

**Directions:**

- Based on the information provided, run CAL3QHCR for a subset of receptors and highway links from the Example Analysis (see next page)
- Select meteorology from St. Louis, MO for 2006 – 2010
- Simulate a typical day using traffic volumes and MOVES emission factors from information for four time periods and four quarters (refer to Class Exercise Data.xlsx)

**Receptor / Link Map (coordinates are in feet):**



**Link configurations:**

- Four 12 ft lanes in each direction
- All segments at-grade

**Link traffic volumes (refer to Class Exercise Data.xlsx):**

|    | A      | B                      | C                    | D      |
|----|--------|------------------------|----------------------|--------|
| 1  |        |                        | VPHL                 |        |
| 2  |        |                        | Traffic Volume (vph) |        |
| 3  |        |                        | ON, MD               | AM, PM |
| 4  | Link # | Link Description       | Off-Peak             | Peak   |
| 5  | 1      | 'NB Freeway Segment 1' | 2775                 | 6032   |
| 6  | 2      | 'NB Freeway Segment 2' | 2519                 | 5476   |
| 7  | 3      | 'NB Freeway Segment 3' | 2519                 | 5476   |
| 8  | 4      | 'SB Freeway Segment 1' | 1960                 | 4260   |
| 9  | 5      | 'SB Freeway Segment 2' | 1960                 | 4260   |
| 10 | 6      | 'SB Freeway Segment 3' | 2337                 | 5079   |

ON Off-Peak = 7 p.m. – 6 a.m.  
 MD Off-Peak = 9 a.m. – 4 p.m.  
 AM Peak = 6 a.m. – 9 a.m.  
 PM Peak = 4 p.m. – 7 p.m.

**MOVES Emission Factors – Q1 (refer to Class Exercise Data.xlsx):**

|    | A        | B      | C       | D      | E      | F           | G              |
|----|----------|--------|---------|--------|--------|-------------|----------------|
| 1  | movesRun | yearID | monthID | hourID | linkID | pollutant   | Grams/veh-mile |
| 2  | 1        | 2020   | 1       | 1      | 1      | Total PM2.5 | 0.044152       |
| 3  | 1        | 2020   | 1       | 1      | 2      | Total PM2.5 | 0.044179       |
| 4  | 1        | 2020   | 1       | 1      | 3      | Total PM2.5 | 0.044179       |
| 5  | 1        | 2020   | 1       | 1      | 4      | Total PM2.5 | 0.044214       |
| 6  | 1        | 2020   | 1       | 1      | 5      | Total PM2.5 | 0.044214       |
| 7  | 1        | 2020   | 1       | 1      | 6      | Total PM2.5 | 0.028208       |
| 8  | 2        | 2020   | 1       | 7      | 1      | Total PM2.5 | 0.049007       |
| 9  | 2        | 2020   | 1       | 7      | 2      | Total PM2.5 | 0.047895       |
| 10 | 2        | 2020   | 1       | 7      | 3      | Total PM2.5 | 0.047895       |
| 11 | 2        | 2020   | 1       | 7      | 4      | Total PM2.5 | 0.046441       |
| 12 | 2        | 2020   | 1       | 7      | 5      | Total PM2.5 | 0.046441       |
| 13 | 2        | 2020   | 1       | 7      | 6      | Total PM2.5 | 0.030816       |
| 14 | 3        | 2020   | 1       | 13     | 1      | Total PM2.5 | 0.040609       |
| 15 | 3        | 2020   | 1       | 13     | 2      | Total PM2.5 | 0.040632       |
| 16 | 3        | 2020   | 1       | 13     | 3      | Total PM2.5 | 0.040632       |
| 17 | 3        | 2020   | 1       | 13     | 4      | Total PM2.5 | 0.040661       |
| 18 | 3        | 2020   | 1       | 13     | 5      | Total PM2.5 | 0.040661       |
| 19 | 3        | 2020   | 1       | 13     | 6      | Total PM2.5 | 0.024339       |
| 20 | 4        | 2020   | 1       | 19     | 1      | Total PM2.5 | 0.043451       |
| 21 | 4        | 2020   | 1       | 19     | 2      | Total PM2.5 | 0.042375       |
| 22 | 4        | 2020   | 1       | 19     | 3      | Total PM2.5 | 0.042375       |
| 23 | 4        | 2020   | 1       | 19     | 4      | Total PM2.5 | 0.040970       |
| 24 | 4        | 2020   | 1       | 19     | 5      | Total PM2.5 | 0.040970       |
| 25 | 4        | 2020   | 1       | 19     | 6      | Total PM2.5 | 0.024820       |

hourID 1 = ON Off-Peak = 7 p.m. – 6 a.m.

hourID 7 = AM Peak = 6 a.m. – 9 a.m.

hourID 13 = MD Off-Peak = 9 a.m. – 4 p.m.

hourID 19 = PM Peak = 4 p.m. – 7 p.m.

**MOVES Emission Factors – Q2 (refer to Class Exercise Data.xlsx):**

|    | A        | B      | C       | D      | E      | F           | G              |
|----|----------|--------|---------|--------|--------|-------------|----------------|
| 1  | movesRun | yearID | monthID | hourID | linkID | pollutant   | Grams/veh-mile |
| 26 | 5        | 2020   | 4       | 1      | 1      | Total PM2.5 | 0.034592       |
| 27 | 5        | 2020   | 4       | 1      | 2      | Total PM2.5 | 0.034608       |
| 28 | 5        | 2020   | 4       | 1      | 3      | Total PM2.5 | 0.034608       |
| 29 | 5        | 2020   | 4       | 1      | 4      | Total PM2.5 | 0.034630       |
| 30 | 5        | 2020   | 4       | 1      | 5      | Total PM2.5 | 0.034630       |
| 31 | 5        | 2020   | 4       | 1      | 6      | Total PM2.5 | 0.017769       |
| 32 | 6        | 2020   | 4       | 7      | 1      | Total PM2.5 | 0.038779       |
| 33 | 6        | 2020   | 4       | 7      | 2      | Total PM2.5 | 0.037735       |
| 34 | 6        | 2020   | 4       | 7      | 3      | Total PM2.5 | 0.037735       |
| 35 | 6        | 2020   | 4       | 7      | 4      | Total PM2.5 | 0.036371       |
| 36 | 6        | 2020   | 4       | 7      | 5      | Total PM2.5 | 0.036371       |
| 37 | 6        | 2020   | 4       | 7      | 6      | Total PM2.5 | 0.019780       |
| 38 | 7        | 2020   | 4       | 13     | 1      | Total PM2.5 | 0.031273       |
| 39 | 7        | 2020   | 4       | 13     | 2      | Total PM2.5 | 0.031286       |
| 40 | 7        | 2020   | 4       | 13     | 3      | Total PM2.5 | 0.031286       |
| 41 | 7        | 2020   | 4       | 13     | 4      | Total PM2.5 | 0.031303       |
| 42 | 7        | 2020   | 4       | 13     | 5      | Total PM2.5 | 0.031303       |
| 43 | 7        | 2020   | 4       | 13     | 6      | Total PM2.5 | 0.014145       |
| 44 | 8        | 2020   | 4       | 19     | 1      | Total PM2.5 | 0.033724       |
| 45 | 8        | 2020   | 4       | 19     | 2      | Total PM2.5 | 0.032714       |
| 46 | 8        | 2020   | 4       | 19     | 3      | Total PM2.5 | 0.032714       |
| 47 | 8        | 2020   | 4       | 19     | 4      | Total PM2.5 | 0.031394       |
| 48 | 8        | 2020   | 4       | 19     | 5      | Total PM2.5 | 0.031394       |
| 49 | 8        | 2020   | 4       | 19     | 6      | Total PM2.5 | 0.014325       |

hourID 1 = ON Off-Peak = 7 p.m. – 6 a.m.  
 hourID 7 = AM Peak = 6 a.m. – 9 a.m.  
 hourID 13 = MD Off-Peak = 9 a.m. – 4 p.m.  
 hourID 19 = PM Peak = 4 p.m. – 7 p.m.

**MOVES Emission Factors – Q3 (refer to Class Exercise Data.xlsx):**

|    | A        | B      | C       | D      | E      | F           | G              |
|----|----------|--------|---------|--------|--------|-------------|----------------|
| 1  | movesRun | yearID | monthID | hourID | linkID | pollutant   | Grams/veh-mile |
| 50 | 9        | 2020   | 7       | 1      | 1      | Total PM2.5 | 0.029325       |
| 51 | 9        | 2020   | 7       | 1      | 2      | Total PM2.5 | 0.029336       |
| 52 | 9        | 2020   | 7       | 1      | 3      | Total PM2.5 | 0.029336       |
| 53 | 9        | 2020   | 7       | 1      | 4      | Total PM2.5 | 0.029350       |
| 54 | 9        | 2020   | 7       | 1      | 5      | Total PM2.5 | 0.029350       |
| 55 | 9        | 2020   | 7       | 1      | 6      | Total PM2.5 | 0.012018       |
| 56 | 10       | 2020   | 7       | 7      | 1      | Total PM2.5 | 0.032628       |
| 57 | 10       | 2020   | 7       | 7      | 2      | Total PM2.5 | 0.031625       |
| 58 | 10       | 2020   | 7       | 7      | 3      | Total PM2.5 | 0.031625       |
| 59 | 10       | 2020   | 7       | 7      | 4      | Total PM2.5 | 0.030314       |
| 60 | 10       | 2020   | 7       | 7      | 5      | Total PM2.5 | 0.030314       |
| 61 | 10       | 2020   | 7       | 7      | 6      | Total PM2.5 | 0.013142       |
| 62 | 11       | 2020   | 7       | 13     | 1      | Total PM2.5 | 0.028601       |
| 63 | 11       | 2020   | 7       | 13     | 2      | Total PM2.5 | 0.028611       |
| 64 | 11       | 2020   | 7       | 13     | 3      | Total PM2.5 | 0.028611       |
| 65 | 11       | 2020   | 7       | 13     | 4      | Total PM2.5 | 0.028624       |
| 66 | 11       | 2020   | 7       | 13     | 5      | Total PM2.5 | 0.028624       |
| 67 | 11       | 2020   | 7       | 13     | 6      | Total PM2.5 | 0.011221       |
| 68 | 12       | 2020   | 7       | 19     | 1      | Total PM2.5 | 0.031193       |
| 69 | 12       | 2020   | 7       | 19     | 2      | Total PM2.5 | 0.030199       |
| 70 | 12       | 2020   | 7       | 19     | 3      | Total PM2.5 | 0.030199       |
| 71 | 12       | 2020   | 7       | 19     | 4      | Total PM2.5 | 0.028901       |
| 72 | 12       | 2020   | 7       | 19     | 5      | Total PM2.5 | 0.028901       |
| 73 | 12       | 2020   | 7       | 19     | 6      | Total PM2.5 | 0.011588       |

hourID 1 = ON Off-Peak = 7 p.m. – 6 a.m.

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hourID 13 = MD Off-Peak = 9 a.m. – 4 p.m.

hourID 19 = PM Peak = 4 p.m. – 7 p.m.

**MOVES Emission Factors – Q4 (refer to Class Exercise Data.xlsx):**

|    | A        | B      | C       | D      | E      | F           | G              |
|----|----------|--------|---------|--------|--------|-------------|----------------|
| 1  | movesRun | yearID | monthID | hourID | linkID | pollutant   | Grams/veh-mile |
| 74 | 13       | 2020   | 10      | 1      | 1      | Total PM2.5 | 0.033436       |
| 75 | 13       | 2020   | 10      | 1      | 2      | Total PM2.5 | 0.033451       |
| 76 | 13       | 2020   | 10      | 1      | 3      | Total PM2.5 | 0.033451       |
| 77 | 13       | 2020   | 10      | 1      | 4      | Total PM2.5 | 0.033470       |
| 78 | 13       | 2020   | 10      | 1      | 5      | Total PM2.5 | 0.033470       |
| 79 | 13       | 2020   | 10      | 1      | 6      | Total PM2.5 | 0.016506       |
| 80 | 14       | 2020   | 10      | 7      | 1      | Total PM2.5 | 0.037276       |
| 81 | 14       | 2020   | 10      | 7      | 2      | Total PM2.5 | 0.036242       |
| 82 | 14       | 2020   | 10      | 7      | 3      | Total PM2.5 | 0.036242       |
| 83 | 14       | 2020   | 10      | 7      | 4      | Total PM2.5 | 0.034890       |
| 84 | 14       | 2020   | 10      | 7      | 5      | Total PM2.5 | 0.034890       |
| 85 | 14       | 2020   | 10      | 7      | 6      | Total PM2.5 | 0.018157       |
| 86 | 15       | 2020   | 10      | 13     | 1      | Total PM2.5 | 0.030603       |
| 87 | 15       | 2020   | 10      | 13     | 2      | Total PM2.5 | 0.030615       |
| 88 | 15       | 2020   | 10      | 13     | 3      | Total PM2.5 | 0.030615       |
| 89 | 15       | 2020   | 10      | 13     | 4      | Total PM2.5 | 0.030631       |
| 90 | 15       | 2020   | 10      | 13     | 5      | Total PM2.5 | 0.030631       |
| 91 | 15       | 2020   | 10      | 13     | 6      | Total PM2.5 | 0.013413       |
| 92 | 16       | 2020   | 10      | 19     | 1      | Total PM2.5 | 0.033724       |
| 93 | 16       | 2020   | 10      | 19     | 2      | Total PM2.5 | 0.032714       |
| 94 | 16       | 2020   | 10      | 19     | 3      | Total PM2.5 | 0.032714       |
| 95 | 16       | 2020   | 10      | 19     | 4      | Total PM2.5 | 0.031394       |
| 96 | 16       | 2020   | 10      | 19     | 5      | Total PM2.5 | 0.031394       |
| 97 | 16       | 2020   | 10      | 19     | 6      | Total PM2.5 | 0.014325       |

hourID 1 = ON Off-Peak = 7 p.m. – 6 a.m.  
 hourID 7 = AM Peak = 6 a.m. – 9 a.m.  
 hourID 13 = MD Off-Peak = 9 a.m. – 4 p.m.  
 hourID 19 = PM Peak = 4 p.m. – 7 p.m.

***Meteorology:***

- St. Louis, Missouri, 2006 – 2010 Meteorology
  - STL2006-2010.met
  - Surface Station Number – 13994
  - Upper Air Station Number – 4833

***Run CAL3QHCR:***

- Step 1 – Create an Input File, \*.INP
  - May use CheaterExcelTemplateFile.xlsx or CheaterInputFile.inp provided
- Step 2 – Create a Batch File for executing the CAL3QHCR run, \*.BAT
- Step 4 – Execute the Batch File created in Step 2
- Summarize the Highest PM<sub>2.5</sub> Concentrations
  - 5-yr average highest 24-hour by quarter
  - 5-yr average annual