# WEBSTER

## WEbster Based Signal Timing Evaluation Routine

For Capacity and Level of Service Analysis Using HCM 2000 Control Delay

**2009 CMP Data**

**Mill St. @ Pepper Ave** **City of SBD** **AM Peak Hour**

**Input**

| | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement Times | *L* | *T* | R | L | T | R | L | *T* | R | *L* | T | R |
| Movement 1: 10 secs | X | | | X | | | | | | | | |
| Movement 2: 20 secs | | X | X | | X | X | | | | | | |
| Movement 3: 10 secs | | | | | | | X | | | X | | |
| Movement 4: 21 secs | | | | | | | | X | X | | X | X |
| Movement 5: 0 secs | | | | | | | | | | | | |
| Movement 6: 0 secs | | | | | | | | | | | | |
| # of Lanes (#, S, P) | 1 | 2 | S | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 2 | 1 |
| Unadjusted Volume | 78 | 217 | 46 | 77 | 196 | 97 | 42 | 511 | 73 | 42 | 330 | 44 |
| Peak Hour Factor (PHF) | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Growth Factor (%) | | | | | | | | | | | | |
| Project Trip Volume (vph) | | | | | | | | | | | | |
| Sat. Flow Override (vph) | | | Shrd | | | | | | | | | |
| Min. Time or Ped. Time | 10 | 20 | 20 | 10 | 20 | 20 | 10 | 20 | 20 | 10 | 20 | 20 |
| Permissive Veh/Cycle | | | | | | | | | | | | |
| Progression Adj. Factor (PAF) | 1.00 | 1.00 | - | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |

**Parameter Values**

| | Other | Default |
|---|---|---|
| Duration of Peak Period (min) | | 15 |
| Lost Time (sec) | | 2 |
| Min. Time (Left Turns, sec) | | 10 |
| Min/Ped Time (Thru Lanes, sec) | | 20 |
| Sat Flow (1 Left lane, vphg) | 1700 | 1800 |
| Sat Flow (2 Left lanes, vphg) | | 3500 |
| Sat Flow (1 Thru lane, vphg) | 1800 | 1900 |
| Sat Flow (1 Right lane, vphg) | | 1800 |
| Vehicle Length (feet) | | 20 |

**Output**

| | *** | *** | | | | | | *** | | *** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pk. Hr. Vol. (vph) | 78 | 217 | 46 | 77 | 196 | 97 | 42 | 511 | 73 | 42 | 330 | 44 |
| Saturation Flow (vph) | 1700 | 3600 | Shrd | 1700 | 3600 | 1800 | 1700 | 3600 | 1800 | 1700 | 3600 | 1800 |
| X or V/C | 0.35 | 0.25 | - | 0.35 | 0.18 | 0.18 | 0.19 | 0.46 | 0.13 | 0.19 | 0.29 | 0.08 |
| Effective green (sec) | 8 | 18 | - | 8 | 18 | 18 | 8 | 19 | 19 | 8 | 19 | 19 |
| Split Time (sec) | 10 | 20 | - | 10 | 20 | 20 | 10 | 21 | 21 | 10 | 21 | 21 |
| Min. Time or Ped. Time (sec) | 10 | 20 | - | 10 | 20 | 20 | 10 | 20 | 20 | 10 | 20 | 20 |
| Delay - 15 min pk (sec/veh) | 28 | 17 | - | 28 | 16 | 17 | 25 | 18 | 16 | 25 | 17 | 15 |
| Level of Service (LOS) | C | B | - | C | B | B | C | B | B | C | B | B |
| Average 'Q' (veh/ln) | 1 | 2 | - | 1 | 1 | 1 | 1 | 3 | 1 | 1 | 2 | 1 |
| Design 'Q'- ft/ln | 40 | 60 | - | 40 | 40 | 40 | 40 | 100 | 40 | 40 | 60 | 40 |
| Do Vehicles Clear? | YES | YES | - | YES | YES | YES | YES | YES | YES | YES | YES | YES |

**Summary**

**Whole Intersection**

Weighted Avg Delay (sec) = 18
Level of Service - LOS = B

**Critical Movements**

Weighted Avg Delay (sec) = 19
Level of Service - LOS = B
Intersection Capacity Utilization - ICU = 0.33

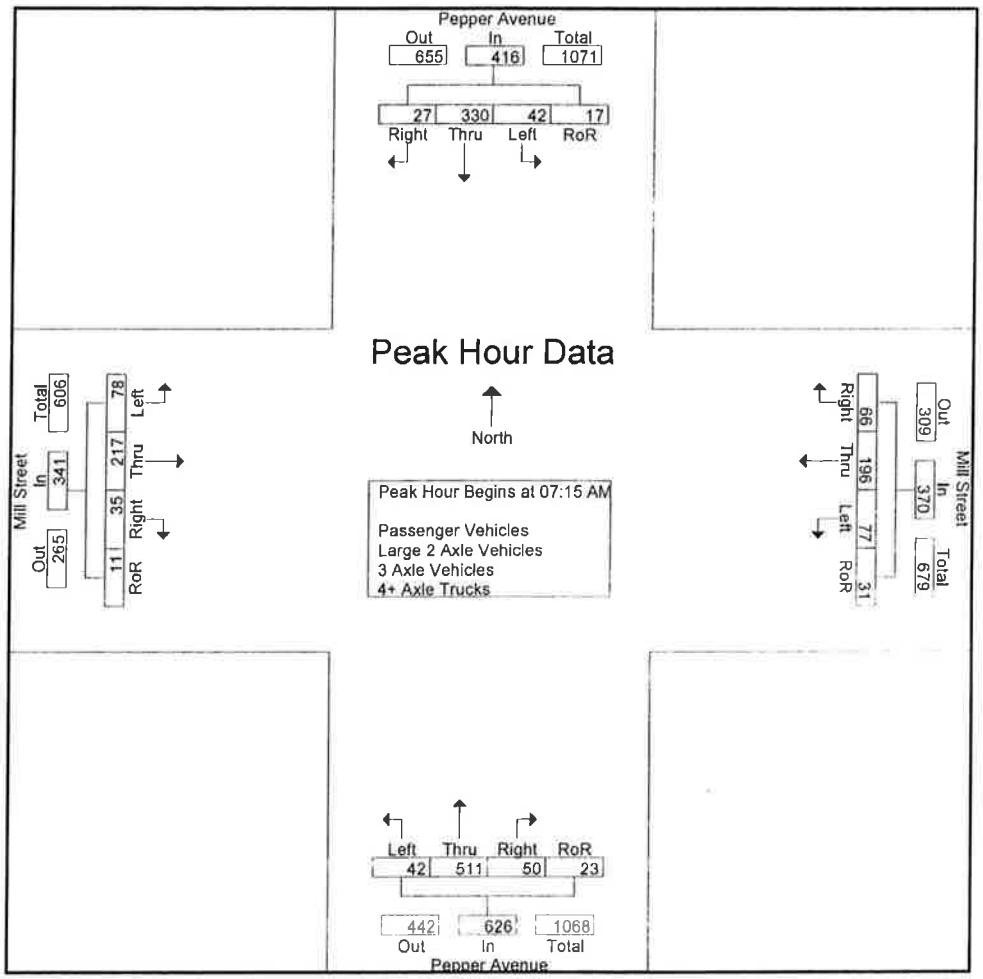
**Required Cycle Length is 61 sec**

**Min./Ped. Times Satisfied**

Counts Unlimited Inc.
25286 Jaclyn Avenue
Moreno Valley, CA 92557
951-485-7934

City of San Bernardino
N/S: Pepper Avenue
E/W: Mill Street
Weather: Sunny

File Name : SBCPEMIAM
Site Code : 9153064
Start Date : 6/10/2009
Page No : 2




Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

| | 07:15 AM | | | | | 07:15 AM | | | | | 07:15 AM | | | | | 07:00 AM | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| +0 mins. | **19** | 88 | 6 | **7** | 120 | **42** | **69** | **33** | **15** | **159** | 12 | **138** | **36** | **13** | **199** | 5 | 46 | 4 | **5** | 60 |
| +15 mins. | 16 | **98** | 7 | 0 | **121** | 24 | 54 | 17 | 10 | 105 | 9 | 137 | 7 | 0 | 153 | **34** | **96** | **9** | 2 | **141** |
| +30 mins. | 5 | 70 | 6 | 6 | 87 | 6 | 45 | 7 | 5 | 63 | **15** | 119 | 4 | 6 | 144 | 19 | 55 | 7 | 2 | 83 |
| +45 mins. | 2 | 74 | **8** | 4 | 88 | 5 | 28 | 9 | 1 | 43 | 6 | 117 | 3 | 4 | 130 | 14 | 37 | 9 | 4 | 64 |
| Total Volume | 42 | 330 | 27 | 17 | 416 | 77 | 196 | 66 | 31 | 370 | 42 | 511 | 50 | 23 | 626 | 72 | 234 | 29 | 13 | 348 |
| % App. Total | 10.1 | 79.3 | 6.5 | 4.1 | | 20.8 | 53 | 17.8 | 8.4 | | 6.7 | 81.6 | 8 | 3.7 | | 20.7 | 67.2 | 8.3 | 3.7 | |
| PHF | .553 | .842 | .844 | .607 | .860 | .458 | .710 | .500 | .517 | .582 | .700 | .926 | .347 | .442 | .786 | .529 | .609 | .806 | .650 | .617 |

# WEBSTER

## WEbster Based Signal Timing Evaluation Routine

For Capacity and Level of Service Analysis Using HCM 2000 Control Delay

**2009 CMP Data**

**Mill St. @ Pepper Ave** **City of SBD** **PM Peak Hour**

**Input**

| | Eastbound | | | Westbound | | | Northbound | | | Southbound | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement Times | *L* | *T* | R | L | T | R | *L* | T | R | L | *T* | R |
| Movement 1: 10 secs | X | | | X | | | | | | | | |
| Movement 2: 20 secs | | X | X | | X | X | | | | | | |
| Movement 3: 10 secs | | | | | | | X | | | X | | |
| Movement 4: 23 secs | | | | | | | | X | X | | X | X |
| Movement 5: 0 secs | | | | | | | | | | | | |
| Movement 6: 0 secs | | | | | | | | | | | | |
| # of Lanes (#, S, P) | 1 | 2 | S | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 2 | 1 |
| Unadjusted Volume | 41 | 211 | 72 | 32 | 216 | 25 | 75 | 445 | 20 | 73 | 578 | 87 |
| Peak Hour Factor (PHF) | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Growth Factor (%) | | | | | | | | | | | | |
| Project Trip Volume (vph) | | | | | | | | | | | | |
| Sat. Flow Override (vph) | | | Shrd | | | | | | | | | |
| Min. Time or Ped. Time | 10 | 20 | 20 | 10 | 20 | 20 | 10 | 20 | 20 | 10 | 20 | 20 |
| Permissive Veh/Cycle | | | | | | | | | | | | |
| Progression Adj. Factor (PAF) | 1.00 | 1.00 | - | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |

**Parameter Values (using default set 'Webster')**

| | Other | Default |
|---|---|---|
| Duration of Peak Period (min) | | 15 |
| Lost Time (sec) | | 2 |
| Min. Time (Left Turns, sec) | | 10 |
| Min/Ped Time (Thru Lanes, sec) | | 20 |
| Sat Flow (1 Left lane, vphg) | | 1800 |
| Sat Flow (2 Left lanes, vphg) | | 3500 |
| Sat Flow (1 Thru lane, vphg) | | 1900 |
| Sat Flow (1 Right lane, vphg) | | 1800 |
| Vehicle Length (feet) | | 20 |

**Output**

| | *** | *** | | | | | *** | | | | *** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pk. Hr. Vol. (vph) | 41 | 211 | 72 | 32 | 216 | 25 | 75 | 445 | 20 | 73 | 578 | 87 |
| Saturation Flow (vph) | 1800 | 3800 | Shrd | 1800 | 3800 | 1800 | 1800 | 3800 | 1800 | 1800 | 3800 | 1800 |
| X or V/C | 0.18 | 0.26 | - | 0.14 | 0.20 | 0.05 | 0.33 | 0.35 | 0.03 | 0.32 | 0.46 | 0.15 |
| Effective green (sec) | 8 | 18 | - | 8 | 18 | 18 | 8 | 21 | 21 | 8 | 21 | 21 |
| Split Time (sec) | 10 | 20 | - | 10 | 20 | 20 | 10 | 23 | 23 | 10 | 23 | 23 |
| Min. Time or Ped. Time (sec) | 10 | 20 | - | 10 | 20 | 20 | 10 | 20 | 20 | 10 | 20 | 20 |
| Delay - 15 min pk (sec/veh) | 26 | 18 | - | 26 | 17 | 16 | 29 | 17 | 14 | 29 | 18 | 15 |
| Level of Service (LOS) | C | B | - | C | B | B | C | B | B | C | B | B |
| Average 'Q' (veh/ln) | 1 | 2 | - | 1 | 1 | 1 | 1 | 3 | 1 | 1 | 3 | 1 |
| Design 'Q'- ft/ln | 40 | 60 | - | 40 | 40 | 40 | 40 | 100 | 40 | 40 | 100 | 40 |
| Do Vehicles Clear? | YES | YES | - | YES | YES | YES | YES | YES | YES | YES | YES | YES |

**Summary**

**Whole Intersection**

Weighted Avg Delay (sec) = 18
Level of Service - LOS = B

**Critical Movements**

Weighted Avg Delay (sec) = 19
Level of Service - LOS = B
Intersection Capacity Utilization - ICU = 0.33

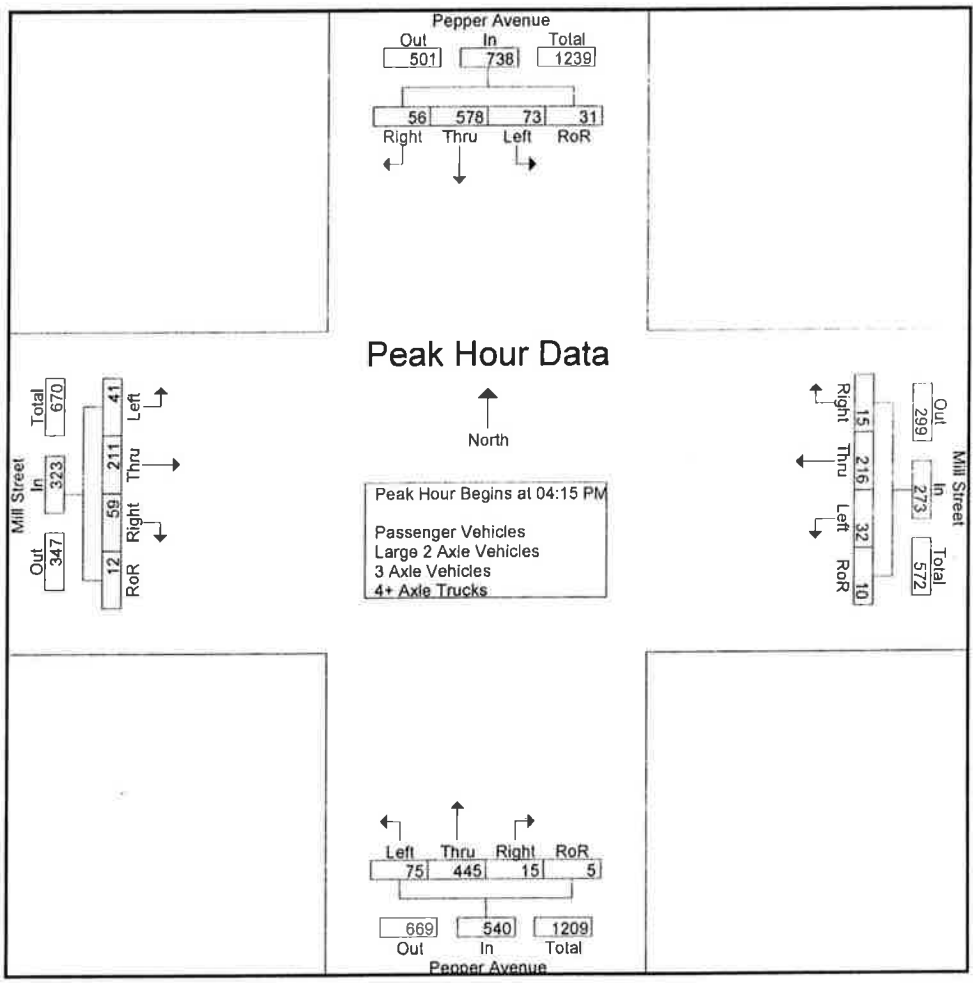
**Required Cycle Length is 63 sec**

**Min./Ped. Times Satisfied**

Counts Unlimited Inc.
25286 Jaclyn Avenue
Moreno Valley, CA 92557
951-485-7934

City of San Bernardino
N/S: Pepper Avenue
E/W: Mill Street
Weather: Sunny

File Name : SBCPEMIPM
Site Code : 9153064
Start Date : 6/10/2009
Page No : 2




Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1

Peak Hour for Each Approach Begins at:

| | 04:15 PM | | | | | 04:45 PM | | | | | 04:15 PM | | | | | 04:45 PM | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| +0 mins. | 18 | **151** | 11 | **16** | 196 | 12 | 55 | 3 | 2 | 72 | 18 | 100 | 4 | 1 | 123 | 11 | 47 | 10 | 3 | 71 |
| +15 mins. | **23** | 133 | 9 | 4 | 169 | 9 | 56 | **6** | 2 | 73 | 17 | 115 | 3 | 1 | 136 | 4 | **60** | **15** | 2 | 81 |
| +30 mins. | 16 | 147 | **23** | 11 | **197** | **16** | 59 | 3 | 2 | **80** | **20** | 96 | **5** | **2** | 123 | **24** | 57 | 10 | 0 | **91** |
| +45 mins. | 16 | 147 | 13 | 0 | 176 | 7 | **64** | 3 | **3** | 77 | 20 | **134** | 3 | 1 | **158** | 11 | 58 | 9 | 4 | 82 |
| Total Volume | 73 | 578 | 56 | 31 | 738 | 44 | 234 | 15 | 9 | 302 | 75 | 445 | 15 | 5 | 540 | 50 | 222 | 44 | 9 | 325 |
| % App. Total | 9.9 | 78.3 | 7.6 | 4.2 | | 14.6 | 77.5 | 5 | 3 | | 13.9 | 82.4 | 2.8 | 0.9 | | 15.4 | 68.3 | 13.5 | 2.8 | |
| PHF | .793 | .957 | .609 | .484 | .937 | .688 | .914 | .625 | .750 | .944 | .938 | .830 | .750 | .625 | .854 | .521 | .925 | .733 | .563 | .893 |