Time Adjust (s)      | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0  | 0.0   | 0.0   | 0.0  | 0.0   | 0.0   | 0.0   |
| Total Lost Time (s)       | 5.5   | 5.5   | 5.5   | 5.5   | 5.5   | 4.0  | 5.5   | 5.5   | 4.0  | 5.5   | 5.5   | 5.5   |
| Lead/Lag                  | Lead  | Lag   | Lag   | Lead  | Lag   |      | Lead  | Lag   |      | Lead  | Lag   | Lag   |
| Lead-Lag Optimize?        | Yes   | Yes   | Yes   | Yes   | Yes   |      | Yes   | Yes   |      | Yes   | Yes   | Yes   |
| Vehicle Extension (s)     | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   |      | 3.0   | 3.0   |      | 3.0   | 3.0   | 3.0   |
| Recall Mode               | None  | None  | None  | None  | None  |      | None  | C-Max |      | None  | C-Max | C-Max |
| Walk Time (s)             |       | 7.0   | 7.0   |       | 7.0   |      |       | 7.0   |      |       | 7.0   | 7.0   |
| Flash Dont Walk (s)       |       | 17.5  | 17.5  |       | 17.5  |      |       | 11.0  |      |       | 15.0  | 15.0  |
| Pedestrian Calls (#/hr)   |       | 0     | 0     |       | 0     |      |       | 0     |      |       | 0     | 0     |
| Act Effect Green (s)      | 13.0  | 19.5  | 19.5  | 9.6   | 7.5   |      | 67.5  | 65.5  |      | 53.8  | 49.3  | 49.3  |
| Actuated g/C Ratio        | 0.13  | 0.20  | 0.20  | 0.10  | 0.08  |      | 0.68  | 0.66  |      | 0.54  | 0.49  | 0.49  |
| v/c Ratio                 | 0.77  | 0.11  | 0.48  | 0.08  | 0.28  |      | 0.49  | 0.12  |      | 0.01  | 0.26  | 0.34  |
| Control Delay             | 55.0  | 32.1  | 8.3   | 28.7  | 44.0  |      | 9.8   | 5.5   |      | 9.2   | 17.6  | 3.6   |
| Queue Delay               | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |      | 0.0   | 0.0   |      | 0.0   | 0.0   | 0.0   |
| Total Delay               | 55.0  | 32.1  | 8.3   | 28.7  | 44.0  |      | 9.8   | 5.5   |      | 9.2   | 17.6  | 3.6   |
| LOS                       | D     | C     | A     | C     | D     |      | A     | A     |      | A     | B     | A     |

Lanes, Volumes, Timings  
9: Stumer & 5th St

2010 Build PM Peak  
Black Hills TIS

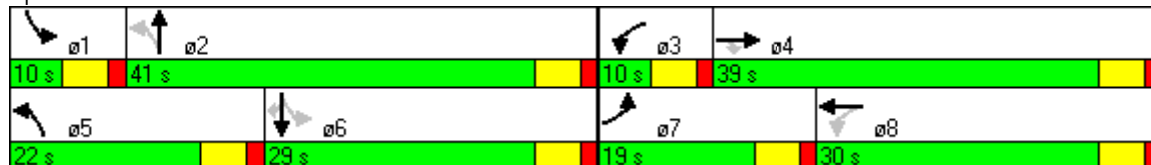


| Lane Group              | EBL  | EBT  | EBR  | WBL  | WBT  | WBR | NBL  | NBT  | NBR | SBL  | SBT  | SBR  |
|-------------------------|------|------|------|------|------|-----|------|------|-----|------|------|------|
| Approach Delay          |      | 35.5 |      |      | 40.5 |     |      | 7.8  |     |      | 11.7 |      |
| Approach LOS            |      | D    |      |      | D    |     |      | A    |     |      | B    |      |
| Queue Length 50th (ft)  | 104  | 18   | 0    | 5    | 20   |     | 47   | 20   |     | 1    | 89   | 0    |
| Queue Length 95th (ft)  | #161 | 49   | 63   | 19   | 52   |     | 105  | 54   |     | 6    | 138  | 53   |
| Internal Link Dist (ft) |      | 393  |      |      | 530  |     |      | 570  |     |      | 504  |      |
| Turn Bay Length (ft)    | 120  |      | 150  | 100  |      |     | 200  |      |     | 150  |      | 150  |
| Base Capacity (vph)     | 439  | 591  | 654  | 142  | 427  |     | 660  | 2195 |     | 586  | 1652 | 893  |
| 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       | 0.74 | 0.06 | 0.35 | 0.08 | 0.09 |     | 0.46 | 0.12 |     | 0.01 | 0.26 | 0.34 |

Intersection Summary




















Area Type: Other  
 Cycle Length: 100  
 Actuated Cycle Length: 100  
 Offset: 18 (18%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green  
 Natural Cycle: 80  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.77  
 Intersection Signal Delay: 18.6  
 Intersection LOS: B  
 Intersection Capacity Utilization 57.2%  
 ICU Level of Service B  
 Analysis Period (min) 15  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

Splits and Phases: 9: Stumer & 5th St



HCM Unsignalized Intersection Capacity Analysis  
 13: Parkview & 5th St

2010 Build PM Peak  
 Black Hills TIS

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement                          | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL  | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations               |   |  |   |   |  |  |  |  |   |  |  |   |
| Volume (veh/h)                    | 20  | 0   | 30  | 50  | 0   | 5   | 45   | 450   | 55  | 15  | 595   | 25  |
| Sign Control                      |   | Stop  |   |   | Stop  |   |  | Free  |   |   | Free  |   |
| Grade                             |   | 0%  |   |   | 0%  |   |  | 0%  |   |   | 0%  |   |
| Peak Hour Factor                  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92   | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  |
| Hourly flow rate (vph)            | 22  | 0   | 33  | 54  | 0   | 5   | 49   | 489   | 60  | 16  | 647   | 27  |
| Pedestrians                       |   |   |   |   |   |   |  |   |   |   |   |   |
| Lane Width (ft)                   |   |   |   |   |   |   |  |   |   |   |   |   |
| Walking Speed (ft/s)              |   |   |   |   |   |   |  |   |   |   |   |   |
| Percent Blockage                  |   |   |   |   |   |   |  |   |   |   |   |   |
| Right turn flare (veh)            | 8   |   |   |   |   |   |  |   |   |   |   |   |
| Median type                       |   |   |   |   | None  |   |  |   | None  |   |   |   |
| Median storage (veh)              |   |   |   |   |   |   |  |   |   |   |   |   |
| Upstream signal (ft)              | 584   |   |   |   |   |   |  |   |   |   |   |   |
| pX, platoon unblocked             | 1.00  | 1.00  |   | 1.00  | 1.00  | 1.00  |  |   |   | 1.00  |   |   |
| vC, conflicting volume            | 1035  | 1340  | 337   | 1005  | 1323  | 274   | 674  |   |   | 549   |   |   |
| vC1, stage 1 conf vol             |   |   |   |   |   |   |  |   |   |   |   |   |
| vC2, stage 2 conf vol             |   |   |   |   |   |   |  |   |   |   |   |   |
| vCu, unblocked vol                | 1031  | 1336  | 337   | 1001  | 1320  | 268   | 674  |   |   | 543   |   |   |
| tC, single (s)                    | 7.5   | 6.5   | 6.9   | 7.5   | 6.5   | 6.9   | 4.1  |   |   | 4.1   |   |   |
| tC, 2 stage (s)                   |   |   |   |   |   |   |  |   |   |   |   |   |
| tF (s)                            | 3.5   | 4.0   | 3.3   | 3.5   | 4.0   | 3.3   | 2.2  |   |   | 2.2   |   |   |
| p0 queue free %                   | 88  | 100   | 95  | 69  | 100   | 99  | 95   |   |   | 98  |   |   |
| cM capacity (veh/h)               | 176   | 141   | 659   | 177   | 145   | 728   | 913  |   |   | 1019  |   |   |
| Direction, Lane #                 | EB 1  | WB 1  | NB 1  | NB 2  | NB 3  | SB 1  | SB 2   | SB 3  |   |   |   |   |
| Volume Total                      | 54  | 60  | 49  | 326   | 223   | 16  | 431  | 243   |   |   |   |   |
| Volume Left                       | 22  | 54  | 49  | 0   | 0   | 16  | 0  | 0   |   |   |   |   |
| Volume Right                      | 33  | 5   | 0   | 0   | 60  | 0   | 0  | 27  |   |   |   |   |
| cSH                               | 314   | 195   | 913   | 1700  | 1700  | 1019  | 1700   | 1700  |   |   |   |   |
| Volume to Capacity                | 0.17  | 0.31  | 0.05  | 0.19  | 0.13  | 0.02  | 0.25   | 0.14  |   |   |   |   |
| Queue Length 95th (ft)            | 15  | 31  | 4   | 0   | 0   | 1   | 0  | 0   |   |   |   |   |
| Control Delay (s)                 | 18.9  | 31.9  | 9.2   | 0.0   | 0.0   | 8.6   | 0.0  | 0.0   |   |   |   |   |
| Lane LOS                          | C   | D   | A   |   |   | A   |  |   |   |   |   |   |
| Approach Delay (s)                | 18.9  | 31.9  | 0.7   |   |   | 0.2   |  |   |   |   |   |   |
| Approach LOS                      | C   | D   |   |   |   |   |  |   |   |   |   |   |
| Intersection Summary              |   |   |   |   |   |   |  |   |   |   |   |   |
| Average Delay                     |   |   | 2.5   |   |   |   |  |   |   |   |   |   |
| Intersection Capacity Utilization |   |   | 41.3%   |   | ICU Level of Service  |   |  |   |   |   | A   |   |
| Analysis Period (min)             | 15  |   |   |   |   |   |  |   |   |   |   |   |

HCM Unsignalized Intersection Capacity Analysis  
 12: Enchanted Pines & 5th St

2010 Build PM Peak  
 Black Hills TIS



| Movement               | EBL  | EBR  | NBL  | NBT  | SBT  | SBR  |
|------------------------|------|------|------|------|------|------|
| Lane Configurations    |      |      |      |      |      |      |
| Volume (veh/h)         | 55   | 10   | 10   | 465  | 555  | 80   |
| Sign Control           | Stop |      |      | Free | Free |      |
| Grade                  | 0%   |      |      | 0%   | 0%   |      |
| Peak Hour Factor       | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 60   | 11   | 11   | 505  | 603  | 87   |
| Pedestrians            |      |      |      |      |      |      |
| Lane Width (ft)        |      |      |      |      |      |      |
| Walking Speed (ft/s)   |      |      |      |      |      |      |
| Percent Blockage       |      |      |      |      |      |      |
| Right turn flare (veh) |      |      |      |      |      |      |
| Median type            |      |      |      | None | None |      |
| Median storage (veh)   |      |      |      |      |      |      |
| Upstream signal (ft)   |      |      |      |      |      |      |
| pX, platoon unblocked  |      |      |      |      |      |      |
| vC, conflicting volume | 921  | 345  | 690  |      |      |      |
| vC1, stage 1 conf vol  |      |      |      |      |      |      |
| vC2, stage 2 conf vol  |      |      |      |      |      |      |
| vCu, unblocked vol     | 921  | 345  | 690  |      |      |      |
| tC, single (s)         | 6.8  | 6.9  | 4.1  |      |      |      |
| tC, 2 stage (s)        |      |      |      |      |      |      |
| tF (s)                 | 3.5  | 3.3  | 2.2  |      |      |      |
| p0 queue free %        | 78   | 98   | 99   |      |      |      |
| cM capacity (veh/h)    | 266  | 651  | 900  |      |      |      |

| Direction, Lane #      | EB 1 | NB 1 | NB 2 | NB 3 | SB 1 | SB 2 |
|------------------------|------|------|------|------|------|------|
| Volume Total           | 71   | 11   | 253  | 253  | 402  | 288  |
| Volume Left            | 60   | 11   | 0    | 0    | 0    | 0    |
| Volume Right           | 11   | 0    | 0    | 0    | 0    | 87   |
| cSH                    | 293  | 900  | 1700 | 1700 | 1700 | 1700 |
| Volume to Capacity     | 0.24 | 0.01 | 0.15 | 0.15 | 0.24 | 0.17 |
| Queue Length 95th (ft) | 23   | 1    | 0    | 0    | 0    | 0    |
| Control Delay (s)      | 21.2 | 9.0  | 0.0  | 0.0  | 0.0  | 0.0  |
| Lane LOS               | C    | A    |      |      |      |      |
| Approach Delay (s)     | 21.2 | 0.2  |      |      | 0.0  |      |
| Approach LOS           | C    |      |      |      |      |      |

| Intersection Summary              |  |  |       |  |                      |   |
|-----------------------------------|--|--|-------|--|----------------------|---|
| Average Delay                     |  |  | 1.2   |  |                      |   |
| Intersection Capacity Utilization |  |  | 29.4% |  | ICU Level of Service | A |
| Analysis Period (min)             |  |  | 15    |  |                      |   |

HCM Unsignalized Intersection Capacity Analysis  
42: #1/Future Office & 5th St

2010 Build PM Peak  
Black Hills TIS



















| Movement               | EBL  | EBR  | NBL  | NBT  | SBT  | SBR  |
|------------------------|------|------|------|------|------|------|
| Lane Configurations    |      |      |      |      |      |      |
| Volume (veh/h)         | 40   | 85   | 45   | 430  | 550  | 15   |
| Sign Control           | Stop |      |      | Free | Free |      |
| Grade                  | 0%   |      |      | 0%   | 0%   |      |
| Peak Hour Factor       | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 43   | 92   | 49   | 467  | 598  | 16   |
| Pedestrians            |      |      |      |      |      |      |
| Lane Width (ft)        |      |      |      |      |      |      |
| Walking Speed (ft/s)   |      |      |      |      |      |      |
| Percent Blockage       |      |      |      |      |      |      |
| Right turn flare (veh) |      |      |      |      |      |      |
| Median type            |      |      |      | None | None |      |
| Median storage (veh)   |      |      |      |      |      |      |
| Upstream signal (ft)   |      |      |      |      |      |      |
| pX, platoon unblocked  |      |      |      |      |      |      |
| vC, conflicting volume | 938  | 307  | 614  |      |      |      |
| vC1, stage 1 conf vol  |      |      |      |      |      |      |
| vC2, stage 2 conf vol  |      |      |      |      |      |      |
| vCu, unblocked vol     | 938  | 307  | 614  |      |      |      |
| tC, single (s)         | 6.8  | 6.9  | 4.1  |      |      |      |
| tC, 2 stage (s)        |      |      |      |      |      |      |
| tF (s)                 | 3.5  | 3.3  | 2.2  |      |      |      |
| p0 queue free %        | 83   | 87   | 95   |      |      |      |
| cM capacity (veh/h)    | 250  | 689  | 961  |      |      |      |

| Direction, Lane #      | EB 1 | NB 1 | NB 2 | NB 3 | SB 1 | SB 2 |
|------------------------|------|------|------|------|------|------|
| Volume Total           | 136  | 49   | 234  | 234  | 399  | 216  |
| Volume Left            | 43   | 49   | 0    | 0    | 0    | 0    |
| Volume Right           | 92   | 0    | 0    | 0    | 0    | 16   |
| cSH                    | 441  | 961  | 1700 | 1700 | 1700 | 1700 |
| Volume to Capacity     | 0.31 | 0.05 | 0.14 | 0.14 | 0.23 | 0.13 |
| Queue Length 95th (ft) | 32   | 4    | 0    | 0    | 0    | 0    |
| Control Delay (s)      | 16.8 | 8.9  | 0.0  | 0.0  | 0.0  | 0.0  |
| Lane LOS               | C    | A    |      |      |      |      |
| Approach Delay (s)     | 16.8 | 0.8  | 0.0  |      |      |      |
| Approach LOS           | C    |      |      |      |      |      |

| Intersection Summary              |  |  |       |                      |   |  |
|-----------------------------------|--|--|-------|----------------------|---|--|
| Average Delay                     |  |  | 2.1   |                      |   |  |
| Intersection Capacity Utilization |  |  | 37.7% | ICU Level of Service | A |  |
| Analysis Period (min)             |  |  | 15    |                      |   |  |

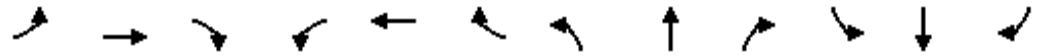
HCM Unsignalized Intersection Capacity Analysis  
 15: Stumer & Enchantment

2010 Build PM Peak  
 Black Hills TIS

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement                          | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL  | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations               |   |  |   |   |  |   |  |  |   |   |  |   |
| Volume (veh/h)                    | 7   | 15  | 1   | 30  | 15  | 25  | 0  | 30  | 30  | 25  | 55  | 5   |
| Sign Control                      |   | Stop  |   |   | Stop  |   |  | Free  |   |   | Free  |   |
| Grade                             |   | 0%  |   |   | 0%  |   |  | 0%  |   |   | 0%  |   |
| Peak Hour Factor                  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92   | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  |
| Hourly flow rate (vph)            | 8   | 16  | 1   | 33  | 16  | 27  | 0  | 33  | 33  | 27  | 60  | 5   |
| Pedestrians                       |   |   |   |   |   |   |  |   |   |   |   |   |
| Lane Width (ft)                   |   |   |   |   |   |   |  |   |   |   |   |   |
| Walking Speed (ft/s)              |   |   |   |   |   |   |  |   |   |   |   |   |
| Percent Blockage                  |   |   |   |   |   |   |  |   |   |   |   |   |
| Right turn flare (veh)            |   |   |   |   |   |   |  |   |   |   |   |   |
| Median type                       |   |   |   |   |   |   |  | None  |   |   | None  |   |
| Median storage (veh)              |   |   |   |   |   |   |  |   |   |   |   |   |
| Upstream signal (ft)              |   |   |   |   |   |   |  |   |   |   |   |   |
| pX, platoon unblocked             |   |   |   |   |   |   |  |   |   |   |   |   |
| vC, conflicting volume            | 201   | 182   | 62  | 175   | 168   | 49  | 65   |   |   | 65  |   |   |
| vC1, stage 1 conf vol             |   |   |   |   |   |   |  |   |   |   |   |   |
| vC2, stage 2 conf vol             |   |   |   |   |   |   |  |   |   |   |   |   |
| vCu, unblocked vol                | 201   | 182   | 62  | 175   | 168   | 49  | 65   |   |   | 65  |   |   |
| tC, single (s)                    | 7.1   | 6.5   | 6.2   | 7.1   | 6.5   | 6.2   | 4.1  |   |   | 4.1   |   |   |
| tC, 2 stage (s)                   |   |   |   |   |   |   |  |   |   |   |   |   |
| tF (s)                            | 3.5   | 4.0   | 3.3   | 3.5   | 4.0   | 3.3   | 2.2  |   |   | 2.2   |   |   |
| p0 queue free %                   | 99  | 98  | 100   | 96  | 98  | 97  | 100  |   |   | 98  |   |   |
| cM capacity (veh/h)               | 714   | 699   | 1002  | 762   | 712   | 1020  | 1537   |   |   | 1537  |   |   |
| <b>Direction, Lane #</b>          | <b>EB 1</b>   | <b>WB 1</b>   | <b>NB 1</b>   | <b>SB 1</b>   |   |   |  |   |   |   |   |   |
| Volume Total                      | 25  | 76  | 65  | 92  |   |   |  |   |   |   |   |   |
| Volume Left                       | 8   | 33  | 0   | 27  |   |   |  |   |   |   |   |   |
| Volume Right                      | 1   | 27  | 33  | 5   |   |   |  |   |   |   |   |   |
| cSH                               | 713   | 824   | 1537  | 1537  |   |   |  |   |   |   |   |   |
| Volume to Capacity                | 0.04  | 0.09  | 0.00  | 0.02  |   |   |  |   |   |   |   |   |
| Queue Length 95th (ft)            | 3   | 8   | 0   | 1   |   |   |  |   |   |   |   |   |
| Control Delay (s)                 | 10.2  | 9.8   | 0.0   | 2.3   |   |   |  |   |   |   |   |   |
| Lane LOS                          | B   | A   |   | A   |   |   |  |   |   |   |   |   |
| Approach Delay (s)                | 10.2  | 9.8   | 0.0   | 2.3   |   |   |  |   |   |   |   |   |
| Approach LOS                      | B   | A   |   |   |   |   |  |   |   |   |   |   |
| <b>Intersection Summary</b>       |   |   |   |   |   |   |  |   |   |   |   |   |
| Average Delay                     |   |   | 4.7   |   |   |   |  |   |   |   |   |   |
| Intersection Capacity Utilization |   |   | 24.6%   |   | ICU Level of Service  |   |  |   |   | A   |   |   |
| Analysis Period (min)             |   |   | 15  |   |   |   |  |   |   |   |   |   |

HCM Unsignalized Intersection Capacity Analysis  
 16: Enchanted Pines & Enchantment

2010 Build PM Peak  
 Black Hills TIS



| Movement               | EBL  | EBT  | EBR  | WBL  | WBT  | WBR  | NBL  | NBT  | NBR  | SBL  | SBT  | SBR  |
|------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Lane Configurations    |      | ↕    |      |      | ↕    |      |      | ↕    |      |      | ↕    |      |
| Volume (veh/h)         | 1    | 10   | 1    | 75   | 10   | 0    | 1    | 5    | 55   | 1    | 5    | 0    |
| Sign Control           |      | Free |      |      | Free |      |      | Stop |      |      | Stop |      |
| Grade                  |      | 0%   |      |      | 0%   |      |      | 0%   |      |      | 0%   |      |
| Peak Hour Factor       | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 1    | 11   | 1    | 82   | 11   | 0    | 1    | 5    | 60   | 1    | 5    | 0    |
| Pedestrians            |      |      |      |      |      |      |      |      |      |      |      |      |
| Lane Width (ft)        |      |      |      |      |      |      |      |      |      |      |      |      |
| Walking Speed (ft/s)   |      |      |      |      |      |      |      |      |      |      |      |      |
| Percent Blockage       |      |      |      |      |      |      |      |      |      |      |      |      |
| Right turn flare (veh) |      |      |      |      |      |      |      |      |      |      |      |      |
| Median type            |      | None |      |      | None |      |      |      |      |      |      |      |
| Median storage (veh)   |      |      |      |      |      |      |      |      |      |      |      |      |
| Upstream signal (ft)   |      |      |      |      |      |      |      |      |      |      |      |      |
| pX, platoon unblocked  |      |      |      |      |      |      |      |      |      |      |      |      |
| vC, conflicting volume | 11   |      |      | 12   |      |      | 190  | 188  | 11   | 250  | 188  | 11   |
| vC1, stage 1 conf vol  |      |      |      |      |      |      |      |      |      |      |      |      |
| vC2, stage 2 conf vol  |      |      |      |      |      |      |      |      |      |      |      |      |
| vCu, unblocked vol     | 11   |      |      | 12   |      |      | 190  | 188  | 11   | 250  | 188  | 11   |
| tC, single (s)         | 4.1  |      |      | 4.1  |      |      | 7.1  | 6.5  | 6.2  | 7.1  | 6.5  | 6.2  |
| tC, 2 stage (s)        |      |      |      |      |      |      |      |      |      |      |      |      |
| tF (s)                 | 2.2  |      |      | 2.2  |      |      | 3.5  | 4.0  | 3.3  | 3.5  | 4.0  | 3.3  |
| p0 queue free %        | 100  |      |      | 95   |      |      | 100  | 99   | 94   | 100  | 99   | 100  |
| cM capacity (veh/h)    | 1608 |      |      | 1607 |      |      | 735  | 671  | 1069 | 634  | 670  | 1070 |

| Direction, Lane #      | EB 1 | WB 1 | NB 1 | SB 1 |
|------------------------|------|------|------|------|
| Volume Total           | 13   | 92   | 66   | 7    |
| Volume Left            | 1    | 82   | 1    | 1    |
| Volume Right           | 1    | 0    | 60   | 0    |
| cSH                    | 1608 | 1607 | 1013 | 664  |
| Volume to Capacity     | 0.00 | 0.05 | 0.07 | 0.01 |
| Queue Length 95th (ft) | 0    | 4    | 5    | 1    |
| Control Delay (s)      | 0.6  | 6.5  | 8.8  | 10.5 |
| Lane LOS               | A    | A    | A    | B    |
| Approach Delay (s)     | 0.6  | 6.5  | 8.8  | 10.5 |
| Approach LOS           |      |      | A    | B    |






















| Intersection Summary              |       |     |                      |
|-----------------------------------|-------|-----|----------------------|
| Average Delay                     |       | 7.1 |                      |
| Intersection Capacity Utilization | 22.3% |     | ICU Level of Service |
| Analysis Period (min)             |       | 15  | A                    |



# HCM Unsignalized Intersection Capacity Analysis

## 8: Stumer & Black Hills

2010 Build PM Peak  
Black Hills TIS

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement                          | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL  | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations               |  |  |  |  |  |   |  |  |  |   |  |  |
| Volume (veh/h)                    | 1   | 60  | 20  | 395   | 70  | 5   | 40   | 10  | 440   | 10  | 40  | 0   |
| Sign Control                      |   | Free  |   |   | Free  |   |  | Stop  |   |   | Stop  |   |
| Grade                             |   | 0%  |   |   | 0%  |   |  | 0%  |   |   | 0%  |   |
| Peak Hour Factor                  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92   | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  |
| Hourly flow rate (vph)            | 1   | 65  | 22  | 429   | 76  | 5   | 43   | 11  | 478   | 11  | 43  | 0   |
| Pedestrians                       |   |   |   |   |   |   |  |   |   |   |   |   |
| Lane Width (ft)                   |   |   |   |   |   |   |  |   |   |   |   |   |
| Walking Speed (ft/s)              |   |   |   |   |   |   |  |   |   |   |   |   |
| Percent Blockage                  |   |   |   |   |   |   |  |   |   |   |   |   |
| Right turn flare (veh)            |   |   |   |   |   |   |  |   | 6   |   |   |   |
| Median type                       |   | None  |   |   | TWLTL   |   |  |   |   |   |   |   |
| Median storage (veh)              |   |   |   |   | 2   |   |  |   |   |   |   |   |
| Upstream signal (ft)              |   |   |   |   |   |   |  |   |   |   |   |   |
| pX, platoon unblocked             |   |   |   |   |   |   |  |   |   |   |   |   |
| vC, conflicting volume            | 82  |   |   | 87  |   |   | 1024   | 1008  | 65  | 1249  | 1027  | 79  |
| vC1, stage 1 conf vol             |   |   |   |   |   |   | 67   | 67  |   | 938   | 938   |   |
| vC2, stage 2 conf vol             |   |   |   |   |   |   | 957  | 940   |   | 312   | 89  |   |
| vCu, unblocked vol                | 82  |   |   | 87  |   |   | 1024   | 1008  | 65  | 1249  | 1027  | 79  |
| tC, single (s)                    | 4.1   |   |   | 4.1   |   |   | 7.1  | 6.5   | 6.2   | 7.1   | 6.5   | 6.2   |
| tC, 2 stage (s)                   |   |   |   |   |   |   | 6.1  | 5.5   |   | 6.1   | 5.5   |   |
| tF (s)                            | 2.2   |   |   | 2.2   |   |   | 3.5  | 4.0   | 3.3   | 3.5   | 4.0   | 3.3   |
| p0 queue free %                   | 100   |   |   | 72  |   |   | 75   | 95  | 52  | 82  | 81  | 100   |
| cM capacity (veh/h)               | 1516  |   |   | 1509  |   |   | 177  | 237   | 999   | 59  | 233   | 982   |
| <b>Direction, Lane #</b>          | <b>EB 1</b>   | <b>EB 2</b>   | <b>EB 3</b>   | <b>WB 1</b>   | <b>WB 2</b>   | <b>NB 1</b>   | <b>SB 1</b>  |   |   |   |   |   |
| Volume Total                      | 1   | 65  | 22  | 429   | 82  | 533   | 54   |   |   |   |   |   |
| Volume Left                       | 1   | 0   | 0   | 429   | 0   | 43  | 11   |   |   |   |   |   |
| Volume Right                      | 0   | 0   | 22  | 0   | 5   | 478   | 0  |   |   |   |   |   |
| cSH                               | 1516  | 1700  | 1700  | 1509  | 1700  | 1112  | 146  |   |   |   |   |   |
| Volume to Capacity                | 0.00  | 0.04  | 0.01  | 0.28  | 0.05  | 0.48  | 0.37   |   |   |   |   |   |
| Queue Length 95th (ft)            | 0   | 0   | 0   | 30  | 0   | 66  | 39   |   |   |   |   |   |
| Control Delay (s)                 | 7.4   | 0.0   | 0.0   | 8.3   | 0.0   | 13.9  | 43.4   |   |   |   |   |   |
| Lane LOS                          | A   |   |   | A   |   | B   | E  |   |   |   |   |   |
| Approach Delay (s)                | 0.1   |   |   | 7.0   |   | 13.9  | 43.4   |   |   |   |   |   |
| Approach LOS                      |   |   |   |   |   | B   | E  |   |   |   |   |   |
| <b>Intersection Summary</b>       |   |   |   |   |   |   |  |   |   |   |   |   |
| Average Delay                     |   |   |   | 11.2  |   |   |  |   |   |   |   |   |
| Intersection Capacity Utilization |   |   | 45.9%   |   |   | ICU Level of Service  |  |   | A   |   |   |   |
| Analysis Period (min)             |   |   | 15  |   |   |   |  |   |   |   |   |   |

# MOVEMENT SUMMARY

Site: PM Single Lane

Stumer Road at Black Hills  
 PM Peak  
 Single Lane Roundabout Alternative  
 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 | Queue Distance ft | Prop. Queued | Effective Stop Rate per veh | Average Speed mph |
| South                           |      | NB Black Hills    |      |               |                   |                  |                                |                   |              |                             |                   |
| 3L                              | L    | 44                | 2.0  | 0.431         | 6.2               | LOS A            | 4.3                            | 110.3             | 0.37         | 0.70                        | 22.5              |
| 8T                              | T    | 11                | 2.0  | 0.427         | 0.7               | LOS A            | 4.3                            | 110.3             | 0.37         | 0.14                        | 23.6              |
| 8R                              | R    | 489               | 2.0  | 0.432         | 1.4               | LOS A            | 4.3                            | 110.3             | 0.37         | 0.21                        | 23.5              |
| Approach                        |      | 544               | 2.0  | 0.432         | 1.8               | LOS A            | 4.3                            | 110.3             | 0.37         | 0.25                        | 23.4              |
| East                            |      | WB Stumer Rd      |      |               |                   |                  |                                |                   |              |                             |                   |
| 1L                              | L    | 439               | 2.0  | 0.395         | 6.0               | LOS A            | 3.7                            | 94.8              | 0.28         | 0.53                        | 22.2              |
| 6T                              | T    | 78                | 2.0  | 0.395         | 0.4               | LOS A            | 3.7                            | 94.8              | 0.28         | 0.12                        | 23.7              |
| 6R                              | R    | 6                 | 2.0  | 0.397         | 1.2               | LOS A            | 3.7                            | 94.8              | 0.28         | 0.18                        | 23.5              |
| Approach                        |      | 522               | 2.0  | 0.395         | 5.1               | LOS A            | 3.7                            | 94.8              | 0.28         | 0.46                        | 22.4              |
| North                           |      | SB Black Hills    |      |               |                   |                  |                                |                   |              |                             |                   |
| 7L                              | L    | 11                | 2.0  | 0.081         | 9.6               | LOS A            | 0.5                            | 13.9              | 0.65         | 0.84                        | 21.8              |
| 4T                              | T    | 44                | 2.0  | 0.080         | 4.0               | LOS A            | 0.5                            | 13.9              | 0.65         | 0.51                        | 22.7              |
| 4R                              | R    | 1                 | 2.0  | 0.079         | 4.8               | LOS A            | 0.5                            | 13.9              | 0.65         | 0.50                        | 22.8              |
| Approach                        |      | 57                | 2.0  | 0.080         | 5.1               | LOS A            | 0.5                            | 13.9              | 0.65         | 0.57                        | 22.5              |
| West                            |      | EB Stumer Rd      |      |               |                   |                  |                                |                   |              |                             |                   |
| 5L                              | L    | 1                 | 2.0  | 0.101         | 9.1               | LOS A            | 0.7                            | 18.2              | 0.62         | 0.89                        | 22.0              |
| 2T                              | T    | 67                | 2.0  | 0.105         | 3.5               | LOS A            | 0.7                            | 18.2              | 0.62         | 0.49                        | 23.0              |
| 2R                              | R    | 11                | 2.0  | 0.105         | 4.3               | LOS A            | 0.7                            | 18.2              | 0.62         | 0.49                        | 23.0              |
| Approach                        |      | 79                | 2.0  | 0.105         | 3.7               | LOS A            | 0.7                            | 18.2              | 0.62         | 0.49                        | 22.9              |
| All Vehicles                    |      | 1202              | 2.0  | 0.432         | 3.5               | LOS A            | 4.3                            | 110.3             | 0.36         | 0.37                        | 22.9              |

Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).  
 Level of Service (Worst Movement): LOS A. LOS Method for individual vehicle movements: Delay (HCM).  
 Approach LOS values are based on the worst delay for any vehicle movement.  
 Roundabout LOS Method: Same as Signalised Intersections.  
 Roundabout Capacity Model: SIDRA Standard.

# MOVEMENT SUMMARY

Site: PM Single Lane w/ bypass

Stumer Road at Black Hills  
 PM Peak  
 Single Lane Roundabout w/Bypass Alternative  
 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 | Queue Distance ft | Prop. Queued | Effective Stop Rate per veh | Average Speed mph |
| South                           |      | NB Black Hills    |      |               |                   |                  |                                |                   |              |                             |                   |
| 3L                              | L    | 44                | 2.0  | 0.064         | 6.3               | LOS A            | 0.4                            | 10.9              | 0.29         | 0.55                        | 22.3              |
| 8T                              | T    | 11                | 2.0  | 0.064         | 0.8               | LOS A            | 0.4                            | 10.9              | 0.29         | 0.13                        | 23.7              |
| 8R                              | R    | 489               | 2.0  | 0.363         | 0.9               | LOS A            | 3.4                            | 86.4              | 0.32         | 0.13                        | 23.8              |
| Approach                        |      | 544               | 2.0  | 0.363         | 1.4               | LOS A            | 3.4                            | 86.4              | 0.32         | 0.17                        | 23.6              |
| East                            |      | WB Stumer Rd      |      |               |                   |                  |                                |                   |              |                             |                   |
| 1L                              | L    | 439               | 2.0  | 0.394         | 6.0               | LOS A            | 3.7                            | 93.2              | 0.28         | 0.53                        | 22.3              |
| 6T                              | T    | 78                | 2.0  | 0.395         | 0.4               | LOS A            | 3.7                            | 93.2              | 0.28         | 0.12                        | 23.7              |
| 6R                              | R    | 6                 | 2.0  | 0.397         | 1.2               | LOS A            | 3.7                            | 93.2              | 0.28         | 0.18                        | 23.6              |
| Approach                        |      | 522               | 2.0  | 0.394         | 5.1               | LOS A            | 3.7                            | 93.2              | 0.28         | 0.46                        | 22.5              |
| North                           |      | SB Black Hills    |      |               |                   |                  |                                |                   |              |                             |                   |
| 7L                              | L    | 11                | 2.0  | 0.081         | 9.6               | LOS A            | 0.5                            | 13.9              | 0.65         | 0.84                        | 21.8              |
| 4T                              | T    | 44                | 2.0  | 0.080         | 4.0               | LOS A            | 0.5                            | 13.9              | 0.65         | 0.51                        | 22.7              |
| 4R                              | R    | 1                 | 2.0  | 0.079         | 4.8               | LOS A            | 0.5                            | 13.9              | 0.65         | 0.50                        | 22.8              |
| Approach                        |      | 57                | 2.0  | 0.080         | 5.1               | LOS A            | 0.5                            | 13.9              | 0.65         | 0.57                        | 22.5              |
| West                            |      | EB Stumer Rd      |      |               |                   |                  |                                |                   |              |                             |                   |
| 5L                              | L    | 1                 | 2.0  | 0.101         | 9.1               | LOS A            | 0.7                            | 18.2              | 0.62         | 0.89                        | 22.0              |
| 2T                              | T    | 67                | 2.0  | 0.105         | 3.5               | LOS A            | 0.7                            | 18.2              | 0.62         | 0.49                        | 23.0              |
| 2R                              | R    | 11                | 2.0  | 0.105         | 4.3               | LOS A            | 0.7                            | 18.2              | 0.62         | 0.49                        | 23.0              |
| Approach                        |      | 79                | 2.0  | 0.105         | 3.7               | LOS A            | 0.7                            | 18.2              | 0.62         | 0.49                        | 22.9              |
| All Vehicles                    |      | 1202              | 2.0  | 0.397         | 3.3               | LOS A            | 3.7                            | 93.2              | 0.34         | 0.34                        | 23.0              |

Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).  
 Level of Service (Worst Movement): LOS A. LOS Method for individual vehicle movements: Delay (HCM).  
 Approach LOS values are based on the worst delay for any vehicle movement.  
 Roundabout LOS Method: Same as Signalised Intersections.  
 Roundabout Capacity Model: SIDRA Standard.

HCM Unsignalized Intersection Capacity Analysis  
4: Stumer & Wal-Mart/Shops

2010 Build PM Peak  
Black Hills TIS



| Movement               | EBL   | EBT  | EBR  | WBL  | WBT   | WBR  | NBL  | NBT  | NBR  | SBL  | SBT  | SBR  |
|------------------------|-------|------|------|------|-------|------|------|------|------|------|------|------|
| Lane Configurations    |       |      |      |      |       |      |      |      |      |      |      |      |
| Volume (veh/h)         | 70    | 220  | 35   | 70   | 190   | 230  | 40   | 5    | 55   | 250  | 5    | 70   |
| Sign Control           |       | Free |      |      | Free  |      |      | Stop |      |      | Stop |      |
| Grade                  |       | 0%   |      |      | 0%    |      |      | 0%   |      |      | 0%   |      |
| Peak Hour Factor       | 0.92  | 0.92 | 0.92 | 0.92 | 0.92  | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 76    | 239  | 38   | 76   | 207   | 250  | 43   | 5    | 60   | 272  | 5    | 76   |
| Pedestrians            |       |      |      |      |       |      |      |      |      |      |      |      |
| Lane Width (ft)        |       |      |      |      |       |      |      |      |      |      |      |      |
| Walking Speed (ft/s)   |       |      |      |      |       |      |      |      |      |      |      |      |
| Percent Blockage       |       |      |      |      |       |      |      |      |      |      |      |      |
| Right turn flare (veh) |       |      |      |      |       |      |      |      |      |      |      |      |
|                        |       |      |      |      |       |      |      |      |      |      |      | 4    |
| Median type            | TWLTL |      |      |      | TWLTL |      |      |      |      |      |      |      |
| Median storage veh     | 2     |      |      |      | 2     |      |      |      |      |      |      |      |
| Upstream signal (ft)   |       |      |      |      | 1178  |      |      |      |      |      |      |      |
| pX, platoon unblocked  |       |      |      |      |       |      |      |      |      |      |      |      |
| vC, conflicting volume | 207   |      |      | 277  |       |      | 810  | 769  | 258  | 812  | 788  | 207  |
| vC1, stage 1 conf vol  |       |      |      |      |       |      | 410  | 410  |      | 359  | 359  |      |
| vC2, stage 2 conf vol  |       |      |      |      |       |      | 399  | 359  |      | 454  | 429  |      |
| vCu, unblocked vol     | 207   |      |      | 277  |       |      | 810  | 769  | 258  | 812  | 788  | 207  |
| tC, single (s)         | 4.1   |      |      | 4.1  |       |      | 7.1  | 6.5  | 6.2  | 7.1  | 6.5  | 6.2  |
| tC, 2 stage (s)        |       |      |      |      |       |      | 6.1  | 5.5  |      | 6.1  | 5.5  |      |
| tF (s)                 | 2.2   |      |      | 2.2  |       |      | 3.5  | 4.0  | 3.3  | 3.5  | 4.0  | 3.3  |
| p0 queue free %        | 94    |      |      | 94   |       |      | 89   | 99   | 92   | 31   | 99   | 91   |
| cM capacity (veh/h)    | 1365  |      |      | 1286 |       |      | 405  | 444  | 780  | 395  | 429  | 834  |

| Direction, Lane #      | EB 1 | EB 2 | WB 1 | WB 2 | WB 3 | NB 1 | SB 1 |
|------------------------|------|------|------|------|------|------|------|
| Volume Total           | 76   | 277  | 76   | 207  | 250  | 109  | 353  |
| Volume Left            | 76   | 0    | 76   | 0    | 0    | 43   | 272  |
| Volume Right           | 0    | 38   | 0    | 0    | 250  | 60   | 76   |
| cSH                    | 1365 | 1700 | 1286 | 1700 | 1700 | 554  | 504  |
| Volume to Capacity     | 0.06 | 0.16 | 0.06 | 0.12 | 0.15 | 0.20 | 0.70 |
| Queue Length 95th (ft) | 4    | 0    | 5    | 0    | 0    | 18   | 136  |
| Control Delay (s)      | 7.8  | 0.0  | 8.0  | 0.0  | 0.0  | 13.1 | 27.8 |
| Lane LOS               | A    |      | A    |      |      | B    | D    |
| Approach Delay (s)     | 1.7  |      | 1.1  |      |      | 13.1 | 27.8 |
| Approach LOS           |      |      |      |      |      | B    | D    |

| Intersection Summary              |       |     |                        |
|-----------------------------------|-------|-----|------------------------|
| Average Delay                     |       | 9.2 |                        |
| Intersection Capacity Utilization | 50.1% |     | ICU Level of Service A |
| Analysis Period (min)             | 15    |     |                        |

HCM Unsignalized Intersection Capacity Analysis  
25: Stumer & Wal-Mart

2010 Build PM Peak  
Black Hills TIS



| Movement               | EBL  | EBT   | EBR  | WBL  | WBT   | WBR  | NBL  | NBT  | NBR  | SBL  | SBT  | SBR  |
|------------------------|------|-------|------|------|-------|------|------|------|------|------|------|------|
| Lane Configurations    |      |       |      |      |       |      |      |      |      |      |      |      |
| Volume (veh/h)         | 215  | 235   | 45   | 15   | 215   | 70   | 15   | 5    | 20   | 70   | 5    | 215  |
| Sign Control           |      | Free  |      |      | Free  |      |      | Stop |      |      | Stop |      |
| Grade                  |      | 0%    |      |      | 0%    |      |      | 0%   |      |      | 0%   |      |
| Peak Hour Factor       | 0.92 | 0.92  | 0.92 | 0.92 | 0.92  | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 234  | 255   | 49   | 16   | 234   | 76   | 16   | 5    | 22   | 76   | 5    | 234  |
| Pedestrians            |      |       |      |      |       |      |      |      |      |      |      |      |
| Lane Width (ft)        |      |       |      |      |       |      |      |      |      |      |      |      |
| Walking Speed (ft/s)   |      |       |      |      |       |      |      |      |      |      |      |      |
| Percent Blockage       |      |       |      |      |       |      |      |      |      |      |      |      |
| Right turn flare (veh) |      |       |      |      |       |      |      |      |      |      |      | 3    |
| Median type            |      | TWLTL |      |      | TWLTL |      |      |      |      |      |      |      |
| Median storage veh     |      | 2     |      |      | 2     |      |      |      |      |      |      |      |
| Upstream signal (ft)   |      |       |      |      |       |      |      |      |      |      |      |      |
| pX, platoon unblocked  |      |       |      |      |       |      |      |      |      |      |      |      |
| vC, conflicting volume | 310  |       |      | 304  |       |      | 1133 | 1090 | 280  | 1052 | 1076 | 272  |
| vC1, stage 1 conf vol  |      |       |      |      |       |      | 747  | 747  |      | 304  | 304  |      |
| vC2, stage 2 conf vol  |      |       |      |      |       |      | 386  | 342  |      | 747  | 772  |      |
| vCu, unblocked vol     | 310  |       |      | 304  |       |      | 1133 | 1090 | 280  | 1052 | 1076 | 272  |
| tC, single (s)         | 4.1  |       |      | 4.1  |       |      | 7.1  | 6.5  | 6.2  | 7.1  | 6.5  | 6.2  |
| tC, 2 stage (s)        |      |       |      |      |       |      | 6.1  | 5.5  |      | 6.1  | 5.5  |      |
| tF (s)                 | 2.2  |       |      | 2.2  |       |      | 3.5  | 4.0  | 3.3  | 3.5  | 4.0  | 3.3  |
| p0 queue free %        | 81   |       |      | 99   |       |      | 91   | 98   | 97   | 73   | 98   | 70   |
| cM capacity (veh/h)    | 1251 |       |      | 1256 |       |      | 185  | 293  | 759  | 285  | 300  | 767  |

| Direction, Lane #      | EB 1 | EB 2 | WB 1 | WB 2 | NB 1 | SB 1 |
|------------------------|------|------|------|------|------|------|
| Volume Total           | 234  | 304  | 16   | 310  | 43   | 315  |
| Volume Left            | 234  | 0    | 16   | 0    | 16   | 76   |
| Volume Right           | 0    | 49   | 0    | 76   | 22   | 234  |
| cSH                    | 1251 | 1700 | 1256 | 1700 | 321  | 1035 |
| Volume to Capacity     | 0.19 | 0.18 | 0.01 | 0.18 | 0.14 | 0.30 |
| Queue Length 95th (ft) | 17   | 0    | 1    | 0    | 12   | 32   |
| Control Delay (s)      | 8.5  | 0.0  | 7.9  | 0.0  | 18.0 | 14.5 |
| Lane LOS               | A    |      | A    |      | C    | B    |
| Approach Delay (s)     | 3.7  |      | 0.4  |      | 18.0 | 14.5 |
| Approach LOS           |      |      |      |      | C    | B    |

Intersection Summary

|                                   |       |
|-----------------------------------|-------|
| Average Delay                     | 6.1   |
| Intersection Capacity Utilization | 48.5% |
| ICU Level of Service              | A     |
| Analysis Period (min)             | 15    |

# HCM Unsignalized Intersection Capacity Analysis

## 27: Stumer & Shops

2010 Build PM Peak  
Black Hills TIS



| Movement               | EBL  | EBT   | EBR  | WBL  | WBT   | WBR  | NBL  | NBT  | NBR  | SBL  | SBT  | SBR  |
|------------------------|------|-------|------|------|-------|------|------|------|------|------|------|------|
| Lane Configurations    |      |       |      |      |       |      |      |      |      |      |      |      |
| Volume (veh/h)         | 45   | 465   | 15   | 20   | 445   | 60   | 5    | 5    | 30   | 50   | 5    | 40   |
| Sign Control           |      | Free  |      |      | Free  |      |      | Stop |      |      | Stop |      |
| Grade                  |      | 0%    |      |      | 0%    |      |      | 0%   |      |      | 0%   |      |
| Peak Hour Factor       | 0.92 | 0.92  | 0.92 | 0.92 | 0.92  | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 49   | 505   | 16   | 22   | 484   | 65   | 5    | 5    | 33   | 54   | 5    | 43   |
| Pedestrians            |      |       |      |      |       |      |      |      |      |      |      |      |
| Lane Width (ft)        |      |       |      |      |       |      |      |      |      |      |      |      |
| Walking Speed (ft/s)   |      |       |      |      |       |      |      |      |      |      |      |      |
| Percent Blockage       |      |       |      |      |       |      |      |      |      |      |      |      |
| Right turn flare (veh) |      |       |      |      |       |      |      |      |      |      |      |      |
| Median type            |      | TWLTL |      |      | TWLTL |      |      |      |      |      |      |      |
| Median storage (veh)   |      | 2     |      |      | 2     |      |      |      |      |      |      |      |
| Upstream signal (ft)   |      |       |      |      | 788   |      |      |      |      |      |      |      |
| pX, platoon unblocked  |      |       |      |      |       |      |      |      |      |      |      |      |
| vC, conflicting volume | 549  |       |      | 522  |       |      | 1185 | 1204 | 514  | 1166 | 1147 | 484  |
| vC1, stage 1 conf vol  |      |       |      |      |       |      | 611  | 611  |      | 527  | 527  |      |
| vC2, stage 2 conf vol  |      |       |      |      |       |      | 573  | 592  |      | 639  | 620  |      |
| vCu, unblocked vol     | 549  |       |      | 522  |       |      | 1185 | 1204 | 514  | 1166 | 1147 | 484  |
| tC, single (s)         | 4.1  |       |      | 4.1  |       |      | 7.1  | 6.5  | 6.2  | 7.1  | 6.5  | 6.2  |
| tC, 2 stage (s)        |      |       |      |      |       |      | 6.1  | 5.5  |      | 6.1  | 5.5  |      |
| tF (s)                 | 2.2  |       |      | 2.2  |       |      | 3.5  | 4.0  | 3.3  | 3.5  | 4.0  | 3.3  |
| p0 queue free %        | 95   |       |      | 98   |       |      | 98   | 98   | 94   | 84   | 99   | 93   |
| cM capacity (veh/h)    | 1021 |       |      | 1045 |       |      | 325  | 347  | 561  | 334  | 365  | 583  |

| Direction, Lane #      | EB 1 | EB 2 | WB 1 | WB 2 | WB 3 | NB 1 | SB 1 |
|------------------------|------|------|------|------|------|------|------|
| Volume Total           | 49   | 522  | 22   | 484  | 65   | 43   | 103  |
| Volume Left            | 49   | 0    | 22   | 0    | 0    | 5    | 54   |
| Volume Right           | 0    | 16   | 0    | 0    | 65   | 33   | 43   |
| cSH                    | 1021 | 1700 | 1045 | 1700 | 1700 | 480  | 409  |
| Volume to Capacity     | 0.05 | 0.31 | 0.02 | 0.28 | 0.04 | 0.09 | 0.25 |
| Queue Length 95th (ft) | 4    | 0    | 2    | 0    | 0    | 7    | 25   |
| Control Delay (s)      | 8.7  | 0.0  | 8.5  | 0.0  | 0.0  | 13.2 | 16.7 |
| Lane LOS               | A    |      | A    |      |      | B    | C    |
| Approach Delay (s)     | 0.7  |      | 0.3  |      |      | 13.2 | 16.7 |
| Approach LOS           |      |      |      |      |      | B    | C    |

### Intersection Summary

|                                   |       |
|-----------------------------------|-------|
| Average Delay                     | 2.3   |
| Intersection Capacity Utilization | 52.6% |
| ICU Level of Service              | A     |
| Analysis Period (min)             | 15    |

## **2010 Build Operating Conditions**

### **Weekday PM Peak Hour Perimeter Study Intersections**

Lanes, Volumes, Timings  
20: Minnesota & 5th St

2010 Build PM Peak  
Black Hills TIS



| Lane Group              | EBL   | EBT   | EBR  | WBL   | WBT   | WBR  | NBL   | NBT   | NBR   | SBL   | SBT   | SBR  |
|-------------------------|-------|-------|------|-------|-------|------|-------|-------|-------|-------|-------|------|
| Lane Configurations     |       |       |      |       |       |      |       |       |       |       |       |      |
| Volume (vph)            | 35    | 20    | 45   | 110   | 20    | 125  | 40    | 415   | 105   | 170   | 535   | 50   |
| Ideal Flow (vphpl)      | 1800  | 1800  | 1800 | 1800  | 1800  | 1800 | 1800  | 1800  | 1800  | 1800  | 1800  | 1800 |
| Storage Length (ft)     | 100   |       | 0    | 150   |       | 0    | 300   |       | 300   | 125   |       | 0    |
| Storage Lanes           | 1     |       | 0    | 1     |       | 0    | 1     |       | 1     | 1     |       | 0    |
| Taper Length (ft)       | 25    |       | 25   | 25    |       | 25   | 25    |       | 25    | 25    |       | 25   |
| Lane Util. Factor       | 1.00  | 1.00  | 1.00 | 1.00  | 1.00  | 1.00 | 1.00  | 0.95  | 1.00  | 1.00  | 0.95  | 0.95 |
| Frt                     |       | 0.896 |      |       | 0.871 |      |       |       | 0.850 |       | 0.987 |      |
| Flt Protected           | 0.950 |       |      | 0.950 |       |      | 0.950 |       |       | 0.950 |       |      |
| Satd. Flow (prot)       | 1676  | 1581  | 0    | 1676  | 1537  | 0    | 1676  | 3353  | 1500  | 1676  | 3309  | 0    |
| Flt Permitted           | 0.657 |       |      | 0.439 |       |      | 0.410 |       |       | 0.356 |       |      |
| Satd. Flow (perm)       | 1159  | 1581  | 0    | 775   | 1537  | 0    | 724   | 3353  | 1500  | 628   | 3309  | 0    |
| Right Turn on Red       |       |       | Yes  |       |       | Yes  |       |       | Yes   |       |       | Yes  |
| Satd. Flow (RTOR)       |       | 49    |      |       | 136   |      |       |       | 114   |       |       | 12   |
| Link Speed (mph)        |       | 35    |      |       | 35    |      |       | 45    |       |       |       | 45   |
| Link Distance (ft)      |       | 1080  |      |       | 1107  |      |       | 2181  |       |       |       | 552  |
| Travel Time (s)         |       | 21.0  |      |       | 21.6  |      |       | 33.0  |       |       |       | 8.4  |
| Peak Hour Factor        | 0.92  | 0.92  | 0.92 | 0.92  | 0.92  | 0.92 | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92 |
| Adj. Flow (vph)         | 38    | 22    | 49   | 120   | 22    | 136  | 43    | 451   | 114   | 185   | 582   | 54   |
| Shared Lane Traffic (%) |       |       |      |       |       |      |       |       |       |       |       |      |
| Lane Group Flow (vph)   | 38    | 71    | 0    | 120   | 158   | 0    | 43    | 451   | 114   | 185   | 636   | 0    |
| Turn Type               | pm+pt |       |      | pm+pt |       |      | pm+pt |       | Perm  | pm+pt |       |      |
| Protected Phases        | 7     | 4     |      | 3     | 8     |      | 5     | 2     |       | 1     | 6     |      |
| Permitted Phases        | 4     |       |      | 8     |       |      | 2     |       | 2     | 6     |       |      |
| Detector Phase          | 7     | 4     |      | 3     | 8     |      | 5     | 2     | 2     | 1     | 6     |      |
| Switch Phase            |       |       |      |       |       |      |       |       |       |       |       |      |
| Minimum Initial (s)     | 4.0   | 12.0  |      | 4.0   | 12.0  |      | 4.0   | 12.0  | 12.0  | 4.0   | 12.0  |      |
| Minimum Split (s)       | 10.0  | 30.0  |      | 10.0  | 30.0  |      | 10.0  | 30.0  | 30.0  | 10.0  | 30.0  |      |
| Total Split (s)         | 10.0  | 30.0  | 0.0  | 12.0  | 32.0  | 0.0  | 10.0  | 33.0  | 33.0  | 15.0  | 38.0  | 0.0  |
| Total Split (%)         | 11.1% | 33.3% | 0.0% | 13.3% | 35.6% | 0.0% | 11.1% | 36.7% | 36.7% | 16.7% | 42.2% | 0.0% |
| Maximum Green (s)       | 4.0   | 24.0  |      | 6.0   | 26.0  |      | 4.0   | 27.0  | 27.0  | 9.0   | 32.0  |      |
| Yellow Time (s)         | 4.5   | 4.5   |      | 4.5   | 4.5   |      | 4.5   | 4.5   | 4.5   | 4.5   | 4.5   |      |
| All-Red Time (s)        | 1.5   | 1.5   |      | 1.5   | 1.5   |      | 1.5   | 1.5   | 1.5   | 1.5   | 1.5   |      |
| Lost Time Adjust (s)    | 0.0   | 0.0   | 0.0  | 0.0   | 0.0   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0  |
| Total Lost Time (s)     | 6.0   | 6.0   | 4.0  | 6.0   | 6.0   | 4.0  | 6.0   | 6.0   | 6.0   | 6.0   | 6.0   | 4.0  |
| Lead/Lag                | Lead  | Lag   |      | Lead  | Lag   |      | Lead  | Lag   | Lag   | Lead  | Lag   |      |
| Lead-Lag Optimize?      | Yes   | Yes   |      | Yes   | Yes   |      | Yes   | Yes   | Yes   | Yes   | Yes   |      |
| Vehicle Extension (s)   | 3.0   | 3.0   |      | 3.0   | 3.0   |      | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   |      |
| Recall Mode             | None  | None  |      | None  | None  |      | None  | None  | None  | None  | None  |      |
| Walk Time (s)           |       | 7.0   |      |       | 7.0   |      |       | 7.0   | 7.0   |       | 7.0   |      |
| Flash Dont Walk (s)     |       | 17.0  |      |       | 17.0  |      |       | 17.0  | 17.0  |       | 17.0  |      |
| Pedestrian Calls (#/hr) |       | 0     |      |       | 0     |      |       | 0     | 0     |       | 0     |      |
| Act Effect Green (s)    | 10.5  | 13.2  |      | 15.7  | 16.0  |      | 20.2  | 15.7  | 15.7  | 30.8  | 28.5  |      |
| Actuated g/C Ratio      | 0.18  | 0.23  |      | 0.27  | 0.28  |      | 0.35  | 0.27  | 0.27  | 0.54  | 0.50  |      |
| v/c Ratio               | 0.15  | 0.18  |      | 0.35  | 0.30  |      | 0.13  | 0.49  | 0.23  | 0.37  | 0.38  |      |
| Control Delay           | 17.3  | 13.1  |      | 19.3  | 8.6   |      | 11.5  | 22.1  | 6.1   | 12.3  | 16.1  |      |
| Queue Delay             | 0.0   | 0.0   |      | 0.0   | 0.0   |      | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |      |
| Total Delay             | 17.3  | 13.1  |      | 19.3  | 8.6   |      | 11.5  | 22.1  | 6.1   | 12.3  | 16.1  |      |
| LOS                     | B     | B     |      | B     | A     |      | B     | C     | A     | B     | B     |      |



Lanes, Volumes, Timings  
20: Minnesota & 5th St

2010 Build PM Peak  
Black Hills TIS

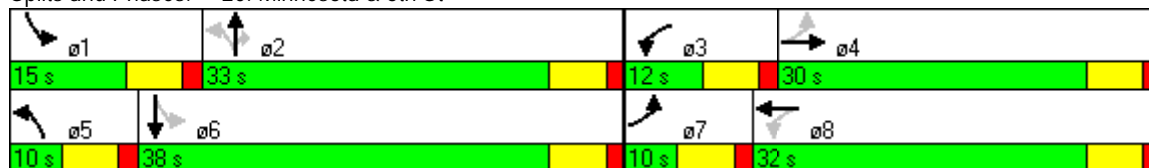


| Lane Group              | EBL  | EBT  | EBR | WBL  | WBT  | WBR | NBL  | NBT  | NBR  | SBL  | SBT | SBR  |
|-------------------------|------|------|-----|------|------|-----|------|------|------|------|-----|------|
| Approach Delay          |      | 14.6 |     |      | 13.2 |     |      | 18.4 |      |      |     | 15.2 |
| Approach LOS            |      | B    |     |      | B    |     |      | B    |      |      |     | B    |
| Queue Length 50th (ft)  | 10   | 7    |     | 32   | 6    |     | 9    | 85   | 0    | 43   |     | 112  |
| Queue Length 95th (ft)  | 30   | 41   |     | 73   | 54   |     | 24   | 127  | 34   | 80   |     | 162  |
| Internal Link Dist (ft) |      | 1000 |     |      | 1027 |     |      | 2101 |      |      |     | 472  |
| Turn Bay Length (ft)    | 100  |      |     | 150  |      |     | 300  |      | 300  | 125  |     |      |
| Base Capacity (vph)     | 252  | 759  |     | 339  | 839  |     | 329  | 1747 | 836  | 521  |     | 2018 |
| Starvation Cap Reductn  | 0    | 0    |     | 0    | 0    |     | 0    | 0    | 0    | 0    |     | 0    |
| Spillback Cap Reductn   | 0    | 0    |     | 0    | 0    |     | 0    | 0    | 0    | 0    |     | 0    |
| Storage Cap Reductn     | 0    | 0    |     | 0    | 0    |     | 0    | 0    | 0    | 0    |     | 0    |
| Reduced v/c Ratio       | 0.15 | 0.09 |     | 0.35 | 0.19 |     | 0.13 | 0.26 | 0.14 | 0.36 |     | 0.32 |

Intersection Summary

|                                   |                        |
|-----------------------------------|------------------------|
| Area Type:                        | Other                  |
| Cycle Length:                     | 90                     |
| Actuated Cycle Length:            | 57.1                   |
| Natural Cycle:                    | 80                     |
| Control Type:                     | Actuated-Uncoordinated |
| Maximum v/c Ratio:                | 0.49                   |
| Intersection Signal Delay:        | 15.9                   |
| Intersection LOS:                 | B                      |
| Intersection Capacity Utilization | 58.5%                  |
| ICU Level of Service              | B                      |
| Analysis Period (min)             | 15                     |

Splits and Phases: 20: Minnesota & 5th St



Lanes, Volumes, Timings  
33: Catron & Hwy 16

2010 Build PM Peak  
Black Hills TIS



| Lane Group              | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
|-------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations     |       |       |       |       |       |       |       |       |       |       |       |       |
| Volume (vph)            | 105   | 380   | 70    | 410   | 580   | 80    | 90    | 205   | 325   | 110   | 265   | 265   |
| Ideal Flow (vphpl)      | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Storage Length (ft)     | 300   |       | 150   | 300   |       | 175   | 500   |       | 1000  | 500   |       | 500   |
| Storage Lanes           | 1     |       | 1     | 1     |       | 1     | 1     |       | 1     | 1     |       | 1     |
| Taper Length (ft)       | 25    |       | 25    | 25    |       | 25    | 25    |       | 25    | 25    |       | 25    |
| Lane Util. Factor       | 1.00  | 1.00  | 1.00  | 1.00  | 0.95  | 1.00  | 1.00  | 0.95  | 1.00  | 1.00  | 0.95  | 1.00  |
| Frt                     |       |       | 0.850 |       |       | 0.850 |       |       | 0.850 |       |       | 0.850 |
| Flt Protected           | 0.950 |       |       | 0.950 |       |       | 0.950 |       |       | 0.950 |       |       |
| Satd. Flow (prot)       | 1676  | 1765  | 1500  | 1676  | 3353  | 1500  | 1676  | 3353  | 1500  | 1676  | 3353  | 1500  |
| Flt Permitted           | 0.413 |       |       | 0.182 |       |       | 0.950 |       |       | 0.950 |       |       |
| Satd. Flow (perm)       | 729   | 1765  | 1500  | 321   | 3353  | 1500  | 1676  | 3353  | 1500  | 1676  | 3353  | 1500  |
| Right Turn on Red       |       |       | Yes   |       |       | Yes   |       |       | Yes   |       |       | Yes   |
| Satd. Flow (RTOR)       |       |       | 59    |       |       | 87    |       |       | 353   |       |       | 288   |
| Link Speed (mph)        |       | 45    |       |       | 60    |       |       | 55    |       |       |       | 55    |
| Link Distance (ft)      |       | 1599  |       |       | 7967  |       |       | 1608  |       |       |       | 7136  |
| Travel Time (s)         |       | 24.2  |       |       | 90.5  |       |       | 19.9  |       |       |       | 88.5  |
| Peak Hour Factor        | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  |
| Adj. Flow (vph)         | 114   | 413   | 76    | 446   | 630   | 87    | 98    | 223   | 353   | 120   | 288   | 288   |
| Shared Lane Traffic (%) |       |       |       |       |       |       |       |       |       |       |       |       |
| Lane Group Flow (vph)   | 114   | 413   | 76    | 446   | 630   | 87    | 98    | 223   | 353   | 120   | 288   | 288   |
| Turn Type               | pm+pt |       | Perm  | pm+pt |       | Perm  | Prot  |       | Perm  | Prot  |       | Perm  |
| Protected Phases        | 7     | 4     |       | 3     | 8     |       | 5     | 2     |       | 1     | 6     |       |
| Permitted Phases        | 4     |       | 4     | 8     |       | 8     |       |       | 2     |       |       | 6     |
| Detector Phase          | 7     | 4     | 4     | 3     | 8     | 8     | 5     | 2     | 2     | 1     | 6     | 6     |
| Switch Phase            |       |       |       |       |       |       |       |       |       |       |       |       |
| Minimum Initial (s)     | 4.0   | 12.0  | 12.0  | 4.0   | 12.0  | 12.0  | 4.0   | 12.0  | 12.0  | 4.0   | 12.0  | 12.0  |
| Minimum Split (s)       | 10.0  | 18.0  | 18.0  | 10.0  | 18.0  | 18.0  | 10.0  | 18.0  | 18.0  | 10.0  | 18.0  | 18.0  |
| Total Split (s)         | 13.0  | 37.0  | 37.0  | 33.0  | 57.0  | 57.0  | 15.0  | 22.0  | 22.0  | 18.0  | 25.0  | 25.0  |
| Total Split (%)         | 11.8% | 33.6% | 33.6% | 30.0% | 51.8% | 51.8% | 13.6% | 20.0% | 20.0% | 16.4% | 22.7% | 22.7% |
| Maximum Green (s)       | 7.0   | 31.0  | 31.0  | 27.0  | 51.0  | 51.0  | 9.0   | 16.0  | 16.0  | 12.0  | 19.0  | 19.0  |
| Yellow Time (s)         | 4.5   | 4.5   | 4.5   | 4.5   | 4.5   | 4.5   | 4.5   | 4.5   | 4.5   | 4.5   | 4.5   | 4.5   |
| All-Red Time (s)        | 1.5   | 1.5   | 1.5   | 1.5   | 1.5   | 1.5   | 1.5   | 1.5   | 1.5   | 1.5   | 1.5   | 1.5   |
| Lost Time Adjust (s)    | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Total Lost Time (s)     | 6.0   | 6.0   | 6.0   | 6.0   | 6.0   | 6.0   | 6.0   | 6.0   | 6.0   | 6.0   | 6.0   | 6.0   |
| Lead/Lag                | Lead  | Lag   | Lag   | Lead  | Lag   | Lag   | Lead  | Lag   | Lag   | Lead  | Lag   | Lag   |
| Lead-Lag Optimize?      | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   |
| Vehicle Extension (s)   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   |
| Recall Mode             | None  | None  | None  | None  | None  | None  | None  | None  | None  | None  | None  | None  |
| Act Effct Green (s)     | 33.6  | 26.6  | 26.6  | 55.6  | 42.5  | 42.5  | 8.7   | 13.5  | 13.5  | 10.8  | 15.6  | 15.6  |
| Actuated g/C Ratio      | 0.34  | 0.27  | 0.27  | 0.57  | 0.43  | 0.43  | 0.09  | 0.14  | 0.14  | 0.11  | 0.16  | 0.16  |
| v/c Ratio               | 0.36  | 0.86  | 0.17  | 0.90  | 0.43  | 0.12  | 0.66  | 0.48  | 0.69  | 0.65  | 0.54  | 0.60  |
| Control Delay           | 16.8  | 54.2  | 12.1  | 43.0  | 20.2  | 4.1   | 68.6  | 45.2  | 12.5  | 62.2  | 43.8  | 10.6  |
| Queue Delay             | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Total Delay             | 16.8  | 54.2  | 12.1  | 43.0  | 20.2  | 4.1   | 68.6  | 45.2  | 12.5  | 62.2  | 43.8  | 10.6  |
| LOS                     | B     | D     | B     | D     | C     | A     | E     | D     | B     | E     | D     | B     |
| Approach Delay          |       | 41.8  |       |       | 27.8  |       |       | 31.5  |       |       | 33.2  |       |
| Approach LOS            |       | D     |       |       | C     |       |       | C     |       |       | C     |       |
| Queue Length 50th (ft)  | 31    | 257   | 8     | 197   | 139   | 0     | 65    | 75    | 0     | 78    | 96    | 0     |

Lanes, Volumes, Timings  
33: Catron & Hwy 16

2010 Build PM Peak  
Black Hills TIS

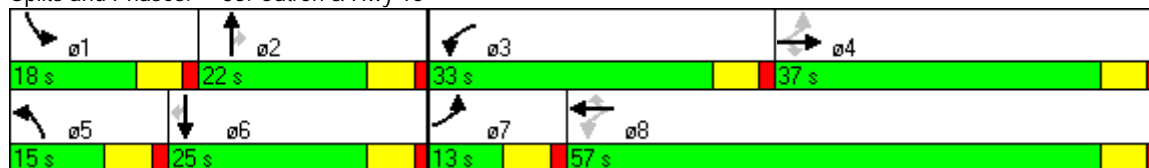


| Lane Group              | EBL  | EBT  | EBR  | WBL  | WBT  | WBR  | NBL  | NBT  | NBR  | SBL  | SBT  | SBR  |
|-------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Queue Length 95th (ft)  | 61   | #435 | 45   | #393 | 196  | 27   | #152 | 116  | 89   | #161 | 142  | 76   |
| Internal Link Dist (ft) |      | 1519 |      |      | 7887 |      |      | 1528 |      |      | 7056 |      |
| Turn Bay Length (ft)    | 300  |      | 150  | 300  |      | 175  | 500  |      | 1000 | 500  |      | 500  |
| Base Capacity (vph)     | 319  | 568  | 523  | 561  | 1775 | 835  | 157  | 557  | 544  | 209  | 661  | 527  |
| Starvation Cap Reductn  | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Spillback Cap Reductn   | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Storage Cap Reductn     | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Reduced v/c Ratio       | 0.36 | 0.73 | 0.15 | 0.80 | 0.35 | 0.10 | 0.62 | 0.40 | 0.65 | 0.57 | 0.44 | 0.55 |

Intersection Summary





















Area Type: Other  
 Cycle Length: 110  
 Actuated Cycle Length: 98.3  
 Natural Cycle: 90  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.90  
 Intersection Signal Delay: 32.5  
 Intersection LOS: C  
 Intersection Capacity Utilization 81.5%  
 ICU Level of Service D  
 Analysis Period (min) 15  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

Splits and Phases: 33: Catron & Hwy 16



Lanes, Volumes, Timings  
36: Catron & Cambell

2010 Build PM Peak  
Black Hills TIS

|                         |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Group              | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations     |  |  |   |  |  |   |  |   |  |  |   |  |
| Volume (vph)            | 275   | 350   | 110   | 65  | 390   | 170   | 75  | 0   | 50  | 135   | 0   | 390   |
| Ideal Flow (vphpl)      | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Storage Length (ft)     | 500   |   | 0   | 325   |   | 0   | 250   |   | 0   | 200   |   | 0   |
| Storage Lanes           | 2   |   | 0   | 2   |   | 0   | 1   |   | 1   | 1   |   | 1   |
| Taper Length (ft)       | 25  |   | 25  | 25  |   | 25  | 25  |   | 25  | 25  |   | 25  |
| Lane Util. Factor       | 0.97  | 0.95  | 0.95  | 0.97  | 0.95  | 0.95  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Frt                     |   | 0.964   |   |   | 0.954   |   |   |   | 0.850   |   |   | 0.850   |
| Flt Protected           | 0.950   |   |   | 0.950   |   |   | 0.950   |   |   | 0.950   |   |   |
| Satd. Flow (prot)       | 3252  | 3232  | 0   | 3252  | 3199  | 0   | 1676  | 0   | 1500  | 1676  | 0   | 1500  |
| Flt Permitted           | 0.950   |   |   | 0.950   |   |   | 0.950   |   |   | 0.950   |   |   |
| Satd. Flow (perm)       | 3252  | 3232  | 0   | 3252  | 3199  | 0   | 1676  | 0   | 1500  | 1676  | 0   | 1500  |
| Right Turn on Red       |   |   | Yes   |   |   | Yes   |   |   | Yes   |   |   | Yes   |
| Satd. Flow (RTOR)       |   | 57  |   |   | 83  |   |   |   | 54  |   |   | 370   |
| Link Speed (mph)        |   | 60  |   |   | 60  |   |   | 30  |   |   |   | 30  |
| Link Distance (ft)      |   | 6259  |   |   | 1790  |   |   | 1477  |   |   |   | 2203  |
| Travel Time (s)         |   | 71.1  |   |   | 20.3  |   |   | 33.6  |   |   |   | 50.1  |
| Peak Hour Factor        | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  |
| Adj. Flow (vph)         | 299   | 380   | 120   | 71  | 424   | 185   | 82  | 0   | 54  | 147   | 0   | 424   |
| Shared Lane Traffic (%) |   |   |   |   |   |   |   |   |   |   |   |   |
| Lane Group Flow (vph)   | 299   | 500   | 0   | 71  | 609   | 0   | 82  | 0   | 54  | 147   | 0   | 424   |
| Turn Type               | Prot  |   |   | Prot  |   |   | custom  |   | custom  | custom  |   | custom  |
| Protected Phases        | 7   | 4   |   | 3   | 8   |   |   |   |   |   |   |   |
| Permitted Phases        |   |   |   |   |   |   | 2   |   | 2   | 6   |   | 6   |
| Detector Phase          | 7   | 4   |   | 3   | 8   |   | 2   |   | 2   | 6   |   | 6   |
| Switch Phase            |   |   |   |   |   |   |   |   |   |   |   |   |
| Minimum Initial (s)     | 7.0   | 12.0  |   | 7.0   | 12.0  |   | 7.0   |   | 7.0   | 7.0   |   | 7.0   |
| Minimum Split (s)       | 13.0  | 18.0  |   | 13.0  | 18.0  |   | 13.0  |   | 13.0  | 13.0  |   | 13.0  |
| Total Split (s)         | 19.0  | 33.0  | 0.0   | 13.0  | 27.0  | 0.0   | 34.0  | 0.0   | 34.0  | 34.0  | 0.0   | 34.0  |
| Total Split (%)         | 23.8%   | 41.3%   | 0.0%  | 16.3%   | 33.8%   | 0.0%  | 42.5%   | 0.0%  | 42.5%   | 42.5%   | 0.0%  | 42.5%   |
| Maximum Green (s)       | 13.0  | 27.0  |   | 7.0   | 21.0  |   | 28.0  |   | 28.0  | 28.0  |   | 28.0  |
| Yellow Time (s)         | 4.5   | 4.5   |   | 4.5   | 4.5   |   | 4.5   |   | 4.5   | 4.5   |   | 4.5   |
| All-Red Time (s)        | 1.5   | 1.5   |   | 1.5   | 1.5   |   | 1.5   |   | 1.5   | 1.5   |   | 1.5   |
| Lost Time Adjust (s)    | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Total Lost Time (s)     | 6.0   | 6.0   | 4.0   | 6.0   | 6.0   | 4.0   | 6.0   | 4.0   | 6.0   | 6.0   | 4.0   | 6.0   |
| Lead/Lag                | Lead  | Lag   |   | Lead  | Lag   |   |   |   |   |   |   |   |
| Lead-Lag Optimize?      | Yes   | Yes   |   | Yes   | Yes   |   |   |   |   |   |   |   |
| Vehicle Extension (s)   | 3.0   | 3.0   |   | 3.0   | 3.0   |   | 3.0   |   | 3.0   | 3.0   |   | 3.0   |
| Recall Mode             | None  | Min   |   | None  | Min   |   | None  |   | None  | None  |   | None  |
| Act Effect Green (s)    | 10.4  | 25.1  |   | 7.2   | 15.6  |   | 11.7  |   | 11.7  | 11.7  |   | 11.7  |
| Actuated g/C Ratio      | 0.18  | 0.45  |   | 0.13  | 0.28  |   | 0.21  |   | 0.21  | 0.21  |   | 0.21  |
| v/c Ratio               | 0.50  | 0.34  |   | 0.17  | 0.65  |   | 0.23  |   | 0.15  | 0.42  |   | 0.70  |
| Control Delay           | 25.4  | 12.1  |   | 27.1  | 19.8  |   | 21.2  |   | 7.5   | 24.1  |   | 11.3  |
| Queue Delay             | 0.0   | 0.0   |   | 0.0   | 0.0   |   | 0.0   |   | 0.0   | 0.0   |   | 0.0   |
| Total Delay             | 25.4  | 12.1  |   | 27.1  | 19.8  |   | 21.2  |   | 7.5   | 24.1  |   | 11.3  |
| LOS                     | C   | B   |   | C   | B   |   | C   |   | A   | C   |   | B   |
| Approach Delay          |   | 17.1  |   |   | 20.6  |   |   |   |   |   |   |   |
| Approach LOS            |   | B   |   |   | C   |   |   |   |   |   |   |   |
| Queue Length 50th (ft)  | 44  | 55  |   | 10  | 75  |   | 23  |   | 0   | 42  |   | 15  |

Lanes, Volumes, Timings  
36: Catron & Cambell

2010 Build PM Peak  
Black Hills TIS

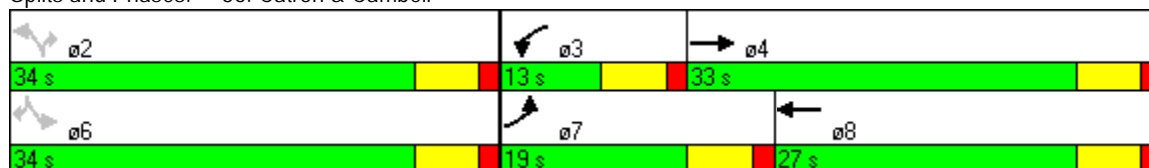


| Lane Group              | EBL  | EBT  | EBR | WBL  | WBT  | WBR | NBL  | NBT  | NBR  | SBL  | SBT  | SBR  |
|-------------------------|------|------|-----|------|------|-----|------|------|------|------|------|------|
| Queue Length 95th (ft)  | 101  | 115  |     | 34   | 161  |     | 59   |      | 24   | 97   |      | 94   |
| Internal Link Dist (ft) |      | 6179 |     |      | 1710 |     |      | 1397 |      |      | 2123 |      |
| Turn Bay Length (ft)    | 500  |      |     | 325  |      |     | 250  |      |      | 200  |      |      |
| Base Capacity (vph)     | 776  | 1632 |     | 418  | 1284 |     | 861  |      | 797  | 861  |      | 951  |
| Starvation Cap Reductn  | 0    | 0    |     | 0    | 0    |     | 0    |      | 0    | 0    |      | 0    |
| Spillback Cap Reductn   | 0    | 0    |     | 0    | 0    |     | 0    |      | 0    | 0    |      | 0    |
| Storage Cap Reductn     | 0    | 0    |     | 0    | 0    |     | 0    |      | 0    | 0    |      | 0    |
| Reduced v/c Ratio       | 0.39 | 0.31 |     | 0.17 | 0.47 |     | 0.10 |      | 0.07 | 0.17 |      | 0.45 |

Intersection Summary

|                                    |                        |
|------------------------------------|------------------------|
| Area Type:                         | Other                  |
| Cycle Length:                      | 80                     |
| Actuated Cycle Length:             | 56.3                   |
| Natural Cycle:                     | 45                     |
| Control Type:                      | Actuated-Uncoordinated |
| Maximum v/c Ratio:                 | 0.70                   |
| Intersection Signal Delay:         | 17.4                   |
| Intersection LOS:                  | B                      |
| Intersection Capacity Utilization: | 60.3%                  |
| ICU Level of Service:              | B                      |
| Analysis Period (min):             | 15                     |

Splits and Phases: 36: Catron & Cambell



## **2010 Build Operating Conditions**

### **Saturday Midday Peak Hour Primary Study Intersections**

Lanes, Volumes, Timings  
5: Catron & 5th St

Black Hills TIS  
2010 Build Saturday Peak

| Lane Group              | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR  | SBL   | SBT   | SBR   |
|-------------------------|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|-------|-------|
| Lane Configurations     |       |       |       |       |       |       |       |       |      |       |       |       |
| Volume (vph)            | 180   | 240   | 1     | 1     | 300   | 305   | 1     | 1     | 1    | 325   | 1     | 160   |
| Ideal Flow (vphpl)      | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800 | 1800  | 1800  | 1800  |
| Grade (%)               |       | -3%   |       |       | 2%    |       |       | 0%    |      |       |       | 0%    |
| Storage Length (ft)     | 450   |       | 450   | 400   |       | 450   | 200   |       | 0    | 200   |       | 0     |
| Storage Lanes           | 2     |       | 1     | 1     |       | 1     | 1     |       | 0    | 2     |       | 1     |
| Taper Length (ft)       | 25    |       | 25    | 25    |       | 25    | 25    |       | 25   | 25    |       | 25    |
| Satd. Flow (prot)       | 3301  | 3403  | 1523  | 1660  | 3319  | 1485  | 1676  | 3101  | 0    | 3252  | 1765  | 1500  |
| Flt Permitted           | 0.950 |       |       | 0.950 |       |       |       |       |      | 0.950 |       |       |
| Satd. Flow (perm)       | 3301  | 3403  | 1523  | 1660  | 3319  | 1485  | 1765  | 3101  | 0    | 3252  | 1765  | 1500  |
| Right Turn on Red       |       |       | Yes   |       |       | Yes   |       |       | Yes  |       |       | Yes   |
| Satd. Flow (RTOR)       |       |       | 1     |       |       | 332   |       | 400   |      |       |       | 174   |
| Link Speed (mph)        |       | 60    |       |       | 60    |       |       | 30    |      |       |       | 45    |
| Link Distance (ft)      |       | 2300  |       |       | 6259  |       |       | 549   |      |       |       | 650   |
| Travel Time (s)         |       | 26.1  |       |       | 71.1  |       |       | 12.5  |      |       |       | 9.8   |
| Peak Hour Factor        | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92 | 0.92  | 0.92  | 0.92  |
| Shared Lane Traffic (%) |       |       |       |       |       |       |       |       |      |       |       |       |
| Lane Group Flow (vph)   | 196   | 261   | 1     | 1     | 326   | 332   | 1     | 2     | 0    | 353   | 1     | 174   |
| Turn Type               | Prot  |       | Perm  | Prot  |       | Perm  | pm+pt |       |      | Prot  |       | Perm  |
| Protected Phases        | 7     | 4     |       | 3     | 8     |       | 5     | 2     |      | 1     | 6     |       |
| Permitted Phases        |       |       | 4     |       |       | 8     | 2     |       |      |       |       | 6     |
| Detector Phase          | 7     | 4     | 4     | 3     | 8     | 8     | 5     | 2     |      | 1     | 6     | 6     |
| Switch Phase            |       |       |       |       |       |       |       |       |      |       |       |       |
| Minimum Initial (s)     | 4.0   | 12.0  | 12.0  | 4.0   | 12.0  | 12.0  | 4.0   | 7.0   |      | 4.0   | 12.0  | 12.0  |
| Minimum Split (s)       | 10.0  | 31.3  | 31.3  | 10.0  | 30.7  | 30.7  | 10.0  | 30.0  |      | 10.0  | 30.0  | 30.0  |
| Total Split (s)         | 23.0  | 50.0  | 50.0  | 10.0  | 37.0  | 37.0  | 10.0  | 16.0  | 0.0  | 34.0  | 40.0  | 40.0  |
| Total Split (%)         | 20.9% | 45.5% | 45.5% | 9.1%  | 33.6% | 33.6% | 9.1%  | 14.5% | 0.0% | 30.9% | 36.4% | 36.4% |
| Maximum Green (s)       | 17.0  | 43.0  | 43.0  | 4.0   | 30.6  | 30.6  | 4.5   | 10.5  |      | 28.5  | 34.5  | 34.5  |
| Yellow Time (s)         | 4.5   | 5.8   | 5.8   | 4.5   | 5.2   | 5.2   | 4.0   | 4.0   |      | 4.0   | 4.0   | 4.0   |
| All-Red Time (s)        | 1.5   | 1.2   | 1.2   | 1.5   | 1.2   | 1.2   | 1.5   | 1.5   |      | 1.5   | 1.5   | 1.5   |
| Lost Time Adjust (s)    | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0  | 0.0   | 0.0   | 0.0   |
| Total Lost Time (s)     | 6.0   | 7.0   | 7.0   | 6.0   | 6.4   | 6.4   | 5.5   | 5.5   | 4.0  | 5.5   | 5.5   | 5.5   |
| Lead/Lag                | Lag   | Lag   | Lag   | Lead  | Lead  | Lead  | Lead  | Lag   |      | Lead  | Lag   | Lag   |
| Lead-Lag Optimize?      | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   |      | Yes   | Yes   | Yes   |
| Vehicle Extension (s)   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   |      | 3.0   | 3.0   | 3.0   |
| Recall Mode             | None  | C-Max | C-Max | None  | C-Max | C-Max | None  | None  |      | Max   | Max   | Max   |
| Walk Time (s)           |       | 7.0   | 7.0   |       | 7.0   | 7.0   |       | 7.0   |      |       | 7.0   | 7.0   |
| Flash Dont Walk (s)     |       | 17.0  | 17.0  |       | 17.0  | 17.0  |       | 17.0  |      |       | 17.0  | 17.0  |
| Pedestrian Calls (#/hr) |       | 0     | 0     |       | 0     | 0     |       | 0     |      |       | 0     | 0     |
| Act Effct Green (s)     | 17.0  | 59.0  | 59.0  | 4.0   | 38.6  | 38.6  | 6.6   | 7.7   |      | 33.3  | 34.5  | 34.5  |
| Actuated g/C Ratio      | 0.15  | 0.54  | 0.54  | 0.04  | 0.35  | 0.35  | 0.06  | 0.07  |      | 0.30  | 0.31  | 0.31  |
| v/c Ratio               | 0.38  | 0.14  | 0.00  | 0.02  | 0.28  | 0.45  | 0.01  | 0.00  |      | 0.36  | 0.00  | 0.29  |
| Control Delay           | 44.4  | 13.1  | 11.0  | 52.0  | 27.3  | 5.4   | 34.0  | 0.0   |      | 25.4  | 22.0  | 3.1   |
| Queue Delay             | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |      | 0.0   | 0.0   | 0.0   |
| Total Delay             | 44.4  | 13.1  | 11.0  | 52.0  | 27.3  | 5.4   | 34.0  | 0.0   |      | 25.4  | 22.0  | 3.1   |
| LOS                     | D     | B     | B     | D     | C     | A     | C     | A     |      | C     | C     | A     |
| Approach Delay          |       | 26.5  |       |       | 16.3  |       |       | 11.3  |      |       | 18.1  |       |
| Approach LOS            |       | C     |       |       | B     |       |       | B     |      |       | B     |       |
| Queue Length 50th (ft)  | 66    | 51    | 0     | 1     | 83    | 0     | 1     | 0     |      | 67    | 0     | 0     |

Lanes, Volumes, Timings  
5: Catron & 5th St

Black Hills TIS  
2010 Build Saturday Peak

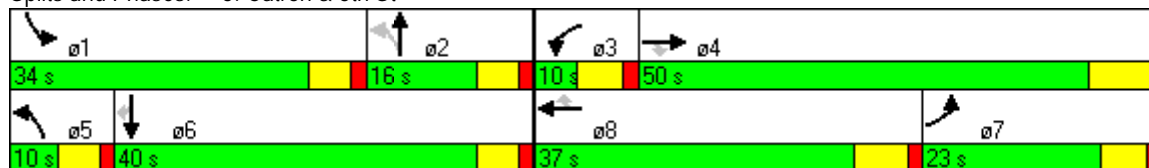


| Lane Group              | EBL  | EBT  | EBR  | WBL  | WBT  | WBR  | NBL  | NBT  | NBR | SBL  | SBT  | SBR  |
|-------------------------|------|------|------|------|------|------|------|------|-----|------|------|------|
| Queue Length 95th (ft)  | 103  | 101  | m3   | 6    | 138  | 69   | 4    | 0    |     | 111  | m2   | 9    |
| Internal Link Dist (ft) |      | 2220 |      |      | 6179 |      |      | 469  |     |      | 570  |      |
| Turn Bay Length (ft)    | 450  |      | 450  | 400  |      | 450  | 200  |      |     | 200  |      |      |
| Base Capacity (vph)     | 510  | 1825 | 818  | 60   | 1165 | 737  | 103  | 658  |     | 985  | 554  | 590  |
| Starvation Cap Reductn  | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |     | 0    | 0    | 0    |
| Spillback Cap Reductn   | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |     | 0    | 0    | 0    |
| Storage Cap Reductn     | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |     | 0    | 0    | 0    |
| Reduced v/c Ratio       | 0.38 | 0.14 | 0.00 | 0.02 | 0.28 | 0.45 | 0.01 | 0.00 |     | 0.36 | 0.00 | 0.29 |

Intersection Summary

Area Type: Other  
 Cycle Length: 110  
 Actuated Cycle Length: 110  
 Offset: 0 (0%), Referenced to phase 4:EBT and 8:WBT, Start of Green  
 Natural Cycle: 85  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.45  
 Intersection Signal Delay: 19.7  
 Intersection LOS: B  
 Intersection Capacity Utilization 46.8%  
 ICU Level of Service A  
 Analysis Period (min) 15  
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Catron & 5th St





Lanes, Volumes, Timings  
3: Catron & Black Hills

2010 Build Saturday Peak  
Black Hills TIS



| Lane Group              | EBL   | EBT   | WBT   | WBR   | SBL   | SBR   |
|-------------------------|-------|-------|-------|-------|-------|-------|
| Lane Configurations     |       |       |       |       |       |       |
| Volume (vph)            | 485   | 365   | 325   | 135   | 55    | 450   |
| Ideal Flow (vphpl)      | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Grade (%)               |       | -4%   | 4%    |       | 0%    |       |
| Storage Length (ft)     | 450   |       |       | 300   | 100   | 0     |
| Storage Lanes           | 1     |       |       | 1     | 1     | 1     |
| Taper Length (ft)       | 25    |       |       | 25    | 25    | 25    |
| Lane Util. Factor       | 1.00  | 0.95  | 0.95  | 1.00  | 1.00  | 1.00  |
| Frt                     |       |       |       | 0.850 |       | 0.850 |
| Flt Protected           | 0.950 |       |       |       | 0.950 |       |
| Satd. Flow (prot)       | 1710  | 3420  | 3286  | 1470  | 1676  | 1500  |
| Flt Permitted           | 0.950 |       |       |       | 0.950 |       |
| Satd. Flow (perm)       | 1710  | 3420  | 3286  | 1470  | 1676  | 1500  |
| Right Turn on Red       |       |       |       | Yes   |       | Yes   |
| Satd. Flow (RTOR)       |       |       |       | 147   |       | 489   |
| Link Speed (mph)        |       | 60    | 60    |       | 25    |       |
| Link Distance (ft)      |       | 1456  | 2300  |       | 402   |       |
| Travel Time (s)         |       | 16.5  | 26.1  |       | 11.0  |       |
| Peak Hour Factor        | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  |
| Adj. Flow (vph)         | 527   | 397   | 353   | 147   | 60    | 489   |
| Shared Lane Traffic (%) |       |       |       |       |       |       |
| Lane Group Flow (vph)   | 527   | 397   | 353   | 147   | 60    | 489   |
| Turn Type               | Prot  |       |       | Perm  |       | Perm  |
| Protected Phases        | 7     | 4     | 8     |       | 6     |       |
| Permitted Phases        |       |       |       | 8     |       | 6     |
| Detector Phase          | 7     | 4     | 8     | 8     | 6     | 6     |
| Switch Phase            |       |       |       |       |       |       |
| Minimum Initial (s)     | 7.0   | 12.0  | 12.0  | 12.0  | 7.0   | 7.0   |
| Minimum Split (s)       | 13.0  | 19.5  | 30.4  | 30.4  | 13.0  | 13.0  |
| Total Split (s)         | 50.0  | 82.0  | 32.0  | 32.0  | 28.0  | 28.0  |
| Total Split (%)         | 45.5% | 74.5% | 29.1% | 29.1% | 25.5% | 25.5% |
| Maximum Green (s)       | 44.0  | 74.8  | 25.9  | 25.9  | 22.5  | 22.5  |
| Yellow Time (s)         | 4.5   | 6.0   | 4.9   | 4.9   | 4.0   | 4.0   |
| All-Red Time (s)        | 1.5   | 1.2   | 1.2   | 1.2   | 1.5   | 1.5   |
| Lost Time Adjust (s)    | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Total Lost Time (s)     | 6.0   | 7.2   | 6.1   | 6.1   | 5.5   | 5.5   |
| Lead/Lag                | Lead  |       | Lag   | Lag   |       |       |
| Lead-Lag Optimize?      | Yes   |       | Yes   | Yes   |       |       |
| Vehicle Extension (s)   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   |
| Recall Mode             | None  | C-Max | C-Max | C-Max | None  | None  |
| Walk Time (s)           |       |       | 7.0   | 7.0   |       |       |
| Flash Dont Walk (s)     |       |       | 17.0  | 17.0  |       |       |
| Pedestrian Calls (#/hr) |       |       | 0     | 0     |       |       |
| Act Effect Green (s)    | 38.3  | 85.5  | 42.2  | 42.2  | 11.8  | 11.8  |
| Actuated g/C Ratio      | 0.35  | 0.78  | 0.38  | 0.38  | 0.11  | 0.11  |
| v/c Ratio               | 0.88  | 0.15  | 0.28  | 0.22  | 0.33  | 0.82  |
| Control Delay           | 50.7  | 3.8   | 12.7  | 1.5   | 46.6  | 15.5  |
| Queue Delay             | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Total Delay             | 50.7  | 3.8   | 12.7  | 1.5   | 46.6  | 15.5  |

Lanes, Volumes, Timings  
3: Catron & Black Hills

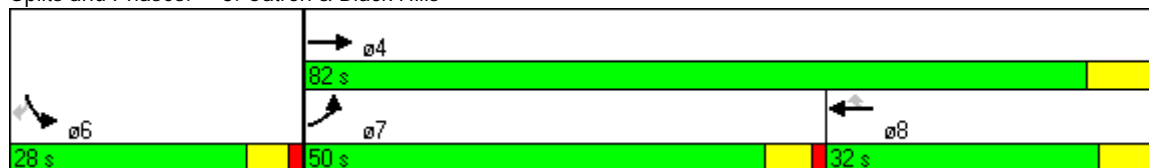


| Lane Group              | EBL  | EBT  | WBT  | WBR  | SBL  | SBR  |
|-------------------------|------|------|------|------|------|------|
| LOS                     | D    | A    | B    | A    | D    | B    |
| Approach Delay          |      | 30.6 | 9.4  |      | 18.9 |      |
| Approach LOS            |      | C    | A    |      | B    |      |
| Queue Length 50th (ft)  | 340  | 26   | 41   | 0    | 41   | 16   |
| Queue Length 95th (ft)  | 458  | 66   | 69   | 3    | 74   | 109  |
| Internal Link Dist (ft) |      | 1376 | 2220 |      | 322  |      |
| Turn Bay Length (ft)    | 450  |      |      | 300  | 100  |      |
| Base Capacity (vph)     | 684  | 2658 | 1262 | 655  | 343  | 696  |
| 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       | 0.77 | 0.15 | 0.28 | 0.22 | 0.17 | 0.70 |

Intersection Summary

|                                   |  |
|-----------------------------------|--|
| Area Type:                        | Other  |
| Cycle Length:                     | 110  |
| Actuated Cycle Length:            | 110  |
| Offset:                           | 10 (9%), Referenced to phase 4:EBT and 8:WBT, Start of Green |
| Natural Cycle:                    | 80   |
| Control Type:                     | Actuated-Coordinated   |
| Maximum v/c Ratio:                | 0.88   |
| Intersection Signal Delay:        | 22.0   |
| Intersection LOS:                 | C  |
| Intersection Capacity Utilization | 58.9%  |
| ICU Level of Service              | B  |
| Analysis Period (min)             | 15   |

Splits and Phases: 3: Catron & Black Hills



Lanes, Volumes, Timings  
9: Stumer & 5th St

2010 Build Saturday Peak  
Black Hills TIS



| Lane Group              | EBL   | EBT   | EBR   | WBL   | WBT   | WBR  | NBL   | NBT   | NBR  | SBL   | SBT   | SBR   |
|-------------------------|-------|-------|-------|-------|-------|------|-------|-------|------|-------|-------|-------|
| Lane Configurations     |       |       |       |       |       |      |       |       |      |       |       |       |
| Volume (vph)            | 340   | 40    | 230   | 5     | 35    | 10   | 305   | 180   | 0    | 5     | 190   | 320   |
| Ideal Flow (vphpl)      | 1800  | 1800  | 1800  | 1800  | 1800  | 1800 | 1800  | 1800  | 1800 | 1800  | 1800  | 1800  |
| Storage Length (ft)     | 120   |       | 150   | 100   |       | 0    | 200   |       | 0    | 150   |       | 150   |
| Storage Lanes           | 2     |       | 1     | 1     |       | 0    | 1     |       | 0    | 1     |       | 1     |
| Taper Length (ft)       | 25    |       | 25    | 25    |       | 25   | 25    |       | 25   | 25    |       | 25    |
| Lane Util. Factor       | 0.97  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00 | 1.00  | 0.95  | 0.95 | 1.00  | 0.95  | 1.00  |
| Frt                     |       |       | 0.850 |       | 0.966 |      |       |       |      |       |       | 0.850 |
| Flt Protected           | 0.950 |       |       | 0.950 |       |      | 0.950 |       |      | 0.950 |       |       |
| Satd. Flow (prot)       | 3252  | 1765  | 1500  | 1676  | 1705  | 0    | 1676  | 3353  | 0    | 1676  | 3353  | 1500  |
| Flt Permitted           | 0.950 |       |       | 0.729 |       |      | 0.556 |       |      | 0.629 |       |       |
| Satd. Flow (perm)       | 3252  | 1765  | 1500  | 1286  | 1705  | 0    | 981   | 3353  | 0    | 1110  | 3353  | 1500  |
| Right Turn on Red       |       |       | Yes   |       |       | Yes  |       |       | Yes  |       |       | Yes   |
| Satd. Flow (RTOR)       |       |       | 250   |       | 11    |      |       |       |      |       |       | 348   |
| Link Speed (mph)        |       | 25    |       |       | 25    |      |       | 45    |      |       |       | 45    |
| Link Distance (ft)      |       | 473   |       |       | 610   |      |       | 650   |      |       |       | 584   |
| Travel Time (s)         |       | 12.9  |       |       | 16.6  |      |       | 9.8   |      |       |       | 8.8   |
| Peak Hour Factor        | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92 | 0.92  | 0.92  | 0.92 | 0.92  | 0.92  | 0.92  |
| Adj. Flow (vph)         | 370   | 43    | 250   | 5     | 38    | 11   | 332   | 196   | 0    | 5     | 207   | 348   |
| Shared Lane Traffic (%) |       |       |       |       |       |      |       |       |      |       |       |       |
| Lane Group Flow (vph)   | 370   | 43    | 250   | 5     | 49    | 0    | 332   | 196   | 0    | 5     | 207   | 348   |
| Turn Type               | Prot  |       | Perm  | pm+pt |       |      | pm+pt |       |      | pm+pt |       | Perm  |
| Protected Phases        | 7     | 4     |       | 3     | 8     |      | 5     | 2     |      | 1     | 6     |       |
| Permitted Phases        |       |       | 4     | 8     |       |      | 2     |       |      | 6     |       | 6     |
| Detector Phase          | 7     | 4     | 4     | 3     | 8     |      | 5     | 2     |      | 1     | 6     | 6     |
| Switch Phase            |       |       |       |       |       |      |       |       |      |       |       |       |
| Minimum Initial (s)     | 7.0   | 12.0  | 12.0  | 4.0   | 7.0   |      | 7.0   | 12.0  |      | 4.0   | 12.0  | 12.0  |
| Minimum Split (s)       | 13.0  | 30.0  | 30.0  | 10.0  | 30.0  |      | 13.0  | 30.0  |      | 10.0  | 30.0  | 30.0  |
| Total Split (s)         | 24.0  | 44.0  | 44.0  | 10.0  | 30.0  | 0.0  | 24.0  | 46.0  | 0.0  | 10.0  | 32.0  | 32.0  |
| Total Split (%)         | 21.8% | 40.0% | 40.0% | 9.1%  | 27.3% | 0.0% | 21.8% | 41.8% | 0.0% | 9.1%  | 29.1% | 29.1% |
| Maximum Green (s)       | 18.5  | 38.5  | 38.5  | 4.5   | 24.5  |      | 18.5  | 40.5  |      | 4.5   | 26.5  | 26.5  |
| Yellow Time (s)         | 4.0   | 4.0   | 4.0   | 4.0   | 4.0   |      | 4.0   | 4.0   |      | 4.0   | 4.0   | 4.0   |
| All-Red Time (s)        | 1.5   | 1.5   | 1.5   | 1.5   | 1.5   |      | 1.5   | 1.5   |      | 1.5   | 1.5   | 1.5   |
| Lost Time Adjust (s)    | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0  | 0.0   | 0.0   | 0.0  | 0.0   | 0.0   | 0.0   |
| Total Lost Time (s)     | 5.5   | 5.5   | 5.5   | 5.5   | 5.5   | 4.0  | 5.5   | 5.5   | 4.0  | 5.5   | 5.5   | 5.5   |
| Lead/Lag                | Lead  | Lag   | Lag   | Lead  | Lag   |      | Lead  | Lag   |      | Lead  | Lag   | Lag   |
| Lead-Lag Optimize?      | Yes   | Yes   | Yes   | Yes   | Yes   |      | Yes   | Yes   |      | Yes   | Yes   | Yes   |
| Vehicle Extension (s)   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   |      | 3.0   | 3.0   |      | 3.0   | 3.0   | 3.0   |
| Recall Mode             | None  | None  | None  | None  | None  |      | None  | C-Max |      | None  | C-Max | C-Max |
| Walk Time (s)           |       | 7.0   | 7.0   |       | 7.0   |      |       | 7.0   |      |       | 7.0   | 7.0   |
| Flash Dont Walk (s)     |       | 17.5  | 17.5  |       | 17.5  |      |       | 11.0  |      |       | 15.0  | 15.0  |
| Pedestrian Calls (#/hr) |       | 0     | 0     |       | 0     |      |       | 0     |      |       | 0     | 0     |
| Act Effect Green (s)    | 16.7  | 26.1  | 26.1  | 11.5  | 8.4   |      | 70.9  | 68.9  |      | 54.9  | 50.4  | 50.4  |
| Actuated g/C Ratio      | 0.15  | 0.24  | 0.24  | 0.10  | 0.08  |      | 0.64  | 0.63  |      | 0.50  | 0.46  | 0.46  |
| v/c Ratio               | 0.75  | 0.10  | 0.46  | 0.03  | 0.35  |      | 0.46  | 0.09  |      | 0.01  | 0.13  | 0.40  |
| Control Delay           | 54.6  | 31.6  | 7.1   | 28.6  | 45.8  |      | 10.7  | 8.3   |      | 11.0  | 20.2  | 4.1   |
| Queue Delay             | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |      | 0.0   | 0.0   |      | 0.0   | 0.0   | 0.0   |
| Total Delay             | 54.6  | 31.6  | 7.1   | 28.6  | 45.8  |      | 10.7  | 8.3   |      | 11.0  | 20.2  | 4.1   |
| LOS                     | D     | C     | A     | C     | D     |      | B     | A     |      | B     | C     | A     |

Lanes, Volumes, Timings  
9: Stumer & 5th St

2010 Build Saturday Peak  
Black Hills TIS

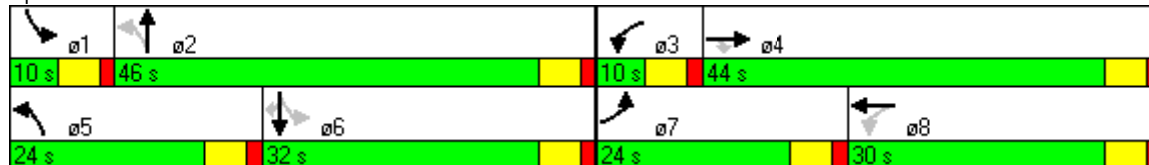


| Lane Group              | EBL  | EBT  | EBR  | WBL  | WBT  | WBR | NBL  | NBT  | NBR | SBL  | SBT  | SBR  |
|-------------------------|------|------|------|------|------|-----|------|------|-----|------|------|------|
| Approach Delay          |      | 35.2 |      |      | 44.2 |     |      | 9.8  |     |      | 10.1 |      |
| Approach LOS            |      | D    |      |      | D    |     |      | A    |     |      | B    |      |
| Queue Length 50th (ft)  | 128  | 22   | 0    | 3    | 26   |     | 60   | 16   |     | 1    | 46   | 0    |
| Queue Length 95th (ft)  | 178  | 55   | 65   | 11   | 63   |     | 274  | 53   |     | 7    | 79   | 60   |
| Internal Link Dist (ft) |      | 393  |      |      | 530  |     |      | 570  |     |      | 504  |      |
| Turn Bay Length (ft)    | 120  |      | 150  | 100  |      |     | 200  |      |     | 150  |      | 150  |
| Base Capacity (vph)     | 547  | 618  | 688  | 151  | 388  |     | 749  | 2100 |     | 577  | 1538 | 876  |
| 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       | 0.68 | 0.07 | 0.36 | 0.03 | 0.13 |     | 0.44 | 0.09 |     | 0.01 | 0.13 | 0.40 |

Intersection Summary




















|                                   |   |
|-----------------------------------|---|
| Area Type:                        | Other   |
| Cycle Length:                     | 110   |
| Actuated Cycle Length:            | 110   |
| Offset:                           | 67 (61%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green |
| Natural Cycle:                    | 90  |
| Control Type:                     | Actuated-Coordinated  |
| Maximum v/c Ratio:                | 0.75  |
| Intersection Signal Delay:        | 20.3  |
| Intersection LOS:                 | C   |
| Intersection Capacity Utilization | 58.5%   |
| ICU Level of Service              | B   |
| Analysis Period (min)             | 15  |

Splits and Phases: 9: Stumer & 5th St



HCM Unsignalized Intersection Capacity Analysis  
 13: Parkview & 5th St

2010 Build Saturday Peak  
 Black Hills TIS

|                                   |  |  |  |  |  |  |   |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement                          | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations               |   |  |   |   |  |  |  |  |   |  |  |   |
| Volume (veh/h)                    | 10  | 0   | 15  | 55  | 5   | 15  | 55  | 420   | 55  | 10  | 445   | 25  |
| Sign Control                      |   | Stop  |   |   | Stop  |   |   | Free  |   |   | Free  |   |
| Grade                             |   | 0%  |   |   | 0%  |   |   | 0%  |   |   | 0%  |   |
| Peak Hour Factor                  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  |
| Hourly flow rate (vph)            | 11  | 0   | 16  | 60  | 5   | 16  | 60  | 457   | 60  | 11  | 484   | 27  |
| Pedestrians                       |   |   |   |   |   |   |   |   |   |   |   |   |
| Lane Width (ft)                   |   |   |   |   |   |   |   |   |   |   |   |   |
| Walking Speed (ft/s)              |   |   |   |   |   |   |   |   |   |   |   |   |
| Percent Blockage                  |   |   |   |   |   |   |   |   |   |   |   |   |
| Right turn flare (veh)            |   |   |   |   |   |   |   |   |   |   |   |   |
| Median type                       |   |   |   |   |   |   |   |   |   |   |   |   |
| Median storage (veh)              |   |   |   |   |   |   |   |   |   |   |   |   |
| Upstream signal (ft)              |   |   |   |   |   |   |   |   |   |   |   |   |
| pX, platoon unblocked             |   |   |   |   |   |   |   |   |   |   |   |   |
| vC, conflicting volume            | 870   | 1155  | 255   | 886   | 1139  | 258   | 511   |   |   | 516   |   |   |
| vC1, stage 1 conf vol             |   |   |   |   |   |   |   |   |   |   |   |   |
| vC2, stage 2 conf vol             |   |   |   |   |   |   |   |   |   |   |   |   |
| vCu, unblocked vol                | 870   | 1155  | 255   | 886   | 1139  | 258   | 511   |   |   | 516   |   |   |
| tC, single (s)                    | 7.5   | 6.5   | 6.9   | 7.5   | 6.5   | 6.9   | 4.1   |   |   | 4.1   |   |   |
| tC, 2 stage (s)                   |   |   |   |   |   |   |   |   |   |   |   |   |
| tF (s)                            | 3.5   | 4.0   | 3.3   | 3.5   | 4.0   | 3.3   | 2.2   |   |   | 2.2   |   |   |
| p0 queue free %                   | 95  | 100   | 98  | 73  | 97  | 98  | 94  |   |   | 99  |   |   |
| cM capacity (veh/h)               | 223   | 183   | 744   | 222   | 187   | 741   | 1051  |   |   | 1046  |   |   |
| Direction, Lane #                 | EB 1  | WB 1  | NB 1  | NB 2  | NB 3  | SB 1  | SB 2  | SB 3  |   |   |   |   |
| Volume Total                      | 27  | 82  | 60  | 304   | 212   | 11  | 322   | 188   |   |   |   |   |
| Volume Left                       | 11  | 60  | 60  | 0   | 0   | 11  | 0   | 0   |   |   |   |   |
| Volume Right                      | 16  | 16  | 0   | 0   | 60  | 0   | 0   | 27  |   |   |   |   |
| cSH                               | 385   | 274   | 1051  | 1700  | 1700  | 1046  | 1700  | 1700  |   |   |   |   |
| Volume to Capacity                | 0.07  | 0.30  | 0.06  | 0.18  | 0.12  | 0.01  | 0.19  | 0.11  |   |   |   |   |
| Queue Length 95th (ft)            | 6   | 30  | 5   | 0   | 0   | 1   | 0   | 0   |   |   |   |   |
| Control Delay (s)                 | 15.1  | 24.6  | 8.6   | 0.0   | 0.0   | 8.5   | 0.0   | 0.0   |   |   |   |   |
| Lane LOS                          | C   | C   | A   |   |   | A   |   |   |   |   |   |   |
| Approach Delay (s)                | 15.1  | 24.6  | 0.9   |   |   | 0.2   |   |   |   |   |   |   |
| Approach LOS                      | C   | C   |   |   |   |   |   |   |   |   |   |   |
| Intersection Summary              |   |   |   |   |   |   |   |   |   |   |   |   |
| Average Delay                     |   |   | 2.5   |   |   |   |   |   |   |   |   |   |
| Intersection Capacity Utilization |   |   | 35.7%   |   | ICU Level of Service  |   |   |   |   |   | A   |   |
| Analysis Period (min)             |   |   | 15  |   |   |   |   |   |   |   |   |   |

HCM Unsignalized Intersection Capacity Analysis  
 12: Enchanted Pines & 5th St

2010 Build Saturday Peak  
 Black Hills TIS



| Movement                          | EBL  | EBR  | NBL   | NBT                  | SBT  | SBR  |
|-----------------------------------|------|------|-------|----------------------|------|------|
| Lane Configurations               |      |      |       |                      |      |      |
| Volume (veh/h)                    | 40   | 10   | 10    | 410                  | 450  | 40   |
| Sign Control                      | Stop |      |       | Free                 | Free |      |
| Grade                             | 0%   |      |       | 0%                   | 0%   |      |
| Peak Hour Factor                  | 0.92 | 0.92 | 0.92  | 0.92                 | 0.92 | 0.92 |
| Hourly flow rate (vph)            | 43   | 11   | 11    | 446                  | 489  | 43   |
| Pedestrians                       |      |      |       |                      |      |      |
| Lane Width (ft)                   |      |      |       |                      |      |      |
| Walking Speed (ft/s)              |      |      |       |                      |      |      |
| Percent Blockage                  |      |      |       |                      |      |      |
| Right turn flare (veh)            |      |      |       |                      |      |      |
| Median type                       |      |      |       | None                 | None |      |
| Median storage (veh)              |      |      |       |                      |      |      |
| Upstream signal (ft)              |      |      |       |                      |      |      |
| pX, platoon unblocked             |      |      |       |                      |      |      |
| vC, conflicting volume            | 755  | 266  | 533   |                      |      |      |
| vC1, stage 1 conf vol             |      |      |       |                      |      |      |
| vC2, stage 2 conf vol             |      |      |       |                      |      |      |
| vCu, unblocked vol                | 755  | 266  | 533   |                      |      |      |
| tC, single (s)                    | 6.8  | 6.9  | 4.1   |                      |      |      |
| tC, 2 stage (s)                   |      |      |       |                      |      |      |
| tF (s)                            | 3.5  | 3.3  | 2.2   |                      |      |      |
| p0 queue free %                   | 87   | 99   | 99    |                      |      |      |
| cM capacity (veh/h)               | 341  | 732  | 1031  |                      |      |      |
| Direction, Lane #                 | EB 1 | NB 1 | NB 2  | NB 3                 | SB 1 | SB 2 |
| Volume Total                      | 54   | 11   | 223   | 223                  | 326  | 207  |
| Volume Left                       | 43   | 11   | 0     | 0                    | 0    | 0    |
| Volume Right                      | 11   | 0    | 0     | 0                    | 0    | 43   |
| cSH                               | 381  | 1031 | 1700  | 1700                 | 1700 | 1700 |
| Volume to Capacity                | 0.14 | 0.01 | 0.13  | 0.13                 | 0.19 | 0.12 |
| Queue Length 95th (ft)            | 12   | 1    | 0     | 0                    | 0    | 0    |
| Control Delay (s)                 | 16.0 | 8.5  | 0.0   | 0.0                  | 0.0  | 0.0  |
| Lane LOS                          | C    | A    |       |                      |      |      |
| Approach Delay (s)                | 16.0 | 0.2  |       |                      | 0.0  |      |
| Approach LOS                      | C    |      |       |                      |      |      |
| Intersection Summary              |      |      |       |                      |      |      |
| Average Delay                     |      |      | 0.9   |                      |      |      |
| Intersection Capacity Utilization |      |      | 24.5% | ICU Level of Service | A    |      |
| Analysis Period (min)             |      |      | 15    |                      |      |      |

HCM Unsignalized Intersection Capacity Analysis  
45: Office/Outlot #1 & 5th St

2010 Build Saturday Peak  
Black Hills TIS



















| Movement               | EBL  | EBR  | NBL  | NBT  | SBT  | SBR  |
|------------------------|------|------|------|------|------|------|
| Lane Configurations    |      |      |      |      |      |      |
| Volume (veh/h)         | 20   | 45   | 45   | 400  | 435  | 25   |
| Sign Control           | Stop |      |      | Free | Free |      |
| Grade                  | 0%   |      |      | 0%   | 0%   |      |
| Peak Hour Factor       | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 22   | 49   | 49   | 435  | 473  | 27   |
| Pedestrians            |      |      |      |      |      |      |
| Lane Width (ft)        |      |      |      |      |      |      |
| Walking Speed (ft/s)   |      |      |      |      |      |      |
| Percent Blockage       |      |      |      |      |      |      |
| Right turn flare (veh) |      |      |      |      |      |      |
| Median type            |      |      |      | None | None |      |
| Median storage (veh)   |      |      |      |      |      |      |
| Upstream signal (ft)   |      |      |      |      |      |      |
| pX, platoon unblocked  |      |      |      |      |      |      |
| vC, conflicting volume | 802  | 250  | 500  |      |      |      |
| vC1, stage 1 conf vol  |      |      |      |      |      |      |
| vC2, stage 2 conf vol  |      |      |      |      |      |      |
| vCu, unblocked vol     | 802  | 250  | 500  |      |      |      |
| tC, single (s)         | 6.8  | 6.9  | 4.1  |      |      |      |
| tC, 2 stage (s)        |      |      |      |      |      |      |
| tF (s)                 | 3.5  | 3.3  | 2.2  |      |      |      |
| p0 queue free %        | 93   | 93   | 95   |      |      |      |
| cM capacity (veh/h)    | 307  | 750  | 1060 |      |      |      |

| Direction, Lane #      | EB 1 | NB 1 | NB 2 | NB 3 | SB 1 | SB 2 |
|------------------------|------|------|------|------|------|------|
| Volume Total           | 71   | 49   | 217  | 217  | 315  | 185  |
| Volume Left            | 22   | 49   | 0    | 0    | 0    | 0    |
| Volume Right           | 49   | 0    | 0    | 0    | 0    | 27   |
| cSH                    | 519  | 1060 | 1700 | 1700 | 1700 | 1700 |
| Volume to Capacity     | 0.14 | 0.05 | 0.13 | 0.13 | 0.19 | 0.11 |
| Queue Length 95th (ft) | 12   | 4    | 0    | 0    | 0    | 0    |
| Control Delay (s)      | 13.0 | 8.6  | 0.0  | 0.0  | 0.0  | 0.0  |
| Lane LOS               | B    | A    |      |      |      |      |
| Approach Delay (s)     | 13.0 | 0.9  | 0.0  |      |      |      |
| Approach LOS           | B    |      |      |      |      |      |

| Intersection Summary              |  |  |       |                      |   |  |
|-----------------------------------|--|--|-------|----------------------|---|--|
| Average Delay                     |  |  | 1.3   |                      |   |  |
| Intersection Capacity Utilization |  |  | 31.0% | ICU Level of Service | A |  |
| Analysis Period (min)             |  |  | 15    |                      |   |  |

HCM Unsignalized Intersection Capacity Analysis  
 15: Stumer & Enchantment

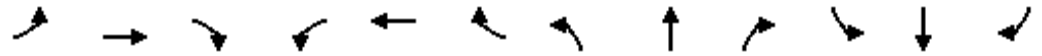
2010 Build Saturday Peak  
 Black Hills TIS

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|--|
| Movement                          | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL  | NBT   | NBR   | SBL   | SBT   | SBR   |  |
| Lane Configurations               |   |  |   |   |  |   |  |  |   |   |  |   |  |
| Volume (veh/h)                    | 5   | 15  | 1   | 35  | 10  | 35  | 1  | 20  | 35  | 15  | 30  | 5   |  |
| Sign Control                      |   | Stop  |   |   | Stop  |   |  | Free  |   |   | Free  |   |  |
| Grade                             |   | 0%  |   |   | 0%  |   |  | 0%  |   |   | 0%  |   |  |
| Peak Hour Factor                  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92   | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  |  |
| Hourly flow rate (vph)            | 5   | 16  | 1   | 38  | 11  | 38  | 1  | 22  | 38  | 16  | 33  | 5   |  |
| 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            | 154   | 130   | 35  | 120   | 114   | 41  | 38   |   |   |   |   | 60  |  |
| vC1, stage 1 conf vol             |   |   |   |   |   |   |  |   |   |   |   |   |  |
| vC2, stage 2 conf vol             |   |   |   |   |   |   |  |   |   |   |   |   |  |
| vCu, unblocked vol                | 154   | 130   | 35  | 120   | 114   | 41  | 38   |   |   |   |   | 60  |  |
| tC, single (s)                    | 7.1   | 6.5   | 6.2   | 7.1   | 6.5   | 6.2   | 4.1  |   |   |   |   | 4.1   |  |
| tC, 2 stage (s)                   |   |   |   |   |   |   |  |   |   |   |   |   |  |
| tF (s)                            | 3.5   | 4.0   | 3.3   | 3.5   | 4.0   | 3.3   | 2.2  |   |   |   |   | 2.2   |  |
| p0 queue free %                   | 99  | 98  | 100   | 95  | 99  | 96  | 100  |   |   |   |   | 99  |  |
| cM capacity (veh/h)               | 767   | 752   | 1037  | 833   | 768   | 1030  | 1572   |   |   |   |   | 1544  |  |
| <b>Direction, Lane #</b>          | <b>EB 1</b>   | <b>WB 1</b>   | <b>NB 1</b>   | <b>SB 1</b>   |   |   |  |   |   |   |   |   |  |
| Volume Total                      | 23  | 87  | 61  | 54  |   |   |  |   |   |   |   |   |  |
| Volume Left                       | 5   | 38  | 1   | 16  |   |   |  |   |   |   |   |   |  |
| Volume Right                      | 1   | 38  | 38  | 5   |   |   |  |   |   |   |   |   |  |
| cSH                               | 766   | 899   | 1572  | 1544  |   |   |  |   |   |   |   |   |  |
| Volume to Capacity                | 0.03  | 0.10  | 0.00  | 0.01  |   |   |  |   |   |   |   |   |  |
| Queue Length 95th (ft)            | 2   | 8   | 0   | 1   |   |   |  |   |   |   |   |   |  |
| Control Delay (s)                 | 9.8   | 9.4   | 0.1   | 2.3   |   |   |  |   |   |   |   |   |  |
| Lane LOS                          | A   | A   | A   | A   |   |   |  |   |   |   |   |   |  |
| Approach Delay (s)                | 9.8   | 9.4   | 0.1   | 2.3   |   |   |  |   |   |   |   |   |  |
| Approach LOS                      | A   | A   |   |   |   |   |  |   |   |   |   |   |  |
| <b>Intersection Summary</b>       |   |   |   |   |   |   |  |   |   |   |   |   |  |
| Average Delay                     |   |   | 5.2   |   |   |   |  |   |   |   |   |   |  |
| Intersection Capacity Utilization |   |   | 24.8%   | ICU Level of Service  | A   |   |  |   |   |   |   |   |  |
| Analysis Period (min)             |   |   | 15  |   |   |   |  |   |   |   |   |   |  |



HCM Unsignalized Intersection Capacity Analysis  
 16: Enchanted Pines & Enchantment

2010 Build Saturday Peak  
 Black Hills TIS



| Movement               | EBL  | EBT  | EBR  | WBL  | WBT  | WBR  | NBL  | NBT  | NBR  | SBL  | SBT  | SBR  |
|------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Lane Configurations    |      | ↕    |      |      | ↕    |      |      | ↕    |      |      | ↕    |      |
| Volume (veh/h)         | 1    | 10   | 1    | 40   | 10   | 1    | 5    | 1    | 45   | 1    | 1    | 1    |
| Sign Control           |      | Free |      |      | Free |      |      | Stop |      |      | Stop |      |
| Grade                  |      | 0%   |      |      | 0%   |      |      | 0%   |      |      | 0%   |      |
| Peak Hour Factor       | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 1    | 11   | 1    | 43   | 11   | 1    | 5    | 1    | 49   | 1    | 1    | 1    |
| Pedestrians            |      |      |      |      |      |      |      |      |      |      |      |      |
| Lane Width (ft)        |      |      |      |      |      |      |      |      |      |      |      |      |
| Walking Speed (ft/s)   |      |      |      |      |      |      |      |      |      |      |      |      |
| Percent Blockage       |      |      |      |      |      |      |      |      |      |      |      |      |
| Right turn flare (veh) |      |      |      |      |      |      |      |      |      |      |      |      |
| Median type            |      | None |      |      | None |      |      |      |      |      |      |      |
| Median storage (veh)   |      |      |      |      |      |      |      |      |      |      |      |      |
| Upstream signal (ft)   |      |      |      |      |      |      |      |      |      |      |      |      |
| pX, platoon unblocked  |      |      |      |      |      |      |      |      |      |      |      |      |
| vC, conflicting volume | 12   |      |      | 12   |      |      | 114  | 112  | 11   | 161  | 113  | 11   |
| vC1, stage 1 conf vol  |      |      |      |      |      |      |      |      |      |      |      |      |
| vC2, stage 2 conf vol  |      |      |      |      |      |      |      |      |      |      |      |      |
| vCu, unblocked vol     | 12   |      |      | 12   |      |      | 114  | 112  | 11   | 161  | 113  | 11   |
| tC, single (s)         | 4.1  |      |      | 4.1  |      |      | 7.1  | 6.5  | 6.2  | 7.1  | 6.5  | 6.2  |
| tC, 2 stage (s)        |      |      |      |      |      |      |      |      |      |      |      |      |
| tF (s)                 | 2.2  |      |      | 2.2  |      |      | 3.5  | 4.0  | 3.3  | 3.5  | 4.0  | 3.3  |
| p0 queue free %        | 100  |      |      | 97   |      |      | 99   | 100  | 95   | 100  | 100  | 100  |
| cM capacity (veh/h)    | 1607 |      |      | 1607 |      |      | 844  | 756  | 1069 | 750  | 756  | 1069 |






















| Direction, Lane #      | EB 1 | WB 1 | NB 1 | SB 1 |
|------------------------|------|------|------|------|
| Volume Total           | 13   | 55   | 55   | 3    |
| Volume Left            | 1    | 43   | 5    | 1    |
| Volume Right           | 1    | 1    | 49   | 1    |
| cSH                    | 1607 | 1607 | 1034 | 835  |
| Volume to Capacity     | 0.00 | 0.03 | 0.05 | 0.00 |
| Queue Length 95th (ft) | 0    | 2    | 4    | 0    |
| Control Delay (s)      | 0.6  | 5.8  | 8.7  | 9.3  |
| Lane LOS               | A    | A    | A    | A    |
| Approach Delay (s)     | 0.6  | 5.8  | 8.7  | 9.3  |
| Approach LOS           |      |      | A    | A    |

| Intersection Summary              |       |     |                        |
|-----------------------------------|-------|-----|------------------------|
| Average Delay                     |       | 6.6 |                        |
| Intersection Capacity Utilization | 19.8% |     | ICU Level of Service A |
| Analysis Period (min)             |       | 15  |                        |

# HCM Unsignalized Intersection Capacity Analysis

## 8: Stumer & Black Hills

2010 Build Saturday Peak  
Black Hills TIS

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement                          | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL  | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations               |  |  |  |  |  |   |  |  |  |   |  |  |
| Volume (veh/h)                    | 1   | 80  | 15  | 455   | 70  | 0   | 25   | 5   | 550   | 0   | 5   | 0   |
| Sign Control                      |   | Free  |   |   | Free  |   |  | Stop  |   |   | Stop  |   |
| Grade                             |   | 0%  |   |   | 0%  |   |  | 0%  |   |   | 0%  |   |
| Peak Hour Factor                  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92   | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  |
| Hourly flow rate (vph)            | 1   | 87  | 16  | 495   | 76  | 0   | 27   | 5   | 598   | 0   | 5   | 0   |
| Pedestrians                       |   |   |   |   |   |   |  |   |   |   |   |   |
| Lane Width (ft)                   |   |   |   |   |   |   |  |   |   |   |   |   |
| Walking Speed (ft/s)              |   |   |   |   |   |   |  |   |   |   |   |   |
| Percent Blockage                  |   |   |   |   |   |   |  |   |   |   |   |   |
| Right turn flare (veh)            |   |   |   |   |   |   |  |   |   |   |   |   |
| Median type                       |   | TWLTL   |   |   | TWLTL   |   |  |   |   |   |   |   |
| Median storage (veh)              |   | 2   |   |   | 2   |   |  |   |   |   |   |   |
| Upstream signal (ft)              |   |   |   |   |   |   |  |   |   |   |   |   |
| pX, platoon unblocked             |   |   |   |   |   |   |  |   |   |   |   |   |
| vC, conflicting volume            | 76  |   |   | 103   |   |   | 1157   | 1154  | 87  | 1755  | 1171  | 76  |
| vC1, stage 1 conf vol             |   |   |   |   |   |   | 89   | 89  |   | 1065  | 1065  |   |
| vC2, stage 2 conf vol             |   |   |   |   |   |   | 1068   | 1065  |   | 690   | 105   |   |
| vCu, unblocked vol                | 76  |   |   | 103   |   |   | 1157   | 1154  | 87  | 1755  | 1171  | 76  |
| tC, single (s)                    | 4.1   |   |   | 4.1   |   |   | 7.1  | 6.5   | 6.2   | 7.1   | 6.5   | 6.2   |
| tC, 2 stage (s)                   |   |   |   |   |   |   | 6.1  | 5.5   |   | 6.1   | 5.5   |   |
| tF (s)                            | 2.2   |   |   | 2.2   |   |   | 3.5  | 4.0   | 3.3   | 3.5   | 4.0   | 3.3   |
| p0 queue free %                   | 100   |   |   | 67  |   |   | 84   | 97  | 38  | 100   | 97  | 100   |
| cM capacity (veh/h)               | 1523  |   |   | 1489  |   |   | 169  | 193   | 972   | 19  | 188   | 985   |
| <b>Direction, Lane #</b>          | <b>EB 1</b>   | <b>EB 2</b>   | <b>EB 3</b>   | <b>WB 1</b>   | <b>WB 2</b>   | <b>NB 1</b>   | <b>NB 2</b>  | <b>SB 1</b>   |   |   |   |   |
| Volume Total                      | 1   | 87  | 16  | 495   | 76  | 33  | 598  | 5   |   |   |   |   |
| Volume Left                       | 1   | 0   | 0   | 495   | 0   | 27  | 0  | 0   |   |   |   |   |
| Volume Right                      | 0   | 0   | 16  | 0   | 0   | 0   | 598  | 0   |   |   |   |   |
| cSH                               | 1523  | 1700  | 1700  | 1489  | 1700  | 173   | 972  | 188   |   |   |   |   |
| Volume to Capacity                | 0.00  | 0.05  | 0.01  | 0.33  | 0.04  | 0.19  | 0.62   | 0.03  |   |   |   |   |
| Queue Length 95th (ft)            | 0   | 0   | 0   | 37  | 0   | 17  | 110  | 2   |   |   |   |   |
| Control Delay (s)                 | 7.4   | 0.0   | 0.0   | 8.6   | 0.0   | 30.7  | 14.4   | 24.7  |   |   |   |   |
| Lane LOS                          | A   |   |   | A   |   | D   | B  | C   |   |   |   |   |
| Approach Delay (s)                | 0.1   |   |   | 7.5   |   | 15.3  |  | 24.7  |   |   |   |   |
| Approach LOS                      |   |   |   |   |   | C   |  | C   |   |   |   |   |
| <b>Intersection Summary</b>       |   |   |   |   |   |   |  |   |   |   |   |   |
| Average Delay                     |   |   |   | 10.7  |   |   |  |   |   |   |   |   |
| Intersection Capacity Utilization |   |   | 53.7%   |   |   | ICU Level of Service  |  | A   |   |   |   |   |
| Analysis Period (min)             |   |   | 15  |   |   |   |  |   |   |   |   |   |

# MOVEMENT SUMMARY

Site: SAT Single Lane

Stumer Road at Black Hills  
 Saturday Peak  
 Single Lane Roundabout Alternative  
 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 | Queue Distance ft | Prop. Queued | Effective Stop Rate per veh | Average Speed mph |
| South                           |      | NB Black Hills    |      |               |                   |                  |                                |                   |              |                             |                   |
| 3L                              | L    | 28                | 2.0  | 0.514         | 6.4               | LOS A            | 5.9                            | 148.8             | 0.45         | 0.70                        | 22.5              |
| 8T                              | T    | 6                 | 2.0  | 0.505         | 0.9               | LOS A            | 5.9                            | 148.8             | 0.45         | 0.17                        | 23.3              |
| 8R                              | R    | 611               | 2.0  | 0.519         | 1.7               | LOS A            | 5.9                            | 148.8             | 0.45         | 0.24                        | 23.3              |
| Approach                        |      | 644               | 2.0  | 0.519         | 1.9               | LOS A            | 5.9                            | 148.8             | 0.45         | 0.25                        | 23.2              |
| East                            |      | WB Stumer Rd      |      |               |                   |                  |                                |                   |              |                             |                   |
| 1L                              | L    | 506               | 2.0  | 0.414         | 5.8               | LOS A            | 4.1                            | 105.4             | 0.22         | 0.52                        | 22.3              |
| 6T                              | T    | 78                | 2.0  | 0.414         | 0.3               | LOS A            | 4.1                            | 105.4             | 0.22         | 0.08                        | 24.0              |
| 6R                              | R    | 1                 | 2.0  | 0.370         | 1.0               | LOS A            | 4.1                            | 105.4             | 0.22         | 0.14                        | 23.8              |
| Approach                        |      | 584               | 2.0  | 0.414         | 5.0               | LOS A            | 4.1                            | 105.4             | 0.22         | 0.46                        | 22.5              |
| North                           |      | SB Black Hills    |      |               |                   |                  |                                |                   |              |                             |                   |
| 7L                              | L    | 1                 | 2.0  | 0.011         | 9.6               | LOS A            | 0.1                            | 1.9               | 0.64         | 0.76                        | 21.7              |
| 4T                              | T    | 6                 | 2.0  | 0.011         | 4.1               | LOS A            | 0.1                            | 1.9               | 0.64         | 0.43                        | 22.8              |
| 4R                              | R    | 1                 | 2.0  | 0.011         | 4.9               | LOS A            | 0.1                            | 1.9               | 0.64         | 0.42                        | 22.8              |
| Approach                        |      | 8                 | 2.0  | 0.011         | 5.0               | LOS A            | 0.1                            | 1.9               | 0.64         | 0.47                        | 22.6              |
| West                            |      | EB Stumer Rd      |      |               |                   |                  |                                |                   |              |                             |                   |
| 5L                              | L    | 1                 | 2.0  | 0.139         | 9.3               | LOS A            | 0.9                            | 23.9              | 0.63         | 0.91                        | 21.9              |
| 2T                              | T    | 89                | 2.0  | 0.136         | 3.8               | LOS A            | 0.9                            | 23.9              | 0.63         | 0.52                        | 22.9              |
| 2R                              | R    | 11                | 2.0  | 0.136         | 4.6               | LOS A            | 0.9                            | 23.9              | 0.63         | 0.51                        | 23.0              |
| Approach                        |      | 101               | 2.0  | 0.136         | 3.9               | LOS A            | 0.9                            | 23.9              | 0.63         | 0.52                        | 22.9              |
| All Vehicles                    |      | 1338              | 2.0  | 0.519         | 3.4               | LOS A            | 5.9                            | 148.8             | 0.36         | 0.36                        | 22.9              |

Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).  
 Level of Service (Worst Movement): LOS A. LOS Method for individual vehicle movements: Delay (HCM).  
 Approach LOS values are based on the worst delay for any vehicle movement.  
 Roundabout LOS Method: Same as Signalised Intersections.  
 Roundabout Capacity Model: SIDRA Standard.

# MOVEMENT SUMMARY

Site: SAT Single Lane w/ Bypass

Stumer Road at Black Hills  
 Saturday Peak  
 Single Lane Roundabout w/ Bypass Alternative  
 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 | Queue Distance ft | Prop. Queued | Effective Stop Rate per veh | Average Speed mph |
| South                           |      | NB Black Hills    |      |               |                   |                  |                                |                   |              |                             |                   |
| 3L                              | L    | 28                | 2.0  | 0.039         | 6.4               | LOS A            | 0.3                            | 6.6               | 0.31         | 0.54                        | 22.2              |
| 8T                              | T    | 6                 | 2.0  | 0.039         | 0.9               | LOS A            | 0.3                            | 6.6               | 0.31         | 0.14                        | 23.6              |
| 8R                              | R    | 611               | 2.0  | 0.460         | 1.1               | LOS A            | 4.9                            | 123.8             | 0.40         | 0.16                        | 23.5              |
| Approach                        |      | 644               | 2.0  | 0.460         | 1.3               | LOS A            | 4.9                            | 123.8             | 0.40         | 0.18                        | 23.5              |
| East                            |      | WB Stumer Rd      |      |               |                   |                  |                                |                   |              |                             |                   |
| 1L                              | L    | 506               | 2.0  | 0.413         | 5.8               | LOS A            | 4.0                            | 102.1             | 0.21         | 0.52                        | 22.3              |
| 6T                              | T    | 78                | 2.0  | 0.414         | 0.3               | LOS A            | 4.0                            | 102.1             | 0.21         | 0.07                        | 24.0              |
| 6R                              | R    | 1                 | 2.0  | 0.370         | 1.0               | LOS A            | 4.0                            | 102.1             | 0.21         | 0.14                        | 23.8              |
| Approach                        |      | 584               | 2.0  | 0.413         | 5.0               | LOS A            | 4.0                            | 102.1             | 0.21         | 0.46                        | 22.5              |
| North                           |      | SB Black Hills    |      |               |                   |                  |                                |                   |              |                             |                   |
| 7L                              | L    | 1                 | 2.0  | 0.011         | 9.6               | LOS A            | 0.1                            | 1.9               | 0.64         | 0.76                        | 21.7              |
| 4T                              | T    | 6                 | 2.0  | 0.011         | 4.1               | LOS A            | 0.1                            | 1.9               | 0.64         | 0.43                        | 22.8              |
| 4R                              | R    | 1                 | 2.0  | 0.011         | 4.9               | LOS A            | 0.1                            | 1.9               | 0.64         | 0.42                        | 22.8              |
| Approach                        |      | 8                 | 2.0  | 0.011         | 5.0               | LOS A            | 0.1                            | 1.9               | 0.64         | 0.47                        | 22.6              |
| West                            |      | EB Stumer Rd      |      |               |                   |                  |                                |                   |              |                             |                   |
| 5L                              | L    | 1                 | 2.0  | 0.139         | 9.3               | LOS A            | 0.9                            | 23.8              | 0.63         | 0.91                        | 21.9              |
| 2T                              | T    | 89                | 2.0  | 0.136         | 3.8               | LOS A            | 0.9                            | 23.8              | 0.63         | 0.52                        | 22.9              |
| 2R                              | R    | 11                | 2.0  | 0.136         | 4.6               | LOS A            | 0.9                            | 23.8              | 0.63         | 0.51                        | 23.0              |
| Approach                        |      | 101               | 2.0  | 0.136         | 3.9               | LOS A            | 0.9                            | 23.8              | 0.63         | 0.52                        | 22.9              |
| All Vehicles                    |      | 1338              | 2.0  | 0.460         | 3.2               | LOS A            | 4.9                            | 123.8             | 0.34         | 0.33                        | 23.0              |

Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).  
 Level of Service (Worst Movement): LOS A. LOS Method for individual vehicle movements: Delay (HCM).  
 Approach LOS values are based on the worst delay for any vehicle movement.  
 Roundabout LOS Method: Same as Signalised Intersections.  
 Roundabout Capacity Model: SIDRA Standard.

# HCM Unsignalized Intersection Capacity Analysis




















## 4: Stumer & Wal-Mart/Shops

2010 Build Saturday Peak  
Black Hills TIS

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement                          | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL  | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations               |  |  |   |  |  |  |  |  |  |   |  |  |
| Volume (veh/h)                    | 85  | 230   | 85  | 80  | 205   | 240   | 65   | 5   | 90  | 240   | 5   | 80  |
| Sign Control                      |   | Free  |   |   | Free  |   |  | Stop  |   |   | Stop  |   |
| Grade                             |   | 0%  |   |   | 0%  |   |  | 0%  |   |   | 0%  |   |
| Peak Hour Factor                  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92   | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  |
| Hourly flow rate (vph)            | 92  | 250   | 92  | 87  | 223   | 261   | 71   | 5   | 98  | 261   | 5   | 87  |
| Pedestrians                       |   |   |   |   |   |   |  |   |   |   |   |   |
| Lane Width (ft)                   |   |   |   |   |   |   |  |   |   |   |   |   |
| Walking Speed (ft/s)              |   |   |   |   |   |   |  |   |   |   |   |   |
| Percent Blockage                  |   |   |   |   |   |   |  |   |   |   |   |   |
| Right turn flare (veh)            |   |   |   |   |   |   |  |   |   |   |   | 4   |
| Median type                       |   | TWLTL   |   |   | TWLTL   |   |  |   |   |   |   |   |
| Median storage (veh)              |   | 2   |   |   | 2   |   |  |   |   |   |   |   |
| Upstream signal (ft)              |   |   |   |   | 1178  |   |  |   |   |   |   |   |
| pX, platoon unblocked             |   |   |   |   |   |   |  |   |   |   |   |   |
| vC, conflicting volume            | 223   |   |   | 342   |   |   | 924  | 878   | 296   | 932   | 924   | 223   |
| vC1, stage 1 conf vol             |   |   |   |   |   |   | 481  | 481   |   | 397   | 397   |   |
| vC2, stage 2 conf vol             |   |   |   |   |   |   | 443  | 397   |   | 535   | 527   |   |
| vCu, unblocked vol                | 223   |   |   | 342   |   |   | 924  | 878   | 296   | 932   | 924   | 223   |
| tC, single (s)                    | 4.1   |   |   | 4.1   |   |   | 7.1  | 6.5   | 6.2   | 7.1   | 6.5   | 6.2   |
| tC, 2 stage (s)                   |   |   |   |   |   |   | 6.1  | 5.5   |   | 6.1   | 5.5   |   |
| tF (s)                            | 2.2   |   |   | 2.2   |   |   | 3.5  | 4.0   | 3.3   | 3.5   | 4.0   | 3.3   |
| p0 queue free %                   | 93  |   |   | 93  |   |   | 80   | 99  | 87  | 17  | 99  | 89  |
| cM capacity (veh/h)               | 1346  |   |   | 1217  |   |   | 351  | 399   | 743   | 315   | 370   | 817   |
| <b>Direction, Lane #</b>          | <b>EB 1</b>   | <b>EB 2</b>   | <b>WB 1</b>   | <b>WB 2</b>   | <b>WB 3</b>   | <b>NB 1</b>   | <b>SB 1</b>  |   |   |   |   |   |
| Volume Total                      | 92  | 342   | 87  | 223   | 261   | 174   | 353  |   |   |   |   |   |
| Volume Left                       | 92  | 0   | 87  | 0   | 0   | 71  | 261  |   |   |   |   |   |
| Volume Right                      | 0   | 92  | 0   | 0   | 261   | 98  | 87   |   |   |   |   |   |
| cSH                               | 1346  | 1700  | 1217  | 1700  | 1700  | 502   | 410  |   |   |   |   |   |
| Volume to Capacity                | 0.07  | 0.20  | 0.07  | 0.13  | 0.15  | 0.35  | 0.86   |   |   |   |   |   |
| Queue Length 95th (ft)            | 6   | 0   | 6   | 0   | 0   | 38  | 212  |   |   |   |   |   |
| Control Delay (s)                 | 7.9   | 0.0   | 8.2   | 0.0   | 0.0   | 15.9  | 48.7   |   |   |   |   |   |
| Lane LOS                          | A   |   | A   |   |   | C   | E  |   |   |   |   |   |
| Approach Delay (s)                | 1.7   |   | 1.2   |   |   | 15.9  | 48.7   |   |   |   |   |   |
| Approach LOS                      |   |   |   |   |   | C   | E  |   |   |   |   |   |
| <b>Intersection Summary</b>       |   |   |   |   |   |   |  |   |   |   |   |   |
| Average Delay                     |   |   | 14.0  |   |   |   |  |   |   |   |   |   |
| Intersection Capacity Utilization |   |   | 53.9%   |   | ICU Level of Service  |   | A  |   |   |   |   |   |
| Analysis Period (min)             |   |   | 15  |   |   |   |  |   |   |   |   |   |





















HCM Unsignalized Intersection Capacity Analysis  
25: Stumer & Wal-Mart

2010 Build Saturday Peak  
Black Hills TIS

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement                          | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL  | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations               |  |  |   |  |  |   |  |  |   |   |  |  |
| Volume (veh/h)                    | 215   | 290   | 75  | 40  | 240   | 70  | 30   | 5   | 40  | 70  | 5   | 215   |
| Sign Control                      |   | Free  |   |   | Free  |   |  | Stop  |   |   | Stop  |   |
| Grade                             |   | 0%  |   |   | 0%  |   |  | 0%  |   |   | 0%  |   |
| Peak Hour Factor                  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92   | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  |
| Hourly flow rate (vph)            | 234   | 315   | 82  | 43  | 261   | 76  | 33   | 5   | 43  | 76  | 5   | 234   |
| Pedestrians                       |   |   |   |   |   |   |  |   |   |   |   |   |
| Lane Width (ft)                   |   |   |   |   |   |   |  |   |   |   |   |   |
| Walking Speed (ft/s)              |   |   |   |   |   |   |  |   |   |   |   |   |
| Percent Blockage                  |   |   |   |   |   |   |  |   |   |   |   |   |
| Right turn flare (veh)            |   |   |   |   |   |   |  |   |   |   |   | 3   |
| Median type                       |   | TWLTL   |   |   | TWLTL   |   |  |   |   |   |   |   |
| Median storage (veh)              |   | 2   |   |   | 2   |   |  |   |   |   |   |   |
| Upstream signal (ft)              |   |   |   |   |   |   |  |   |   |   |   |   |
| pX, platoon unblocked             |   |   |   |   |   |   |  |   |   |   |   |   |
| vC, conflicting volume            | 337   |   |   | 397   |   |   | 1291   | 1247  | 356   | 1215  | 1250  | 299   |
| vC1, stage 1 conf vol             |   |   |   |   |   |   | 823  | 823   |   | 386   | 386   |   |
| vC2, stage 2 conf vol             |   |   |   |   |   |   | 467  | 424   |   | 829   | 864   |   |
| vCu, unblocked vol                | 337   |   |   | 397   |   |   | 1291   | 1247  | 356   | 1215  | 1250  | 299   |
| tC, single (s)                    | 4.1   |   |   | 4.1   |   |   | 7.1  | 6.5   | 6.2   | 7.1   | 6.5   | 6.2   |
| tC, 2 stage (s)                   |   |   |   |   |   |   | 6.1  | 5.5   |   | 6.1   | 5.5   |   |
| tF (s)                            | 2.2   |   |   | 2.2   |   |   | 3.5  | 4.0   | 3.3   | 3.5   | 4.0   | 3.3   |
| p0 queue free %                   | 81  |   |   | 96  |   |   | 76   | 98  | 94  | 65  | 98  | 68  |
| cM capacity (veh/h)               | 1222  |   |   | 1162  |   |   | 135  | 253   | 688   | 219   | 244   | 741   |
| <b>Direction, Lane #</b>          | <b>EB 1</b>   | <b>EB 2</b>   | <b>WB 1</b>   | <b>WB 2</b>   | <b>NB 1</b>   | <b>SB 1</b>   |  |   |   |   |   |   |
| Volume Total                      | 234   | 397   | 43  | 337   | 82  | 315   |  |   |   |   |   |   |
| Volume Left                       | 234   | 0   | 43  | 0   | 33  | 76  |  |   |   |   |   |   |
| Volume Right                      | 0   | 82  | 0   | 76  | 43  | 234   |  |   |   |   |   |   |
| cSH                               | 1222  | 1700  | 1162  | 1700  | 250   | 853   |  |   |   |   |   |   |
| Volume to Capacity                | 0.19  | 0.23  | 0.04  | 0.20  | 0.33  | 0.37  |  |   |   |   |   |   |
| Queue Length 95th (ft)            | 18  | 0   | 3   | 0   | 34  | 43  |  |   |   |   |   |   |
| Control Delay (s)                 | 8.6   | 0.0   | 8.2   | 0.0   | 26.2  | 16.9  |  |   |   |   |   |   |
| Lane LOS                          | A   |   | A   |   | D   | C   |  |   |   |   |   |   |
| Approach Delay (s)                | 3.2   |   | 0.9   |   | 26.2  | 16.9  |  |   |   |   |   |   |
| Approach LOS                      |   |   |   |   | D   | C   |  |   |   |   |   |   |
| <b>Intersection Summary</b>       |   |   |   |   |   |   |  |   |   |   |   |   |
| Average Delay                     |   |   | 7.0   |   |   |   |  |   |   |   |   |   |
| Intersection Capacity Utilization |   |   | 51.7%   |   | ICU Level of Service  |   |  |   | A   |   |   |   |
| Analysis Period (min)             |   |   | 15  |   |   |   |  |   |   |   |   |   |

HCM Unsignalized Intersection Capacity Analysis  
27: Stumer & Shops

2010 Build Saturday Peak  
Black Hills TIS

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement                          | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL  | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations               |  |  |   |  |  |  |  |  |   |   |  |  |
| Volume (veh/h)                    | 55  | 485   | 20  | 20  | 475   | 90  | 10   | 5   | 30  | 80  | 5   | 40  |
| Sign Control                      |   | Free  |   |   | Free  |   |  | Stop  |   |   | Stop  |   |
| Grade                             |   | 0%  |   |   | 0%  |   |  | 0%  |   |   | 0%  |   |
| Peak Hour Factor                  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92   | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  |
| Hourly flow rate (vph)            | 60  | 527   | 22  | 22  | 516   | 98  | 11   | 5   | 33  | 87  | 5   | 43  |
| Pedestrians                       |   |   |   |   |   |   |  |   |   |   |   |   |
| Lane Width (ft)                   |   |   |   |   |   |   |  |   |   |   |   |   |
| Walking Speed (ft/s)              |   |   |   |   |   |   |  |   |   |   |   |   |
| Percent Blockage                  |   |   |   |   |   |   |  |   |   |   |   |   |
| Right turn flare (veh)            |   |   |   |   |   |   |  |   |   |   |   |   |
| Median type                       |   | TWLTL   |   |   | TWLTL   |   |  |   |   |   |   |   |
| Median storage (veh)              |   | 2   |   |   | 2   |   |  |   |   |   |   |   |
| Upstream signal (ft)              |   |   |   |   | 788   |   |  |   |   |   |   |   |
| pX, platoon unblocked             | 0.99  |   |   |   |   |   | 0.99   | 0.99  |   | 0.99  | 0.99  | 0.99  |
| vC, conflicting volume            | 614   |   |   | 549   |   |   | 1264   | 1315  | 538   | 1242  | 1228  | 516   |
| vC1, stage 1 conf vol             |   |   |   |   |   |   | 658  | 658   |   | 560   | 560   |   |
| vC2, stage 2 conf vol             |   |   |   |   |   |   | 606  | 658   |   | 682   | 668   |   |
| vCu, unblocked vol                | 608   |   |   | 549   |   |   | 1262   | 1314  | 538   | 1240  | 1226  | 510   |
| tC, single (s)                    | 4.1   |   |   | 4.1   |   |   | 7.1  | 6.5   | 6.2   | 7.1   | 6.5   | 6.2   |
| tC, 2 stage (s)                   |   |   |   |   |   |   | 6.1  | 5.5   |   | 6.1   | 5.5   |   |
| tF (s)                            | 2.2   |   |   | 2.2   |   |   | 3.5  | 4.0   | 3.3   | 3.5   | 4.0   | 3.3   |
| p0 queue free %                   | 94  |   |   | 98  |   |   | 96   | 98  | 94  | 72  | 98  | 92  |
| cM capacity (veh/h)               | 964   |   |   | 1021  |   |   | 298  | 314   | 543   | 310   | 341   | 560   |
| Direction, Lane #                 | EB 1  | EB 2  | WB 1  | WB 2  | WB 3  | NB 1  | SB 1   |   |   |   |   |   |
| Volume Total                      | 60  | 549   | 22  | 516   | 98  | 49  | 136  |   |   |   |   |   |
| Volume Left                       | 60  | 0   | 22  | 0   | 0   | 11  | 87   |   |   |   |   |   |
| Volume Right                      | 0   | 22  | 0   | 0   | 98  | 33  | 43   |   |   |   |   |   |
| cSH                               | 964   | 1700  | 1021  | 1700  | 1700  | 430   | 363  |   |   |   |   |   |
| Volume to Capacity                | 0.06  | 0.32  | 0.02  | 0.30  | 0.06  | 0.11  | 0.37   |   |   |   |   |   |
| Queue Length 95th (ft)            | 5   | 0   | 2   | 0   | 0   | 10  | 42   |   |   |   |   |   |
| Control Delay (s)                 | 9.0   | 0.0   | 8.6   | 0.0   | 0.0   | 14.5  | 20.7   |   |   |   |   |   |
| Lane LOS                          | A   |   | A   |   |   | B   | C  |   |   |   |   |   |
| Approach Delay (s)                | 0.9   |   | 0.3   |   |   | 14.5  | 20.7   |   |   |   |   |   |
| Approach LOS                      |   |   |   |   |   | B   | C  |   |   |   |   |   |
| <b>Intersection Summary</b>       |   |   |   |   |   |   |  |   |   |   |   |   |
| Average Delay                     |   |   | 3.0   |   |   |   |  |   |   |   |   |   |
| Intersection Capacity Utilization |   |   | 55.8%   |   |   | ICU Level of Service  |  |   | B   |   |   |   |
| Analysis Period (min)             |   |   | 15  |   |   |   |  |   |   |   |   |   |





































## **2030 Build Operating Conditions**

### **Weekday PM Peak Hour Primary Study Intersections**



Lanes, Volumes, Timings  
5: Catron & 5th St

2030 Build PM Peak  
Black Hills TIS

|                         |    |    |    |    |    |   |    |    |    |    |    |    |
|-------------------------|---|---|---|---|---|--|---|---|---|---|---|---|
| Lane Group              | EBL   | EBT   | EBR   | WBL   | WBT   | WBR  | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations     |   |   |   |   |   |   |   |   |   |   |   |   |
| Volume (vph)            | 205   | 395   | 300   | 290   | 775   | 325  | 390   | 240   | 390   | 415   | 305   | 260   |
| Ideal Flow (vphpl)      | 1800  | 1800  | 1800  | 1800  | 1800  | 1800   | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Grade (%)               |   | -3%   |   |   | 2%  |  |   | 0%  |   |   | 0%  |   |
| Storage Length (ft)     | 450   |   | 450   | 400   |   | 450  | 200   |   | 0   | 200   |   | 0   |
| Storage Lanes           | 2   |   | 1   | 2   |   | 1  | 2   |   | 0   | 2   |   | 0   |
| Taper Length (ft)       | 25  |   | 25  | 25  |   | 25   | 25  |   | 25  | 25  |   | 25  |
| Lane Util. Factor       | 0.97  | 0.95  | 1.00  | 0.97  | 0.95  | 1.00   | 0.97  | 0.95  | 0.95  | 0.97  | 0.95  | 0.95  |
| Frt                     |   |   | 0.850   |   |   | 0.850  |   | 0.907   |   |   | 0.931   |   |
| Flt Protected           | 0.950   |   |   | 0.950   |   |  | 0.950   |   |   | 0.950   |   |   |
| Satd. Flow (prot)       | 3301  | 3403  | 1523  | 3220  | 3319  | 1485   | 3252  | 3041  | 0   | 3252  | 3122  | 0   |
| Flt Permitted           | 0.950   |   |   | 0.950   |   |  | 0.950   |   |   | 0.950   |   |   |
| Satd. Flow (perm)       | 3301  | 3403  | 1523  | 3220  | 3319  | 1485   | 3252  | 3041  | 0   | 3252  | 3122  | 0   |
| Right Turn on Red       |   |   | Yes   |   |   | Yes  |   |   | Yes   |   |   | Yes   |
| Satd. Flow (RTOR)       |   |   | 326   |   |   | 353  |   | 307   |   |   | 162   |   |
| Link Speed (mph)        |   | 60  |   |   | 60  |  |   | 30  |   |   | 45  |   |
| Link Distance (ft)      |   | 2300  |   |   | 6259  |  |   | 549   |   |   | 650   |   |
| Travel Time (s)         |   | 26.1  |   |   | 71.1  |  |   | 12.5  |   |   | 9.8   |   |
| Peak Hour Factor        | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92   | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  |
| Adj. Flow (vph)         | 223   | 429   | 326   | 315   | 842   | 353  | 424   | 261   | 424   | 451   | 332   | 283   |
| Shared Lane Traffic (%) |   |   |   |   |   |  |   |   |   |   |   |   |
| Lane Group Flow (vph)   | 223   | 429   | 326   | 315   | 842   | 353  | 424   | 685   | 0   | 451   | 615   | 0   |
| Turn Type               | Prot  |   | Perm  | Prot  |   | Perm   | Prot  |   |   | Prot  |   |   |
| Protected Phases        | 7   | 4   |   | 3   | 8   |  | 5   | 2   |   | 1   | 6   |   |
| Permitted Phases        |   |   | 4   |   |   | 8  |   |   |   |   |   |   |
| Detector Phase          | 7   | 4   | 4   | 3   | 8   | 8  | 5   | 2   |   | 1   | 6   |   |
| Switch Phase            |   |   |   |   |   |  |   |   |   |   |   |   |
| Minimum Initial (s)     | 4.0   | 12.0  | 12.0  | 4.0   | 12.0  | 12.0   | 7.0   | 7.0   |   | 12.0  | 12.0  |   |
| Minimum Split (s)       | 10.0  | 31.3  | 31.3  | 10.0  | 30.7  | 30.7   | 30.0  | 30.0  |   | 30.0  | 30.0  |   |
| Total Split (s)         | 18.0  | 36.0  | 36.0  | 24.0  | 42.0  | 42.0   | 30.0  | 30.0  | 0.0   | 30.0  | 30.0  | 0.0   |
| Total Split (%)         | 15.0%   | 30.0%   | 30.0%   | 20.0%   | 35.0%   | 35.0%  | 25.0%   | 25.0%   | 0.0%  | 25.0%   | 25.0%   | 0.0%  |
| Maximum Green (s)       | 12.0  | 29.0  | 29.0  | 18.0  | 35.6  | 35.6   | 24.5  | 24.5  |   | 24.5  | 24.5  |   |
| Yellow Time (s)         | 4.5   | 5.8   | 5.8   | 4.5   | 5.2   | 5.2  | 4.0   | 4.0   |   | 4.0   | 4.0   |   |
| All-Red Time (s)        | 1.5   | 1.2   | 1.2   | 1.5   | 1.2   | 1.2  | 1.5   | 1.5   |   | 1.5   | 1.5   |   |
| Lost Time Adjust (s)    | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Total Lost Time (s)     | 6.0   | 7.0   | 7.0   | 6.0   | 6.4   | 6.4  | 5.5   | 5.5   | 4.0   | 5.5   | 5.5   | 4.0   |
| Lead/Lag                | Lag   | Lag   | Lag   | Lead  | Lead  | Lead   | Lead  | Lead  |   | Lag   | Lag   |   |
| Lead-Lag Optimize?      | Yes   | Yes   | Yes   | Yes   | Yes   | Yes  | Yes   | Yes   |   | Yes   | Yes   |   |
| Vehicle Extension (s)   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0  | 3.0   | 3.0   |   | 3.0   | 3.0   |   |
| Recall Mode             | None  | C-Max   | C-Max   | None  | C-Max   | C-Max  | None  | None  |   | Max   | Max   |   |
| Walk Time (s)           |   | 7.0   | 7.0   |   | 7.0   | 7.0  | 7.0   | 7.0   |   | 7.0   | 7.0   |   |
| Flash Dont Walk (s)     |   | 17.0  | 17.0  |   | 17.0  | 17.0   | 17.0  | 17.0  |   | 17.0  | 17.0  |   |
| Pedestrian Calls (#/hr) |   | 0   | 0   |   | 0   | 0  | 0   | 0   |   | 0   | 0   |   |
| Act Effect Green (s)    | 12.0  | 34.1  | 34.1  | 16.1  | 38.8  | 38.8   | 20.5  | 21.0  |   | 24.8  | 25.3  |   |
| Actuated g/C Ratio      | 0.10  | 0.28  | 0.28  | 0.13  | 0.32  | 0.32   | 0.17  | 0.18  |   | 0.21  | 0.21  |   |
| v/c Ratio               | 0.68  | 0.44  | 0.49  | 0.73  | 0.78  | 0.49   | 0.76  | 0.87  |   | 0.67  | 0.78  |   |
| Control Delay           | 52.5  | 29.0  | 3.2   | 60.1  | 43.7  | 5.9  | 56.7  | 38.8  |   | 38.4  | 29.4  |   |
| Queue Delay             | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0  | 0.0   | 0.0   |   | 0.0   | 0.0   |   |
| Total Delay             | 52.5  | 29.0  | 3.2   | 60.1  | 43.7  | 5.9  | 56.7  | 38.8  |   | 38.4  | 29.4  |   |

Lanes, Volumes, Timings  
5: Catron & 5th St

2030 Build PM Peak  
Black Hills TIS

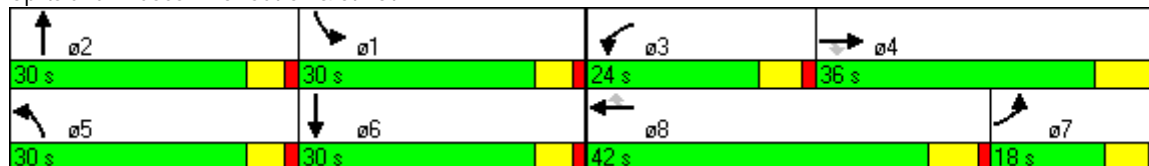


| Lane Group              | EBL  | EBT  | EBR  | WBL  | WBT  | WBR  | NBL  | NBT  | NBR | SBL  | SBT  | SBR |
|-------------------------|------|------|------|------|------|------|------|------|-----|------|------|-----|
| LOS                     | D    | C    | A    | E    | D    | A    | E    | D    |     | D    | C    |     |
| Approach Delay          |      | 25.7 |      |      | 38.3 |      |      | 45.6 |     |      | 33.2 |     |
| Approach LOS            |      | C    |      |      | D    |      |      | D    |     |      | C    |     |
| Queue Length 50th (ft)  | 88   | 88   | 0    | 121  | 315  | 0    | 162  | 154  |     | 171  | 181  |     |
| Queue Length 95th (ft)  | 123  | 118  | 13   | 169  | #411 | 72   | 211  | 225  |     | 184  | 201  |     |
| Internal Link Dist (ft) |      | 2220 |      |      | 6179 |      |      | 469  |     |      | 570  |     |
| Turn Bay Length (ft)    | 450  |      | 450  | 400  |      | 450  | 200  |      |     | 200  |      |     |
| Base Capacity (vph)     | 330  | 967  | 666  | 483  | 1073 | 719  | 664  | 865  |     | 673  | 787  |     |
| 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       | 0.68 | 0.44 | 0.49 | 0.65 | 0.78 | 0.49 | 0.64 | 0.79 |     | 0.67 | 0.78 |     |

Intersection Summary

Area Type: Other  
 Cycle Length: 120  
 Actuated Cycle Length: 120  
 Offset: 0 (0%), Referenced to phase 4:EBT and 8:WBT, Start of Green  
 Natural Cycle: 105  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.87  
 Intersection Signal Delay: 36.2  
 Intersection LOS: D  
 Intersection Capacity Utilization 81.0%  
 ICU Level of Service D  
 Analysis Period (min) 15  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

Splits and Phases: 5: Catron & 5th St



Lanes, Volumes, Timings  
3: Catron & Black Hills

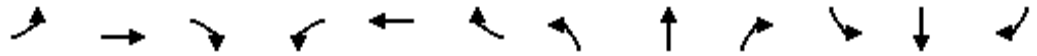
2030 Build PM Peak  
Black Hills TIS



| Lane Group              | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
|-------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations     |       |       |       |       |       |       |       |       |       |       |       |       |
| Volume (vph)            | 415   | 695   | 60    | 60    | 1285  | 80    | 105   | 25    | 130   | 75    | 25    | 425   |
| Ideal Flow (vphpl)      | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  |
| Grade (%)               |       | -4%   |       |       | 4%    |       |       | 0%    |       |       | 0%    |       |
| Storage Length (ft)     | 450   |       | 200   | 200   |       | 300   | 200   |       | 0     | 100   |       | 100   |
| Storage Lanes           | 1     |       | 1     | 1     |       | 1     | 1     |       | 0     | 1     |       | 1     |
| Taper Length (ft)       | 25    |       | 25    | 25    |       | 25    | 25    |       | 25    | 25    |       | 25    |
| Lane Util. Factor       | 1.00  | 0.95  | 1.00  | 1.00  | 0.95  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Frt                     |       |       | 0.850 |       |       | 0.850 |       |       | 0.874 |       |       | 0.850 |
| Flt Protected           | 0.950 |       |       | 0.950 |       |       | 0.950 |       |       | 0.950 |       |       |
| Satd. Flow (prot)       | 1710  | 3420  | 1530  | 1643  | 3286  | 1470  | 1676  | 1542  | 0     | 1676  | 1765  | 1500  |
| Flt Permitted           | 0.950 |       |       | 0.950 |       |       | 0.441 |       |       | 0.678 |       |       |
| Satd. Flow (perm)       | 1710  | 3420  | 1530  | 1643  | 3286  | 1470  | 778   | 1542  | 0     | 1196  | 1765  | 1500  |
| Right Turn on Red       |       |       | Yes   |       |       | Yes   |       |       | Yes   |       |       | Yes   |
| Satd. Flow (RTOR)       |       |       | 65    |       |       | 79    |       |       | 141   |       |       | 41    |
| Link Speed (mph)        |       | 60    |       |       | 60    |       |       | 30    |       |       | 25    |       |
| Link Distance (ft)      |       | 1456  |       |       | 2300  |       |       | 547   |       |       | 402   |       |
| Travel Time (s)         |       | 16.5  |       |       | 26.1  |       |       | 12.4  |       |       | 11.0  |       |
| Peak Hour Factor        | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  |
| Adj. Flow (vph)         | 451   | 755   | 65    | 65    | 1397  | 87    | 114   | 27    | 141   | 82    | 27    | 462   |
| Shared Lane Traffic (%) |       |       |       |       |       |       |       |       |       |       |       |       |
| Lane Group Flow (vph)   | 451   | 755   | 65    | 65    | 1397  | 87    | 114   | 168   | 0     | 82    | 27    | 462   |
| Turn Type               | Prot  |       | Perm  | Prot  |       | Perm  | pm+pt |       |       | pm+pt |       | pm+ov |
| Protected Phases        | 7     | 4     |       | 3     | 8     |       | 5     | 2     |       | 1     | 6     | 7     |
| Permitted Phases        |       |       | 4     |       |       | 8     | 2     |       |       | 6     |       | 6     |
| Detector Phase          | 7     | 4     | 4     | 3     | 8     | 8     | 5     | 2     |       | 1     | 6     | 7     |
| Switch Phase            |       |       |       |       |       |       |       |       |       |       |       |       |
| Minimum Initial (s)     | 7.0   | 12.0  | 12.0  | 4.0   | 12.0  | 12.0  | 7.0   | 7.0   |       | 7.0   | 7.0   | 7.0   |
| Minimum Split (s)       | 13.0  | 19.5  | 19.5  | 10.0  | 30.4  | 30.4  | 13.0  | 13.0  |       | 13.0  | 13.0  | 13.0  |
| Total Split (s)         | 34.0  | 74.0  | 74.0  | 16.0  | 56.0  | 56.0  | 13.0  | 17.0  | 0.0   | 13.0  | 17.0  | 34.0  |
| Total Split (%)         | 28.3% | 61.7% | 61.7% | 13.3% | 46.7% | 46.7% | 10.8% | 14.2% | 0.0%  | 10.8% | 14.2% | 28.3% |
| Maximum Green (s)       | 28.0  | 66.8  | 66.8  | 10.0  | 49.9  | 49.9  | 7.0   | 11.0  |       | 7.0   | 11.0  | 28.0  |
| Yellow Time (s)         | 4.5   | 6.0   | 6.0   | 4.5   | 4.9   | 4.9   | 4.5   | 4.5   |       | 4.5   | 4.5   | 4.5   |
| All-Red Time (s)        | 1.5   | 1.2   | 1.2   | 1.5   | 1.2   | 1.2   | 1.5   | 1.5   |       | 1.5   | 1.5   | 1.5   |
| Lost Time Adjust (s)    | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Total Lost Time (s)     | 6.0   | 7.2   | 7.2   | 6.0   | 6.1   | 6.1   | 6.0   | 6.0   | 4.0   | 6.0   | 6.0   | 6.0   |
| Lead/Lag                | Lead  | Lag   | Lag   | Lead  | Lag   | Lag   | Lead  | Lag   |       | Lead  | Lag   | Lead  |
| Lead-Lag Optimize?      | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   |       | Yes   | Yes   | Yes   |
| Vehicle Extension (s)   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   |       | 3.0   | 3.0   | 3.0   |
| Recall Mode             | None  | C-Max | C-Max | None  | C-Max | C-Max | None  | None  |       | None  | None  | None  |
| Walk Time (s)           |       |       |       |       | 7.0   | 7.0   |       |       |       |       |       |       |
| Flash Dont Walk (s)     |       |       |       |       | 17.0  | 17.0  |       |       |       |       |       |       |
| Pedestrian Calls (#/hr) |       |       |       |       | 0     | 0     |       |       |       |       |       |       |
| Act Effect Green (s)    | 28.0  | 75.2  | 75.2  | 8.9   | 54.8  | 54.8  | 15.5  | 8.7   |       | 12.9  | 8.7   | 37.5  |
| Actuated g/C Ratio      | 0.23  | 0.63  | 0.63  | 0.07  | 0.46  | 0.46  | 0.13  | 0.07  |       | 0.11  | 0.07  | 0.31  |
| v/c Ratio               | 1.13  | 0.35  | 0.07  | 0.53  | 0.93  | 0.12  | 0.66  | 0.69  |       | 0.52  | 0.21  | 0.93  |
| Control Delay           | 127.8 | 13.1  | 3.1   | 66.1  | 36.2  | 6.0   | 64.1  | 28.3  |       | 57.1  | 56.1  | 63.5  |
| Queue Delay             | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |       | 0.0   | 0.0   | 0.0   |
| Total Delay             | 127.8 | 13.1  | 3.1   | 66.1  | 36.2  | 6.0   | 64.1  | 28.3  |       | 57.1  | 56.1  | 63.5  |

Lanes, Volumes, Timings  
3: Catron & Black Hills

2030 Build PM Peak  
Black Hills TIS

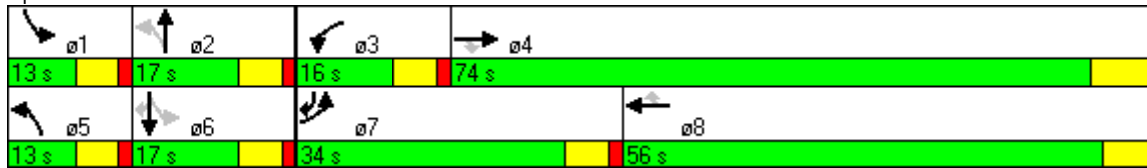


| Lane Group              | EBL  | EBT  | EBR  | WBL  | WBT  | WBR  | NBL  | NBT  | NBR | SBL  | SBT  | SBR  |
|-------------------------|------|------|------|------|------|------|------|------|-----|------|------|------|
| LOS                     | F    | B    | A    | E    | D    | A    | E    | C    |     | E    | E    | E    |
| Approach Delay          |      | 53.3 |      |      | 35.8 |      |      | 42.8 |     |      | 62.2 |      |
| Approach LOS            |      | D    |      |      | D    |      |      | D    |     |      | E    |      |
| Queue Length 50th (ft)  | ~405 | 155  | 0    | 53   | 610  | 7    | 79   | 20   |     | 56   | 20   | 301  |
| Queue Length 95th (ft)  | #610 | 211  | 20   | m72  | #768 | m12  | #151 | 93   |     | m104 | m48  | #425 |
| Internal Link Dist (ft) |      | 1376 |      |      | 2220 |      |      | 467  |     |      | 322  |      |
| Turn Bay Length (ft)    | 450  |      | 200  | 200  |      | 300  | 200  |      |     | 100  |      | 100  |
| Base Capacity (vph)     | 399  | 2142 | 983  | 138  | 1501 | 714  | 172  | 269  |     | 157  | 162  | 497  |
| Starvation Cap Reductn  | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |     | 0    | 0    | 0    |
| Spillback Cap Reductn   | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |     | 0    | 0    | 0    |
| Storage Cap Reductn     | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |     | 0    | 0    | 0    |
| Reduced v/c Ratio       | 1.13 | 0.35 | 0.07 | 0.47 | 0.93 | 0.12 | 0.66 | 0.62 |     | 0.52 | 0.17 | 0.93 |

Intersection Summary

Area Type: Other  
 Cycle Length: 120  
 Actuated Cycle Length: 120  
 Offset: 117 (98%), Referenced to phase 4:EBT and 8:WBT, Start of Green  
 Natural Cycle: 120  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 1.13  
 Intersection Signal Delay: 46.5      Intersection LOS: D  
 Intersection Capacity Utilization 97.5%      ICU Level of Service F  
 Analysis Period (min) 15  
 ~ Volume exceeds capacity, queue is theoretically infinite.  
   Queue shown is maximum after two cycles.  
 # 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: 3: Catron & Black Hills



Lanes, Volumes, Timings  
9: Stumer & 5th St

Black Hills TIS  
2030 Build PM Peak






















| Lane Group              | EBL   | EBT   | EBR   | WBL   | WBT   | WBR  | NBL   | NBT   | NBR  | SBL   | SBT   | SBR   |
|-------------------------|-------|-------|-------|-------|-------|------|-------|-------|------|-------|-------|-------|
| Lane Configurations     | ↖↗    | ↑     | ↖     | ↖     | ↖     |      | ↖     | ↖↗    |      | ↖     | ↖↗    | ↖     |
| Volume (vph)            | 310   | 45    | 230   | 115   | 55    | 60   | 295   | 405   | 70   | 35    | 600   | 285   |
| Ideal Flow (vphpl)      | 1800  | 1800  | 1800  | 1800  | 1800  | 1800 | 1800  | 1800  | 1800 | 1800  | 1800  | 1800  |
| Storage Length (ft)     | 150   |       | 150   | 100   |       | 0    | 200   |       | 0    | 150   |       | 150   |
| Storage Lanes           | 2     |       | 1     | 1     |       | 0    | 1     |       | 0    | 1     |       | 1     |
| Taper Length (ft)       | 25    |       | 25    | 25    |       | 25   | 25    |       | 25   | 25    |       | 25    |
| Satd. Flow (prot)       | 3252  | 1765  | 1500  | 1676  | 1627  | 0    | 1676  | 3279  | 0    | 1676  | 3353  | 1500  |
| Flt Permitted           | 0.950 |       |       | 0.725 |       |      | 0.295 |       |      | 0.461 |       |       |
| Satd. Flow (perm)       | 3252  | 1765  | 1500  | 1279  | 1627  | 0    | 521   | 3279  | 0    | 814   | 3353  | 1500  |
| Right Turn on Red       |       |       | Yes   |       |       | Yes  |       |       | Yes  |       |       | Yes   |
| Satd. Flow (RTOR)       |       |       | 250   |       | 42    |      |       | 20    |      |       |       | 254   |
| Link Speed (mph)        |       | 25    |       |       | 25    |      |       | 45    |      |       |       | 45    |
| Link Distance (ft)      |       | 473   |       |       | 610   |      |       | 650   |      |       |       | 584   |
| Travel Time (s)         |       | 12.9  |       |       | 16.6  |      |       | 9.8   |      |       |       | 8.8   |
| Peak Hour Factor        | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92 | 0.92  | 0.92  | 0.92 | 0.92  | 0.92  | 0.92  |
| Shared Lane Traffic (%) |       |       |       |       |       |      |       |       |      |       |       |       |
| Lane Group Flow (vph)   | 337   | 49    | 250   | 125   | 125   | 0    | 321   | 516   | 0    | 38    | 652   | 310   |
| Turn Type               | Prot  |       | Perm  | pm+pt |       |      | pm+pt |       |      | pm+pt |       | Perm  |
| Protected Phases        | 7     | 4     |       | 3     | 8     |      | 5     | 2     |      | 1     | 6     |       |
| Permitted Phases        |       |       | 4     | 8     |       |      | 2     |       |      | 6     |       | 6     |
| Detector Phase          | 7     | 4     | 4     | 3     | 8     |      | 5     | 2     |      | 1     | 6     | 6     |
| Switch Phase            |       |       |       |       |       |      |       |       |      |       |       |       |
| 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)       | 10.0  | 30.0  | 30.0  | 10.0  | 30.0  |      | 10.0  | 23.5  |      | 10.0  | 27.5  | 27.5  |
| Total Split (s)         | 22.0  | 38.0  | 38.0  | 16.0  | 32.0  | 0.0  | 30.0  | 56.0  | 0.0  | 10.0  | 36.0  | 36.0  |
| Total Split (%)         | 18.3% | 31.7% | 31.7% | 13.3% | 26.7% | 0.0% | 25.0% | 46.7% | 0.0% | 8.3%  | 30.0% | 30.0% |
| Maximum Green (s)       | 16.5  | 32.5  | 32.5  | 10.5  | 26.5  |      | 24.5  | 50.5  |      | 4.5   | 30.5  | 30.5  |
| Yellow Time (s)         | 4.0   | 4.0   | 4.0   | 4.0   | 4.0   |      | 4.0   | 4.0   |      | 4.0   | 4.0   | 4.0   |
| All-Red Time (s)        | 1.5   | 1.5   | 1.5   | 1.5   | 1.5   |      | 1.5   | 1.5   |      | 1.5   | 1.5   | 1.5   |
| Lost Time Adjust (s)    | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0  | 0.0   | 0.0   | 0.0  | 0.0   | 0.0   | 0.0   |
| Total Lost Time (s)     | 5.5   | 5.5   | 5.5   | 5.5   | 5.5   | 4.0  | 5.5   | 5.5   | 4.0  | 5.5   | 5.5   | 5.5   |
| Lead/Lag                | Lead  | Lag   | Lag   | Lead  | Lag   |      | Lead  | Lag   |      | Lead  | Lag   | Lag   |
| Lead-Lag Optimize?      | Yes   | Yes   | Yes   | Yes   | Yes   |      | Yes   | Yes   |      | Yes   | Yes   | Yes   |
| Vehicle Extension (s)   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   |      | 3.0   | 3.0   |      | 3.0   | 3.0   | 3.0   |
| Recall Mode             | None  | None  | None  | None  | None  |      | None  | C-Max |      | None  | C-Max | C-Max |
| Walk Time (s)           |       | 7.0   | 7.0   |       | 7.0   |      |       | 7.0   |      |       | 7.0   | 7.0   |
| Flash Dont Walk (s)     |       | 17.5  | 17.5  |       | 17.5  |      |       | 11.0  |      |       | 15.0  | 15.0  |
| Pedestrian Calls (#/hr) |       | 0     | 0     |       | 0     |      |       | 0     |      |       | 0     | 0     |
| Act Effct Green (s)     | 15.7  | 17.3  | 17.3  | 21.6  | 11.6  |      | 76.2  | 70.2  |      | 57.5  | 53.0  | 53.0  |
| Actuated g/C Ratio      | 0.13  | 0.14  | 0.14  | 0.18  | 0.10  |      | 0.64  | 0.58  |      | 0.48  | 0.44  | 0.44  |
| v/c Ratio               | 0.79  | 0.19  | 0.58  | 0.47  | 0.64  |      | 0.64  | 0.27  |      | 0.09  | 0.44  | 0.39  |
| Control Delay           | 64.7  | 44.9  | 11.0  | 39.8  | 48.5  |      | 12.4  | 8.6   |      | 12.5  | 26.6  | 7.6   |
| Queue Delay             | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |      | 0.0   | 0.0   |      | 0.0   | 0.0   | 0.0   |
| Total Delay             | 64.7  | 44.9  | 11.0  | 39.8  | 48.5  |      | 12.4  | 8.6   |      | 12.5  | 26.6  | 7.6   |
| LOS                     | E     | D     | B     | D     | D     |      | B     | A     |      | B     | C     | A     |
| Approach Delay          |       | 42.1  |       |       | 44.1  |      |       | 10.0  |      |       | 20.2  |       |
| Approach LOS            |       | D     |       |       | D     |      |       | B     |      |       | C     |       |
| Queue Length 50th (ft)  | 131   | 34    | 0     | 75    | 62    |      | 54    | 52    |      | 10    | 182   | 25    |
| Queue Length 95th (ft)  | #185  | 67    | 71    | 120   | 121   |      | m107  | 151   |      | 28    | 283   | 106   |






















HCM Unsignalized Intersection Capacity Analysis  
 13: Parkview & 5th St

2030 Build PM Peak  
 Black Hills TIS

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement                          | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations               |   |  |   |   |  |  |  |  |   |  |  |   |
| Volume (veh/h)                    | 20  | 0   | 30  | 70  | 0   | 15  | 45  | 645   | 85  | 20  | 820   | 25  |
| Sign Control                      |   | Stop  |   |   | Stop  |   |   | Free  |   |   | Free  |   |
| Grade                             |   | 0%  |   |   | 0%  |   |   | 0%  |   |   | 0%  |   |
| Peak Hour Factor                  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  |
| Hourly flow rate (vph)            | 22  | 0   | 33  | 76  | 0   | 16  | 49  | 701   | 92  | 22  | 891   | 27  |
| Pedestrians                       |   |   |   |   |   |   |   |   |   |   |   |   |
| Lane Width (ft)                   |   |   |   |   |   |   |   |   |   |   |   |   |
| Walking Speed (ft/s)              |   |   |   |   |   |   |   |   |   |   |   |   |
| Percent Blockage                  |   |   |   |   |   |   |   |   |   |   |   |   |
| Right turn flare (veh)            |   |   |   |   |   |   |   |   |   |   |   |   |
| Median type                       |   |   |   |   |   |   |   |   |   |   |   |   |
| Median storage veh                |   |   |   |   |   |   |   |   |   |   |   |   |
| Upstream signal (ft)              |   |   |   |   |   |   |   |   |   |   |   |   |
| pX, platoon unblocked             | 0.95  | 0.95  |   | 0.95  | 0.95  | 0.95  |   |   |   |   | 0.95  |   |
| vC, conflicting volume            | 1397  | 1840  | 459   | 1367  | 1807  | 397   | 918   |   |   |   | 793   |   |
| vC1, stage 1 conf vol             |   |   |   |   |   |   |   |   |   |   |   |   |
| vC2, stage 2 conf vol             |   |   |   |   |   |   |   |   |   |   |   |   |
| vCu, unblocked vol                | 1316  | 1781  | 459   | 1285  | 1747  | 266   | 918   |   |   |   | 682   |   |
| tC, single (s)                    | 7.5   | 6.5   | 6.9   | 7.5   | 6.5   | 6.9   | 4.1   |   |   |   | 4.1   |   |
| tC, 2 stage (s)                   |   |   |   |   |   |   |   |   |   |   |   |   |
| tF (s)                            | 3.5   | 4.0   | 3.3   | 3.5   | 4.0   | 3.3   | 2.2   |   |   |   | 2.2   |   |
| p0 queue free %                   | 78  | 100   | 94  | 25  | 100   | 98  | 93  |   |   |   | 97  |   |
| cM capacity (veh/h)               | 100   | 70  | 549   | 102   | 74  | 698   | 739   |   |   |   | 863   |   |
| Direction, Lane #                 | EB 1  | WB 1  | NB 1  | NB 2  | NB 3  | SB 1  | SB 2  | SB 3  |   |   |   |   |
| Volume Total                      | 54  | 92  | 49  | 467   | 326   | 22  | 594   | 324   |   |   |   |   |
| Volume Left                       | 22  | 76  | 49  | 0   | 0   | 22  | 0   | 0   |   |   |   |   |
| Volume Right                      | 33  | 16  | 0   | 0   | 92  | 0   | 0   | 27  |   |   |   |   |
| cSH                               | 196   | 123   | 739   | 1700  | 1700  | 863   | 1700  | 1700  |   |   |   |   |
| Volume to Capacity                | 0.28  | 0.75  | 0.07  | 0.27  | 0.19  | 0.03  | 0.35  | 0.19  |   |   |   |   |
| Queue Length 95th (ft)            | 27  | 106   | 5   | 0   | 0   | 2   | 0   | 0   |   |   |   |   |
| Control Delay (s)                 | 30.2  | 89.8  | 10.2  | 0.0   | 0.0   | 9.3   | 0.0   | 0.0   |   |   |   |   |
| Lane LOS                          | D   | F   | B   |   |   | A   |   |   |   |   |   |   |
| Approach Delay (s)                | 30.2  | 89.8  | 0.6   |   |   | 0.2   |   |   |   |   |   |   |
| Approach LOS                      | D   | F   |   |   |   |   |   |   |   |   |   |   |
| Intersection Summary              |   |   |   |   |   |   |   |   |   |   |   |   |
| Average Delay                     |   |   | 5.5   |   |   |   |   |   |   |   |   |   |
| Intersection Capacity Utilization |   |   | 47.9%   | ICU Level of Service  | A   |   |   |   |   |   |   |   |
| Analysis Period (min)             |   |   | 15  |   |   |   |   |   |   |   |   |   |

HCM Unsignalized Intersection Capacity Analysis  
 12: Enchanted Pines & 5th St

2030 Build PM Peak  
 Black Hills TIS

|                                   |  |  |  |  |  |  |   |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement                          | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations               |   |  |   |   |  |   |  |  |   |  |  |  |
| Volume (veh/h)                    | 60  | 5   | 10  | 15  | 5   | 10  | 25  | 645   | 20  | 10  | 745   | 90  |
| Sign Control                      |   | Stop  |   |   | Stop  |   |   | Free  |   |   | Free  |   |
| Grade                             |   | 0%  |   |   | 0%  |   |   | 0%  |   |   | 0%  |   |
| Peak Hour Factor                  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  |
| Hourly flow rate (vph)            | 65  | 5   | 11  | 16  | 5   | 11  | 27  | 701   | 22  | 11  | 810   | 98  |
| Pedestrians                       |   |   |   |   |   |   |   |   |   |   |   |   |
| Lane Width (ft)                   |   |   |   |   |   |   |   |   |   |   |   |   |
| Walking Speed (ft/s)              |   |   |   |   |   |   |   |   |   |   |   |   |
| Percent Blockage                  |   |   |   |   |   |   |   |   |   |   |   |   |
| Right turn flare (veh)            |   |   |   |   |   |   |   |   |   |   |   |   |
| Median type                       |   |   |   |   |   |   |   | None  |   |   | None  |   |
| Median storage (veh)              |   |   |   |   |   |   |   |   |   |   |   |   |
| Upstream signal (ft)              |   |   |   |   |   |   |   |   |   |   |   |   |
| pX, platoon unblocked             |   |   |   |   |   |   |   |   |   |   |   |   |
| vC, conflicting volume            | 1299  | 1658  | 454   | 1207  | 1696  | 361   | 908   |   |   | 723   |   |   |
| vC1, stage 1 conf vol             |   |   |   |   |   |   |   |   |   |   |   |   |
| vC2, stage 2 conf vol             |   |   |   |   |   |   |   |   |   |   |   |   |
| vCu, unblocked vol                | 1299  | 1658  | 454   | 1207  | 1696  | 361   | 908   |   |   | 723   |   |   |
| tC, single (s)                    | 7.5   | 6.5   | 6.9   | 7.5   | 6.5   | 6.9   | 4.1   |   |   | 4.1   |   |   |
| tC, 2 stage (s)                   |   |   |   |   |   |   |   |   |   |   |   |   |
| tF (s)                            | 3.5   | 4.0   | 3.3   | 3.5   | 4.0   | 3.3   | 2.2   |   |   | 2.2   |   |   |
| p0 queue free %                   | 39  | 94  | 98  | 87  | 94  | 98  | 96  |   |   | 99  |   |   |
| cM capacity (veh/h)               | 107   | 92  | 553   | 126   | 87  | 635   | 746   |   |   | 875   |   |   |
| Direction, Lane #                 | EB 1  | WB 1  | NB 1  | NB 2  | NB 3  | SB 1  | SB 2  | SB 3  |   |   |   |   |
| Volume Total                      | 82  | 33  | 27  | 467   | 255   | 11  | 540   | 368   |   |   |   |   |
| Volume Left                       | 65  | 16  | 27  | 0   | 0   | 11  | 0   | 0   |   |   |   |   |
| Volume Right                      | 11  | 11  | 0   | 0   | 22  | 0   | 0   | 98  |   |   |   |   |
| cSH                               | 119   | 156   | 746   | 1700  | 1700  | 875   | 1700  | 1700  |   |   |   |   |
| Volume to Capacity                | 0.69  | 0.21  | 0.04  | 0.27  | 0.15  | 0.01  | 0.32  | 0.22  |   |   |   |   |
| Queue Length 95th (ft)            | 92  | 19  | 3   | 0   | 0   | 1   | 0   | 0   |   |   |   |   |
| Control Delay (s)                 | 84.6  | 34.1  | 10.0  | 0.0   | 0.0   | 9.2   | 0.0   | 0.0   |   |   |   |   |
| Lane LOS                          | F   | D   | B   |   |   | A   |   |   |   |   |   |   |
| Approach Delay (s)                | 84.6  | 34.1  | 0.4   |   |   | 0.1   |   |   |   |   |   |   |
| Approach LOS                      | F   | D   |   |   |   |   |   |   |   |   |   |   |
| Intersection Summary              |   |   |   |   |   |   |   |   |   |   |   |   |
| Average Delay                     |   |   | 4.7   |   |   |   |   |   |   |   |   |   |
| Intersection Capacity Utilization |   |   | 38.3%   | ICU Level of Service  | A   |   |   |   |   |   |   |   |
| Analysis Period (min)             |   |   | 15  |   |   |   |   |   |   |   |   |   |



**2030 Build Operating Conditions**

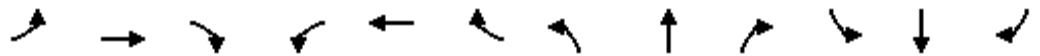
**Weekday PM Peak Hour**

**Catron Boulevard & Black Hills Boulevard**

**With Potential Eastbound Dual-Lefts**

Lanes, Volumes, Timings  
3: Catron & Black Hills

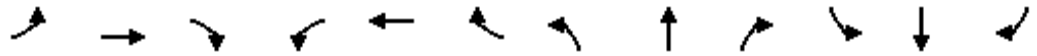
2030 Build PM Peak  
Black Hills TIS



| Lane Group              | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR  | SBL   | SBT   | SBR   |
|-------------------------|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|-------|-------|
| Lane Configurations     |       |       |       |       |       |       |       |       |      |       |       |       |
| Volume (vph)            | 415   | 695   | 60    | 60    | 1285  | 80    | 105   | 25    | 130  | 75    | 25    | 425   |
| Ideal Flow (vphpl)      | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800  | 1800 | 1800  | 1800  | 1800  |
| Grade (%)               |       | -4%   |       |       | 4%    |       |       | 0%    |      |       |       | 0%    |
| Storage Length (ft)     | 450   |       | 200   | 200   |       | 300   | 200   |       | 0    | 100   |       | 100   |
| Storage Lanes           | 2     |       | 1     | 1     |       | 1     | 1     |       | 0    | 1     |       | 1     |
| Taper Length (ft)       | 25    |       | 25    | 25    |       | 25    | 25    |       | 25   | 25    |       | 25    |
| Lane Util. Factor       | *0.65 | 0.95  | 1.00  | 1.00  | 0.95  | 1.00  | 1.00  | 1.00  | 1.00 | 1.00  | 1.00  | 1.00  |
| Frt                     |       |       | 0.850 |       |       | 0.850 |       | 0.874 |      |       |       | 0.850 |
| Flt Protected           | 0.950 |       |       | 0.950 |       |       | 0.950 |       |      | 0.950 |       |       |
| Satd. Flow (prot)       | 2223  | 3420  | 1530  | 1643  | 3286  | 1470  | 1676  | 1542  | 0    | 1676  | 1765  | 1500  |
| Flt Permitted           | 0.950 |       |       | 0.950 |       |       | 0.438 |       |      | 0.656 |       |       |
| Satd. Flow (perm)       | 2223  | 3420  | 1530  | 1643  | 3286  | 1470  | 773   | 1542  | 0    | 1158  | 1765  | 1500  |
| Right Turn on Red       |       |       | Yes   |       |       | Yes   |       |       | Yes  |       |       | Yes   |
| Satd. Flow (RTOR)       |       |       | 65    |       |       | 76    |       |       | 141  |       |       | 59    |
| Link Speed (mph)        |       | 60    |       |       | 60    |       |       | 30    |      |       |       | 25    |
| Link Distance (ft)      |       | 1456  |       |       | 2300  |       |       | 547   |      |       |       | 402   |
| Travel Time (s)         |       | 16.5  |       |       | 26.1  |       |       | 12.4  |      |       |       | 11.0  |
| Peak Hour Factor        | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92 | 0.92  | 0.92  | 0.92  |
| Adj. Flow (vph)         | 451   | 755   | 65    | 65    | 1397  | 87    | 114   | 27    | 141  | 82    | 27    | 462   |
| Shared Lane Traffic (%) |       |       |       |       |       |       |       |       |      |       |       |       |
| Lane Group Flow (vph)   | 451   | 755   | 65    | 65    | 1397  | 87    | 114   | 168   | 0    | 82    | 27    | 462   |
| Turn Type               | Prot  |       | Perm  | Prot  |       | Perm  | pm+pt |       |      | pm+pt |       | pm+ov |
| Protected Phases        | 7     | 4     |       | 3     | 8     |       | 5     | 2     |      | 1     | 6     | 7     |
| Permitted Phases        |       |       | 4     |       |       | 8     | 2     |       |      | 6     |       | 6     |
| Detector Phase          | 7     | 4     | 4     | 3     | 8     | 8     | 5     | 2     |      | 1     | 6     | 7     |
| Switch Phase            |       |       |       |       |       |       |       |       |      |       |       |       |
| Minimum Initial (s)     | 7.0   | 12.0  | 12.0  | 4.0   | 12.0  | 12.0  | 7.0   | 7.0   |      | 7.0   | 7.0   | 7.0   |
| Minimum Split (s)       | 13.0  | 19.5  | 19.5  | 10.0  | 30.4  | 30.4  | 13.0  | 13.0  |      | 13.0  | 13.0  | 13.0  |
| Total Split (s)         | 34.0  | 69.0  | 69.0  | 18.0  | 53.0  | 53.0  | 15.0  | 18.0  | 0.0  | 15.0  | 18.0  | 34.0  |
| Total Split (%)         | 28.3% | 57.5% | 57.5% | 15.0% | 44.2% | 44.2% | 12.5% | 15.0% | 0.0% | 12.5% | 15.0% | 28.3% |
| Maximum Green (s)       | 28.0  | 61.8  | 61.8  | 12.0  | 46.9  | 46.9  | 9.0   | 12.0  |      | 9.0   | 12.0  | 28.0  |
| Yellow Time (s)         | 4.5   | 6.0   | 6.0   | 4.5   | 4.9   | 4.9   | 4.5   | 4.5   |      | 4.5   | 4.5   | 4.5   |
| All-Red Time (s)        | 1.5   | 1.2   | 1.2   | 1.5   | 1.2   | 1.2   | 1.5   | 1.5   |      | 1.5   | 1.5   | 1.5   |
| Lost Time Adjust (s)    | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0  | 0.0   | 0.0   | 0.0   |
| Total Lost Time (s)     | 6.0   | 7.2   | 7.2   | 6.0   | 6.1   | 6.1   | 6.0   | 6.0   | 4.0  | 6.0   | 6.0   | 6.0   |
| Lead/Lag                | Lead  | Lag   | Lag   | Lead  | Lag   | Lag   | Lead  | Lag   |      | Lead  | Lag   | Lead  |
| Lead-Lag Optimize?      | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   |      | Yes   | Yes   | Yes   |
| Vehicle Extension (s)   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   |      | 3.0   | 3.0   | 3.0   |
| Recall Mode             | None  | C-Max | C-Max | None  | C-Max | C-Max | None  | None  |      | None  | None  | None  |
| Walk Time (s)           |       |       |       |       | 7.0   | 7.0   |       |       |      |       |       |       |
| Flash Dont Walk (s)     |       |       |       |       | 17.0  | 17.0  |       |       |      |       |       |       |
| Pedestrian Calls (#/hr) |       |       |       |       | 0     | 0     |       |       |      |       |       |       |
| Act Effect Green (s)    | 27.6  | 72.4  | 72.4  | 9.6   | 53.2  | 53.2  | 17.5  | 9.1   |      | 14.7  | 8.9   | 37.3  |
| Actuated g/C Ratio      | 0.23  | 0.60  | 0.60  | 0.08  | 0.44  | 0.44  | 0.15  | 0.08  |      | 0.12  | 0.07  | 0.31  |
| v/c Ratio               | 0.88  | 0.37  | 0.07  | 0.49  | 0.96  | 0.13  | 0.57  | 0.68  |      | 0.46  | 0.21  | 0.91  |
| Control Delay           | 64.2  | 14.8  | 3.7   | 60.4  | 34.8  | 5.6   | 54.3  | 27.1  |      | 50.3  | 54.8  | 58.8  |
| Queue Delay             | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |      | 0.0   | 0.0   | 0.0   |
| Total Delay             | 64.2  | 14.8  | 3.7   | 60.4  | 34.8  | 5.6   | 54.3  | 27.1  |      | 50.3  | 54.8  | 58.8  |

Lanes, Volumes, Timings  
3: Catron & Black Hills

2030 Build PM Peak  
Black Hills TIS



| Lane Group              | EBL  | EBT  | EBR  | WBL  | WBT  | WBR  | NBL  | NBT  | NBR | SBL  | SBT  | SBR  |
|-------------------------|------|------|------|------|------|------|------|------|-----|------|------|------|
| LOS                     | E    | B    | A    | E    | C    | A    | D    | C    |     | D    | D    | E    |
| Approach Delay          |      | 31.8 |      |      | 34.2 |      |      | 38.1 |     |      | 57.4 |      |
| Approach LOS            |      | C    |      |      | C    |      |      | D    |     |      | E    |      |
| Queue Length 50th (ft)  | 260  | 163  | 0    | 48   | 592  | 7    | 78   | 20   |     | 55   | 20   | 289  |
| Queue Length 95th (ft)  | #395 | 234  | 22   | m68  | #775 | m12  | 129  | 92   |     | m100 | m47  | 414  |
| Internal Link Dist (ft) |      | 1376 |      |      | 2220 |      |      | 467  |     |      | 322  |      |
| Turn Bay Length (ft)    | 450  |      | 200  | 200  |      | 300  | 200  |      |     | 100  |      | 100  |
| Base Capacity (vph)     | 519  | 2064 | 949  | 164  | 1456 | 694  | 201  | 281  |     | 185  | 177  | 512  |
| Starvation Cap Reductn  | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |     | 0    | 0    | 0    |
| Spillback Cap Reductn   | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |     | 0    | 0    | 0    |
| Storage Cap Reductn     | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |     | 0    | 0    | 0    |
| Reduced v/c Ratio       | 0.87 | 0.37 | 0.07 | 0.40 | 0.96 | 0.13 | 0.57 | 0.60 |     | 0.44 | 0.15 | 0.90 |

Intersection Summary

Area Type: Other  
 Cycle Length: 120  
 Actuated Cycle Length: 120  
 Offset: 112 (93%), Referenced to phase 4:EBT and 8:WBT, Start of Green  
 Natural Cycle: 100  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.96  
 Intersection Signal Delay: 37.3  
 Intersection LOS: D  
 Intersection Capacity Utilization 86.5%  
 ICU Level of Service E  
 Analysis Period (min) 15  
 \* User Entered Value  
 # 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: 3: Catron & Black Hills

