
























## Appendix I

### Future Intersection Levels of Service w/o Right Turn Lanes

# HCM Signalized Intersection Capacity Analysis

## 1: E. Glebe Road & US Route 1



















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|                                   |  |  |  |  |  |  |  |  |  |  |  |  |      |
|-----------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|------|
| Movement                          | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |      |
| Lane Configurations               |  |  |   |  |  |  |   |  |  |  |  |  |      |
| Ideal Flow (vphpl)                | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  |      |
| Total Lost time (s)               | 4.0   | 4.0   |   | 4.0   | 4.0   | 4.0   | 4.0   | 4.0   |   | 4.0   | 4.0   |   |      |
| Lane Util. Factor                 | 1.00  | 1.00  |   | 1.00  | 1.00  | 1.00  | 1.00  | 0.95  |   | 1.00  | 0.95  |   |      |
| Frt                               | 1.00  | 0.88  |   | 1.00  | 1.00  | 0.85  | 1.00  | 1.00  |   | 1.00  | 1.00  |   |      |
| Flt Protected                     | 0.95  | 1.00  |   | 0.95  | 1.00  | 1.00  | 0.95  | 1.00  |   | 0.95  | 1.00  |   |      |
| Satd. Flow (prot)                 | 1770  | 1647  |   | 1770  | 1863  | 1583  | 1770  | 3530  |   | 1770  | 3525  |   |      |
| Flt Permitted                     | 0.56  | 1.00  |   | 0.32  | 1.00  | 1.00  | 0.07  | 1.00  |   | 0.05  | 1.00  |   |      |
| Satd. Flow (perm)                 | 1043  | 1647  |   | 596   | 1863  | 1583  | 137   | 3530  |   | 101   | 3525  |   |      |
| Volume (vph)                      | 247   | 65  | 219   | 15  | 27  | 75  | 190   | 2039  | 37  | 174   | 1322  | 35  |      |
| Peak-hour factor, PHF             | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  |      |
| Adj. Flow (vph)                   | 260   | 68  | 231   | 16  | 28  | 79  | 200   | 2146  | 39  | 183   | 1392  | 37  |      |
| RTOR Reduction (vph)              | 0   | 100   | 0   | 0   | 0   | 12  | 0   | 1   | 0   | 0   | 1   | 0   |      |
| Lane Group Flow (vph)             | 260   | 199   | 0   | 16  | 28  | 67  | 200   | 2184  | 0   | 183   | 1428  | 0   |      |
| Turn Type                         | pm+pt   |   |   | Perm  |   | pm+ov   | pm+pt   |   |   | pm+pt   |   |   |      |
| Protected Phases                  | 7   | 4   |   |   | 8   | 1   | 5   | 2   |   | 1   | 6   |   |      |
| Permitted Phases                  | 4   |   |   | 8   |   | 8   | 2   |   |   | 6   |   |   |      |
| Actuated Green, G (s)             | 21.9  | 21.9  |   | 11.5  | 11.5  | 29.5  | 108.1   | 85.1  |   | 91.1  | 73.1  |   |      |
| Effective Green, g (s)            | 22.9  | 22.9  |   | 12.5  | 12.5  | 31.5  | 109.1   | 86.1  |   | 93.1  | 74.1  |   |      |
| Actuated g/C Ratio                | 0.16  | 0.16  |   | 0.09  | 0.09  | 0.22  | 0.78  | 0.62  |   | 0.66  | 0.53  |   |      |
| Clearance Time (s)                | 5.0   | 5.0   |   | 5.0   | 5.0   | 5.0   | 5.0   | 5.0   |   | 5.0   | 5.0   |   |      |
| Vehicle Extension (s)             | 3.0   | 3.0   |   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   |   | 3.0   | 3.0   |   |      |
| Lane Grp Cap (vph)                | 204   | 269   |   | 53  | 166   | 401   | 468   | 2171  |   | 294   | 1866  |   |      |
| v/s Ratio Prot                    | c0.06   | 0.12  |   |   | 0.02  | 0.02  | 0.09  | c0.62   |   | c0.08   | 0.40  |   |      |
| v/s Ratio Perm                    | c0.15   |   |   | 0.03  |   | 0.02  | 0.24  |   |   | 0.33  |   |   |      |
| v/c Ratio                         | 1.27  | 0.74  |   | 0.30  | 0.17  | 0.17  | 0.43  | 1.01  |   | 0.62  | 0.77  |   |      |
| Uniform Delay, d1                 | 58.4  | 55.7  |   | 59.7  | 58.9  | 43.7  | 26.2  | 27.0  |   | 58.3  | 26.1  |   |      |
| Progression Factor                | 1.00  | 1.00  |   | 1.00  | 1.00  | 1.00  | 1.08  | 0.60  |   | 1.00  | 1.00  |   |      |
| Incremental Delay, d2             | 156.0   | 10.5  |   | 3.2   | 0.5   | 0.2   | 0.4   | 16.4  |   | 4.1   | 3.1   |   |      |
| Delay (s)                         | 214.4   | 66.2  |   | 62.9  | 59.4  | 43.9  | 28.6  | 32.6  |   | 62.4  | 29.1  |   |      |
| Level of Service                  | F   | E   |   | E   | E   | D   | C   | C   |   | E   | C   |   |      |
| Approach Delay (s)                |   | 135.1   |   |   | 49.9  |   |   | 32.3  |   |   | 32.9  |   |      |
| Approach LOS                      |   | F   |   |   | D   |   |   | C   |   |   | C   |   |      |
| <b>Intersection Summary</b>       |   |   |   |   |   |   |   |   |   |   |   |   |      |
| HCM Average Control Delay         |   |   | 45.2  |   |   |   |   |   |   |   |   | HCM Level of Service  | D    |
| HCM Volume to Capacity ratio      |   |   | 0.99  |   |   |   |   |   |   |   |   |   |      |
| Actuated Cycle Length (s)         |   |   | 140.0   |   |   |   |   |   |   |   |   | Sum of lost time (s)  | 12.0 |
| Intersection Capacity Utilization |   |   | 100.9%  |   |   |   |   |   |   |   |   | ICU Level of Service  | G    |
| Analysis Period (min)             |   |   | 15  |   |   |   |   |   |   |   |   |   |      |
| c Critical Lane Group             |   |   |   |   |   |   |   |   |   |   |   |   |      |

# HCM Signalized Intersection Capacity Analysis

## 3: Swann Ave. & US Route 1


















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|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement                          | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations               |   |  |   |   |  |   |   |  |   |  |  |  |
| Ideal Flow (vphpl)                | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  |
| Total Lost time (s)               |   | 4.0   |   |   | 4.0   |   |   | 4.0   |   | 4.0   | 4.0   |   |
| Lane Util. Factor                 |   | 1.00  |   |   | 1.00  |   |   | 0.95  |   | 1.00  | 0.95  |   |
| Frt                               |   | 0.98  |   |   | 0.88  |   |   | 1.00  |   | 1.00  | 1.00  |   |
| Flt Protected                     |   | 0.96  |   |   | 1.00  |   |   | 1.00  |   | 0.95  | 1.00  |   |
| Satd. Flow (prot)                 |   | 1749  |   |   | 1625  |   |   | 3536  |   | 1770  | 3533  |   |
| Flt Permitted                     |   | 0.80  |   |   | 0.98  |   |   | 0.94  |   | 0.03  | 1.00  |   |
| Satd. Flow (perm)                 |   | 1452  |   |   | 1598  |   |   | 3339  |   | 65  | 3533  |   |
| Volume (vph)                      | 30  | 0   | 6   | 3   | 0   | 32  | 9   | 2210  | 12  | 80  | 1555  | 19  |
| Peak-hour factor, PHF             | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  |
| Adj. Flow (vph)                   | 32  | 0   | 6   | 3   | 0   | 34  | 9   | 2326  | 13  | 84  | 1637  | 20  |
| RTOR Reduction (vph)              | 0   | 6   | 0   | 0   | 32  | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
| Lane Group Flow (vph)             | 0   | 32  | 0   | 0   | 5   | 0   | 0   | 2348  | 0   | 84  | 1657  | 0   |
| Turn Type                         | Perm  |   | Perm  |   | Perm  |   | pm+pt   |   |   |   |   |   |
| Protected Phases                  |   | 4   |   |   | 8   |   |   | 2   |   | 1   | 6   |   |
| Permitted Phases                  | 4   |   |   | 8   |   |   | 2   |   |   | 6   |   |   |
| Actuated Green, G (s)             |   | 5.9   |   |   | 5.9   |   |   | 110.2   |   | 124.1   | 124.1   |   |
| Effective Green, g (s)            |   | 6.9   |   |   | 6.9   |   |   | 111.2   |   | 125.1   | 125.1   |   |
| Actuated g/C Ratio                |   | 0.05  |   |   | 0.05  |   |   | 0.79  |   | 0.89  | 0.89  |   |
| Clearance Time (s)                |   | 5.0   |   |   | 5.0   |   |   | 5.0   |   | 5.0   | 5.0   |   |
| Vehicle Extension (s)             |   | 3.0   |   |   | 3.0   |   |   | 3.0   |   | 3.0   | 3.0   |   |
| Lane Grp Cap (vph)                |   | 72  |   |   | 79  |   |   | 2652  |   | 179   | 3157  |   |
| v/s Ratio Prot                    |   |   |   |   |   |   |   |   |   | 0.03  | c0.47   |   |
| v/s Ratio Perm                    |   | c0.02   |   |   | 0.00  |   |   | c0.70   |   | 0.39  |   |   |
| v/c Ratio                         |   | 0.45  |   |   | 0.06  |   |   | 0.89  |   | 0.47  | 0.52  |   |
| Uniform Delay, d1                 |   | 64.7  |   |   | 63.5  |   |   | 10.0  |   | 34.8  | 1.5   |   |
| Progression Factor                |   | 1.00  |   |   | 1.00  |   |   | 0.43  |   | 2.48  | 0.03  |   |
| Incremental Delay, d2             |   | 4.4   |   |   | 0.3   |   |   | 2.9   |   | 1.3   | 0.4   |   |
| Delay (s)                         |   | 69.1  |   |   | 63.8  |   |   | 7.1   |   | 87.6  | 0.5   |   |
| Level of Service                  |   | E   |   |   | E   |   |   | A   |   | F   | A   |   |
| Approach Delay (s)                |   | 69.1  |   |   | 63.8  |   |   | 7.1   |   |   | 4.7   |   |
| Approach LOS                      |   | E   |   |   | E   |   |   | A   |   |   | A   |   |
| <b>Intersection Summary</b>       |   |   |   |   |   |   |   |   |   |   |   |   |
| HCM Average Control Delay         |   |   | 7.2   |   |   |   |   | HCM Level of Service  |   |   | A   |   |
| HCM Volume to Capacity ratio      |   |   | 0.84  |   |   |   |   |   |   |   |   |   |
| Actuated Cycle Length (s)         |   |   | 140.0   |   |   |   |   | Sum of lost time (s)  |   | 12.0  |   |   |
| Intersection Capacity Utilization |   |   | 84.5%   |   |   |   |   | ICU Level of Service  |   | E   |   |   |
| Analysis Period (min)             |   |   | 15  |   |   |   |   |   |   |   |   |   |
| c Critical Lane Group             |   |   |   |   |   |   |   |   |   |   |   |   |

# HCM Signalized Intersection Capacity Analysis

## 4: Custis Ave & US Route 1




















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|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement                          | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations               |   |  |   |   |  |   |   |  |   |  |  |   |
| Ideal Flow (vphpl)                | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  |
| Total Lost time (s)               |   | 4.0   |   |   | 4.0   |   |   | 4.0   |   | 4.0   | 4.0   |   |
| Lane Util. Factor                 |   | 1.00  |   |   | 1.00  |   |   | 0.95  |   | 1.00  | 0.95  |   |
| Frt                               |   | 0.95  |   |   | 0.90  |   |   | 1.00  |   | 1.00  | 1.00  |   |
| Flt Protected                     |   | 0.97  |   |   | 0.99  |   |   | 1.00  |   | 0.95  | 1.00  |   |
| Satd. Flow (prot)                 |   | 1720  |   |   | 1658  |   |   | 3538  |   | 1770  | 3532  |   |
| Flt Permitted                     |   | 0.78  |   |   | 0.97  |   |   | 0.95  |   | 0.05  | 1.00  |   |
| Satd. Flow (perm)                 |   | 1376  |   |   | 1614  |   |   | 3351  |   | 89  | 3532  |   |
| Volume (vph)                      | 60  | 3   | 35  | 6   | 5   | 36  | 7   | 2190  | 2   | 14  | 1623  | 21  |
| Peak-hour factor, PHF             | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  |
| Adj. Flow (vph)                   | 63  | 3   | 37  | 6   | 5   | 38  | 7   | 2305  | 2   | 15  | 1708  | 22  |
| RTOR Reduction (vph)              | 0   | 17  | 0   | 0   | 12  | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
| Lane Group Flow (vph)             | 0   | 86  | 0   | 0   | 37  | 0   | 0   | 2314  | 0   | 15  | 1730  | 0   |
| Turn Type                         | Perm  |   | Perm  |   | Perm  |   | Perm  |   | Perm  |   | Perm  |   |
| Protected Phases                  |   | 4   |   |   | 8   |   |   | 2   |   |   | 6   |   |
| Permitted Phases                  | 4   |   |   | 8   |   |   | 2   |   |   | 6   |   |   |
| Actuated Green, G (s)             |   | 13.2  |   |   | 13.2  |   |   | 116.8   |   | 116.8   | 116.8   |   |
| Effective Green, g (s)            |   | 14.2  |   |   | 14.2  |   |   | 117.8   |   | 117.8   | 117.8   |   |
| Actuated g/C Ratio                |   | 0.10  |   |   | 0.10  |   |   | 0.84  |   | 0.84  | 0.84  |   |
| Clearance Time (s)                |   | 5.0   |   |   | 5.0   |   |   | 5.0   |   | 5.0   | 5.0   |   |
| Vehicle Extension (s)             |   | 3.0   |   |   | 3.0   |   |   | 3.0   |   | 3.0   | 3.0   |   |
| Lane Grp Cap (vph)                |   | 140   |   |   | 164   |   |   | 2820  |   | 75  | 2972  |   |
| v/s Ratio Prot                    |   |   |   |   |   |   |   |   |   |   | 0.49  |   |
| v/s Ratio Perm                    |   | c0.06   |   |   | 0.02  |   |   | c0.69   |   | 0.17  |   |   |
| v/c Ratio                         |   | 0.61  |   |   | 0.23  |   |   | 0.82  |   | 0.20  | 0.58  |   |
| Uniform Delay, d1                 |   | 60.3  |   |   | 57.9  |   |   | 5.7   |   | 2.1   | 3.4   |   |
| Progression Factor                |   | 1.00  |   |   | 1.00  |   |   | 0.19  |   | 0.68  | 0.57  |   |
| Incremental Delay, d2             |   | 7.7   |   |   | 0.7   |   |   | 0.9   |   | 5.3   | 0.7   |   |
| Delay (s)                         |   | 68.0  |   |   | 58.6  |   |   | 1.9   |   | 6.7   | 2.7   |   |
| Level of Service                  |   | E   |   |   | E   |   |   | A   |   | A   | A   |   |
| Approach Delay (s)                |   | 68.0  |   |   | 58.6  |   |   | 1.9   |   |   | 2.7   |   |
| Approach LOS                      |   | E   |   |   | E   |   |   | A   |   |   | A   |   |
| <b>Intersection Summary</b>       |   |   |   |   |   |   |   |   |   |   |   |   |
| HCM Average Control Delay         |   |   | 4.5   |   |   |   |   | HCM Level of Service  |   |   | A   |   |
| HCM Volume to Capacity ratio      |   |   | 0.80  |   |   |   |   |   |   |   |   |   |
| Actuated Cycle Length (s)         |   |   | 140.0   |   |   |   |   | Sum of lost time (s)  |   |   | 8.0   |   |
| Intersection Capacity Utilization |   |   | 86.1%   |   |   |   |   | ICU Level of Service  |   |   | E   |   |
| Analysis Period (min)             |   |   | 15  |   |   |   |   |   |   |   |   |   |
| c Critical Lane Group             |   |   |   |   |   |   |   |   |   |   |   |   |

# HCM Signalized Intersection Capacity Analysis

## 5: Howell Ave. & US Route 1
























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|                                   |  |  |  |  |  |  |   |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement                          | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations               |   |  |   |  |  |   |  |  |   |  |  |   |
| Ideal Flow (vphpl)                | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  |
| Total Lost time (s)               |   | 4.0   |   | 4.0   | 4.0   |   | 4.0   | 4.0   |   | 4.0   | 4.0   |   |
| Lane Util. Factor                 |   | 1.00  |   | 1.00  | 1.00  |   | 1.00  | 0.95  |   | 1.00  | 0.95  |   |
| Frt                               |   | 0.94  |   | 1.00  | 0.88  |   | 1.00  | 1.00  |   | 1.00  | 1.00  |   |
| Flt Protected                     |   | 0.98  |   | 0.95  | 1.00  |   | 0.95  | 1.00  |   | 0.95  | 1.00  |   |
| Satd. Flow (prot)                 |   | 1710  |   | 1770  | 1643  |   | 1770  | 3533  |   | 1770  | 3537  |   |
| Flt Permitted                     |   | 0.84  |   | 0.79  | 1.00  |   | 0.15  | 1.00  |   | 0.03  | 1.00  |   |
| Satd. Flow (perm)                 |   | 1474  |   | 1478  | 1643  |   | 287   | 3533  |   | 64  | 3537  |   |
| Volume (vph)                      | 17  | 3   | 16  | 22  | 3   | 10  | 6   | 2635  | 33  | 75  | 1477  | 7   |
| Peak-hour factor, PHF             | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  |
| Adj. Flow (vph)                   | 18  | 3   | 17  | 23  | 3   | 11  | 6   | 2774  | 35  | 79  | 1555  | 7   |
| RTOR Reduction (vph)              | 0   | 16  | 0   | 0   | 11  | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
| Lane Group Flow (vph)             | 0   | 22  | 0   | 23  | 3   | 0   | 6   | 2809  | 0   | 79  | 1562  | 0   |
| Turn Type                         | Perm  |   | Perm  |   | pm+pt   |   | pm+pt   |   |   |   |   |   |
| Protected Phases                  | 8   |   | 4   |   | 5   |   | 2   |   | 1   |   | 6   |   |
| Permitted Phases                  | 8   |   | 4   |   | 2   |   | 6   |   |   |   |   |   |
| Actuated Green, G (s)             | 5.3   |   | 5.3   |   | 5.3   |   | 112.5   |   | 111.4   |   | 124.7   |   |
| Effective Green, g (s)            | 6.3   |   | 6.3   |   | 6.3   |   | 114.5   |   | 112.4   |   | 125.7   |   |
| Actuated g/C Ratio                | 0.04  |   | 0.04  |   | 0.04  |   | 0.82  |   | 0.80  |   | 0.90  |   |
| Clearance Time (s)                | 5.0   |   | 5.0   |   | 5.0   |   | 5.0   |   | 5.0   |   | 5.0   |   |
| Vehicle Extension (s)             | 3.0   |   | 3.0   |   | 3.0   |   | 3.0   |   | 3.0   |   | 3.0   |   |
| Lane Grp Cap (vph)                | 66  |   | 67  |   | 74  |   | 257   |   | 2836  |   | 171   |   |
| v/s Ratio Prot                    |   |   | 0.00  |   | 0.00  |   | c0.80   |   | c0.03   |   | 0.44  |   |
| v/s Ratio Perm                    | 0.01  |   | c0.02   |   | 0.02  |   | 0.38  |   |   |   |   |   |
| v/c Ratio                         | 0.33  |   | 0.34  |   | 0.05  |   | 0.02  |   | 0.99  |   | 0.46  |   |
| Uniform Delay, d1                 | 64.8  |   | 64.8  |   | 64.0  |   | 2.5   |   | 13.3  |   | 63.9  |   |
| Progression Factor                | 1.00  |   | 1.00  |   | 1.00  |   | 1.05  |   | 0.71  |   | 1.33  |   |
| Incremental Delay, d2             | 2.9   |   | 3.1   |   | 0.3   |   | 0.0   |   | 12.7  |   | 1.6   |   |
| Delay (s)                         | 67.7  |   | 67.9  |   | 64.2  |   | 2.6   |   | 22.1  |   | 86.7  |   |
| Level of Service                  | E   |   | E   |   | E   |   | A   |   | C   |   | F   |   |
| Approach Delay (s)                | 67.7  |   | 66.5  |   | 22.0  |   | 7.8   |   |   |   |   |   |
| Approach LOS                      | E   |   | E   |   | C   |   | A   |   |   |   |   |   |
| <b>Intersection Summary</b>       |   |   |   |   |   |   |   |   |   |   |   |   |
| HCM Average Control Delay         | 17.6  |   | HCM Level of Service  |   | B   |   |   |   |   |   |   |   |
| HCM Volume to Capacity ratio      | 0.92  |   |   |   |   |   |   |   |   |   |   |   |
| Actuated Cycle Length (s)         | 140.0   |   | Sum of lost time (s)  |   | 12.0  |   |   |   |   |   |   |   |
| Intersection Capacity Utilization | 92.0%   |   | ICU Level of Service  |   | F   |   |   |   |   |   |   |   |
| Analysis Period (min)             | 15  |   |   |   |   |   |   |   |   |   |   |   |
| c Critical Lane Group             |   |   |   |   |   |   |   |   |   |   |   |   |

# HCM Signalized Intersection Capacity Analysis

## 1: E. Glebe Road & US Route 1

3/29/2006

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |      |
|-----------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|------|
| Movement                          | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |      |
| Lane Configurations               |  |  |   |  |  |  |  |  |  |  |  |  |      |
| Ideal Flow (vphpl)                | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  |      |
| Total Lost time (s)               | 4.0   | 4.0   |   | 4.0   | 4.0   | 4.0   | 4.0   | 4.0   |   | 4.0   | 4.0   |   |      |
| Lane Util. Factor                 | 1.00  | 1.00  |   | 1.00  | 1.00  | 1.00  | 1.00  | 0.95  |   | 1.00  | 0.95  |   |      |
| Frt                               | 1.00  | 0.89  |   | 1.00  | 1.00  | 0.85  | 1.00  | 1.00  |   | 1.00  | 0.99  |   |      |
| Flt Protected                     | 0.95  | 1.00  |   | 0.95  | 1.00  | 1.00  | 0.95  | 1.00  |   | 0.95  | 1.00  |   |      |
| Satd. Flow (prot)                 | 1770  | 1651  |   | 1770  | 1863  | 1583  | 1770  | 3535  |   | 1770  | 3499  |   |      |
| Flt Permitted                     | 0.47  | 1.00  |   | 0.32  | 1.00  | 1.00  | 0.05  | 1.00  |   | 0.09  | 1.00  |   |      |
| Satd. Flow (perm)                 | 873   | 1651  |   | 588   | 1863  | 1583  | 97  | 3535  |   | 168   | 3499  |   |      |
| Volume (vph)                      | 159   | 65  | 203   | 67  | 92  | 232   | 340   | 1511  | 11  | 173   | 1937  | 157   |      |
| Peak-hour factor, PHF             | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  |      |
| Adj. Flow (vph)                   | 167   | 68  | 214   | 71  | 97  | 244   | 358   | 1591  | 12  | 182   | 2039  | 165   |      |
| RTOR Reduction (vph)              | 0   | 89  | 0   | 0   | 0   | 27  | 0   | 0   | 0   | 0   | 4   | 0   |      |
| Lane Group Flow (vph)             | 167   | 193   | 0   | 71  | 97  | 217   | 358   | 1603  | 0   | 182   | 2200  | 0   |      |
| Turn Type                         | pm+pt   |   |   | Perm  |   | pm+ov   | pm+pt   |   |   | pm+pt   |   |   |      |
| Protected Phases                  | 7   | 4   |   |   | 8   | 1   | 5   | 2   |   | 1   | 6   |   |      |
| Permitted Phases                  | 4   |   |   | 8   |   | 8   | 2   |   |   | 6   |   |   |      |
| Actuated Green, G (s)             | 25.5  | 25.5  |   | 16.5  | 16.5  | 31.1  | 104.5   | 84.9  |   | 86.6  | 72.0  |   |      |
| Effective Green, g (s)            | 26.5  | 26.5  |   | 17.5  | 17.5  | 33.1  | 105.5   | 85.9  |   | 88.6  | 73.0  |   |      |
| Actuated g/C Ratio                | 0.19  | 0.19  |   | 0.12  | 0.12  | 0.24  | 0.75  | 0.61  |   | 0.63  | 0.52  |   |      |
| Clearance Time (s)                | 5.0   | 5.0   |   | 5.0   | 5.0   | 5.0   | 5.0   | 5.0   |   | 5.0   | 5.0   |   |      |
| Vehicle Extension (s)             | 3.0   | 3.0   |   | 3.0   | 3.0   | 3.0   | 3.0   | 3.0   |   | 3.0   | 3.0   |   |      |
| Lane Grp Cap (vph)                | 197   | 313   |   | 74  | 233   | 419   | 414   | 2169  |   | 285   | 1824  |   |      |
| v/s Ratio Prot                    | c0.03   | 0.12  |   |   | 0.05  | 0.06  | c0.18   | 0.45  |   | 0.07  | c0.63   |   |      |
| v/s Ratio Perm                    | c0.13   |   |   | 0.12  |   | 0.08  | 0.48  |   |   | 0.33  |   |   |      |
| v/c Ratio                         | 0.85  | 0.62  |   | 0.96  | 0.42  | 0.52  | 0.86  | 0.74  |   | 0.64  | 1.21  |   |      |
| Uniform Delay, d1                 | 55.4  | 52.1  |   | 60.9  | 56.5  | 46.5  | 55.7  | 19.1  |   | 21.7  | 33.5  |   |      |
| Progression Factor                | 1.00  | 1.00  |   | 1.00  | 1.00  | 1.00  | 1.01  | 0.49  |   | 1.00  | 1.00  |   |      |
| Incremental Delay, d2             | 27.1  | 3.6   |   | 89.6  | 1.2   | 1.1   | 12.6  | 1.6   |   | 4.6   | 98.1  |   |      |
| Delay (s)                         | 82.5  | 55.7  |   | 150.5   | 57.7  | 47.6  | 68.6  | 11.0  |   | 26.4  | 131.6   |   |      |
| Level of Service                  | F   | E   |   | F   | E   | D   | E   | B   |   | C   | F   |   |      |
| Approach Delay (s)                |   | 65.7  |   |   | 67.7  |   |   | 21.5  |   |   | 123.6   |   |      |
| Approach LOS                      |   | E   |   |   | E   |   |   | C   |   |   | F   |   |      |
| <b>Intersection Summary</b>       |   |   |   |   |   |   |   |   |   |   |   |   |      |
| HCM Average Control Delay         |   |   | 75.8  |   |   |   |   |   |   |   |   | HCM Level of Service  | E    |
| HCM Volume to Capacity ratio      |   |   | 1.05  |   |   |   |   |   |   |   |   |   |      |
| Actuated Cycle Length (s)         |   |   | 140.0   |   |   |   |   |   |   |   |   | Sum of lost time (s)  | 12.0 |
| Intersection Capacity Utilization |   |   | 113.3%  |   |   |   |   |   |   |   |   | ICU Level of Service  | H    |
| Analysis Period (min)             |   |   | 15  |   |   |   |   |   |   |   |   |   |      |
| c Critical Lane Group             |   |   |   |   |   |   |   |   |   |   |   |   |      |

# HCM Signalized Intersection Capacity Analysis

## 3: Swann Ave. & US Route 1

3/29/2006



| Movement               | EBL  | EBT   | EBR  | WBL  | WBT  | WBR  | NBL   | NBT   | NBR  | SBL   | SBT   | SBR  |
|------------------------|------|-------|------|------|------|------|-------|-------|------|-------|-------|------|
| Lane Configurations    |      | ↕     |      |      | ↕    |      |       | ↕     |      | ↕     | ↕     |      |
| Ideal Flow (vphpl)     | 1900 | 1900  | 1900 | 1900 | 1900 | 1900 | 1900  | 1900  | 1900 | 1900  | 1900  | 1900 |
| Total Lost time (s)    |      | 4.0   |      |      | 4.0  |      |       | 4.0   |      | 4.0   | 4.0   |      |
| Lane Util. Factor      |      | 1.00  |      |      | 1.00 |      |       | 0.95  |      | 1.00  | 0.95  |      |
| Frt                    |      | 0.97  |      |      | 0.93 |      |       | 1.00  |      | 1.00  | 1.00  |      |
| Flt Protected          |      | 0.96  |      |      | 0.98 |      |       | 1.00  |      | 0.95  | 1.00  |      |
| Satd. Flow (prot)      |      | 1737  |      |      | 1695 |      |       | 3536  |      | 1770  | 3536  |      |
| Flt Permitted          |      | 0.62  |      |      | 0.83 |      |       | 0.95  |      | 0.06  | 1.00  |      |
| Satd. Flow (perm)      |      | 1125  |      |      | 1449 |      |       | 3362  |      | 107   | 3536  |      |
| Volume (vph)           | 59   | 0     | 18   | 53   | 0    | 52   | 3     | 1884  | 10   | 75    | 2118  | 14   |
| Peak-hour factor, PHF  | 0.95 | 0.95  | 0.95 | 0.95 | 0.95 | 0.95 | 0.95  | 0.95  | 0.95 | 0.95  | 0.95  | 0.95 |
| Adj. Flow (vph)        | 62   | 0     | 19   | 56   | 0    | 55   | 3     | 1983  | 11   | 79    | 2229  | 15   |
| RTOR Reduction (vph)   | 0    | 9     | 0    | 0    | 30   | 0    | 0     | 0     | 0    | 0     | 0     | 0    |
| Lane Group Flow (vph)  | 0    | 72    | 0    | 0    | 81   | 0    | 0     | 1997  | 0    | 79    | 2244  | 0    |
| Turn Type              | Perm |       | Perm |      | Perm |      | pm+pt |       |      |       |       |      |
| Protected Phases       |      | 4     |      |      | 8    |      |       | 2     |      | 1     | 6     |      |
| Permitted Phases       | 4    |       |      | 8    |      |      | 2     |       |      | 6     |       |      |
| Actuated Green, G (s)  |      | 12.6  |      |      | 12.6 |      |       | 104.1 |      | 117.4 | 117.4 |      |
| Effective Green, g (s) |      | 13.6  |      |      | 13.6 |      |       | 105.1 |      | 118.4 | 118.4 |      |
| Actuated g/C Ratio     |      | 0.10  |      |      | 0.10 |      |       | 0.75  |      | 0.85  | 0.85  |      |
| Clearance Time (s)     |      | 5.0   |      |      | 5.0  |      |       | 5.0   |      | 5.0   | 5.0   |      |
| Vehicle Extension (s)  |      | 3.0   |      |      | 3.0  |      |       | 3.0   |      | 3.0   | 3.0   |      |
| Lane Grp Cap (vph)     |      | 109   |      |      | 141  |      |       | 2524  |      | 201   | 2990  |      |
| v/s Ratio Prot         |      |       |      |      |      |      |       |       |      | 0.03  | c0.63 |      |
| v/s Ratio Perm         |      | c0.06 |      |      | 0.06 |      |       | c0.59 |      | 0.31  |       |      |
| v/c Ratio              |      | 0.66  |      |      | 0.58 |      |       | 0.79  |      | 0.39  | 0.75  |      |
| Uniform Delay, d1      |      | 61.0  |      |      | 60.4 |      |       | 10.7  |      | 16.2  | 4.6   |      |
| Progression Factor     |      | 1.00  |      |      | 1.00 |      |       | 1.06  |      | 2.44  | 0.94  |      |
| Incremental Delay, d2  |      | 14.0  |      |      | 5.6  |      |       | 1.2   |      | 0.1   | 0.2   |      |
| Delay (s)              |      | 75.0  |      |      | 66.0 |      |       | 12.6  |      | 39.7  | 4.4   |      |
| Level of Service       |      | E     |      |      | E    |      |       | B     |      | D     | A     |      |
| Approach Delay (s)     |      | 75.0  |      |      | 66.0 |      |       | 12.6  |      |       | 5.6   |      |
| Approach LOS           |      | E     |      |      | E    |      |       | B     |      |       | A     |      |


















### Intersection Summary

|                                   |       |                      |      |
|-----------------------------------|-------|----------------------|------|
| HCM Average Control Delay         | 11.4  | HCM Level of Service | B    |
| HCM Volume to Capacity ratio      | 0.78  |                      |      |
| Actuated Cycle Length (s)         | 140.0 | Sum of lost time (s) | 12.0 |
| Intersection Capacity Utilization | 73.5% | ICU Level of Service | D    |
| Analysis Period (min)             | 15    |                      |      |
| c Critical Lane Group             |       |                      |      |

# HCM Signalized Intersection Capacity Analysis

## 4: Custis Ave & US Route 1




















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|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement                          | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL  | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations               |   |  |   |   |  |   |  |  |   |  |  |   |
| Ideal Flow (vphpl)                | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  | 1900   | 1900  | 1900  | 1900  | 1900  | 1900  |
| Total Lost time (s)               |   | 4.0   |   |   | 4.0   |   |  | 4.0   |   | 4.0   | 4.0   |   |
| Lane Util. Factor                 |   | 1.00  |   |   | 1.00  |   |  | 0.95  |   | 1.00  | 0.95  |   |
| Frt                               |   | 0.95  |   |   | 0.92  |   |  | 1.00  |   | 1.00  | 1.00  |   |
| Flt Protected                     |   | 0.98  |   |   | 1.00  |   |  | 1.00  |   | 0.95  | 1.00  |   |
| Satd. Flow (prot)                 |   | 1728  |   |   | 1705  |   |  | 3535  |   | 1770  | 3530  |   |
| Flt Permitted                     |   | 0.87  |   |   | 0.98  |   |  | 0.85  |   | 0.09  | 1.00  |   |
| Satd. Flow (perm)                 |   | 1544  |   |   | 1679  |   |  | 3009  |   | 167   | 3530  |   |
| Volume (vph)                      | 21  | 6   | 15  | 3   | 10  | 20  | 23   | 1861  | 6   | 33  | 2186  | 39  |
| Peak-hour factor, PHF             | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95   | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  |
| Adj. Flow (vph)                   | 22  | 6   | 16  | 3   | 11  | 21  | 24   | 1959  | 6   | 35  | 2301  | 41  |
| RTOR Reduction (vph)              | 0   | 12  | 0   | 0   | 20  | 0   | 0  | 0   | 0   | 0   | 0   | 0   |
| Lane Group Flow (vph)             | 0   | 32  | 0   | 0   | 15  | 0   | 0  | 1989  | 0   | 35  | 2342  | 0   |
| Turn Type                         | Perm  |   | Perm  |   | Perm  |   | Perm   |   | Perm  |   | Perm  |   |
| Protected Phases                  |   | 4   |   |   | 8   |   |  | 2   |   |   | 6   |   |
| Permitted Phases                  | 4   |   |   | 8   |   |   | 2  |   |   | 6   |   |   |
| Actuated Green, G (s)             |   | 7.1   |   |   | 7.1   |   |  | 122.9   |   | 122.9   | 122.9   |   |
| Effective Green, g (s)            |   | 8.1   |   |   | 8.1   |   |  | 123.9   |   | 123.9   | 123.9   |   |
| Actuated g/C Ratio                |   | 0.06  |   |   | 0.06  |   |  | 0.88  |   | 0.88  | 0.88  |   |
| Clearance Time (s)                |   | 5.0   |   |   | 5.0   |   |  | 5.0   |   | 5.0   | 5.0   |   |
| Vehicle Extension (s)             |   | 3.0   |   |   | 3.0   |   |  | 3.0   |   | 3.0   | 3.0   |   |
| Lane Grp Cap (vph)                |   | 89  |   |   | 97  |   |  | 2663  |   | 148   | 3124  |   |
| v/s Ratio Prot                    |   |   |   |   |   |   |  |   |   |   | c0.66   |   |
| v/s Ratio Perm                    |   | c0.02   |   |   | 0.01  |   |  | 0.66  |   | 0.21  |   |   |
| v/c Ratio                         |   | 0.36  |   |   | 0.16  |   |  | 0.75  |   | 0.24  | 0.75  |   |
| Uniform Delay, d1                 |   | 63.4  |   |   | 62.7  |   |  | 2.7   |   | 1.2   | 2.8   |   |
| Progression Factor                |   | 1.00  |   |   | 1.00  |   |  | 1.15  |   | 0.20  | 0.18  |   |
| Incremental Delay, d2             |   | 2.4   |   |   | 0.8   |   |  | 1.0   |   | 2.6   | 1.2   |   |
| Delay (s)                         |   | 65.9  |   |   | 63.5  |   |  | 4.2   |   | 2.8   | 1.7   |   |
| Level of Service                  |   | E   |   |   | E   |   |  | A   |   | A   | A   |   |
| Approach Delay (s)                |   | 65.9  |   |   | 63.5  |   |  | 4.2   |   |   | 1.7   |   |
| Approach LOS                      |   | E   |   |   | E   |   |  | A   |   |   | A   |   |
| <b>Intersection Summary</b>       |   |   |   |   |   |   |  |   |   |   |   |   |
| HCM Average Control Delay         |   |   | 3.9   |   |   |   |  | HCM Level of Service  |   |   | A   |   |
| HCM Volume to Capacity ratio      |   |   | 0.73  |   |   |   |  |   |   |   |   |   |
| Actuated Cycle Length (s)         |   |   | 140.0   |   |   |   |  | Sum of lost time (s)  |   |   | 8.0   |   |
| Intersection Capacity Utilization |   |   | 80.4%   |   |   |   |  | ICU Level of Service  |   |   | D   |   |
| Analysis Period (min)             |   |   | 15  |   |   |   |  |   |   |   |   |   |
| c Critical Lane Group             |   |   |   |   |   |   |  |   |   |   |   |   |

# HCM Signalized Intersection Capacity Analysis

## 5: Howell Ave. & US Route 1

3/29/2006

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement                          | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL   | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations               |   |  |   |  |  |   |  |  |   |  |  |   |
| Ideal Flow (vphpl)                | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  |
| Total Lost time (s)               |   | 4.0   |   | 4.0   | 4.0   |   | 4.0   | 4.0   |   | 4.0   | 4.0   |   |
| Lane Util. Factor                 |   | 1.00  |   | 1.00  | 1.00  |   | 1.00  | 0.95  |   | 1.00  | 0.95  |   |
| Frt                               |   | 0.95  |   | 1.00  | 0.86  |   | 1.00  | 1.00  |   | 1.00  | 1.00  |   |
| Flt Protected                     |   | 0.97  |   | 0.95  | 1.00  |   | 0.95  | 1.00  |   | 0.95  | 1.00  |   |
| Satd. Flow (prot)                 |   | 1722  |   | 1770  | 1604  |   | 1770  | 3537  |   | 1770  | 3534  |   |
| Flt Permitted                     |   | 0.84  |   | 0.74  | 1.00  |   | 0.04  | 1.00  |   | 0.04  | 1.00  |   |
| Satd. Flow (perm)                 |   | 1481  |   | 1385  | 1604  |   | 74  | 3537  |   | 67  | 3534  |   |
| Volume (vph)                      | 10  | 2   | 8   | 65  | 7   | 83  | 32  | 2324  | 9   | 22  | 2134  | 22  |
| Peak-hour factor, PHF             | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  | 0.95  |
| Adj. Flow (vph)                   | 11  | 2   | 8   | 68  | 7   | 87  | 34  | 2446  | 9   | 23  | 2246  | 23  |
| RTOR Reduction (vph)              | 0   | 7   | 0   | 0   | 47  | 0   | 0   | 0   | 0   | 0   | 0   | 0   |
| Lane Group Flow (vph)             | 0   | 14  | 0   | 68  | 47  | 0   | 34  | 2455  | 0   | 23  | 2269  | 0   |
| Turn Type                         | Perm  |   | Perm  |   | pm+pt   |   | pm+pt   |   |   |   |   |   |
| Protected Phases                  | 4   |   | 8   |   | 5   |   | 2   |   | 1   |   | 6   |   |
| Permitted Phases                  | 4   |   | 8   |   | 2   |   | 6   |   |   |   |   |   |
| Actuated Green, G (s)             | 11.8  |   | 11.8  |   | 11.8  |   | 113.6   |   | 109.8   |   | 112.8   |   |
| Effective Green, g (s)            | 12.8  |   | 12.8  |   | 12.8  |   | 115.6   |   | 110.8   |   | 114.8   |   |
| Actuated g/C Ratio                | 0.09  |   | 0.09  |   | 0.09  |   | 0.83  |   | 0.79  |   | 0.82  |   |
| Clearance Time (s)                | 5.0   |   | 5.0   |   | 5.0   |   | 5.0   |   | 5.0   |   | 5.0   |   |
| Vehicle Extension (s)             | 3.0   |   | 3.0   |   | 3.0   |   | 3.0   |   | 3.0   |   | 3.0   |   |
| Lane Grp Cap (vph)                | 135   |   | 127   |   | 147   |   | 119   |   | 2799  |   | 108   |   |
| v/s Ratio Prot                    |   |   |   |   | 0.03  |   | c0.01   |   | c0.69   |   | 0.01  |   |
| v/s Ratio Perm                    | 0.01  |   | c0.05   |   |   |   | 0.23  |   |   |   | 0.17  |   |
| v/c Ratio                         | 0.10  |   | 0.54  |   | 0.32  |   | 0.29  |   | 0.88  |   | 0.21  |   |
| Uniform Delay, d1                 | 58.3  |   | 60.8  |   | 59.5  |   | 16.1  |   | 10.0  |   | 22.2  |   |
| Progression Factor                | 1.00  |   | 1.00  |   | 1.00  |   | 3.30  |   | 0.89  |   | 0.85  |   |
| Incremental Delay, d2             | 0.3   |   | 4.3   |   | 1.3   |   | 1.0   |   | 3.2   |   | 0.7   |   |
| Delay (s)                         | 58.7  |   | 65.0  |   | 60.8  |   | 54.2  |   | 12.1  |   | 19.5  |   |
| Level of Service                  | E   |   | E   |   | E   |   | D   |   | B   |   | B   |   |
| Approach Delay (s)                | 58.7  |   |   |   | 62.6  |   |   |   | 12.6  |   | 4.7   |   |
| Approach LOS                      | E   |   |   |   | E   |   |   |   | B   |   | A   |   |
| <b>Intersection Summary</b>       |   |   |   |   |   |   |   |   |   |   |   |   |
| HCM Average Control Delay         |   |   | 10.8  |   | HCM Level of Service  |   |   |   | B   |   |   |   |
| HCM Volume to Capacity ratio      |   |   | 0.80  |   |   |   |   |   |   |   |   |   |
| Actuated Cycle Length (s)         |   |   | 140.0   |   | Sum of lost time (s)  |   |   |   | 8.0   |   |   |   |
| Intersection Capacity Utilization |   |   | 81.0%   |   | ICU Level of Service  |   |   |   | D   |   |   |   |
| Analysis Period (min)             |   |   | 15  |   |   |   |   |   |   |   |   |   |
| c Critical Lane Group             |   |   |   |   |   |   |   |   |   |   |   |   |