

City of Mesa
Development of Design Guidelines For Sight Triangles (In Feet)
on Straight Sections of Road

Based on 2001 AASHTO Intersection Sight Distance Guidelines for
Case B1 – Left Turn Maneuver From STOP, Level Grade, Passenger Car

| Recommended Sight Distance (SD) | | | | | |
|---------------------------------|---------------------|------------------|---------|-------------|-------------|
| Through Road Cross-Section | | 2 LU | 3 LU | 4LD 5 LU | 6LD 7 LU |
| <i>Through Road Width</i> | | 34', 40', 48' | 46, 48' | 68', 72' | 88', 94' |
| <i>Time gap (t_g)</i> | | 7.5" | 8.0" | 8.5" | 9.0" |
| Speed Limit | <i>Design Speed</i> | | | | |
| 20 mph | <i>25 mph</i> | 276 | 294 | 312 | 331 |
| 25 mph | <i>30 mph</i> | 331 | 353 | 375 | 397 |
| 30 mph | <i>35 mph</i> | 386 | 412 | 437 | 463 |
| 35 mph | <i>40 mph</i> | 441 | 470 | 500 | 529 |
| 40 mph | <i>45 mph</i> | 496 | 529 | 562 | 595 |
| 45 mph | <i>50 mph</i> | 551 | 588 | 625 | 662 |
| 50 mph | <i>55 mph</i> | 606 | 647 | 687 | 723 |

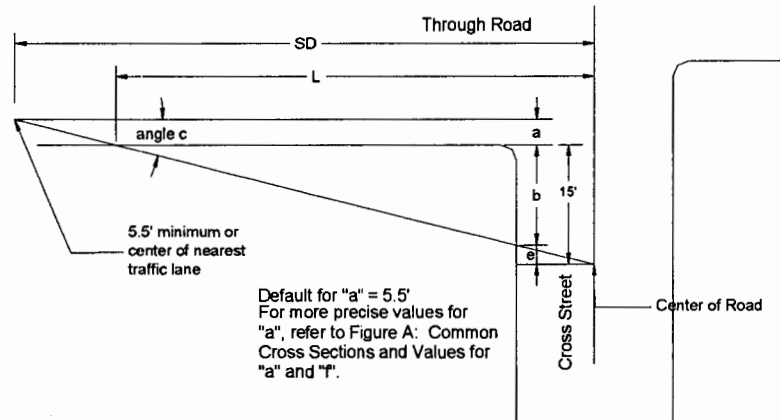
LU = lanes undivided

LD = lanes divided

$$\text{Intersection Sight Distance (SD)} = 1.47 * V * t_g$$

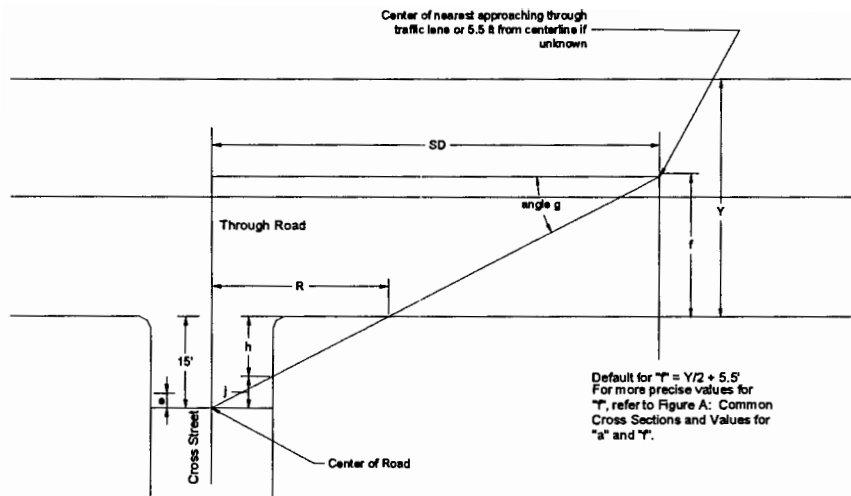
V = Design Speed (mph) = typically 5 mph over the speed limit in COM

t_g = time gap (seconds) – Exhibit 9-54 in AASHTO for Passenger Cars, Level Grade



$$L = \frac{15 * SD}{15 + a}$$

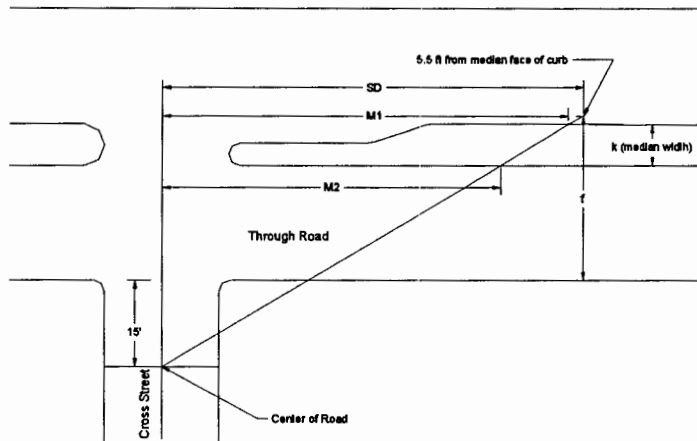
- The driver's eye position on the cross street is 15 feet back from the face of the through road curb.
- "a", the position of traffic approaching from the left, can be assumed to be equal to 5.5 feet; OR, "a" can be determined precisely if the cross-section lane configuration is known. Refer to Figure A: Common Cross Sections and Values for "a" and "f" for more precise values of "a" for the most common through street lane configurations.



$$R = \frac{15 \cdot SD}{15 + f}$$

Default for "f" = Y/2 + 5.5'
 For more precise values for "f", refer to Figure A: Common Cross Sections and Values for "a" and "f".

- "f", the position of traffic approaching from the right, can be assumed to be equal to one-half of the through street width plus 5.5 feet; OR, "f" can be determined precisely if the cross-section lane configuration is known. Refer to Figure A: Common Cross Sections and Values for "a" and "f" for more precise values of "f" for the most common through street lane configurations.



$$M1 = \frac{(15+f-5.5) \cdot SD}{15+f} = \frac{(9.5+f) \cdot SD}{15+f}$$

$$M2 = \frac{(15+f-5.5-k) \cdot SD}{15+f} = \frac{(9.5+f-k) \cdot SD}{15+f}$$

- The driver's eye position on the cross street is 15 feet back from the face of through road curb.
- For 4LD, 68' wide street with median, f = 47', k = 15'
- For 6LD, 88' wide street with median, f = 57.5', k = 16'
- For 6LD, 94' wide street with median, f = 60.5', k = 16'

Development of Design Guidelines for Sight Distance For Left Turns From Divided Roads

**Based on 2001 AASHTO Intersection Sight Distance Guidelines for
Case F – Left Turns From Major Road, Level Grade, Passenger Car**

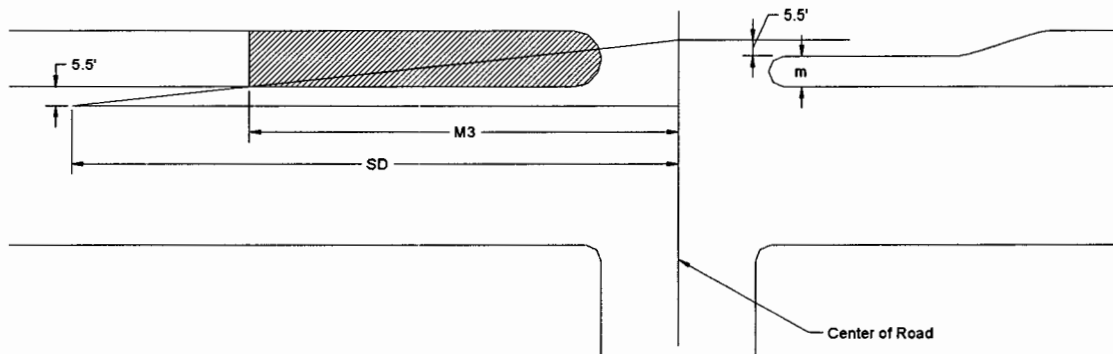
| Recommended Sight Distance (SD) | | | |
|------------------------------------|---------------------|------------|------------|
| Through Road Cross-Section | | 4LD | 6LD |
| <i>Through Road Width</i> | | 68' | 88', 94' |
| <i>Time gap (t_g)</i> | | 6.0" | 6.5" |
| Speed Limit | <i>Design Speed</i> | | |
| 25 mph | <i>30 mph</i> | 265 | 290 |
| 30 mph | <i>35 mph</i> | 310 | 335 |
| 35 mph | <i>40 mph</i> | 355 | 385 |
| 40 mph | <i>45 mph</i> | 400 | 430 |
| 45 mph | <i>50 mph</i> | 445 | 480 |
| 50 mph | <i>55 mph</i> | 485 | 530 |

LD = lanes divided

*Intersection Sight Distance (SD) = 1.47 * V * t_g*

V = Design Speed (mph) = typically 5 mph over the speed limit in COM

t_g = time gap (seconds) – Exhibit 9-66 in AASHTO for Passenger Cars, Level Grade

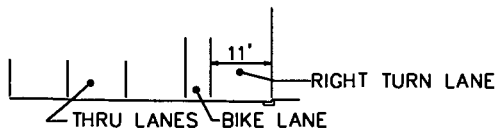


$$M3 = \frac{(5.5 + m) * SD}{11 + m}$$

- The left-turning driver's eye position is 5.5 feet back from the face of the center median curb.
- The position of oncoming traffic is 5.5 feet from the face of the center median curb.
- "m", the width of the median, is typically 4 feet.

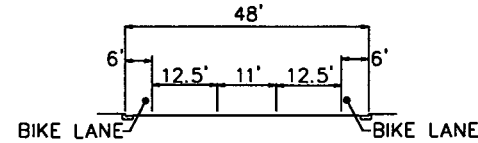
Common Cross-Sections and Values for "a" and "f"
 Use 5.5 feet for the center of lane dimension
 regardless of actual lane width page 1/2

RIGHT TURN LANES



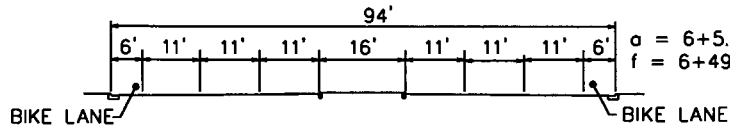
$a = 5.5'$ ("a" is of the nearest approach lane which in this case is the right turn lane).

48' PAVEMENT - 3LU



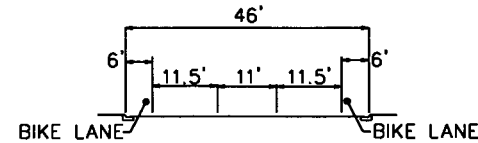
$a = 6 + 5.5 = 11.5'$
 $f = 6 + 12.5 + 11 + 5.5 = 35'$

94' PAVEMENT (RAISED MEDIAN) - 6LD



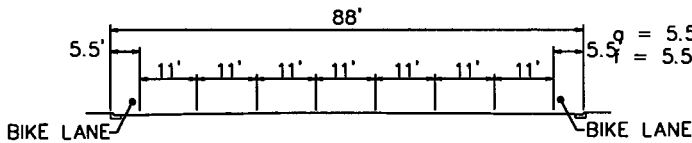
$a = 6 + 5.5 = 11.5'$
 $f = 6 + 49 + 5.5 = 60.5'$

46' PAVEMENT - 3LU



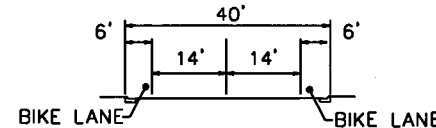
$a = 6 + 5.5 = 11.5'$
 $f = 6 + 11.5 + 11 + 5.5 = 34'$

88' PAVEMENT (NO RAISED MEDIAN) - 7LU



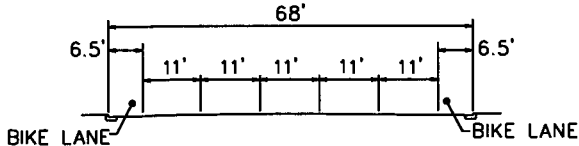
$a = 5.5 + 5.5 = 11'$
 $f = 5.5 + 44 + 5.5 = 55'$

40' PAVEMENT - 2LU



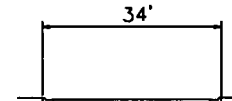
$a = 6 + 5.5 = 11.5'$
 $f = 20 + 5.5 = 25.5'$

68' PAVEMENT (NO RAISED MEDIAN) - 5LU



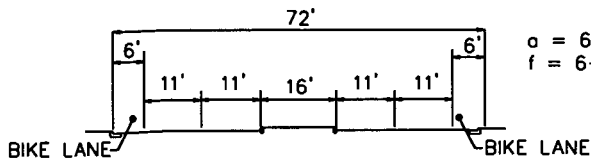
$a = 6.5 + 5.5 = 12'$
 $f = 6.5 + 33 + 5.5 = 45'$

34' PAVEMENT - 2LU



$a = 5.5'$
 $f = 17 + 5.5 = 22.5'$

72' PAVEMENT (RAISED MEDIAN) - 4LD



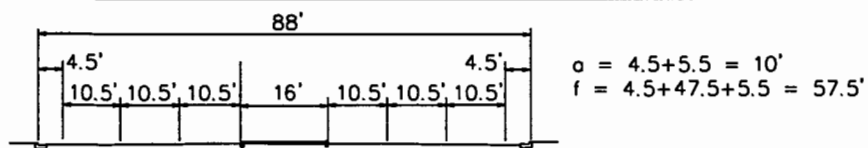
$a = 6 + 5.5 = 11.5'$
 $f = 6 + 38 + 5.5 = 49.5'$

FIGURE A: COMMON CROSS SECTIONS AND VALUES FOR "a" and "f" page 1/2

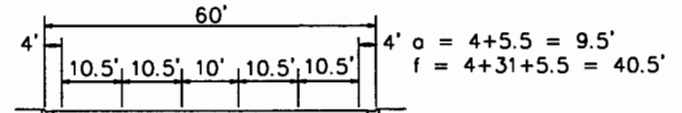
Revision Date
 March 9, 2004

Common Cross-Sections and Values for "a" and "f" page 2/2

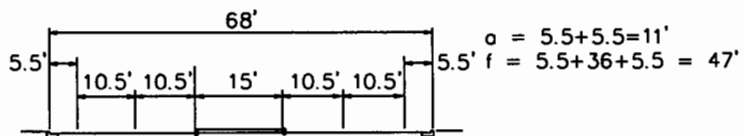
88' PAVEMENT (RAISED MEDIAN) - 6LD



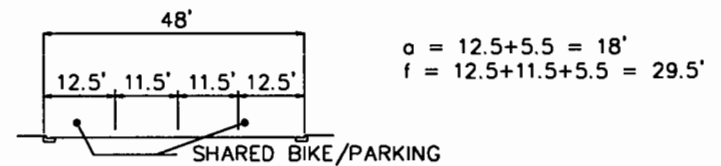
60' PAVEMENT (NO BIKE LANES POSSIBLE)



68' PAVEMENT (RAISED MEDIAN) - 4LD



48' PAVEMENT (SHARED BIKE/PARKING) - 2LU



64' PAVEMENT

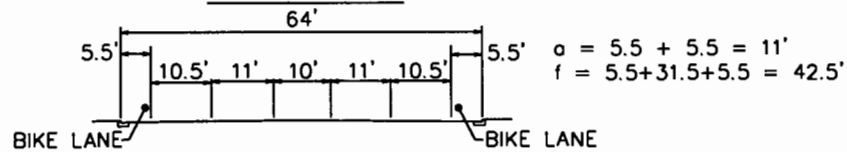


FIGURE A: COMMON CROSS SECTIONS AND VALUES FOR "a" and "f" page 2/2

Revision Date
March 9, 2004

| Excel Spreadsheet Calculations of L, R, M1 and M2 distances | | | | | | | | | | | | |
|---|-----------|------------|-----|-----|-----------|------|--------------|----|----------|----------|-----------|-----------|
| March 9, 2004 | | | | | | | | | | | | |
| Spd Lim | Design Sp | Through Rd | | ISD | Minor Rd | a | f | k | Design L | Design R | Design M1 | Design M2 |
| | | X-section | | | width (W) | | median width | | | | | |
| 20 | 25 | 2LU | 34' | 276 | 0 | 5.5 | 22.5 | | 202 | 110 | | |
| 20 | 25 | 2LU | 40' | 276 | 0 | 11.5 | 25.5 | | 156 | 102 | | |
| 20 | 25 | 3LU | 46' | 294 | 0 | 11.5 | 34 | | 166 | 90 | | |
| 20 | 25 | 2LU | 48' | 276 | 0 | 18 | 29.5 | | 125 | 93 | | |
| 20 | 25 | 3LU | 48' | 294 | 0 | 11.5 | 35 | | 166 | 88 | | |
| 20 | 25 | 4LD | 72' | 312 | 0 | 11.5 | 49.5 | 16 | 177 | 73 | 285 | 208 |
| 20 | 25 | 4LD | 68' | 312 | 0 | 11 | 47 | 15 | 180 | 75 | 284 | 209 |
| 20 | 25 | 5LU | 68' | 312 | 0 | 12 | 45 | | 173 | 78 | | |
| 20 | 25 | 6LD | 88' | 331 | 0 | 10 | 57.5 | 16 | 199 | 68 | 306 | 233 |
| 20 | 25 | 7LU | 88' | 331 | 0 | 11 | 55 | | 191 | 71 | | |
| 20 | 25 | 6LD | 94' | 331 | 0 | 11.5 | 60.5 | 16 | 187 | 66 | 307 | 237 |
| 25 | 30 | 2LU | 34' | 331 | 0 | 5.5 | 22.5 | | 242 | 132 | | |
| 25 | 30 | 2LU | 40' | 331 | 0 | 11.5 | 25.5 | | 187 | 123 | | |
| 25 | 30 | 3LU | 46' | 353 | 0 | 11.5 | 34 | | 200 | 108 | | |
| 25 | 30 | 2LU | 48' | 331 | 0 | 18 | 29.5 | | 150 | 112 | | |
| 25 | 30 | 3LU | 48' | 353 | 0 | 11.5 | 35 | | 200 | 106 | | |
| 25 | 30 | 4LD | 72' | 375 | 0 | 11.5 | 49.5 | 16 | 212 | 87 | 343 | 250 |
| 25 | 30 | 4LD | 68' | 375 | 0 | 11 | 47 | 15 | 216 | 91 | 342 | 251 |
| 25 | 30 | 5LU | 68' | 375 | 0 | 12 | 45 | | 208 | 94 | | |
| 25 | 30 | 6LD | 88' | 397 | 0 | 10 | 57.5 | 16 | 238 | 82 | 367 | 279 |
| 25 | 30 | 7LU | 88' | 397 | 0 | 11 | 55 | | 229 | 85 | | |
| 25 | 30 | 6LD | 94' | 397 | 0 | 11.5 | 60.5 | 16 | 225 | 79 | 368 | 284 |
| 30 | 35 | 2LU | 34' | 386 | 0 | 5.5 | 22.5 | | 282 | 154 | | |
| 30 | 35 | 2LU | 40' | 386 | 0 | 11.5 | 25.5 | | 218 | 143 | | |
| 30 | 35 | 3LU | 46' | 412 | 0 | 11.5 | 34 | | 233 | 126 | | |
| 30 | 35 | 2LU | 48' | 386 | 0 | 18 | 29.5 | | 175 | 130 | | |
| 30 | 35 | 3LU | 48' | 412 | 0 | 11.5 | 35 | | 233 | 124 | | |
| 30 | 35 | 4LD | 72' | 437 | 0 | 11.5 | 49.5 | 16 | 247 | 102 | 400 | 291 |
| 30 | 35 | 4LD | 68' | 437 | 0 | 11 | 47 | 15 | 252 | 106 | 398 | 293 |
| 30 | 35 | 5LU | 68' | 437 | 0 | 12 | 45 | | 243 | 109 | | |
| 30 | 35 | 6LD | 88' | 463 | 0 | 10 | 57.5 | 16 | 278 | 96 | 428 | 326 |
| 30 | 35 | 7LU | 88' | 463 | 0 | 11 | 55 | | 267 | 99 | | |
| 30 | 35 | 6LD | 94' | 463 | 0 | 11.5 | 60.5 | 16 | 262 | 92 | 429 | 331 |

| Excel Spreadsheet Calculations of L, R, M1 and M2 distances | | | | | | | | | | | | |
|---|-----------|------------|-----|-----|-----------|------|------|--------------|----------|----------|-----------|-----------|
| March 9, 2004 | | | | | | | | | | | | |
| Spd Lim | Design Sp | Through Rd | | ISD | Minor Rd | a | f | k | Design L | Design R | Design M1 | Design M2 |
| | | X-section | | | width (W) | | | median width | | | | |
| 35 | 40 | 2LU | 34 | 441 | 0 | 5.5 | 22.5 | | 323 | 176 | | |
| 35 | 40 | 2LU | 40' | 441 | 0 | 11.5 | 25.5 | | 250 | 163 | | |
| 35 | 40 | 3LU | 46' | 470 | 0 | 11.5 | 34 | | 266 | 144 | | |
| 35 | 40 | 2LU | 48' | 441 | 0 | 18 | 29.5 | | 200 | 149 | | |
| 35 | 40 | 3LU | 48' | 470 | 0 | 11.5 | 35 | | 266 | 141 | | |
| 35 | 40 | 4LD | 72' | 500 | 0 | 11.5 | 49.5 | 16 | 283 | 116 | 457 | 333 |
| 35 | 40 | 4LD | 68' | 500 | 0 | 11 | 47 | 15 | 288 | 121 | 456 | 335 |
| 35 | 40 | 5LU | 68' | 500 | 0 | 12 | 45 | | 278 | 125 | | |
| 35 | 40 | 6LD | 88' | 529 | 0 | 10 | 57.5 | 16 | 317 | 109 | 489 | 372 |
| 35 | 40 | 7LU | 88' | 529 | 0 | 11 | 55 | | 305 | 113 | | |
| 35 | 40 | 6LD | 94' | 529 | 0 | 11.5 | 60.5 | 16 | 299 | 105 | 490 | 378 |
| 40 | 45 | 2LU | 34' | 496 | 0 | 5.5 | 22.5 | | 363 | 198 | | |
| 40 | 45 | 2LU | 40' | 496 | 0 | 11.5 | 25.5 | | 281 | 184 | | |
| 40 | 45 | 3LU | 46' | 529 | 0 | 11.5 | 34 | | 299 | 162 | | |
| 40 | 45 | 2LU | 48' | 496 | 0 | 18 | 29.5 | | 225 | 167 | | |
| 40 | 45 | 3LU | 48' | 529 | 0 | 11.5 | 35 | | 299 | 159 | | |
| 40 | 45 | 4LD | 72' | 562 | 0 | 11.5 | 49.5 | 16 | 318 | 131 | 514 | 375 |
| 40 | 45 | 4LD | 68' | 562 | 0 | 11 | 47 | 15 | 324 | 136 | 512 | 376 |
| 40 | 45 | 5LU | 68' | 562 | 0 | 12 | 45 | | 312 | 141 | | |
| 40 | 45 | 6LD | 88' | 595 | 0 | 10 | 57.5 | 16 | 357 | 123 | 550 | 419 |
| 40 | 45 | 7LU | 88' | 595 | 0 | 11 | 55 | | 343 | 128 | | |
| 40 | 45 | 6LD | 94' | 595 | 0 | 11.5 | 60.5 | 16 | 337 | 118 | 552 | 426 |
| 45 | 50 | 2LU | 34' | 551 | 0 | 5.5 | 22.5 | | 403 | 220 | | |
| 45 | 50 | 2LU | 40' | 551 | 0 | 11.5 | 25.5 | | 312 | 204 | | |
| 45 | 50 | 3LU | 46' | 588 | 0 | 11.5 | 34 | | 333 | 180 | | |
| 45 | 50 | 2LU | 48' | 551 | 0 | 18 | 29.5 | | 250 | 186 | | |
| 45 | 50 | 3LU | 48' | 588 | 0 | 11.5 | 35 | | 333 | 176 | | |
| 45 | 50 | 4LD | 72' | 625 | 0 | 11.5 | 49.5 | 16 | 354 | 145 | 572 | 417 |
| 45 | 50 | 4LD | 68' | 625 | 0 | 11 | 47 | 15 | 361 | 151 | 570 | 418 |
| 45 | 50 | 5LU | 68' | 625 | 0 | 12 | 45 | | 347 | 156 | | |
| 45 | 50 | 6LD | 88' | 662 | 0 | 10 | 57.5 | 16 | 397 | 137 | 612 | 466 |
| 45 | 50 | 7LU | 88' | 662 | 0 | 11 | 55 | | 382 | 142 | | |
| 45 | 50 | 6LD | 94' | 662 | 0 | 11.5 | 60.5 | 16 | 375 | 132 | 614 | 473 |

Case F - Left Turns from Major Road
 March 9, 2004

| Speed Limit | Design Speed | Major Rd X-Section | | time gap | SD | M3 for |
|-------------|--------------|-----------------------|-----|----------|-----|--------|
| 20 | 25 | 4LD | 68' | 6 | 221 | 140 |
| 20 | 25 | 4LD | 72' | 6 | 221 | 140 |
| 20 | 25 | 6LD | 88' | 6.5 | 239 | 151 |
| 20 | 25 | 6LD | 94' | 6.5 | 239 | 151 |
| 25 | 30 | 4LD | 68' | 6 | 265 | 168 |
| 25 | 30 | 4LD | 72' | 6 | 265 | 168 |
| 25 | 30 | 6LD | 88' | 6.5 | 287 | 182 |
| 25 | 30 | 6LD | 94' | 6.5 | 287 | 182 |
| 30 | 35 | 4LD | 68' | 6 | 309 | 196 |
| 30 | 35 | 4LD | 72' | 6 | 309 | 196 |
| 30 | 35 | 6LD | 88' | 6.5 | 334 | 212 |
| 30 | 35 | 6LD | 94' | 6.5 | 334 | 212 |
| 35 | 40 | 4LD | 68' | 6 | 353 | 223 |
| 35 | 40 | 4LD | 72' | 6 | 353 | 223 |
| 35 | 40 | 6LD | 88' | 6.5 | 382 | 242 |
| 35 | 40 | 6LD | 94' | 6.5 | 382 | 242 |
| 40 | 45 | 4LD | 68' | 6 | 397 | 251 |
| 40 | 45 | 4LD | 72' | 6 | 397 | 251 |
| 40 | 45 | 6LD | 88' | 6.5 | 430 | 272 |
| 40 | 45 | 6LD | 94' | 6.5 | 430 | 272 |
| 45 | 50 | 4LD | 68' | 6 | 441 | 279 |
| 45 | 50 | 4LD | 72' | 6 | 441 | 279 |
| 45 | 50 | 6LD | 88' | 6.5 | 478 | 303 |
| 45 | 50 | 6LD | 94' | 6.5 | 478 | 303 |
| 50 | 55 | 4LD | 68' | 6 | 485 | 307 |
| 50 | 55 | 6LD | 88' | 6.5 | 526 | 333 |
| 55 | 60 | 4LD | 68' | 6 | 529 | 335 |
| 55 | 60 | 6LD | 88' | 6.5 | 573 | 363 |